U.S. Army. Signal Corps.

ANNUAL REPORT, 1881|82

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OF THE

CHIEF SIGNAL OFFICER,

UNITED STATES ARMY,

TO THE

SECRETARY OF WAR,

FOR THE

FISCAL YEAR ENDING JUNE 30, 1882.

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Annual Report of the Chief Signal Officer, U.S. Army Signal Corps

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REPORT

OF THE

CHIEF SIGNAL OFFICER OF THE ARMY.

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, D. C., September 15, 1882.

SIR: Since my last annual report the Signal Service has greatly increased its usefulness. What advance has been made, however, has been in spite of difficulties greater than have been experienced since the organization of the weather service. Although the work of the corps has grown, there are fewer officers to do it, and for the fiscal year 1883 I have $55,000 less for observation and report of storms than was actually expended in 1880, 1881, or 1882. Eleven new stations have been added, special reports are made for the cotton and tobacco growing regions of the country, and the means for giving warnings to the cattle raisers of Texas against the approach of "northers" have been improved, and now it is expected that the increased work is to go on, and that the service is to continue meeting the growing demands of the country upon it with a smaller appropriation than it has had for a number of years.

For several months two officers only have been available for "indication" work. The wearing duties of weather prediction ought not to be thus imposed. The exactions of the work are so great that two men, or even three, must soon wear out under them. The weather service of the country ought not to be dependent on the health of two officers. When all the instructed officers of the corps—those who are prepared to make weather indications—are in Washington, there are seven. One, Lieutenant Greely, is at Lady Franklin Bay, and it is expected that he will remain there two years longer. Another, Lieutenant Powell, is in command of the supply expedition that has gone to Point Barrow. He is expected back this fall, when there will be six indication officers on duty in Washington. The time of all these officers should be completely occupied in scientific work. The data collected by the weather bureau should be constantly studied for the purpose of determining accurately the laws that govern storms. The accumulations are so great that at least three of the six officers could find constant employment in their study. Three instructed officers are now doing administrative work. Their places should be supplied by others.

It is hoped that, in time, all the officers of the corps will be instructed meteorologists; but until that time shall come, it will be necessary to rely on details of uninstructed officers for the performance of the administrative work of the office. At least three officers are needed for this purpose now, and I respectfully suggest the detail of that number. One of these will take the place of Lieutenant W. E. Birkhimer, who had charge of the military telegraph lines.

The force employed at the office to carry on the work of the different divisions numbers one hundred and thirty-four men, and it is hardly sufficient to conduct the growing business of the service. This force receives and files three hundred and sixty-one daily service telegraphic reports, an increase since last year of one hundred and fourteen; eight hundred and seventy-four international daily simultaneous reports, an increase of three hundred and fifty-three; seventy-four reports from the medical corps of the army, a decrease of nine; forty-five reports from United States naval observers, an increase of nine. These make a total of 1,499 reports. All the telegraphic reports come in cipher and must be translated before they can be used. The cipher is used for purposes of economy. All the reports from the regular stations of the Signal Service, from four hundred and ninety-two points from which voluntary observers send daily reports, and from three hundred and eighty-two foreign places from which reports of daily simultaneous observations are sent, come to this office. From this great collection of data are made the weather forecasts that are sent to the daily press by telegraph, the charts and bulletins, and the daily, weekly, and monthly publications of the office. With the weather forecasts the system of cautionary signals ought to be mentioned, for they are based on the same data.

The duty of inspecting the stations of the Signal Service is very important. It cannot be performed by the regular inspecting officers of the army, for it involves the examination of the instruments at each station, and their comparison with standards which the inspecting officer carries with him from the instrument room of this office. This duty must be performed by officers who are instructed in the use of the instruments employed by the service, in signaling, and in telegraphy. All the officers who were especially depended on for this work have been relieved from duty since I assumed charge of the Signal Service. Their places should be filled at once, and I think it necessary that I should have at least two officers detailed for this purpose. At present there is no one properly available for inspection duty, unless he shall be taken from scientific work of a higher character, for the doing of which he has received special instruction.

The difficulties of the service are largely to be accounted for by reason of the defective organization of the corps. It is probably the only corps of an army that has two grades of rank alone for its officers. Between the chief, who is a brigadier-general, and the second lieutenants, who come from the enlisted men, there are no grades. All other officers connected with the service are detailed from the line of the army. This

state of affairs is satisfactory neither to the line of the army nor to this corps. How it has affected the Signal Service is shown in its poverty of officers. How it affects the line of the army is shown by the objections made whenever a detail of an officer is asked for. As the corps is of the army it ought to have a complement of officers of its own. Its usefulness ought not to depend on details from other branches of the service. The bills which have been reported favorably from the military committees of both the Senate and House of Representatives embody the correct principle of organization. There should be not only other grades between the brigadier-generalship and the second lieutenancies, but the second lieutenants ought to be in a line of promotion. Under the existing law an enlisted man can never reach a higher rank than second lieutenant, an anomaly in military organization.

In his last annual report, the Secretary of War recommended to Congress that the corps should have a permanant organization. It is necessary that the army should always possess such a body of men as is found at present in this corps, instructed in the use of signals and in telegraphy. The constant study of this subject in Europe has so far developed the art which received a great impetus from the operations of this corps during the war of the rebellion, that a well-trained signal corps is an essential feature of every army. Our own army is to be congratulated that its signal corps has found a field of activity in peace that maintains its discipline and keeps full its ranks. The military duties of the corps are strictly performed. The post at Fort Myer is under thoroughly good discipline. The battalion is organized and under drill. And while the military feature of the corps is thus preserved, because it is of the first importance, its scientific work is done better than that of any other meteorological service in the world. Its weather predictions are from 20 to 25 per cent. nearer accuracy than the predictions of any other service. The average of verified indications for the fiscal year ending June 30, 1882, was 88.2 per cent.

The answer to those who talk of giving the weather work to a civil bureau is, that the work is well done in the army; that the observers could not be kept on some of the more exposed stations if they were not soldiers and under orders; and that while now the entire cost to the government of the men who do the work is less than $450,000 a year, the cost of the salaries alone of the same number of civilian clerks would amount to more than $600,000. I trust that at the coming session, Congress will take speedy and friendly action on a subject of such great importance to the army, and to the commercial and agricultural interests of the country.

SCHOOL OF INSTRUCTION AT FORT MYER.

The school of instruction at Fort Myer has been reorganized, and the course of instruction for both officers and enlisted men of the Signal Corps has been extended to include those branches which, when thoroughly understood, will render the services of the signal officers

more valuable in time of war, and prepare the enlisted men of the Signal Corps for original investigation in the science of meteorology.

The course of military signaling has been supplemented by a course of military surveying, field reconnoissance, and use of instruments, which will add to the efficiency of all officers instructed at this school.

The value of military signaling in time of war has been conclusively demonstrated in recent military operations, and I have directed that special attention be given to this subject in the course of study at this post.

The value of the heliograph in maintaining long lines of communication by means of sun flashes has been demonstrated both at Fort Myer and in active campaigns against the Indians in Arizona. Instruments were furnished by this office to the officer in charge of the military telegraph line in Arizona, and to Lieutenant Maus, who reports the results of his experiments (see appendix No. 1).

Lieutenant Maus reports that he communicated messages over ranges of from twenty-five to forty miles, and states that in his opinion, with the advantages which this section offers for the selection of stations, the distance could be extended to sixty miles and the messages read without the aid of a glass. A description of the instrument used will be found in appendix No. 2. This mode of communication has been used by the United States Coast Survey, in the work of triangulation during the past forty years, and over lines ranging from twenty to one hundred and ninety-two miles in length.

The course of instruction, as now arranged, will place at the disposition of the War Department a force of five hundred men carefully selected, thoroughly disciplined as soldiers, qualified not only to perform the duties of the Signal Service in time of peace, but trained in military signaling and able to assume charge of signal parties and operate military telegraph lines should such service be required.

The enlisted men of the Signal Corps are selected after careful examination as to their mental and physical qualifications. With a view of raising the standard of the *personnel* of the enlisted force of the Signal Corps, I have solicited the co-operation of the presidents of the various colleges throughout the country, bringing to their attention the opportunities which this service presents to young graduates. A number of young men, qualified for the pursuit of scientific studies, have been secured for two classes organized at Fort Myer, and it is believed that a continuation of this plan will add much to the value of the work of this service. Enlisted men, except those of the permanent party, are required to pass a course of preliminary training in drill and signal duties, field-telegraphy, and meteorology.

The enlisted force of the Signal Corps is of unusually high character, and I desire to fill vacancies by the enlistment of young men of good college standing, who, with minds already disciplined, possess those manly qualities without which learning and industry are so often perverted to unworthy ends. I hope, in this way, to furnish from the

ranks of the Signal Corps, men who may take high standing in the science of meteorology.

All men enlisting in the Signal Corps are required to pass a preliminary physical examination. Those who are not college graduates are subjected to a preliminary mental examination. The latter examination is held at this office, and is chiefly directed to accurate spelling, legible handwriting, proficiency in arithmetic, English grammar, history, and geography. After completing the course of instruction at Fort Myer, they are further taught, by experience and study, the duties of assistants on station. They are held to a rigid observance of duty under careful discipline at their several stations. As vacancies occur in the list of sergeants they are filled by selection from the corporals or first-class privates, who, after finishing the course of instruction at Fort Myer, have served at least one year on station, and who have been distinguished for fidelity and ability in the discharge of their duties.

The military duties at this school are performed in strict accordance with the Articles of War and Army Regulations. Each enlisted man of the corps is furnished with a copy of the "Hand-book for the Signal corps," containing the Articles of War and selected paragraphs from the Army Regulations, with which every soldier should be conversant. The course of instruction embraces cavalry drill, mounted and dismounted, artillery (standing gun drill), and duties of guards. The military instruction continues during the whole term of service at Fort Myer. After two months military duty each recruit is placed under instruction which renders him competent to perform signal duties. This course of instruction is as follows: Manual of Signals, International Code of Signals, Hand-Book of Practical Telegraphy, Modern Practice of the Electric Telegraph, Meteorology, and Instructions to Observers. A special course of lectures on subjects relating to meteorology and allied sciences now forms a part of the regular instruction. Appendices Nos. 3, 4, 5, 6, and 7 present a general summary of the lectures delivered during the past year. The enlisted men, excepting those of the permanent party, are instructed in the use and connection of repeaters, telephones, and call-bells; use, construction, and connection of telegraph instruments; climbing, building, and repair of land lines; application of lightning-conductors to lines and offices; methods of splicing and connecting sub-marine cables and land lines; establishing terminal and intermediate stations, and finding the position of, and repairing faults in, telegraph lines and instruments. All duties are performed under the direction of an officer and in accordance with military rule, and neglects are punished under the rules and articles of war. It is owing to this speedy method of punishment for neglect or failure to properly perform duty that this service is enabled to control a force of men detached as are the observers of the Signal Service, serving in every state and territory of the United States. The tri-daily telegraphic reports required from the several stations are roll-

calls of the command, and failure to receive reports at this office from any station is followed by such action as the case may require.

During the past year the commanding officer has had, in addition to his regular duties, immediate charge of all instruction at the post, and has attended personally to matters of detail as far as practicable. The average number of men for duty was fifty-seven. Much embarrassment has been caused by the frequent change of instructors during the year. First Lieutenant B. H. Gilman, 13th Infantry, Acting Signal Officer, the only experienced officer available for this duty, was relieved from signal duty November 1 and ordered to his regiment. Second Lieutenant James A. Swift, Signal Corps, has continued as instructor in telegraphy and other branches, and has also performed the duties of Acting Assistant Quartermaster and Acting Commissary of Subsistence. The class of officers detailed for instruction under General Orders No. 26, War Department, 1881, reported for duty during the month of May, and entered at once upon the course of instruction. Three officers of this class were relieved and ordered to their regiments before completing the course, and General Orders No. 26, Adjutant General's Office, were revoked February 10, 1882, before the completion of the first year's course of instruction. I am confirmed in the view hitherto expressed that instruction in field signaling and telegraphy, to be successfully carried on, should be confided to officers first carefully instructed themselves, and responsible to the Chief Signal Officer for the discharge of their duties as instructors. I would therefore respectfully recommend the re-establishment of the School of Instruction provided for by General Orders No. 26, Adjutant General's Office, series of 1881.

During the year sixty-eight men have been fully instructed in station duties. Of this number forty-two have been ordered to duty on station, leaving twenty-six awaiting orders.

The practice-line and sea-coast loop, referred to in my last annual report, have been completed, and are now in successful operation. The barracks have been greatly improved and the rooms sub-divided so as to reduce the number of men in each room; this arrangement is best in view of the character and amount of the study required of the men. On the 10th of October, 1881, the commanding officer of Fort Myer, with two officers and thirty enlisted men and one section of field-telegraph train, proceeded to Yorktown, and reported to Major General W. S. Hancock, United States Army. Field-telegraph lines were erected connecting the different headquarters of the camp at Yorktown, and five stations were opened on the line, which was successfully operated during the ceremonies. Connection was also made with the Western Union telegraph office at Yorktown, thus placing all stations in the camp in connection with the cities of the country. Flag signal stations were also established in the harbor, which reported the arrival of distinguished guests in time to enable the officials to prepare for their reception. The detachment performed its duties in a very sat-

isfactory manner, and received the thanks of General Hancock for its services.

The School of Instruction at Fort Myer should be maintained in a high state of efficiency, and I earnestly recommend the detail of a competent officer to perform the duties of instructor at that post.

The annual report of 1st Lieutenant R. P. Strong, 4th Artillery, Acting Signal Officer, the officer in command at Fort Myer during the past year, will be found in appendix No. 8.

CORRESPONDENCE AND RECORD DIVISION.

The work of the Correspondence and Record Division of this office has increased about fifty per cent. The accumulation of data from the observations of past years naturally leads to many requests from investigators of all classes for information regarding the meteorological record of different sections of this country. There is also a large increase in the number of persons whose interest in meteorology creates new correspondence in the form of offers of daily observations of a more or less limited extent, or in the form of inquiries regarding the methods, instruments, etc., best suited to this work. There is also a very large increase in correspondence relating to enlistments.

The series of General Orders, Special Orders, and Instructions have been printed with uniformity of style and in number sufficient to meet the wants of the service, thus reducing the amount of clerical labor and securing greater correctness of text; and the clerical force formerly employed has been made available for other more important work.

The series of Professional Papers promised last year has been published, as elsewhere reported, and great care will be taken to secure accuracy in facts and language—all these being edited in the copy and proof. The Signal Service Notes will receive the same careful revision.

The rules of the War Department for keeping records are now rigidly followed in this office.

Appendix No. 9 exhibits the number and character of communications sent from and received at the office of the Chief Signal Officer (exclusive of telegrams). The office continues in communication with a number of foreign correspondents, and is co-operating with the chiefs of the meteorological services of the world, for the extension of the system of simultaneous reports inaugurated by the War Department of the United States in 1873.

Preparation of statistics and reports for the use of individuals, institutions, and journals has been continued as in former years. The number of applications for information on various subjects, and for copies of meteorological data collected in this office from the various stations, has increased; and these requests (frequently requiring days of labor to enable the office to furnish the records required) have uniformly been complied with. A record of the data so furnished is exhibited in appendix No. 10.

These records have frequently been furnished to persons interested in the study of meteorology, and the deductions made by distinguished scholars based upon data so furnished have proved valuable in the execution of the meteorological work of this office. A list of the correspondents of this office, to whom the publications are furnished, contains the names of many of the leading scholars and scientific men of the world. The most interesting papers on the subject of meteorology read before the National Academy of Sciences have been prepared from data and charts furnished from this office.

Copies of records for use as evidence.

A large number of subpœnas are constantly issued by the courts in the trial of civil or criminal cases, for the production of the meteorological records of Signal Service stations. These are generally made in ignorance of the fact that the original records of the observations are not retained at the stations but are sent to and kept in this office, a copy being made and retained at the station. This station copy is not so authenticated as to make it a proper copy for evidence; but the law (Revised Statutes, 1878, section 882) provides that "copies of any books, records, papers, or documents in any of the executive departments, authenticated under the seals of such departments, respectively, shall be admitted in evidence equally with the originals thereof," and this office has arranged, with the consent and authority of the Secretary of War, for furnishing legal copies of the original record at the shortest notice. It seems highly important that the bench and bar should be publicly informed of these facts, and of the strong desire and ability of this office to furnish such legal copies.

The records of the Signal Service, when properly authenticated by the seal of the War Department, are now received as evidence in the courts of the United States. Mr. Justice Strong, in delivering the opinion of the court in the case of Evanston *vs.* Gunn, remarks:

> The record admitted in this case was not a private entry or memorandum. It had been kept by a person whose public duty it was to record truly the facts stated in it. Sections 221 and 222 of the Revised Statutes require meteorological observations to be taken at the military stations in the interior of the continent and at other points in the states and territories, for giving notice of the approach and force of storms. The Secretary of War is also required to provide, in the system of observations and reports in charge of the Chief Signal Officer of the Army, for such stations, reports, and signals as may be found necessary for the benefit of agriculture and commercial interests. Under these acts a system has been established, and records are kept at the stations designated, of which Chicago is one. Extreme accuracy in all such observations and in recording them is demanded by the rules of the Signal Service, and it is indispensable in order that they may answer the purposes for which they are required. They are, as we have seen, of a public character, kept for public purposes, and so immediately before the eyes of the community that inaccuracies, if they exist, could hardly escape exposure. They come, therefore, within the rule which admits in evidence 'official registers or records kept by persons in public office in which they are required, either by statute or by nature of their office, to write down particular transaction occurring in the course of their public duties or under their personal observation.' Taylor, Evid., sect. 1429; 1 Greenl., Evid., sect. 483. To entitle them to admission, it is not necessary that a statute requires them to be kept. It is sufficient that they are kept in the discharge of a public duty. 1 Greenl., Evid., sect. 496. Nor need they be kept by a public officer himself, if the entries are made

under his direction by a person authorized by him. *Galt* v. *Gallomay*, 4 Pet., 332. It is hardly necessary to refer to judicial decision illustrating the rule. They are numerous. A few may be mentioned. *DeArmond* v. *Nesmith*, 32 Mich., 231; *Gurney* v. *House*, 9 Gray (Mass.), 404; *The Catharine Maria*, Law Rep., 1 Ad. & Ec., 53; *Cliquot's Champagne*, 3 Wall., 114. We think, therefore, that there was no error in admitting the record kept by the person employed for the purpose by the United States Signal Service.

* * * * * * * * * * * *

Judgment affirmed.

Observers of the Signal Service are instructed that the records which they keep are part of the records of the War Department, and that by law they are in the custody of the Secretary of War; they are not open to unauthorized inspection, nor are observers to produce them in the courts, upon subpœnas, without authority of the War Department.

The work of meteorological observation must be made at fixed hours, and the reports, to be of value, must make up a continuous series; therefore, observers are instructed to make a respectful return to any subpœnas demanding the production of their stations records, stating that such records belong to the War Department and cannot be produced without the authority of the Secretary of War, but that authenticated copies of the records may be immediately supplied, as provided by the statute.

In a few cases during the past year, the observers have been summoned to produce the orginal record in court at points far distant from their stations—this, where there is but one instructed man on station, and in cases where the original record was not at the station, but at this office. It is believed that these facts should be better known. The men should only be called away from their duties in cases of absolute necessity, as their absence breaks the continuity of the station records.

ECONOMY OF ADMINISTRATION.

To insure a more rigid and exact scrutiny of accounts prior to payment—which, from their great number, cannot be examined by the Chief Signal Officer—an officer of the army, Captain J. W. Powell, jr., 6th Infantry, was assigned, December 1, 1881, to duty as examiner of accounts. Included in the other accounts assigned him for examination are all vouchers for money, receipts, and expenditures pertaining to the military telegraphs under the control of this bureau, and of returns of signal property received and issued.

Two enlisted men of the Signal Corps, and one civilian at sixty dollars per month, are allowed as clerks.

Payments are now made by the property and disbursing officer, only when authorized under the written signature of the Chief Signal Officer, or after examination, correction, and record by the examiner, and after comparison with the original accounts from telegraph companies. These last aggregate large amounts, and were at one time the means used for defrauding the government. In addition, these ac-

counts are also, prior to payment, audited by the officer in charge of the telegraph division, who certifies the amounts due but has no further connection with them. Similarly, with regard to services rendered by civilian observers in the United States, Great Britain, Germany, and the West Indian Islands, the officer in charge of the division receiving the report certifies the accounts. All of these accounts, after payment, are verified by the examiner by comparison with disbursements made by the purchasing and disbursing officer before their transmittal to the Treasury Department.

Disbursements by officers in charge of the military telegraph lines require authorization by the Chief Signal Officer in advance, except for purchases for lights and fuel, and purchases made in cases of emergency. Vouchers for all these disbursements and transfers, and for receipts from tolls derived from the use of the lines for commercial purposes, are carefully scrutinized and verified by comparison with the accounts current of the officers in the examiner's office before their transmission to the Treasury Department. This system has caused a marked economy in the management of these lines. The examination of signal property returns, also made in this office, makes certain that all articles received by officers, either by purchase or transfer, are taken up on their returns and accounted for until disposed of in accordance with the Regulation of the Army.

Under these regulations, established by the Chief Signal Officer, it is believed to be impossible that either errors or frauds can be committed.

Aggregate cash audits recorded in the examiner's office from December 3, 1881, to June 30, 1882	$254,960 60
Number of vouchers on which payments were made	5,162
Number of requisitions entered	1,214
Number of property returns examined and transmitted to the Third Auditor of the Treasury, pertaining to period ending June 30, 1882	471

Other returns partially examined or held pending explanation of discrepancies.

Number of accounts current examined and passed, pertaining to the period ending June 30, 1882:

Texas division	23
Northwestern division	15
California and Arizona division	18
Property and Disbursing officer, Signal Service, Washington	15
Fort Klamath and Ashland division	2

Other returns partially examined and held pending explanation of discrepancies.

Letters sent, Examiner's Division	1,293
Letters received, Examiner's Division	1,135

Much opposition was developed in Congress this year to giving the full amount necessary for the work and maintenance of the Signal Corps, because, as alleged, its expenditures were not definitely under-

stood. I therefore append as elaborate a statement of costs as space will permit:

Pay of officers	$55,417 00
Cost of 509 enlisted men, including their pay, clothing, subsistence, fuel, quarters, medicines, and medical attendance	441,147 03
Pay of civilians in main office, including professors, computers, clerks, printers, messengers, janitors, watchmen, and laborers	40,000 00
Special pay of clerks otherwise provided	10,660 00
Transportation of instruments and Signal Service men to their stations, and of telegraph material in constructing lines of telegraph, and of officers on tours of inspection	63,511 81
Repairs at post of Fort Myer	3,000 00
Rents paid at Washington for offices occupied	6,379 96
Construction, maintenance, and repair of military telegraph lines on the frontier	50,000 00
Manufacturing of meteorological and philosophical instruments, $1,000; purchase of instruments, $7,000, and repair of instruments, $1,000	9,000 00
Cost of cipher telegraphic weather reports received at this office, $81,000; of messages pertaining to same, $36,000; of extra (night) services of operators, $36,000; leases of telegraph lines, $15,000	168,000 00
Pay of cautionary signal observers	6,500 00
Cost of cautionary flags and lanterns	4,000 00
Incidental expenses of cautionary stations	500 00
Repairs in continuing the establishment and connection of stations at life-saving stations	4,000 00
Materials for lines connecting life-saving stations	9,000 00
Incidental expenses at these stations	1,000 00
Maintaining 140 meteorological stations: For hire of offices, $30,000; for fuel for offices, $6,000; for light for offices, $4,000; for supplies, repairs, &c., $5,000; for contingent expenses, $1,500	46,500 00
Pay of river observers	3,000 00
Incidentals at river stations	1,000 00
Cost of maps, bulletins, &c., for display and distribution: For paper, $17,000; printing material, $4,000; hire of printers, $2,000, and of incidentals at printing stations, $1,000	24,000 00
Meteorological books and publications	1,000 00
Miscellaneous stationery	5,000 00
For equipment and expenses of cotton-belt stations: For instruments, $3,500, and pay of observers, $7,000	10,500 00
For instruments, pay of observers, making reports on flood and frost warnings in the tobacco, sugar, and fruit interests	11,000 00
Incidentals not otherwise provided for	4,000 00
For military signaling: Purchase, repair, and manufacture of equipments and stores and maintenance of field-telegraph trains, &c., in the army at large	10,500 00

In addition to the above, especial provision is made by Congress of $33,000 for "Exploration and observation in the Arctic seas." This work was originated by Congress and assigned to the Signal Service,

but it forms no part of the regular duties of the bureau. Its annual average cost is about the amount appropriated, and is a part of the International Polar Commission's work.

The average cost of maintaining each station of observation during the year, exclusive of cost of telegraph services, and of the pay and maintenance of the men on duty at each, has been $339.95.

The sum of two hundred and seventy-six dollars and fifty-nine cents ($276.59) has been received during the year ending June 30, 1882, from the sales of maps and other office publications, in accordance with the act of Congress, approved March 3, 1874.

The many inquiries received as to the manner of procuring the publications of this office, indicate the want of a general knowledge of the fact that the sale of copies of any, or all of its publications, or of maps or papers regularly issued by it, is authorized by law to be made to any applicant, upon the payment of the actual cost of printing.

STATIONS DIVISION.

Signal Service stations.

The total number of stations in operation June 30, 1882, within the territory of the United States, and maintained for the Signal Service, was four hundred and ninety-five, including those upon the telegraph lines in charge of this office and the special river, cautionary display, cotton-belt, and sunset stations, from which reports are regularly received. Reports are received from eighteen additional stations established by the authorities of the Dominion of Canada, also from one at St. John's, N. F., and one at York Factory, B. A. Telegraphic reports have been regularly received throughout the year from one, and mail reports from two, stations located in the West Indian islands, and, during the seasons of tropical storms, telegraphic reports were received from five stations in this region. The number of stations from which telegraphic reports are received at this office daily is one hundred and fifty-two.

Eleven full reporting stations have been established and nine discontinued during the year.

In response to numerous requests, the number of stations in Alaska has been increased to four stations of the first-class, thirteen of the second-class, and four of the third-class.

Telegraphic reports received from the regular telegraphic-reporting stations, daily, are at once utilized in the preparation of the weather forecasts and for the display of cautionary signals when necessary, and the records forwarded by mail to this office are carefully examined, tabulated, and published each year, thus affording opportunities for all who may be interested to become familiar with the climatology of the country. With the continuation of the observations they become more valuable from year to year, and form a basis for the study of the science of meteorology.

The following summary shows the number of stations in operation at the close of the year ending June 30, 1882:

General summary showing the number of Signal Service stations in the United States in operation on June 30, 1882.

Stations taking five observations daily and making full reports, three times a day by telegraph and monthly by mail	115
Stations taking five observations daily and making full reports, once a day by telegraph and monthly by mail	1
Stations taking five observations daily and reporting monthly by mail	12
Stations on the United States military telegraph lines taking three observations daily, reporting three times a day by telegraph and monthly by mail	22
Stations on the United States military and sea-coast telegraph lines taking three observations daily and reporting monthly by mail	18
Stations taking three observations daily and reporting by mail as opportunity offers	1
Stations on the United States military and sea-coast lines taking sunset observations only and reporting monthly by mail	3
Printing stations taking sunset observations only and reporting monthly by mail	3
Stations on the United States military and sea-coast telegraph lines at which observations of the maximum and minimum temperatures and amount of precipitation are taken daily at the hour of sunset	33
Repair stations on the United States military telegraph lines at which no observations are taken	40
Supply stations	1
Second-class stations in Alaska at which two observations are taken daily	8
Third-class stations in Alaska at which one observation is taken daily	4
Sunset stations	3
Cautionary display stations	74
Special river stations	30
Cotton-belt stations	127
Total	495

The following is a classified list of the stations of the Signal Service, exclusive of cotton-belt stations, which are enumerated in appendix No. 11.

The figures 1, 2, 3, 4, 5, or 6, placed after the names of certain stations, indicate as follows:

1. Cautionary signal stations.
2. Observations of water temperature taken daily.
3. Observations of stage of water taken daily.
4. United States military telegraph stations.
5. Printing stations—Farmers' Bulletin.
6. United States sea-coast telegraph stations.

Classified list of stations of the Signal Service, United States Army, in operation on June 30, 1882:

Stations taking five observations daily, and making full reports three times a day by telegraph, and monthly by mail: Albany, New York, 5; Alpena, Michigan, 1, 2; Atlanta, Georgia; Atlantic City, New Jersey, 1, 2, 6; Augusta, Georgia, 3; Baltimore, Maryland, 1, 2, 6; Barnegat, New Jersey, 1, 6; Bismarck, Dakota, 4; Block Island, Rhode Island, 1, 6; Boston, Massachusetts, 1, 2, 5; Buffalo, New York, 1, 2, 5; Burlington, Vermont, 2; Cairo, Illinois, 3; Cape Henry, Virginia, 1, 6; Cedar Keys, Florida, 1, 2; Champaign, Illinois; Charleston, South Carolina, 1, 2; Charlotte, North Carolina; Chattanooga, Tennessee, 3; Cheyenne, Wyoming; Chicago, Illinois, 1, 2, 5; Chincoteague, Virginia, 1, 2, 6; Cincinnati, Ohio, 3, 5; Cleveland, Ohio, 1, 2; Columbus, Ohio; Davenport, Iowa, 3; Deadwood, Dakota, 4; Delaware Breakwater, Delaware, 1, 2, 6; Denver, Colorado; Des Moines, Iowa, 5; Dodge City, Kansas, 4; Duluth, Minnesota, 1, 2; Eagle Rock, Idaho; Eastport, Maine, 1, 2; Erie, Pennsylvania, 1; Escanaba, Michigan, 1, 2; Fort Macon, North Carolina, 1, 6; Fort Smith, Arkansas, 3; Fort Washakie, Wyoming; Galveston, Texas, 1; Grand Haven, Michigan, 1, 2; Hatteras, North Carolina, 1, 6; Huron, Dakota; Indianapolis, Indiana; Indianola, Texas, 1, 2; Jacksonville, Florida, 1, 2; Keokuk, Iowa, 3; Key West, Florida, 1, 2; Kittyhawk, North Carolina, 1, 6; Knoxville, Tennessee; La Crosse, Wisconsin, 3; Leavenworth, Kansas, 3, 5; Little Rock, Arkansas, 3; Los Angeles, California; Louisville, Kentucky, 3; Lynchburg, Virginia; Marquette, Michigan, 1, 2; Memphis, Tennessee, 3, 5; Milwaukee, Wisconsin, 1, 2; Montgomery, Alabama; Moorhead, Minnesota; Mount Washington; New Hampshire; Nashville, Tennessee, 3, 5; New Haven, Connecticut, 1, 2; New Orleans, Louisiana, 1, 3; New York, New York, 1, 2, 5; Norfolk, Virginia, 1, 2, 6; North Platte, Nebraska; Olympia, Washington territory; Omaha, Nebraska, 3; Oswego, New York, 1; Palestine, Texas; Pensacola, Florida, 1, 2; Philadelphia, Pennsylvania, 5, 6; Pioche, Nevada; Pittsburg, Pennsylvania, 3, 5; Port Eads, Louisiana, 1; Port Huron, Michigan, 1; Portland, Maine, 1, 2; Portland, Oregon, 3; Prescott, Arizona, 4; Provincetown, Massachusetts, 1, 2; Punta Rassa, Florida; Red Bluff, California, 3; Roseburg, Oregon; Sacramento, California; Saint Louis, Missouri, 3, 5; Saint Paul, Minnesota, 3; Saint Vincent, Minnesota; Salt Lake City, Utah; San Antonio, Texas, 4; San Diego, California, 4; Sandusky, Ohio, 1, 2; Sandy Hook, New Jersey, 1, 2, 6; San Francisco, California, 2, 5; Santa Fé, New Mexico; Savannah, Georgia, 1, 2; Shreveport, Louisiana, 3; Silver City, New Mexico, 4; Smithville, North Carolina, 1, 2, 6; Springfield, Illinois; Springfield, Missouri; Starkville, Mississippi; Toledo, Ohio, 1, 2; Tucson, Arizona; Umatilla, Oregon, 3; Vicksburg, Mississippi, 3; Visalia, California; Washington, District of Columbia, 5, 6; West Las Animas, Colorado; Williamsport, Pennsylvania; Wilmington, North Carolina, 1, 2, 6; Winnemucca, Nevada; Yankton, Dakota, 3; Yuma, Arizona, 3.

Stations taking five observations daily and reporting by mail monthly: Boisé City, Idaho; Detroit, Michigan, 1, 2, 5; Madison, Wisconsin;

Mobile, Alabama, 1, 2; Morgantown, West Virginia, 3; New London, Connecticut, 1, 2; Newport, Rhode Island, 1, 2; Pike's Peak, Colorado; Rochester New York, 1; Sitka, Alaska; Springfield, Massachusetts; Thatcher's Island, Massachusetts, 1, 2, 6.

Stations taking five observations daily and making full reports, once a day by telegraph and monthly by mail: Dubuque, Iowa, 3.

Stations on the United States military telegraph lines taking three observations daily, reporting three times a day by telegraph, and monthly by mail: Brownsville, Texas; Concho, Texas; Denison, Texas; Eagle Pass, Texas; El Paso, Texas; Fort Apache, Arizona; Fort Assininiboine, Montana; Fort Bennett, Dakota; Fort Benton, Montana; Fort Buford, Dakota; Fort Custer, Montana; Fort Elliott, Texas; Fort Keogh, Montana; Fort Missoula, Montana; Fort Shaw, Montana; Fort Sill, Indian Territory; Fort Stevenson, Dakota; Helena, Montana; Lewiston, Idaho; Poplar River, Montana; Spokane Falls, Washington Territory; Stockton, Texas.

Stations on the United States military and sea-coast telegraph lines taking three observations daily, and reporting by mail monthly: Campo, California; Camp Thomas, Arizona; Cape May, New Jersey; Coleman City, Texas; Dayton, Washington Territory; Decatur, Texas; Fort Davis, Texas; Fort Grant, Arizona; Fort McKavett, Texas; Fort Verde, Arizona; Fredericksburg, Texas; Henrietta, Texas; Jacksborough, Texas; La Mesila, New Mexico; Portsmouth, North Carolina; Rio Grande City, Texas; Uvalde, Texas; Wickenburg, Arizona.

Stations taking three observations daily, and reporting by mail as opportunity offers: Saint Paul's Island, Alaska.

Stations on the United States military telegraph lines taking sunset observations only, and reporting by mail monthly: Apache Pass, Arizona; Fort Ellis, Montana; Fort Yates, Dakota.

Printing stations taking sunset observations only, and reporting monthly by mail: Bangor, Maine, 5; Burlington, Iowa, 5; Logansport, Indiana, 5. Stations on the United States military and sea-coast telegraph lines at which observations of the maximum and minimum temperatures and amount of precipitation are taken daily at the hour of sunset: Almota, Washington; Brackettville, Texas; Cape Lookout, North Carolina; Cartersville, Montana; Colfax, Washington; Cœur d'Alene Mission, Idaho; Deer Lodge, Montana; Fort Bayard, New Mexico; Fort Cœur d'Alene, Idaho; Fort Lapwai, Idaho; Fort Meade, Dakota; Fort Reno, Indian Territory; Fort Sully, Dakota; Fort Supply, Indian Territory; Glendive, Montana; Graham, Texas; Grierson Springs, Texas; Laredo, Texas; Life-saving Station No. 6, North Carolina; Little Egg Harbor, New Jersey; Manasquan, New Jersey; Narragansett Pier, Rhode Island; New Chicago, Montana; New River Inlet, North Carolina; Ocean City, Maryland; Phœnix, Arizona; Point Judith, Rhode Island; Pomeroy, Washington; Rapid City, Dakota; San Carlos Agency, Arizona; Sloop Point, North Carolina; Smithville, Dakota; Terry's Landing, Montana; Tobacco Garden, Dakota. Repair and tele-

graph stations on the United States military telegraph lines at which no observations are taken: Baird, Texas; Bozeman, Montana; Cantonment, Indian Territory; Coal Banks, Montana; Corrilla Station, Arizona; Coulson, Montana; Crows' Nest, Montana; Dos Cabezas, Arizona; Durango, Colorado; Fort Abraham Lincoln, Dakota; Fort Craig, New Mexico; Fort Cummings, New Mexico; Fort Dodge, Kansas; Fort Lewis, Colorado; Fort Quitman, Texas; Fort Sisseton, Dakota; Fort Spokane, Washington; Fort Stanton, New Mexico; Fort Union, New Mexico; Frenchtown, Montana; Froze-to-Death, Montana; Gunnison City, Colorado; Le Beau's, Dakota; Lordsburg, New Mexico; Maricopa, Arizona; Miles City, Montana; Miners Camp, Idáho; Plum Creek, Dakota; Porter's Station, New Mexico; Radersburg, Montana; Rocky Point, Montana; San Marcial, New Mexico; Spangle, Washington; Stillwater, Montana; Summit House, Idaho; Watrous, New Mexico; Webster, Dakota; Wichita Indian Agency, Indian Territory; Willcox, Arizona.

Supply station to Pike's Peak, Colorado Springs, Colorado. Second-class stations in Alaska: Atka, Chilcoot, Fort Alexander, Fort Saint Michael's, Fort Wrangel, Hoochnahoo, Hoonyah, Unalashka. Third-class stations in Alaska: Chernofsky, Harrisburg or Juneau City, Marzovia, Saint George's Island. Sunset stations: Lytton, British Columbia; New Westminster, British Columbia; Victoria, Vancouver's Island. Cautionary display stations: Almapee, Wisconsin; Ashland, Wisconsin; Ashtabula, Ohio; Bass River Light, Massachusetts; Bath, Maine; Bay City, Michigan; Booth Bay, Maine; Brunswick, Georgia; Cape Vincent, New York; Charlevoix, Michigan; Charlotte, New York; Chatham, Massachusetts; City Island, New York; Crisfield, Maryland; Dunkirk, New York; East Chop Light, Massachusetts; Elk Rapids, Michigan; Fairport, Ohio; Fall River, Massachusetts; Fernandina, Florida; Forrester, Michigan; Fort George's Island, Florida; Fort Monroe, Virginia; Fort Morgan, Alabama; Frankfort, Michigan; Georgetown, South Carolina; Gloucester, Massachusetts; Green Bay, Wisconsin; Highland Light, Massachusetts; Horn's Pier, Wisconsin; Houghton, Michigan; Hyannis, Massachusetts; Kenosha, Wisconsin; Kewaunee, Wisconsin; L'Anse, Michigan; Ludlington, Michigan; Lynn, Massachusetts; Mackinac City, Michigan; Manistee, Michigan; Manitowoc, Wisconsin; Marblehead, Massachusetts; Menomonee, Michigan; Monroe, Michigan; Montague, Michigan; Muskegon, Michigan; New Bedford, Massachusetts; Newburyport, Massachusetts; New Haven Light, Connecticut; North Fair Haven, New York; Northport, Michigan; Oscoda, Michigan; Pentwater, Michigan; Port Austin, Michigan; Port Royal, South Carolina; Put-in-Bay, Ohio; Racine, Wisconsin; Rockland, Maine; Rogers' City, Michigan; Sand Beach, Michigan; Sand Key Light, Key West, Florida; Sheboygan, Wisconsin; South East Light, Rhode Island; South Haven, Michigan; South-West Harbor, Maine; Saint Augustine, Florida; Saint Joseph, Michigan; Stonington, Connecticut;

Stony Island, Michigan; Sturgeon Bay, Wisconsin; Traverse City, Michigan; Tybee Island, Georgia; United States ship Wyoming, Battery Creek and Beaufort river, South Carolina; Wood's Holl, Massachusetts.

Special River Stations: Albany, Oregon; Boonville, Missouri; Brownsville, Pennsylvania; Brunswick, Missouri; Colusa, California; Confluence, Pennsylvania; Decatur, Alabama; Eugene City, Oregon; Evansville, Indiana; Folsom City, California; Freeport, Pennsylvania; Helena, Arkansas; Hermann, Missouri; Jefferson City, Missouri; Johnsonville, Tennessee; Kansas City, Missouri; Le Claire, Iowa; Lexington, Missouri; Marietta, Ohio; Marysville, California; Muscatine, Iowa; New Geneva, Pennsylvania; Oil City, Pennsylvania; Oroville, California; Paducah, Kentucky; Peoria, Illinois; Plattsmouth, Nebraska; Saint Joseph, Missouri; Warsaw, Illinois; Wheeling, West Virginia.

Appendix No. 12, is a list of United States military posts from which meteorological reports have been received at this office throughout the year, through the co-operation of the Surgeon General of the Army.

Appendix No. 13, is a list of voluntary observers who have furnished monthly meteorological reports to this office during the year.

Appendix No. 14 contains a list of places from which applications have been received for the establishment of Signal Service stations, but at which stations have not been established.

Meteorological data.

The regular monthly reports received from the Signal Service stations during the year have been carefully compared and tabulated for publication and exhibit not only the result of observations taken during the current year, but the means of the several meteorological elements determined from observations taken since the establishment of the Signal Service. The tables accompanying this report are much more extensive than those previously published by this office, and the forms have been so improved as to give the complete meteorological history of each station. The temperature, rainfall, and other meteorological elements for each month of the current year may be readily compared with the means as deduced from many years of observation, and the departure from the normal value utilized in determing the effect of the varying atmospheric conditions on agricultural products in each section of the country. In addition to the practical application of the information contained in these tables, they will doubtless be found of great service to meteorologists as a basis of research.

The following list of appendices shows the character of the meteorological data prepared for publication in this report:

Appendix No. 15.—Annual and mean barometric annual pressure (corrected to sea-level), at Signal Service stations, for a series of years.

Appendix No. 16.—Mean barometric pressure (corrected for temperature and instrumental error), by months, at Signal Service stations, for two years.

Appendix No. 17.—Monthly and annual mean barometric pressure (corrected to sea-level), at Signal Service stations, for the year ending June 30, 1882.

Appendix No. 18.—Monthly and annual mean barometric pressure (corrected for temperature and instrumental error only), at Signal Service stations, for the year ending June 30, 1882.

Appendix No. 19.—Annual and mean annual temperatures, at Signal Service Stations, for a series of years.

Appendix No. 20.—Monthly and annual mean temperatures, at Signal Service stations, for the year ending June 30, 1882.

Appendix No. 21.—Monthly and annual mean temperatures, at United States military posts for the year ending June 30, 1882.

Appendix No. 22.—Monthly and annual mean temperatures reported by voluntary observers, at selected stations, during the year ending June 30, 1882.

Appendix No. 23.—Comparative mean temperatures, by months, at selected Signal Service stations.

Appendix No. 24.—Monthly and annual mean temperatures of each state and territory.

Appendix No. 25.—Monthly and annual mean temperatures of the several geographical districts.

Appendix No. 26 —Monthly and annual mean temperatures at stations on the Central and Southern Pacific railroads for the year ending June 30, 1882.

Appendix No. 27.—Maximum and minimum temperatures, by months, at Signal Service stations, for the year ending June 30, 1882.

Appendix No. 28.—Maximum and minimum temperatures, by months, at United States military posts, for the year ending June 30, 1882.

Appendix No. 29.—Maximum and minimum temperatures, by months, reported by voluntary observers at selected stations, for the year ending June 30, 1882.

Appendix No. 30.—Maximum and minimum temperatures, by months, at stations on the Central and Southern Pacific railroads, for the year ending June 30, 1882.

Appendix No. 31.—Monthly and annual maximum and minimum temperatures and precipitation, at third-class stations on the United States military telegraph lines, for the year ending June 30, 1882.

Appendix No. 32.—Monthly and annual maximum and minimum temperatures and precipitation, at Signal Service stations in Alaska, for the year ending June 30, 1882.

Appendix No. 33.—Annual and mean annual precipitation, at Signal Service stations, for a series of years.

Appendix No. 34.—Monthly and annual precipitation, at Signal Service stations, for the year ending June 30, 1882.

Appendix No. 35.—Monthly and annual precipitation, at United States military posts, for the year ending June 30, 1882.

Appendix No. 36.—Monthly and annual precipitation, reported by voluntary observers, at selected stations, for the year ending June 30, 1882.

Appendix No. 37.—Comparative precipitation, by months, at selected Signal Service stations.

Appendix No. 38.—Monthly and annual average precipitation, for each state and territory, for a series of years.

Appendix No. 39.—Monthly and annual average precipitation, for the several geographical districts of the United States, for a series of years.

Appendix No. 40.—Monthly and annual precipitation, at stations on the Central and Southern Pacific railroads, for the year ending June 30, 1882.

Appendix No. 41.—Monthly and mean annual relative humidity, at Signal Service stations, for the year ending June 30, 1882.

Appendix No. 42.—Monthly mean dew-point, at Signal Service stations, for the year ending June 30, 1882.

Appendix No. 43.—Dates of the occurrence of the first light and first killing frosts, at Signal Service stations, for the season of 1881 and 1882.

Appendix No. 44.—Prevailing winds, by months, at Signal Service stations, for a series of years.

Appendix No. 45.—Winds most likely to be followed by rain, by months, at Signal Service stations, for a series of years.

Appendix No. 46.—Winds least likely to be followed by rain, by months, at Signal Service stations, for a series of years.

Appendix No. 47.—Winds most likely to be followed by rain, by months, in the several geographical districts, for a series of years.

Appendix No. 48.—Winds least likely to be followed by rain, by months, in the several geographical districts, for a series of years.

Appendix No. 49.—Prevailing winds, by months, at stations on the Central and Southern Pacific railroads, for the year ending June 30, 1882.

Appendix No. 50.—Highest summer and lowest winter temperatures, in each state and territory, for a series of years.

Appendix No. 51.—Highest and lowest water, at river stations, for a series of years.

Appendix No. 52.—Normal barometric pressure, corrected for temperature and instrumental error only, and mean temperatures, at Canadian stations, for each month of the year.

Appendix No. 53.—Highest and lowest temperatures, at Signal Service stations, for a series of years.

Appendix No. 54.—Annual meteorological summary of Signal Service stations, for year ending June 30, 1882.

Inspection of Signal Service stations.

One hundred and twenty-five stations, including display stations, and those upon the United States Military Telegraph lines in the interior, were inspected during the year ending June 30, 1882. Appendix No. 55 shows the name of each station inspected, with date of inspection, and name of inspecting officer.

Owing to the limited number of officers connected with the Signal Service during the year, available for such duty, the inspection of its stations has been comparatively suspended, and such inspection duty only has been performed as could be done by the assistants to the Chief Signal Officer, in addition to their respective duties at this office.

The efficiency of the Signal Service work depends largely upon thorough inspections of the several stations by competent inspecting officers, and it is to be regretted that the force of officers now detailed as Acting Signal Officers is so limited as to compel the suspension of this important work. To insure the best results each station should

be inspected twice a year, and at least two officers should be kept continually on this duty. In inspecting a station an officer is required to compare the instruments at the station with the standard instruments with which he is provided for that purpose. These comparisons are necessary for the correction of errors which may occur from time to time in the station instruments, and insure the reliability of the reports.

Observers and assistants are also examined by the inspecting officers as to their practical knowledge of their duties and the progress made by them in the study of meteorology. Inspectors are also required to confer with the meteorological committee at each station inspected for the purpose of ascertaining the manner in which the duties of the station are performed, and to invite suggestions which would tend to increase the usefulness of the service by a wider diffusion of the reports. The full instructions under which inspectors act, and the character of the report made by them, are given in appendix No. 31 of my last annual report.

General duties of observers on stations

The duties of enlisted men at each station are as follows:

At stations forwarding telegraphic reports, they are required to take, put in cipher, and furnish, to be telegraphed tri-daily on each day, at different fixed times, the result of observations made, and embracing in each case, the readings of the barometer, the thermometer, the wind velocity and direction, the rain-gauge, the dew-point, the character, kind, and movement of upper and lower clouds, and the condition of the weather. These observations are taken simultaneously throughout the whole extent of the territory of the United States.

In addition to the three telegraphic reports, two, taken at hours simultaneous, viz: 11 a. m. and 7 p. m., Washington mean time, are made and recorded at each station.

A sixth observation is required to be taken at the exact hour of sunset at each station. This observation, which calls for a careful study of the western sky, and such other local signs as may presage fair or foul weather for the ensuing twenty-four hours, is reported with the midnight observation.

At stations at which cautionary signals are displayed, an observer must be constantly on duty to receive the order and show the signal, which may be ordered at any moment. At stations from which river reports are furnished, an observation and record of the depth of the water is made and reported at a fixed hour on each day. In cases of threatening storms or dangerous freshets, any station may be called upon to make hourly reports. In cases of violent thunder-storms, reports are sometimes made hourly during its continuance.

The data thus gathered on the files of each station are consolidated on forms which, with copies of the telegraphic cipher reports, are forwarded monthly to the central office in the form of a careful digest,

The form exhibited in appendix No. 54 contains a very complete summary of all the meteorological observations taken at each station during the month. None of these observations or records ought to be dispensed with, nor can they be taken and recorded more economically. At stations where the population warrants it, the duties of the enlisted men are increased by the receipt and record of data from other stations, to be exhibited upon written bulletins or furnished to the press for public use. In the great cities there are the further duties of display, at the rooms of the boards of trade, chambers of commerce, and other similar places, of maps on which the meteoric conditions are shown by symbols.

There are to be prepared and posted, also, by the enlisted men at these stations, bulletins of the storm-warning orders as received from the central office, on which appear very frequently, in addition to the order, brief notes as to the force of the anticipated storm, the direction in which it may be moving, the names of places menaced, though storm-signals may not yet have been ordered at them, and other items of information, all of which require to be carefully copied and posted with dispatch.

In cases of disasters occurring on the lakes or sea-coasts, full information concerning which is often in possession of the service, or in the instances of any matter of public interest coming within the scope of the service, the station force is required to exhibit bulletins containing, in detail, full reports.

The local offices of the Signal Service are always places of resort for those desiring to be informed what changes of weather have been particularly noticed or are likely to affect the various industries in which the populations are engaged.

In the cities upon the sea-coast of the United States, or at the lake ports, the offices of the service are open for the comparison of instruments; to obtain special instrumental readings; to make examinations of data, or to furnish whatever information may be practicable, to captains of vessels or others concerned in shipping interests. The enlisted men stationed on telegraph lines operated and maintained by the Signal Service are required to perform the duties of meteorological ob servers in addition to those of operators and repairmen.

The cautionary signal flag is always, when flown officially, an invitation to mariners or others interested to visit the offices for information. The courtesies and duties of the office are not limited to the people of the United States alone, but are tendered freely to foreigners.

In times of especial emergencies, or danger of any kind threatening the separate States or United States, the different stations, when ordered, telegraph reports in cipher upon any subject under the attention of superior authorities.

The enlisted men in charge of stations are responsible for the care, cleanliness, and good work of the instruments; the clearness of the records; the correctness and punctuality of the reports; the display of

signals or bulletins, and, in fine, for the conduct and good condition of the station itself. It has been considered necessary to make this description thus minute that it may be understood what duties are required of non-commissioned officers and privates of the Signal Corps, in addition to the military duties heretofore referred to, and that it may be understood that the force must consist of men of more than ordinary acquirements to be competent for such duties.

In time of dangerous pestilence these soldiers are, by their duties, more exposed than others forces of the army. Other forces may be moved, for sanitary reasons, to places of comparative safety. The exigencies of the service, and the necessity of continuing the regular series of observations, have required that the enlisted men of the service should remain faithfully at their posts, during some of the worst visitations of disease which have devastated the country.

FARMERS' BULLETIN.

This bulletin contains the general synopsis showing the meteorological conditions which have prevailed throughout the country during the preceding twenty-four hours, and the weather indications for the coming twenty-four hours. It is distributed, by co-operation of the Post Office Department, from selected centers in the more densely populated regions of the United States, and displayed at post offices for the special benefit of those interested in agriculture. Many applications have been received during the year for the extension of this work, and in every case the bulletins have been supplied, when the place from which the application was made could be reached in time to render the bulletin of service. Eight thousand and ninety-four Farmers' Bulletins have been distributed and displayed in frames, daily, at as many different post offices. At one o'clock, a. m., of each day, except Sunday, the midnight report has been telegraphed, during the year ending June 30, 1882, to eighteen centers of distribution, located in the following-named cities: Albany, N. Y., 339; Bangor, Me., 211; Boston, Mass., 954; Buffalo, N. Y., 350; Burlington, Iowa, 220; Chicago, Ill., 625; Cincinnati, O., 787; Des Moines, Iowa, 101; Detroit, Mich., 362; Leavenworth, Kans., 180; Logansport, Ind., 189; Memphis, Tenn., 18; Nashville, Tenn., 184; New York, N. Y., 776; Pittsburgh, Pa., 452; Philadelphia, Pa., 1,179; San Francisco, Cal., 134; Saint Louis, Mo., 553. The figures following the names of the cities denote the number of post offices supplied from each. Four hundred and eighty copies of the bulletin are issued daily from the central office in Washington. An additional printing station has been established during the year at Williamsport, Pa., to supply the wants of that section.

In addition to the bulletins furnished post offices, a limited number is printed at each station to supply the wants of individuals specially interested. These bulletins are printed at the signal stations under the direction of the sergeant in charge.

The synopsis of the weather and the indications, are telegraphed from the central office in Washington, at 1 a. m., each day, and received at the printing stations, where they are at once printed on bulletin forms provided for the purpose. Postmasters receiving the bulletin are required by the Postmaster General to display it immediately in a frame furnished by this office, and to report, in writing, to the Chief Signal Officer the time of receipt and display of each bulletin.

Experiments have been made during the year, with a view of increasing the value of this bulletin, by the addition of a weather chart of the United states, similar to that which is published daily in the "New York Graphic," and it is believed that in a short time these charts may be successfully reproduced on the Farmers' bulletin. At present these bulletins exhibit, in addition to the weather synopsis and indications, the general laws accompanying weather changes, and notes relative to the climatology of the different sections, which have been determined by careful examination of the data collected by the Signal Service during the past ten years. With each year the popular knowledge of the uses of this bulletin, enables those interested in agriculture to judge of the correctness of the forecasts, and, with the addition of the proposed weather map, individuals will be able to make correct predictions of the weather, for localities which it is impossible to provide for in the brief sentence which expresses the prevailing weather indications anticipated for an entire district. It is contemplated, as the work of the office progresses, to add to this bulletin brief instructions for the use of instruments which may hereafter be furnished for local observers.

RAILWAY BULLETINS.

This service has been maintained during the year, and has proven of great value both to the companies co-operating with the Signal Service, and to the citizens of the sections traversed by the roads, in the rapid transmission of the weather indications issued from this office. This service is operated on the lines of railway, which, upon the receipt of the synopsis and indications, prepared at 1 a. m., each day, telegraph and bulletin the same at the stations along the line of the railroad, without expense to the United States. These reports are distributed under the supervision of the superintendents of the railway telegraphs, and reports are made to this office by the station agents every two weeks, showing the time of receipt of the bulletin. Fifty companies, with a total of two thousand three hundred and six stations, are now receiving, daily, the weather reports from this office. The bulletin exhibits the forecasts for the ensuing day, and is posted in a conspicuous place for the benefit of the traveling public, and the farmers and other residents in the vicinity of the road. Many of the officials of the co-operating lines have expressed great satisfaction at the receipt of these reports, and, in a number of cases, the benefits to the companies performing the service, in regulating the shipment of perishable goods,

have been acknowledged, and the continuance of the service especially requested. The railway companies now co-operating in this work, with the number of stations on each line, are as follows:

1. Atchison, Topeka and Santa Fé Railroad, C. C. Wheeler, General Manager, Topeka, Kansas, forty-three stations.

2. Boston and Albany Railroad, C. O. Russell, Superintendent, Springfield, Massachusetts, fourteen stations.

3. Burlington, Cedar Rapids and Northern Railroad, C. J. Ives, General Superintendent, Cedar Rapids, Iowa, eighty-one stations.

4. Baltimore and Ohio Railroad, John Thomas, General Superintendent, Chicago, Illinois, ninety-nine stations.

5. Boston and Lowell Railroad, H. E. Chamberlain, Superintendent, Concord, New Hampshire, thirteen stations.

6. Boston and Maine Railroad, J. T. Furber, General Superintendent, Boston, Massachusetts, thirty-four stations.

7. Boston, Barre and Gardner Railroad, H. M. Witter, Superintendent, Worcester, Massachusetts, seven stations.

8. Chicago, Milwaukee and Saint Paul Railroad, J. T. Clark, General Superintendent, Milwaukee, Wisconsin, three hundred and twenty-seven stations.

9. Cleveland, Columbus, Cincinnati and Indianapolis Railroad, E. B. Thomas, General Manager, Cleveland, Ohio, thirty-five stations.

10. Chicago, Saint Paul, Minneapolis and Omaha Railroad, C. F. Hatch, General Superintendent, Saint Paul, Minnesota, one hundred and twenty-five stations.

11. Chicago and Northwestern Railroad, J. D. Layng, General Superintendent, Chicago, Illinois, eighty-seven stations.

12. Chicago, Burlington and Quincy Railroad, H. B. Stone, General Superintendent, Chicago, Illinois, two hundred and fifty-eight stations.

13. Cumberland Valley Railroad, J. F. Boyd, Superintendent, Chambersburg, Pennsylvania, nine stations.

14. Chicago and West Michigan Railroad, C. Harris, General Superintendent, Muskegon, Michigan, forty-one stations.

15. Cleveland, Akron and Columbus Railroad, N. Monsarrat, General Superintendent, Akron, Ohio, nine stations.

16. Detroit, Lansing and Northern Railroad, T. M. Fish, General Superintendent, Ionia, Michigan, ten stations.

17. Detroit, Grand Haven and Milwaukee Railroad, W. J. Morgan, Superintendent, Detroit, Michigan, four stations.

18. Eastern Railroad, E. B. Phillips, President, Boston, Massachusetts, fifty-four stations.

19. Flint and Pere Marquette Railroad, Sanford Keeler, Superintendent, East Saginaw, Michigan, nine stations.

20. Fort Wayne, Cincinnati and Louisville Railroad, W. W. Worthington, General Superintendent, Fort Wayne, Indiana, thirteen stations.

21. Grand Trunk Railroad, W. J. Spicer, Superintendent, Montreal, Quebec, fourteen stations.

22. Grand Rapids and Indiana Railroad, W. O. Hughart, President, Grand Rapids, Michigan, sixty-three stations.

23. Huntingdon and Broad Top Mountain Railroad, G. F. Gage, General Superintendent, Huntingdon, Pennsylvania, six stations.

24. Indianapolis, Peru and Chicago Railroad, V. F. Malott, General Manager, Indianapolis, Indiana, twenty-two stations.

25. Kansas City, Fort Scott and Gulf Railroad, L. W. Towne, Superintendent, Kansas City, Missouri, twenty stations.

26. Kansas City, Lawrence and Southern Kansas Railroad, L. W. Towne, Superintendent, Kansas City, Missouri, nineteen stations.

27. Kansas City, Saint Joseph and Council Bluffs Railroad, J. F. Barnard, General Superintendent, Saint Joseph, Missouri, eleven stations.

28. Lehigh Valley Railroad, R. H. Sayre, General Superintendent, Bethlehem, Pennsylvania, thirty stations.

29. Maine Central Railroad, Payson Tucker, Superintendent, Portland, Maine, twelve stations.

30. Marietta and Cincinnati Railroad, C. A. Berry, Superintendent of Telegraph, Chillicothe, Ohio, nine stations.

31. Memphis and Charleston Railroad, J. F. O'Brien, General Superintendent, Knoxville, Tennessee, twelve stations.

32. Memphis and Little Rock Railroad, E. K. Sibley, General Manager, Little Rock, Arkansas, thirteen stations.

33. Norfolk and Western Railroad, Henry Fink, General Manager, Lynchburg, Virginia, eight stations.

34. New York, Ontario and Western Railroad, J. E. Childs, General Superintendent, Middletown, New York, forty-nine stations.

35. New York Central and Hudson River Railroad, J. M. Toucy, General Superintendent, New York City, thirty-one stations.

36. New York and New England Railroad, S. M. Felton, Jr., General Manager, Boston, Massachusetts, sixteen stations.

37. New York, Lake Erie and Western Railroad, E. S. Bowen, General Superintendent, New York City, eight stations.

38. Old Colony Railroad, J. R. Kendrick, General Superintendent, Boston, Massachusetts, one hundred and eight stations.

39. Philadelphia, Wilmington and Baltimore Railroad, H. F. Kenney, General Superintendent, Philadelphia, Pennsylvania, forty-three stations.

40. Philadelphia and Reading Railroad, J. E. Wootten, General Manager, Philadelphia, Pennsylvania, eighty-two stations.

41. Pennsylvania Railroad, Frank Thomson, General Manager, Philadelphia, Pennsylvania, two hundred and seventy-two stations.

42. Providence and Worcester Railroad, W. E. Chamberlain, Superintendent, Providence, Rhode Island, thirteen stations.

43. Pittsburg, Fort Wayne and Chicago Railroad, C. E. Gorham, Superintendent, Pittsburg, Pennsylvania, thirty-five stations..

44. Portland and Ogdensburg Railroad, J. Hamilton, Superintendent, Portland, Maine, twelve stations.

45. Richmond and Danville Railroad, T. M. R. Talcott, General Manager, Richmond, Virginia, twelve stations.

46. Rome, Watertown and Ogdensburg Railroad, E. A. Van Horne, General Superintendent, Oswego, New York, seventeen stations.

47. Saint Louis and San Francisco Railroad, W. D. Littlefield, Superintendent of telegraph, Springfield, Missouri, thirty-seven stations.

48. Southern Central Railroad, J. G. Knapp, Superintendent, Auburn, New York, twenty-one stations.

49. Saint Louis, Vandalia, Terre Haute and Indianapolis Railroad, J. Hill, General Superintendent, Saint Louis, Missouri, twenty-one stations.

50. Worcester and Nashua Railroad, G. W. Hurlburt, Superintendent, Worcester, Massachusetts, eighteen stations.

RELATIONS WITH COMMERCIAL ORGANIZATIONS.

The service continues its co-operation with the boards of trade and chambers of commerce of the principal cities throughout the country, and also with a large number of agricultural societies. Many of these organizations have appointed special committees to confer with the Chief Signal Officer upon matters relating to the Signal Service, as far as it affects the commercial interests of their respective sections. The organizations which are thus co-operating with the office are given in appendix No. 56. The appointment of these committees enables the Chief Signal Officer to refer questions of local interest to those whose knowledge of the facts in each case renders them competent to offer suggestions. These committees inspect the signal stations and report direct to the Chief Signal Officer any failure on the part of the observer in charge of the station to properly perform his duties, and offer suggestions as to the best means of extending the usefulness of the service. The Chief Signal Officer takes pleasure in publicly acknowledging his indebtedness to these organizations for the performance of duties which have been fully appreciated and have greatly benefited the service.

FROST WARNINGS, NORTHERS, ETC.

The system of frost warnings for the benefit of the sugar interests in Louisiana has been continued.

Indications of approaching frost are telegraphed to New Orleans, where they are furnished to the press, and to the secretary of the Sugar Planters' Association. This association has undertaken to forward the warnings by telegraph to the different plantations in the sugar district.

During the coming year it is proposed to telegraph frost warnings direct from this office to all telegraph offices in the sugar-growing section.

A new district has been established in Texas, consisting of Fort Bend, Brazoria, Wharton, and Matagorda counties. The frost warnings for this district will be sent to Galveston, Texas, the cotton exchange at that point assuming charge of their distribution.

It is proposed to establish during the coming fall a system of frost warnings, similar to those mentioned above, for the benefit of the tobacco-growing interests of the country. The following points have been selected as centers to which warnings will be telgraphed from this office, and arrangements have been made with the telegraph and railroad companies for their rapid distribution from these points throughout the tobacco-growing sections of the country:

Lexington, Kentucky; Louisville, Kentucky; Nashville, Tennessee; Memphis, Tennessee; Cincinnati, Ohio; Marietta, Ohio; Wheeling, West Virginia; Washington, District of Columbia; Harrisburg, Pennsylvania; York, Pennsylvania; Lancaster, Pennsylvania; Reading, Pennsylvania; Oxford, Pennsylvania; Elmira, New York; Lynchburg, Virginia; Richmond, Virginia; Raleigh, North Carolina; Salisbury, North Carolina; Saint Louis, Missouri; West Quincy, Missouri; New Haven, Connecticut; Hartford, Connecticut; Springfield, Massachusetts, and Madison, Wisconsin.

These warnings are received, as a rule, from thirty-six to forty-eight hours in advance of the cold wave.

A service similar in all respects to this, but for the benefit of the orange-growers of Florida, is also in operation. Notifications of anticipated frosts are telegraphed to the Signal Service observer at Jacksonville, who communicates the warnings by all available means to those interested in orange culture throughout the state.

At the solicitation of those interested in the cultivation of wheat and other grains in the Northwest, it is contemplated to establish a service similar to that now in operation for the benefit of the cotton interests, which will enable this office to publish in the journals of the northwest the daily rainfall and temperature as determined from a large number of stations.

The system of warnings of the approach of "northers" in the southwestern section of the country and in Texas has been continued with gratifying results, and all railroads traversing the sections visited by these destructive storms are in active co-operation with this office in the execution of this important work. These storms are attended by areas of high barometer, which first appear in the extreme northwest, and the warnings are generally received in the threatened localities from twelve to twenty-four hours in advance, thus giving ample time for agriculturists, ranchmen, and others who may be able to receive the notifications, to prepare for their approach. This system of warn-

ings, which is highly prized by the citizens of the southwestern section of the country, will be extended as facilities offer.

The warnings of the approach of "northers" are now sent to the following railroads, which forward them by telegraph to the various stations on their respective lines:

Burlington and Missouri River Railroad, in Nebraska, Omaha, Nebraska.

Atchison, Topeka and Santa Fé Railroad, Topeka, Kansas.

Missouri Pacific Railroad, Saint Louis, Missouri.

Saint Louis, Iron Mountain and Southern Railroad, Saint Louis, Missouri.

Saint Louis and San Francisco Railroad, Springfield, Missouri.

International and Great Northern Railroad, Palestine, Texas.

Dallas and Wichita Railroad, Dallas, Texas.

Missouri and Arkansas Division, Texas and Saint Louis Railroad, Tyler, Texas.

Texas and Pacific Railroad, Marshall, Texas.

Texas and New Orleans Railroad, Houston, Texas.

Houston and Texas Central Railroad, Houston, Texas.

Galveston, Harrisburg and San Antonio Railroad, Columbus, Texas.

Galveston, Houston and Henderson Railroad, Galveston, Texas.

Texas Mexican Railroad, Corpus Christi, Texas.

As an evidence of the interest taken in the special work of the Signal Service by the most prominent agriculturists of the country, I take pleasure in inviting your attention to the following report, which was unanimously adopted by the convention of agriculturists which met in the city of Washington, January 10, 1882:

The committee appointed to consider the relations of the United States Signal Service to the agricultural interests of the country, and to present such statements and suggestions, as might, in the judgment of this convention, be deemed proper to be commended to the attention of the Chief Signal Officer, General W. B. Hazen, beg leave to submit the following report:

1. The Chief Signal Officer has already instituted special services for the benefit of agriculture, by way of forecasting, and, as far as practicable, giving timely notice of the approach of northers, frosts, rain storms, &c. The cotton, sugar, and orange producers are understood to be the special beneficiaries of this service. Within the cotton-belt there are now one hundred and fifty stations, from which daily reports of temperature and rainfall are received. A special service is also under consideration for the benefit of the grain-growing interests. The feasibility of extending similar services to other agricultural interests, and notably those of hay and tobacco, is suggested.

2. The Chief Signal Officer has already suggested to the governors of the several states, the expediency of instituting a system of weather service, to be conducted by the state authorities, upon a plan furnished by the United States Signal Service. Meteorological data could thus be gathered, through the agency of the state central officers, from every county in each state, and thus the climatic conditions of every locality be made known. The data thus collected and published by the United States Signal Service, would be available for every purpose for which such data are needed, and could be especially utilized by the Department of Agriculture, in determining important questions relating to agricultural production. For instance, if studied in connection with the thorough and comprehensive crop reports, so earnestly and justly insisted upon by this convention, they would furnish means of ascertaining to what belts or sections of country, certain crops are, or are not, appropriate. Some of the states have already adopted the suggestion of the Chief Signal Officer respecting the institution of services, and in other states the matter is awaiting legislative action.

3. The United States Signal Service is conducting observations with a view to suggest, if possible, some means of preventing the devastations of grasshoppers in the west. It

is suggested by the Chief Signal Officer that it may be practicable to search them out in their fastnesses and destroy them before they begin to migrate from their hatching grounds.

4. These measures adopted by the Chief Signal Officer, in the interests of agriculture, are duly recognized and appreciated by this convention, and they cordially indorse any efforts he may make to secure on the part of Congress, such legislative action as may enable him to carry out these and any other measures which tend to advance the manifold agricultural interests of our entire country.

REPORTS FOR THE BENEFIT OF THE COTTON INTERESTS.

This important system of reports which was referred to in my last annual report, has been thoroughly organized and successfully operated since September, 1881. It was inaugurated at the earnest solicitation of many prominent citizens of the south, especially cotton-growers, and those interested in the production of this important staple. The plan of work was made feasible by the generous co-operation of the railway and telegraph officials in the sections of the country where the stations are located. During the present season, the reports have been regularly distributed from the various centers, and by means of an interchange of reports all the prominent cities of the south are supplied with information daily, showing the temperature and rainfall in the cotton districts. This is published in the newspapers, bulletined at cotton exchanges, and at other prominent places where business men assemble, and is therefore readily obtained. Tables showing the monthly means of rainfall and temperature in the cotton districts, have been regularly published in the MONTHLY WEATHER REVIEW of this office. These will be continued from month to month during successive years, and by comparison with the cotton production of corresponding years it is believed that the conditions particularly favorable or unfavorable to the growth of cotton in each district, may be determined some months in advance of the time at which planters are at present enabled to estimate the probable value of the crop. This work has been especially commended by the commercial organizations of the country. The monthly mean tables have also been favorably noticed by foreign journals, and the hope expressed that their publication might be continued.

The following resolution was adopted by the Meteorological Committee of the New York Cotton Exchange, at a meeting held on the 23d of August, 1882:

Resolved, That the weather reports of the United States Signal Service are of great use to the members of the New York Cotton Exchange and to the trade at large.

As the cotton crop is more or less at risk for nine months of the year, there is great need of prompt, accurate and impartial information concerning the atmospheric influences and the changes therein, the rainfall and the temperatures.

In past seasons we have put full faith in the reports of the United States Signal Service, which we have not found misplaced, and we recognize with pleasure and approval the efforts of the service to extend and perfect the reports, and we will heartily co-operate with it to that end.

(Signed) WALTER T. MILLER,
Chairman, &c.

At a meeting of the Cincinnati Cotton Exchange, held August 21, 1882, the following resolution was unanimously adopted:

Resolved, That the Cincinnati Cotton Exchange desires to express its approbation of the great value of the weather report of the cotton-belt, as published in daily papers, to planters and merchants of not only the cotton section, but of every part of the country, and that whenever the fund appropriated by Congress will admit of it, to extend its reports from a greater number of points.

(Signed) JOHN R. KING,
Secretary Cincinnati Cotton Exchange.

Extract from minutes of meeting of Board of Directors of Little Rock Cotton and Produce Exchange:

* * * * * * *

Resolved, That the Board of Directors of the Little Rock Cotton and Produce Exchange give their unqualified indorsement of the system of reports adopted by the Signal Bureau to advance the intelligent cultivation of crops in the cotton-growing regions.

Resolved, That the information thus furnished is of inestimable value, not only to the residents of this region, but to extended commercial interests throughout the entire country, which are so closely interwoven with the prosperity of the cotton states.

Resolved, That the thanks of this directory are due to the Chief Signal Officer for the prompt and efficient manner in which these reports have been furnished, and that it be urged upon him that a discontinuance of this service would be regarded as a great calamity.

Resolved, That the secretary be instructed to transmit a copy of these resolutions, without delay, to the Chief Signal Officer at Washington.

* * * * * * *

(A true copy.)
(Signed) H. H. BRICE,
Secretary.

At a called meeting of the Merchants' Exchange, of Nashville, Tennessee, August 25, 1882, the following resolution was unanimously adopted:

Resolved, That the reports of the weather in the cotton-belt, furnished by the Signal Corps of the U. S. Army, are of inestimable benefit to the cotton-growing interest, and could not, in our opinion, be dispensed with, without great injury to the same; and that we believe the best interest of the country will be subserved by maintaining and extending the field of operations of the Signal Service.

(Signed) O. H. HIGHT,
Secretary.

Appendix No. 11 presents the general plan of this work, with a list of the stations; and a chart showing the several cotton districts is published in the MONTHLY WEATHER REVIEW of April, 1882.

ROCKY MOUNTAIN LOCUSTS.

In 1877, this bureau was invited to co-operate with the United States Entomological Commission, in collecting and summarizing all obtainable data relating to the origin, habits, flight, and devastations of the grasshoppers or locusts in the regions west of the Mississippi river. All stations of the Signal Service west of the 93d meridian, and east of the Rocky mountains, are required to report from March to November, "the date of appearance of the locusts, the direction and velocity of the wind and state of the weather at the time of observation, &c," and, generally, all information which, when systematically arranged and studied, will aid the entomologist to foretell, with more or less certainty, the annual and periodical return of noxious insects, particularly the western locusts.

It is now one of the regular duties of observers of the Signal Service in the territory afflicted by this scourge, to make report of all facts connected with these insects of which they may become cognizant. Much of the data given to the public in the report of the Entomological Commission was furnished by the observers of the Signal Service, and an important contribution to the subject of the hatching of locusts' eggs, based on our observations of temperature, has been made by one of the assistants to the Chief Signal Officer. During the summer just past every preparation was made, through the regular and many volunteer observers, to have reports furnished this office of the movements of grasshoppers and locusts; but it is agreeable to report that in no instance has any mention of damage been made. These instructions are continuing, and in future years opportunities may offer for this service to give notice, some time in advance, of the approach of these destructive insects.

TELEGRAPH DIVISION.

The importance of a thorough and systematic supervision over the telegraphic work of this bureau, and the dependence of the work of this office on efficient and prompt transmission of all reports, have led to the formation of a new division.

I have therefore established a division in this office to be known as the "Telegraph Division," and placed it under the charge of an experienced officer, who has, under the direction of the Chief Signal Officer, entire supervision of all the telegraphic work of the Signal Service, consisting of—

The transmission of the weather reports and special messages by telegraph;

The supervision of all the divisions of the United States military telegraph lines, their operation, maintenance, and fiscal management;

The supervision of the construction of all Signal Service telegraph lines;

The direct control of the sea-coast telegraph lines, and the men serving thereon;

The preparation of all estimates for material to be used in the construction of United States military telegraph lines, and supplies for the sea-coast lines;

The revision of all estimates from officers in charge of divisions of United States military telegraph lines;

The inspection of the accounts of officers in charge of United States military telegraph lines before they are transmitted to the examiner's office;

The auditing in this office of all telegraph bills;

The testing and inspection of all telegraph material and instruments;

The charge of the cotton-belt system of reports;

The collection and dissemination of reports of the frost, "northers," locusts, and flood predictions;

The preparation, jointly with the property and disbursing officer, of lists of all articles required for the supply of the telegraph lines.

Telegraphic circuits.

The system of telegraphic circuits for transmission of weather reports extends over the United States, and, by arrangement, over the West Indies and the most populous portions of the Dominion of Canada. A telegraph circuit is a definite length of telegraph lines, to be worked without relaying, connecting certain defined places. All Signal Service stations on a circuit forward weather reports over it at stipulated rates. Thus, the "Washington and Cincinnati circuit" connects Washington, District of Columbia, and Cincinnati, Ohio, running via Pittsburgh, Pennsylvania, and Columbus, Ohio. Messages are sent through, from one end to the other, directly, and for this particular circuit the rate is two cents per word. The system of telegraphic circuits embraces the lines of the Western Union, Northwestern, International Ocean, West India and Panama, Montreal, Dominion Government, and Florida telegraph companies, and a number of small companies controlled by the Western Union company.

Working in unison with this system of circuits, for the purpose of forwarding weather reports, are the United States military telegraph lines, and the sea-coast telegraph line.

For the privilege of the circuit system, rates are paid in excess of those for ordinary government messages, but when it is considered that each station receives all reports passing over the circuit upon which it is located, without extra expense, the average cost of the system is far less than it would be under the schedule of rates for ordinary government messages.

The average time consumed in transmitting these reports to this office over the principal circuits, at each signal hour, is about fifty minutes, and the time elapsing between the hour of observation and the delivery of the "indications" to the press, has been about one hour and forty minutes.

The system of telegraphic cipher devised at this office for the transmission of weather reports, secures a great reduction in the cost of telegraphing.

Six hundred and fifty-two thousand, nine hundred and fifty-two cipher words of weather reports have been received at, and thirty-one thousand, three hundred sent from, this office during the year ending June 30, 1882. Fifteen thousand, nine hundred and eighty telegraphic messages (exclusive of those sent and received by the sea-coast line), other than weather reports, were received; and eight thousand, six hundred and ten sent in the same period. There were also received during the same period two thousand, one hundred and ninety cipher words of special river reports.

SEA-COAST TELEGRAPH LINE.

The total length of sea-coast telegraph line, constructed and operated by the Signal Service, is six hundred and ten miles, extending from Sandy Hook, New Jersey, to the mouth of the Cape Fear river, North Carolina. The lines on the immediate coast are connected with this office by means of leased lines, and the stations of the Signal Service, occupied by the enlisted men of the Signal Corps, are so located as to be of the greatest service to shipping; and they, in connection with the Life-saving Service, constitute a coast-guard, the value of which has frequently been proven by the prompt assistance rendered in response to wreck reports transmitted over the sea-coast telegraph line.

The experience of this service in past years, in connection with these lines, leaves no doubt as to the importance of maintaining those already constructed and the necessity of extending them, especially along the New England coast.

The total number of messages received over the sea-coast line during the year ending June 30, 1882, was eleven thousand five hundred and twenty-nine; the total number sent in the same period, seven thousand one hundred and fifty, or a total of eighteen thousand six hundred and seventy-nine received and sent.

During the past year the south shore end of the cable at Bear Inlet, North Carolina, was lengthened three hundred and fifty yards on account of the widening of the inlet.

Between Sandy Hook, New Jersey, and Smithville, North Carolina, there are twenty-eight cables, varying in length from forty feet to three and one-half miles, and having a total length of eighteen miles.

A new heavy armor cable was laid at the Delaware Breakwater, the old one having been frequently broken and rendered useless by vessels dragging their anchors in storms and fouling it.

All vessels passing the Delaware Breakwater and Cape Henry are reported by telegraph to Philadelphia, Baltimore, New York, and to this office, as soon as sighted, and copies of the telegrams are furnished to the different shipping exchanges at once, by messenger, and to the public through the columns of the daily press.

The act of Congress authorizing this service, contemplates the establishment of signal stations at life-saving stations and light-houses at points along the coast, in such manner that the coast and sea in their vicinity may be at once kept under observation, warning of approaching storms be given to vessels within signal distance, and information of disasters and other incidents occurring be rapidly conveyed to the chain of life-saving stations, to ports from which aid may come in case of need, and to this office.

Communication on telegraph lines operated by the Signal Corps need not be interrupted by the breaking of wires or cables, as messages may be transmitted over extensive breaks by means of the usual day and night signals with flags and torches.

The enlisted men at these stations are taught to take and report meteorological observations, and, as signal men, are practiced in both the army and navy codes of international flag signals, to enable them to communicate with vessels of any nationality. The service has proved its usefulness in the cases of disaster to shipping, and for the meteorological purposes for which it was established.

The Signal Service is required by law to provide all official coast signals used on the coasts of the United States. To carry into effect the provisions of this law, there was issued from this office in 1878 a partial code of "Danger or Distress Signals," to be used and recognized on the coasts of the United States. This circular has been revised and enlarged and now contains a "Shipmasters' Weather Code," which, when published, will facilitate the transmission of messages to passing vessels, and enable this office to communicate the weather conditions prevailing or indicated on any portion of the coasts of the United States.

Temporary telegraph wreck stations.

These stations are established in the immediate vicinity of wrecks by an enlisted man of the Signal Corps, from the nearest station, and the occurrence of the wreck immediately reported by telegraph to this office, and the necessary aid summoned from the neighboring stations. In previous reports have appeared accounts of special services on this line, in which it was clearly shown that valuable cargoes have been saved by the assistance which it would have been impossible to secure had these lines not been in operation. The following wreck stations have been established during the year:

During the night of October 5, 1881, three schooners went ashore on the coast of North Carolina, near Life-saving Station No. 20. The Signal Service assistant at Hatteras started immediately for the scene of the wrecks and opened a telegraph station, at which he remained until the 13th, keeping up communication between the wrecked vessels and thisoffice. The vessels were the schooner "Charles," of Beaufort, North Carolina, Captain J. E. Ireland; schooner "H. W. MacCally," of Philadelphia, Captain Isaiah Doughty, and the three-masted schooner "Thomas J. Lancaster," Captain Hunter, of Philadelphia. The crews of the first two vessels were saved by the crews of Life-saving Stations Nos. 20 and 21. The "Lancaster" had thirteen persons on board. Of these, seven were lost, including Captain Hunter, his three children, and the first mate. The Captain's wife was saved. The second mate was brought ashore with a broken thigh, and medical assistance summoned by telegraph. All these vessels proved total wrecks. The Signal Service operator and life-saving crews rendered assistance in caring for the survivors and burying the bodies washed ashore.

The schooner "James W. Brown," of Belfast Maine, went ashore at 9 p. m. on November 23, 1881, at Lynn Haven Bay, Virginia, five

miles north of the signal station at Cape Henry. The captain and three of the crew managed to reach the shore. The Signal Service operator at Cape Henry promptly notified Life-saving Station No. 1, by telephone, and at once started, with the crew of the life-saving station, for the scene of the wreck. The life-boat was launched, and proceeding to the vessel rescued the three remaining seamen, who were benumbed by cold and exposure. Telegrams were sent to Norfolk for assistance, and the owners of the vessel notified of the disaster, but the vessel and greater part of the cargo were lost.

On January 17, 1882, about midnight, the Dutch steamer "Nederland" went ashore about one-quarter of a mile south of Cape Henry station. The steamer was seen by the observer at the station before it struck, and the life-saving station was notified by telephone, the crew arriving at the vessel a few moments after it stranded. The steamer fortunately got off during the night, without damage, but the captain expressed himself as highly pleased with the prompt action taken by the United States Signal, and Life-saving Services.

At 5 p. m., on January 19, 1882, the Signal Service operator stationed at Portsmouth, North Carolina, discovered a vessel at sea, three miles from his station, flying signals of distress. A boat was able to reach the vessel early the next morning, and brought her crew ashore. It proved to be the brigantine "Mary E. Dana," Captain Benson, of Salem, Massachusetts, and was water-logged, having sprung a leak on the night of January 16th. The facts were immediately telegraphed to this office, and to Wilmington, North Carolina, and Norfolk, Virginia; the revenue cutter "Colfax," from Wilmington, and Baker's wrecking steamer, from Norfolk, arriving within thirty hours after the vessel was first discovered. The wrecking steamer towed the water-logged vessel safely to Norfolk.

Telephone line.

The telephone line on the coast of Virginia and North Carolina, constructed and equipped by the Signal Service, continues in operation, being used in maintaining communication between the several life-saving stations and the stations of the Signal Service along the line. It is particularly useful in securing additional aid, when required, in case of wreck.

UNITED STATES MILITARY TELEGRAPH LINES.

The telegraph lines under the supervision of the Signal Service, on the exposed Mexican, Indian, and northern frontiers, together with those connecting military posts and stations, continue their usefulness, and demonstrate the sound policy which led to their erection and operation.

That these telegraph lines are important factors in the protection of a widely extended frontier line has been made manifest in many particulars, more especially in forming a line of connection for the military

posts, over which information may be immediately communicated in cases of Indian outbreaks—thus securing prompt and energetic action and preventing the disastrous results attending Indian wars. Instances, too numerous for separate reference, have occurred in the territories, where early information has led to action which has not only averted the immediate danger, but has shown that the system is the only trustworthy one to enable a comparatively small defensive force to protect an extensive line subject to sudden outbreaks and raids of Indian war parties. These points have been strongly dwelt upon in previous reports, but too much cannot be said in favor of the facilities which enable the troops to concentrate at any point threatened, and which alone renders it possible to suppress movements which might otherwise develop into a general Indian war.

Many of the difficulties encountered heretofore in the construction and operation of these lines are gradually disappearing or growing less, and, as the value of the lines become better understood and appreciated, interference becomes less frequent, and the settlers realize that lines constructed for the benefit of the community must be protected from injury. Gradually it has been found practicable to establish repair stations along the lines, and, as they become more numerous, fewer interruptions occur in the working of the lines. It is very important that this high state of efficiency should be maintained A total length of 4,006 miles of telegraph line along the frontier is now operated and maintained under the charge of the officers of the Signal Service. (See chart No. 23.)

During the year, 888 miles of these lines have been abandoned on account of the rapid progress of railroads and the consequent erection of private or corporate lines of telegraph. The material of these abandoned lines has been used in the construction of 716 miles of new line, which has been built in the more exposed regions, as circumstances required.

Detailed instructions for the proper construction and equipment of permanent telegraph lines are given in appendix No. 40 of my annual report of 1881. Important advances have been made in telegraphic construction, and the advantage to the United States and to the service of permanent lines cannot be overestimated. While economy is daily considered, permanence of use and the values of the results obtained fully return to the people of the United States and to the army far more than the cost of construction and maintenance. The troops of the frontier posts have furnished the greater part of the manual labor for the construction of the lines, and the local military authorities have, as heretofore, rendered every assistance in the arduous labor of preparing and transporting the rough material for construction. Without such co-operation, the amounts appropriated by Congress would be entirely inadequate to build and equip the desired lines of communication.

Wherever these lines of telegraph extend, meteorological stations of observation are also established, and by combining the duties of observer and telegraph operator, an economical system is possible which saves the cost of reports, and this, with the receipts from commercial business, may be regarded as paying for the construction and maintenance of the lines. Their use for commercial purposes is not the least important value of the lines, as they furnish, in many instances, facilities for, and promote the development of, regions not otherwise provided with accessories of railroad or telegraph to facilitate the advance toward the interior and frontiers. In Texas the existence of the military telegraph lines makes it practicable to issue warnings of destructive storms on the coast, and particularly of the "northers," to which that section is subject. The commerce of the lakes is largely indebted for the protection afforded by storm warnings, to the reports furnished over these lines from the northwest, which supply data for the study of atmospheric movements not otherwise attainable. Thus, both at the north and south, these lines complete the circuit of observation, which render it possible to study the meteorological conditions of a wide extent of country, and forewarn the classes interested of approaching dangers.

To facilitate reference and show the distribution of the various lines, they will be treated herein according to their location in different military departments, and not as has been done in previous reports, by a description of each telegraph division.

Department of the Columbia

The lines in this department, comprising the Washington and Idaho Division, have been in charge of Sergeant Frank Greene, Signal Corps, United States Army, who was recently promoted to be a second lieutenant in the Signal Corps, and who has now full charge of all the lines in the department, four hundred and seventy-three miles in length, and divided into circuits as follows: Dayton to summit of Rocky mountains, two hundred and sixteen miles; Pomeroy to Fort Lapwai, forty-five miles; Spokane Falls to Fort Spokane, sixty-two miles; and Ashland to Klamath, one hundred miles. There are thirteen stations on these lines, seven of which are in charge of enlisted men of the Signal Corps; the remaining six are in charge of enlisted men of the army, detailed for that purpose. Five additional men, detailed from the line of the army, serve as line repairers. The number of messages sent and received over the telegraph lines in this department during the year was 27,072, and the total money value of the receipts for messages would have been $6,939.54, but $730.70 of this amount must be deducted, being the value of free messages sent over the wires.

The difficulties experienced in working the line on the Mullan road have been nearly overcome. This route was in successful working order three hundred days from July 1, 1881, to June 30, 1882.

In comparison with the showing of the previous year, when this line was in working order only one hundred and nineteen days, this is a a gain in efficiency of over 100 per cent. This was due to the plan of separating the repair force into a number of small squads evenly distributed along the Mullan road, and also to the fact that the experience gained every year shows how more economical results can be obtained with no increase of force.

Three lines have been constructed in this department during the year; namely: the line from Ashland to Klamath, one hundred miles in length, under the supervision of Captain G. H. Burton, Twenty-first Infantry; the line from Spokane Falls to Fort Spokane, sixty-two miles in length, under the supervision of Captain James Miller, Second Infantry, and 1st Lieutenant L. J. Ames, Second Infantry.

The following are the proposed extensions of the lines in this department during the current fiscal year:

From Fort Klamath to Bidwell, and from Oak Point to Fort Canby. The material for the Klamath-Bidwell line has been furnished, but it is not finally decided whether the line from Oak Point to Fort Canby will be constructed. From Astoria to Fort Canby, via Fort Stevens, with cable across the mouth of the Columbia river. From Port Angeles to Tatoosh Island, off Cape Flattery, with a cable from the main land to the island.

Department of Dakota.

1st Lieutenant George S. Grimes, Acting Signal Officer, continues in charge.

In the last annual report the total length of the lines in this department was 1,747 miles, on which forty-two stations were in operation. During the past year the following extensions have been built:

From Fort Buford, Dakota, to Poplar River, Montana, 60 miles; from Fort Maginnis to Rocky Point, Montana, 60 miles; from Fort Sisseton to Webster, Dakota, 23 miles, (this line was placed by the general commanding the department under the supervision of the Signal Service on the 31st of March, 1882); from Fort Meade to Deadwood, 15 miles, (this line was rebuilt during the year). The line from Fort Keogh to Deadwood, 172 miles in length, has been discontinued, and the material has been used in repairs and construction. The lines in this department, 1,718 miles in length, are divided into the following circuits: Bismarck to Deadwood, 334 miles; Bismarck to Fort Assinniboine, 981 miles; Helena to summit of Rocky mountains, 243 miles; Fort Buford to Poplar River, 60 miles; Fort Maginnis to Rocky Point, 60 miles; Fort Sisseton to Webster, 40 miles. Forty-one stations are established, maintained, and operated in this department by twenty-nine enlisted men of the Signal Corps, twenty enlisted men detailed from the line of the army, and six civilian employés. During the year the number of messages sent and received over the lines in the

Department of Dakota amounted to 151,293, the charges on which were $41,048.73. From this sum, however, must be deducted $11,110.30, the money value of the free messages transmitted.

At the date of the last annual report it was proposed to construct a line from Fort Buford to Fort Maginnis, but insuperable difficulties arose and it was found impracticable to complete the line. It is intended, however, to resume work on it as soon as possible.

The line from Fort Totten to Larimore is being pushed forward as rapidly as possible, and it is expected that work will soon begin on the line from Fort Maginnis to Helena.

The building of the Northern Pacific railroad has frequently interrupted communication on some of the lines in this department, but owing to the prompt action of commanding officers, these interruptions have always been speedily remedied.

An attempt was made during the fall to recover the cables which had been laid across the Missouri river at Forts Buford, Yates, and Sully, and which became unserviceable, but it was only partially successful, as they were so firmly imbedded in the sand. At the time these cables became unserviceable, the overhead wire system, consisting of long single spans, was adopted, and has given entire satisfaction during the year. These single spans are from one thousand two hundred to one thousand five hundred feet in length, and the lowest point of the sag is from eighty to ninety feet above the surface of the river, which is high enough to admit the passage of steamboats in all stages of water.

The main difficulties to be overcome in keeping the lines in this department in efficient working order, are, as has before been said, snow, cold weather, and falling trees, and in spring and summer, freshets, thus rendering the work of repairs both constant and arduous.

Department of the Missouri.

Lieutenant W. A. Glassford, Signal Corps, U. S. Army, has charge of the lines in this department, and is stationed at the headquarters of the department, Leavenworth, Kansas.

The lines are short and detached, and their total length only six hundred and eighteen miles. They are divided into the following circuits:

Fort Elliott to Red river, south of Fort Sill, two hundred and ninety miles; Fort Supply to Dodge City, ninety miles; San Marcial to Fort Stanton, one hundred and twenty miles; Gunnison to Uncompahgre, ninety miles; Durango to Fort Lewis, fifteen miles; Fort Union to Watrous, nine miles; Fort Wingate to Wingate Station, four miles.

Seventeen stations are established on these lines, maintained and operated by four enlisted men of the Signal Corps, four enlisted men detailed from the line of the army, and ten civilian employés.

The line from Santa Fé to San Marcial was abandoned, and the

material taken up and used in the construction and completion of the following lines:

Dodge City to Fort Supply; Fort Stanton to Fort Craig; Fort Wingate to Wingate Station; Fort Union to Watrous; Fort Lewis to Durango; Uncompahgre to Gunnison.

The following lines are being constructed: From Rollins to Camp on White river; from Pike's Peak to Colorado Springs.

Upon the recommendation of Lieutenant Glassford, the line between Las Cruces and La Mesilla, no longer useful to this service, and only three miles in length, has been turned over to the citizens who contributed towards its construction.

The commanding officer at Fort Cummings built a line from that point to Porter's Station, and this rendered unnecessary the telegraph office maintained at Lordsburg, which was closed, and the line from that point to Silver City abandoned. The line from Dodge City to Fort Dodge, has also been abandoned, it being no longer necessary, as Fort Dodge was discontinued as a military post during the past year.

Department of Arizona.

1st Lieutenant F. K. Ward, Acting Signal Officer, continues in charge of the lines in this department. He was temporarily relieved, by 1st Lieutenant F. Von Schrader, 12th Infantry, on July 27, 1881, and re-assumed charge of the lines, September 4, 1881.

The length of the telegraph line in this department is five hundred and thirty-two miles, and it is divided into the following circuits:

Silver City to Porter's station, seventy-six miles; Camp Thomas to San Carlos agency, thirty-five miles; Fort Apache to Fort Bowie, one hundred and eighty-four miles; Fort Verde to Maricopa, two hundred miles; Phœnix to Fort McDowell, twenty-seven miles; Tucson to Fort Lowell, ten miles.

Twenty-two stations are established on these lines, and they are maintained and operated by fourteen enlisted men of the Signal Corps, thirteen enlisted men detailed from the line of the army, and eleven civilian employés.

The number of messages sent and received over these lines during the year was 123,238, and the charges for these messages amounted to $38,936.85, from which, however, must be deducted $10.016.51, the money value of the free messages transmitted.

The following lines were abandoned during the year: Fort Lowell to Point of Mountain; Point of Mountain to Fort Grant; Tucson to Florence; Fort Bowie to crossing of Southern Pacific Railroad, near Lordsburg; Fort Cummings to La Mesilla.

This last abandonment left La Mesilla in telegraphic communication with the officer in charge of the telegraph lines in the department of Texas over a continuous military line, while the communication with this office was over a connecting link furnished by a com-

mercial line, and on this account La Mesilla and the line to El Paso was transferred to the Department of Texas, October 31, 1881.

The line from Maricopa to Florence was abandoned in April, 1882, and the station at Florence discontinued. The line from San Diego to Campo, was abandoned in June, 1882. All the serviceable material of these abandoned lines was collected and the worthless portion left undisturbed. The only line constructed during the year was a branch from Phœnix to McDowell, which was begun February 15 and completed March 13, 1882. The commanding officer at Fort Cummings utilized the material from the abandoned line east of that post by building a line extending the Lordsburg-Cummings section to Porter, now called Florida station, which gave an eastern outlet for the line. An officer was placed, at the request of General Willcox, commanding the department, on February 15, 1882, at the sub-agency between San Carlos and Camp Thomas, and also, one at Ash Creek, Camp Hentig, between Camp Thomas and Fort Apache. Nearly all the lines in this department are in good condition and have been much used at all times. During Indian hostilities they have frequently been unable to transmit commercial messages, as the military required the entire use of the lines for several days at a time. The following lines will be constructed in this department at as early date as practicable: Fort Bowie to vicinity of Camp John A. Rucker; Fort Benson to Camp Huachuca.

Department of California.

At present there is only one short line in this department—from Cape Mendocino to the nearest telegraph office—but it is proposed to build lines and lay cables to connect the military posts in the harbor of San Francisco, as follows: Angel Island, Alcatraz, Black Point, Presidio, and Fort Point.

Department of Texas.

Lieutenant C. A. Tingle, Acting Signal Officer, who had charge of the lines in this department at date of the last annual report was relieved by 2d Lieutenant Leroy E. Sebree, Signal Corps, United States Army, on July 12, 1881, and Lieutenant Sebree has since that date continued in charge. The headquarters of the officer in charge of this line was removed from Denison to San Antonio, Texas. The length of the lines in this department is 1,565 miles, and they are divided into the following circuits: Denison to Brownsville, 1,038 miles; Jacksborough to Red river, 70 miles; Concho to El Paso, 457 miles.

There are twenty-four stations on the lines, maintained and operated by nineteen enlisted men of the Signal Corps, six enlisted men detailed from the line of the army, twenty-six civilian employés.

The number of messages transmitted over these lines during the year was 196,999, the charges on which amounted to $41,042.98, from which must be deducted $9,949.83, the money value of the free messages sent and received.

The line between El Paso and La Mesilla was abandoned during the year.

Extensive repairs were made on the lines in this department in the past year, and they are now in very efficient condition.

It is proposed to abandon, during the ensuing year, the line from Denison to El Paso, and also the line from Denison to Jacksborough.

Lieutenant Sebree has recommended the construction of a line from Fort Elliott to *Kutah Howay*, and also the connection by line of Del Rio and Fort Clark. He also recommended that a line be built from Camp Rice to Guadalupe Pass, but no decided action has been taken as railway progress in that section may render unnecessary the construction of these branches.

Much of the success and efficiency attained in the construction of these lines is due to the valuable assistance rendered by commanding officers of the military posts in the several departments.

The following is an extract from the annual report of 1st Lieutenant F. K. Ward, Acting Signal Officer, in charge of the lines in the Department of Arizona:

* * * * * * *

In conclusion I would say that acknowledgment is due again this year for the great amount of assistance given by the military authorities for the maintenance, repair, and operation of the lines. Every request for assistance which I have made, has been promptly and favorably acted upon, except when the continuance of active field operations, or the lack of money rendered it impossible, and even then assistance has been given, when it was difficult to do so. Without this assistance, the total cost to the United States of maintaining the lines would have been very much greater than it has been, and in some cases it would have been impossible to keep them in operation at any cost.

The above quotation is an example of the manner in which the officers in charge of the various lines have written relative to the assistance received by them.

The following is a summary of the lines abandoned and the new lines constructed during the fiscal year:

Lines abandoned.

Fort Keogh to Deadwood, 172 miles; Santa Fé to Porter's Station, 300 miles; Las Cruces to La Mesilla, 3 miles; Dodge City to Fort Dodge, 5 miles; El Paso to La Mesilla, 55 miles; Fort Lowell to Fort Grant, 121 miles; Fort Bowie to Southern Pacific Railroad, 40 miles; Fort Cummings to La Mesilla, 78 miles; Maricopa to Florence, 60 miles; San Diego to Campo, 54 miles; total length of lines abandoned, 888 miles.

Lines erected.

Ashland to Fort Klamath, 100 miles; Spokane Falls to Fort Spokane, 62 miles; Vancouver to Oak Point, 50 miles; Fort Buford to Poplar River, 60 miles; Fort Maginnis to Rocky Point, 60 miles; Fort Meade to Deadwood, 14 miles; Dodge City to Fort Supply, 90 miles; Fort Stanton to Fort Craig, 128 miles; Fort Wingate to Wingate Station,

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CHART NO. 23.

WAR DEPARTMENT,
SIGNAL SERVICE, UNITED STATES ARMY.
Map showing United States Military Telegraph Lines and other Circuits over which the Signal Service Weather Reports are transmitted.
RED—United States Military and Sea-coast Telegraph Lines.
BLUE—Other Telegraph Circuits.
LARGE CIRCLES indicate the termini of circuits.
SMALL CIRCLES indicate stations through which circuits pass.
DOTTED BLUE LINES indicate Canadian and West Indian Circuits.
DOTTED RED LINES indicate Military Lines abandoned since June 30. 1881.
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
W. B. Hazen
Brig. & Bvt. Maj. Gen'l,
Chief Signal Officer, U. S. A.
EDMONTON
BATTLEFORD
HUMBOLDT
PORTLAND
UMATILLA
ROSEBURG
ASHLAND
LINKVILLE
FT. KLAMATH
FT. BIDWELL
RED BLUFF
WINNEMUCCA
SAN FRANCISCO
SACRAMENTO
VISALIA
LOS ANGELES
SAN DIEGO
YUMA
TUCSON
WILCOX
LORDSBURG
PIOCHE
EAGLE ROCK
SALT LAKE CITY
FT. WASHAKIE
CHEYENNE
NORTH PLATTE
DENVER
WEST LAS ANIMAS
SANTA FE
EL PASO
FT. CONCHO
FT. STOCKTON
FT. DAVIS
FT. SPOKANE
SPOKANE FALLS
COLFAX
DAYTON
LEWISTON
FT. LAPWAI
MISSOULA
DEER LODGE
HELENA
FT. ELLIS
FT. SHAW
BILLINGS
STILLWATER
FT. CUSTER
FT. KEOGH
DEADWOOD
RAPID CITY
BISMARCK
FT. ELLIOTT
FT. SILL
FT. RENO
FT. GRIFFIN
FT. STANTON
FT. CUMMINGS
SILVER CITY
SAN MARCIAL
FT. CRAIG
PRESCOTT
WICKENBURG
PHOENIX
MARICOPA
FT. VERDE
FT. APACHE
SAN CARLOS
CAMP THOMAS
FT. GRANT
UVALDE
EAGLE PASS
RIO GRANDE CITY
BROWNSVILLE
GALVESTON
INDIANOLA
PALESTINE
SHREVEPORT
VICKSBURG
NEW ORLEANS
PORT EADS
MOBILE
MONTGOMERY
ATLANTA
AUGUSTA
CHARLESTON
SAVANNAH
JACKSONVILLE
LAKE CITY
CEDAR KEYS
PUNTA RASSA
KEY WEST
HAVANA
SANTIAGO DE CUBA
KINGSTON
ST. PAUL
LA CROSSE
DUBUQUE
DES MOINES
DAVENPORT
OMAHA
LEAVENWORTH
KEOKUK
SPRINGFIELD
ST. LOUIS
CAIRO
NASHVILLE
MEMPHIS
LITTLE ROCK
FT. SMITH
STARKVILLE
CHATTANOOGA
KNOXVILLE
LOUISVILLE
CINCINNATI
INDIANAPOLIS
COLUMBUS
CHAMPAIGN
CHICAGO
MILWAUKEE
GRAND HAVEN
DETROIT
PORT HURON
TOLEDO
SANDUSKY
CLEVELAND
ERIE
BUFFALO
PITTSBURG
LYNCHBURG
WASHINGTON
BALTIMORE
PHILADELPHIA
NEW YORK
NEW HAVEN
NEW LONDON
BOSTON
PROVINCETOWN
NEW SHOREHAM
ALBANY
OSWEGO
KINGSTON
TORONTO
OTTAWA
MONTREAL
QUEBEC
FATHER POINT
CHATHAM
EASTPORT
PORTLAND
MT. WASHINGTON
BURLINGTON
PARRY SOUND
ALPENA
MARQUETTE
ESCANABA
DULUTH
SANDY HOOK
BARNEGAT
ATLANTIC CITY
CAPE MAY
DELAWARE BREAKWATER
OCEAN CITY
CHINCOTEAGUE
CAPE HENRY
NORFOLK
KITTYHAWK
HATTERAS
FORT MACON
WILMINGTON
SMITHVILLE
CHARLOTTE
WILLIAMSPORT

4 miles; Fort Union to Watrous, 9 miles; Fort Lewis to Durango, 15 miles; Uncompahgre to Gunnison, 90 miles; Fort Cummings to Porter's Station, 6 miles; Phœnix to Fort McDowell, 27 miles. Total length of lines constructed during the fiscal year, 716 miles.

INDICATIONS DIVISION.

Indications and synopses.

The tri-daily telegraphic reports received at the office of the Chief Signal Officer have been carefully studied, and from them synopses and indications of the weather issued regularly at the hours of 1 a. m., 10 a. m., and 6 p. m., each day during the year. At each report a brief synopsis is prepared showing the general atmospheric conditions which have prevailed throughout the United States during the preceding twenty-four hours, and after a careful examination of the data and charts, the weather indications for each district for the next succeeding twenty-four hours are prepared. The indications are necessarily brief statements showing the state of weather, prevailing winds, temperature, and barometric changes which will probably prevail during the coming twenty-four hours. Observers at stations located upon the principal rivers report daily, by telegraph, the stages of water at their respective stations, and the changes which have occurred and are likely to occur in these rivers form a part of each issue of the synopsis and indications.

The assistant in charge of the preparation of the synopses and indications also examines carefully each report, and, when necessary, orders the display of cautionary signals at stations on the northern lakes or on the sea-coast where dangerous winds may be anticipated.

The weather forecasts as issued apply to the whole district named, and therefore express the prevailing conditions. Owing to the limited number of stations and the increased expense of telegraphing, this office does not attempt special forecasts of the weather for particular localities.

The weather forecasts of this office have been issued regularly three times daily since the organization of the service in 1870, without a single omission, and, as an evidence of their practical value, they now form an important item of news for the associated press of the country, and the deductions are eagerly sought for and published by the daily journals. There is scarcely a branch of industry that may not be affected by the weather conditions, and this office is called upon almost daily to furnish special predictions in the interests of special trades, commerce, and agriculture.

This important division of the office requires special study and experience to insure the best results, and the assistants who are required to make these deductions should devote their whole time to meteorological studies. The limited force now on duty, however, will not admit of such assignment, and, as the duty is of such a nature as to require, at least, monthly changes in the detail, I have been com-

pelled to assign officers charged with the preparation of this work to executive duties of a totally different nature, thus losing the benefits which would result from continuous study.

These forecasts are deduced from the study of charts in connection with such results and generalizations as experience and the study of meteorology have determined. The study for each issue requires the draughting and examination of seven charts, these charts graphically exhibiting the data furnished by the simultaneous reports of the stations heretofore referred to, and located in the United States, and in the Dominion of Canada, Nova Scotia, Newfoundland, New Brunswick, and the West India Islands.

The charts prepared for each report are as follows:

Chart No. I.—Weather.

Chart No. II.—Barometric changes.

Chart No. III.—Barometric departures and abnormal variations.

Chart No. IV.—Temperature changes.

Chart No. V.—Temperature departures and abnormal variations.

Chart No. VI.—Clouds.

Chart No. VII.—Dew-points.

A minute description of the manner in which these charts are prepared, and a sample of each chart appeared in my annual report of last year.

For the purpose of ascertaining the character of the work performed in this division, a careful analysis of each weather forecast is made by an assistant other than the one preparing the report, and a comparison is made between the meteoric conditions occurring during the twenty-four hours following the report, and those which were anticipated, and the percentage of verifications of each element for each district, determined in accordance with definite rules.

The following tables exhibit the results of these comparisons during the past year:

Percentage of verifications for each month of the year ending June 30, 1882.

	1881.						1882.					
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.
New England	86.9	89.7	83.4	85.1	87.3	91.8	84.0	90.1	86.6	82.6	84.8	88.4
Middle states	82.6	90.3	87.6	85.5	88.4	91.5	88.0	92.5	89.9	85.0	87.8	90.1
South Atlantic states	87.9	91.3	90.1	87.2	89.8	91.6	83.6	86.9	86.4	84.4	91.2	86.7
Eastern Gulf states	91.4	91.7	91.1	90.2	85.4	88.6	82.1	85.8	83.8	87.4	90.1	85.7
Western Gulf states	92.2	95.1	92.5	87.8	86.2	85.4	80.7	86.9	81.9	86.0	91.3	91.9
Lower lake region	86.0	92.7	85.0	86.6	85.3	89.8	87.7	88.5	89.1	86.2	96.6	85.7
Upper lake region	86.6	87.0	84.2	81.3	84.6	88.6	83.6	84.6	89.6	83.8	88.3	81.5
Tennessee and Ohio valley	90.8	88.7	86.6	84.2	86.8	88.4	85.4	87.8	91.4	83.1	90.7	88.5
Upper Mississippi valley	86.1	80.7	83.9	80.9	86.4	86.3	81.9	86.1	86.4	83.9	90.4	84.8
Lower Missouri valley	84.3	80.1	78.6	73.9	80.6	87.2	76.7	81.1	80.5	84.1	89.8	82.9
Total percentage of verifications	87.5	88.7	86.3	84.2	86.1	88.9	83.4	87.0	86.6	84.7	89.5	86.6

Percentage of verifications for the year (changes of barometric pressure, temperature, wind-direction, and character of weather expected, comprised) 86.6

Percentage of verifications for the year (forecasts of the character of the weather only) 88.2

Percentage of verifications for the Pacific coast regions for the months given.

	1881.						1882.					
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.
North Pacific coast region	98.3	67.9	90.9	91.7	65.9	92.5	83.3	98.2	81.9	94.1	77.1	94.4
Middle Pacific coast region	100.0	100.0	100.0	94.7	86.6	89.2	82.1	97.1	93.1	78.0	96.9	98.9
South Pacific coast region	100.0	100.0	100.0	100.0	93.5	86.9	85.3	93.7	93.1	98.6	87 5	97.8
Total percentage of verifications	99.4	89.3	97.0	95.5	82.0	89.5	83.6	96.3	89.4	90.2	87.2	97.0

The indications for the Pacific coast are for the "Weather" only, and for the period made the general percentage is 91.4

To facilitate the work of this service, and for convenience in the preparation of weather forecasts, the country has been divided into districts, the titles and boundaries of which are exhibited on chart No. 24.

The percentage of accuracy first given in the above tables are for statements comprising the predictions of the changes of barometric pressures, temperature, wind-directions, as well as the character of weather anticipated in the districts to which they have reference. Such predictions are more difficult to make correctly than those relating to the future conditions of the weather alone, for in such forecasts it must be pre-announced for twenty-four hours for each district outlined upon the map whether in that particular district the barometric pressures will increase or diminish; whether the temperature will rise or fall; what will be the wind-direction in each district, and other statements far more difficult to make accurately than the general forecasts that the skies will be clear or cloudy, and with or without rain. The percentage of verifications for the year, considering the four meteorological elements, was 86.6 per cent., an increase of 1.4 per cent. over that of the previous year. The percentage of accuracy of forecasts limited to the pre-announcement of the character of the weather anticipated in the districts, exclusive of the other conditions above referred to, was 88.2.

Special weather forecasts are made for the districts on the Pacific coast, when practicable, from the midnight report of each day. Owing to the great distance, imperfect telegraphic facilities, and limited time allowed for the preparation of weather forecasts at that hour, they are not made with the same regularity as are those for other districts. The general percentage of these forecasts for the year was 91.4 per cent. showing a gain of 1.2 per cent. in accuracy over that of the previous year.

It is not possible to describe within the limits of the press report, which is necessarily brief, the weather changes which are anticipated for the entire districts, and more satisfactory results would follow if special forecasts could be prepared for each state.

The district map has been widely circulated in order that the public

may be better able to correctly understand the full signification of the the weather forecasts by this office.

The attempt has been continued to utilize the statements of indications issued in bulletin form, by adding, when possible, precise information as to the location of storm-centers and their expected movements.

During the months of November, December, and January, special "Indications" are prepared for the benefit of those interested in canal navigation, in which are announced approaching changes of temperature which might probably cause the closing of the canal by freezing. These reports have been continued during the past ten years, and have been highly commended by the canal companies and the commercial associations interested.

SPECIAL BULLETIN.

The publication of the special bulletin for the press which is a new feature of the weather forecasts issued by the office, was inaugurated last year and has been continued. These bulletins contain a more general account of the meteorological conditions than it is possible to give in the synopsis referred to, and, when practicable, contain the indications of weather likely to prevail over various sections during the succeeding forty or forty-eight hours. They treat especially of severe storms, extreme temperatures, approaching frosts, heavy rains, and temperatures at selected stations throughout the country which are frequented as health resorts. These bulletins are of special value during the fall and winter seasons, as the cold waves which first appear in the northwest, moving slowly toward the Atlantic coast, render it possible for this office to give timely warning of their approach toward the more densely populated sections of the country. I have given this subject my especial attention, and with the view of increasing the usefulness of the service, each officer who is charged with the preparation of weather forecasts is required to prepare, each day, statements showing the probable condition of weather, which, in his opinion, will prevail in all districts east of the Mississippi river during the forty hours immediately following the preparation of the statement. These deductions are compared and the percentage of accuracy determined in each case. From such studies it is hoped that the office may soon be able to extend the time for which the regular indications are now issued.

An increase in the number of stations in the regions west of the Mississippi river and in British America north of Minnesota and Dakota would enable this service to greatly increase the value of this bulletin. The stations which it has been possible to establish by the erection of the United States Military Telegraph lines on the frontier are of special service in the meteorological department of this office, and the government could well afford to construct these lines for no other purpose than the transmission of meteorological reports.

STORM SIGNALS.

The display of storm signals has been continued during the year at ports on the northern lakes and on the Atlantic and gulf coasts with gratifying results. The system of display stations referred to in my last annual report affords an economical means of extending the benefits to be derived from the pre-announcement of dangerous storms to almost every port on the lake and Atlantic coasts. Signals are now displayed at one hundred and twenty stations. The following additional display stations have been established during the year:

Put-in-Bay, Ohio, July 5, 1881; Fort Morgan, Alabama, October 1, 1881; U. S. S. "Wyoming," (moored at junction of Battery creek and Beaufort river,) South Carolina, September 19, 1881; Bass River Light, Massachusetts, November 14, 1881; Sand Key Light, Florida, November 19, 1881; Crisfield, Maryland, November 23, 1881; Stony Island, (near mouth of Detroit river,) Michigan, February 7, 1882; Georgetown, South Carolina, February 16, 1882; Bath, Maine, February 18, 1882.

For the better protection of the New England coast a full station has been established at Provincetown, Massachusetts, and the full station at Wood's Holl, Massachusetts, has been discontinued. An additional display section, No. 9, has been organized, and is under the control of the observer in charge of the signal station at Boston. It contains the following stations: Highland Light, Chatham, Hyannis, Wood's Holl, and Bass River Light, Massachusetts.

When cautionary signals are ordered on the northern lakes notice that such signals have been ordered is communicated to all signal stations on the adjacent lakes, thus affording additional warning and enabling those interested in lake navigation to take necessary precautions to save vessels from exposure. Three classes of storm signals are displayed by the direction of this office, as follows: First, the cautionary signal, a red flag with black square in the center for the day signal, and a red light for the night signal; second, the cautionary off-shore signal, *i. e.*, a white flag with a black square in the center, hoisted above a red flag with a black square in the center, for the day signal, and a white light shown above a red light for the night signal; third, the cautionary Northwest signal, which is displayed at the lake ports only. The latter is the same in appearance as the cautionary off-shore signal, and signifies that dangerous winds are anticipated from points between north and west.

Experience has shown that wind velocities of twenty-five miles per hour and upwards, when occurring at the stations of the Signal Service, indicate that dangerous winds of much higher velocity prevail off the coast and near the station. Signals are therefore displayed when the assistant preparing the "indications" anticipates that the wind at any station will reach a velocity of twenty-five miles per hour.

It should be clearly understood that the "cautionary" signal gives

warning of an approaching storm and is cautionary with reference to winds blowing from any direction, and that the "cautionary off-shore" signal indicates that the dangerous winds will probably come from points between north and west, or off-shore at or near the port where the signal may be displayed.

The display of cautionary signals has proved of great value to the shipping interests of the country, and disasters to shipping on the lakes have materially decreased since the establishment of this service.

The reports from particular stations give instances in which numerous vessels have avoided dangerous storms by remaining in port in recognition of the warnings issued from this office.

These storm warnings are particularly valuable to coasters and fishermen on the sea-coast, and to shipping generally on the lakes.

During the year ending June 30, 1882, in anticipation of dangerous storms, 2,051 signals have been ordered, counting each separate display at each port as a separate signal. Of the number of cautionary signals displayed, 85.7 per cent. have been afterward reported as justified. Of the number of off-shore signals displayed, 86.8 per cent. have been afterward reported as justified. Of the number of cautionary northwest signals displayed, 100 per cent. have been afterward reported as justified.

The following table exhibits the number of signals (cautionary, off-shore, and northwest) ordered during each month, with the number and percentage justified; also the total number of signals ordered during the year, with the total number and annual percentage justified:

Month and Year.	Cautionary Signals.	Justified.	Per cent.	Cautionary Off-shore Signals.	Justified.	Per cent.	Northwest Signals.	Justified.	Per cent.	Total number of Signals.	Total number justified.	Per cent.
1881.												
July	35	29	82.9	none	none	.....	none	none	.....	35	29	82.9
August	60	45	75.0	none	none	.....	none	none	.....	60	45	75.0
September	77	63	81.8	2	none	0.0	none	none	.....	79	63	79.8
October	231	178	77.1	31	22	71.0	none	none	.....	262	200	76.3
November	221	199	90.1	67	51	76.1	2	2	100.0	290	252	86.9
December	139	125	89.9	90	73	81.1	13	13	100.0	242	210	86.8
1882.												
January	97	94	96.9	100	80	73.4	2	2	100.0	208	176	84.6
February	130	130	93.5	76	60	78.9	2	2	100.0	217	192	88.5
March	174	162	93.0	64	55	86.0	none	none	.....	238	217	91.2
April	165	168	86.1	13	9	69.2	none	none	.....	208	177	85.1
May	91	73	80.2	13	6	46.2	none	none	.....	104	79	76.0
June	100	82	82.0	8	8	100.0	none	none	.....	108	90	83.3
Total	1,559	1,348	85.7	473	364	66.8	19	19	100.0	2,051	1,730	83.0

Of the total number of cautionary off-shore and northwest signals thus displayed, eighty-three per cent. have been afterward reported as justified by the occurrence of winds held to warrant them at the points where the signals were displayed, or within a radius of one hundred miles distant from those points, as set forth in the rules of this office. In the cases reported as failures the winds did not attain,

at the port, or within the prescribed radius, a violence held to justify the warning. The signal ordered is always cautionary in its character, not announcing that a storm will come, but that the indications are sufficiently threatening to call for caution, both as to going to sea, and preparation for rough weather, if vessels are about to sail.

During the year ending June 30, 1881, three hundred and twenty storm warnings for Canadian stations were telegraphed from this office to the Superintendent of the Dominion Meteorological Service, at Toronto, Canada. The uses made of these warnings, or their results when displayed, have not been communicated to this office.

Special instructions have been issued during the year with the view of securing timely notice of the approach of dangerous storms from the West Indies. These storms are of the most violent character, and frequently move slowly westward over the West Indies, thus threatening the stations on the Atlantic and Gulf coasts. Warnings of the approach of these West Indian storms are of the greatest importance, and in past years the display of signals at a single port has saved from destruction vessels and cargoes, the value of which has exceeded the amount appropriated for the maintenance of this service for an entire year.

RIVER SERVICE.

The work of watching, recording, and giving timely warning, by telegraph, of the rise and fall of rivers, has been continued during the past year, and these reports were of especial value during the recent destructive floods in the western rivers. The daily river reports received at this office, considered in connection with the amount of rainfall occurring in the regions drained by particular rivers, enable those charged with the preparation of bulletins at this office to estimate the probable change which will occur in the water-level. The experience of past years has enabled this office to determine the rate of movement of freshet waves in each river upon which stations are located. The circular issued by the Chief Signal Officer in 1875, in which is given the "danger-line" at points on the various rivers, has been revised (see appendix No. 57), and much information obtained which will lead to an extension of this service for the benefit of the agricultural, commercial, and manufacturing interests which may be endangered by approaching floods.

The changes in the principal western rivers for the year ending June 30, 1882, are exhibited in graphic form (see charts Nos. 25 to 37, inclusive).

By the study of such charts, continued from year to year, those seasons can be determined in which floods are most likely to occur in any water-course, and it can be ascertained what amount of precipitation will be followed by floods.

The daily river reports are useful at time of low water, the information they then give permitting river shipping to be moved with intel-

ligent foreknowledge of the probable depths of water to be found in the river channels at different point upon the river's course.

The stations from which telegraphic river reports have been received, and at which daily river bulletins are displayed, are enumerated in the classified list of stations.

A complete description of the freshets which recently occurred in the western rivers will be found in appendix No. 57, part II.

STATE WEATHER SERVICES.

The plan of organizing state weather services referred to in my last annual report has met with encouraging success in a number of states, and the general interest expressed by the governors of states with whom I have communicated on this subject, promises a further extension of this valuable and economical system of reports in the near future. The object of these local state weather services is to increase, without expense to the General Government, the number of stations at which meteorological observations may be taken. The data thus collected is utilized by the Signal Service in determining the extent and severity of particular storms, and, finally, after years of observation, in determining the peculiarities of climate of each section of the country, and in defining localities favorable or unfavorable to special crops. It is proposed that the state weather services should act in co-operation with the Signal Service, and be so organized that any communication of importance, such as special predictions of frost which may prove destructive to growing crops, predictions of the approach of floods and destructive storms, may be disseminated from the Office of the Chief Signal Officer throughout the state or districts threatened, in time to serve as warnings of approaching danger. State weather services have been organized in Ohio, Indiana, Illinois, Missouri, Kansas, Nebraska, Michigan, and New Jersey, and are in co-operation with this service.

Instructions to voluntary observers have been prepared under my direction and these, with necessary forms, are supplied, without expense to them, to the observers of each of the local services. The progress made during the year in the organization of this special work, is an indication of the general interest felt by the people of the country in the subject of meteorology, and the benefits which will accrue to the states in which these services are organized, will doubtless induce neighboring states to follow the lead of those already engaged in this work. In appendix No. 58, will be found a complete account of the organization of the state weather services of each state, showing the plan of organization, and the assistance rendered by the Signal Service. The act of Congress organizing the meteorological division of the Signal Service, provided for the taking of meteorological observations at military stations in the interior of the continent, and at other points in the states and territories of the United States, and for giving notice on the northern lakes and on the sea-coast, by telegraph

and marine signals, of the approach and force of storms. The stations of the Signal Service are so located as to best enable the Chief Signal Officer to comply with the requirements of the law above referred to. These stations are, however, so limited in number, and so distributed throughout the country, as to furnish information bearing more directly upon current meteorology. The observations thus obtained, cannot be utilized in defining climatic provinces which are peculiar to many states. The state weather service will enable the people of the whole country to become conversant with the climatic conditions of every locality, and in time of severe storms, will enable this office to communicate readily with threatened districts.

PACIFIC COAST WEATHER SERVICE.

In my last annual report I referred to the organization of a special division of the Signal Service for the purpose of a more thorough study of the atmospheric condition of the Pacific coast. The climate on this coast differs greatly from that of any other section, and there is no section of the country where trustworthy weather forecasts would be of greater value. Numerous applications have been received for an increase in the number of stations and the establishment of a separate sytem of forecasts for the Pacific slope. It is believed that with more stations on the coast, and a central office at San Francisco, under the charge of an intelligent assistant authorized to give public notice of the approach of storms, it would be possible to give timely warnings to those most interested in weather changes. The construction of Signal Service telegraph lines near the mouth of the Columbia river, which is now in progress, will enable this service to establish a regular reporting station near the coast, and this, with other stations, will increase the trustworthiness of the weather forecasts for this region. The uncertainty of telegraphic communication, the time consumed in transmitting reports to this office, and the peculiarities of the climate, all suggest the necessity of this special service, and I hope to be able to comply with the many requests I have received for its establishment. At present, however, the force of officers detailed as acting signal officers is so limited as not only to prevent the assignment of an officer to the charge of this work, but to render it necessary for those now serving in this office and at Fort Myer to perform duties which cannot be executed within reasonable office hours.

REVIEW AND BULLETIN DIVISION.

Monthly Weather Review.

This publication has been enlarged and improved during the year, and is now one of the most valuable productions of this office. Each REVIEW presents a general summary of meteorological data collected by this office during the month for which it is issued. The introduction presents a brief statement of the general weather conditions

throughout the country, and the probable effect of the same upon the agricultural products of each section. Any unusual phenomena observed during the month, and new features of the REVIEW of particular interest, are also described in the introduction.

The daily reports from the cotton region are collected, and the monthly means of temperature and rainfall for each district are regularly published in the REVIEW, and add greatly to its value. These tables are much sought after by those interested in the cotton trade, and the continuance of their publication is urged by American and foreign associations. Additional charts, showing the limits within which ice was observed in the North Atlantic, have appeared with each REVIEW since April. These charts have been reproduced in maritime publications, as they are of particular interest to ship-masters, enabling them to select the safer routes for vessels passing to and from the ports of the United States. These charts are also valuable as a permanent record of the unusual ice-flow of the present year, and, when considered with the meteorological conditions which have prevailed over continents, it is probable that some relation may be found to exist between the weather conditions which prevail in the lower and higher latitudes, or that unusually warm years in polar latitudes may be followed by cool summers in lower latitudes.

The opportune establishment of polar stations last year will furnish trustworthy observations from which may be determined the primary cause of the unusual ice-flow of the present year; whether it may be due to abnormally high temperatures, unusual precipitation, or to other causes.

The text of the MONTHLY WEATHER REVIEW is uniformly arranged, the several meteorological elements being treated of in different chapters, as follows: Under the heading "Barometric Pressure," the general distribution of pressure is described, departures from the normal values for the month and barometric ranges in the several districts are noted. The movements of the areas of high and low barometer appearing within the limits of the United States are also traced, accompanied by a general description of the atmospheric changes attending each disturbance.

The chapter on "International Meteorology," accompanying the REVIEW contains a general description of the meteorological conditions based upon the simultaneous international reports as printed in the INTERNATIONAL BULLETIN of this office, and therefore is a general account of the weather conditions which prevailed in the northern hemisphere during the month for which the REVIEW was published. As this chapter has been continued during the past three years, tables have been inserted during the present year showing the departures of temperature and barometric pressure from the normals, as determined from the mean of three years' observations.

The International charts, which are issued with the REVIEW, exhibit the tracks of barometric depressions and the distribution of barometric

pressure and temperature over the northern hemisphere, with the prevailing wind at each station. Issued as they are, from month to month, they disclose the atmospheric changes which occur, and furnish valuable material for the solution of the great problem of climatic changes. From these charts may be traced the changes in the distribution of barometric pressure and the effect of the same upon the general weather conditions and storm-areas; and if the observations are continued, and the number of stations increased, they will offer material from which the successive meteorological changes may be determined.

Under the heading "Temperature of the Air" are noted deviations from the mean temperature in each state, ranges of temperature, dates of frost, and effects of the same upon vegetation, with comparative tables showing maximum and minimum temperature. The distribution of rainfall throughout the United States is shown in the chart accompanying the REVIEW, which is based upon observations taken at over five hundred stations.

Special heavy rains, largest and smallest monthly rainfall, number of rainy and cloudy days, hail and sleet, are noted under the heading of "Precipitation."

The chapter on "Local Storms" contains accounts of tornadoes and local disturbances, with a detailed account of the atmospheric conditions attending these storms, and the loss of life and property resulting from them.

Under the heading "Navigation" are given the stage of water in the principal rivers, the changes which may have occurred during the month, and a full account of floods.

Under the heading "Miscellaneous Phenomena" are given the results of excellent observations of sun spots, which have been furnished regularly by several astronomical observatories, observations of meteors, polar bands, zodiacal light, water-spouts, earthquakes, drought, and observations of the appearance and flight of insects.

The distribution of temperature and pressure, rainfall and movements of storm-areas, are exhibited on the charts accompanying the REVIEW, upon which are printed tables showing the actual temperature and rainfall, and the departure of the same from the normal values in each meteorological district (see part II of this report).

International Bulletin.

The simultaneous meteorological observations inaugurated by this service in 1873, have been continued throughout the year, and the INTERNATIONAL BULLETIN has been enlarged by the co-operation of foreign meteorological services and by the organization of the marine division of this office. This bulletin is issued daily one year after the date of observation, and exhibits the atmospheric conditions prevailing over the northern hemisphere daily at 7 a. m., Washington mean time-

and is accompanied by charts exhibiting the distribution of temperature and pressure, and direction of wind. The publication of the bulletin was begun July 1, 1875, and the daily synoptic chart was first issued in 1877. It is not possible to overestimate the value which this collection of data furnishes for the solution of the great problem of weather prognostics.

In the execution of this important work, I have to acknowledge the valuable co-operation of the chiefs of the meteorological services of the different countries represented, as follows:

Algeria, Morocco, and Tunis, by General Maritz, Supériour and Génie in Algeria; Australia, by R. L. G. Ellery, Director of the Melbourne Observatory at Melbourne, N. S. W.; Austro-Hungary, by Prof. Dr. Julius Hann, Director of the Imperial and Royal Central Meteorological Institute at Vienna; Belgium, by J. C. Houzeau, Director of the Royal Observatory at Brussels; Great Britain, by the Meteorological Council, London, Robert H. Scott, F. R. S., Secretary; Canada, by Charles Carpmael, A. M., F. R. A. S., Director of the Magnetic Observatory at Toronto, and Superintendent of the Meteorological Office of the Dominion of Canada; Cape Colony, by the Meteorological Commission of Cape Colony at Cape Town; China, by Marc Dechevrens, S. J., Director of the Meteorological Observatory at Zi-ka-wei; Costa Rica, by His Excellency, the Minister of Foreign Affairs, through Señor Amand Maison, Director of the Central Office of Statistics and Meteorology; Denmark, by Captain N. Hoffmeyer, Director of the Royal Danish Meteorological Institute at Copenhagen; France, by Prof. E. Mascart, Director of the Central Meteorological Bureau of France; Germany, by Prof. Dr. Neumayer, Director of the German Marine Observatory at Hamburg; Greece, by Prof. Dr. Julius Schmidt, Director of the Royal Observatory at Athens; India, by H. F. Blanford, Meteorological Reporter to the Government of India; Italy, by His Excellency, the Minister of Agriculture, Industry, and Commerce, through Prof. P. Tacchini, Director of the Central Meteorological Bureau at Rome; Japan, by I. Arai, Director of the Royal Meteorological Observatory at Tokei; Mauritius, by C. Meldrum, Secretary of the Meteorological Society of Mauritius; Mexico, by His Excellency, the Secretary of Public Works, through Señor Mariano Bárcena, Director of the Central Meteorological Observatory at Mexico; Netherlands, by Prof. Buys Ballot, Director of the Royal Meteorological Institute at Utrecht; Norway, by Prof. H. Mohn, Director of the Royal Norwegian Meteorological Institute at Christiana; Portugal, by J. C. de Brito Capello, Director of the Meteorological Observatory of the Infante Dom Luiz at Lisbon; Russia, by Prof. H. Wild, Director of the Imperial Central Physical Observatory of Russia at Saint Petersburg; Scotland by the Scottish Meteorological Society at Edinburgh, through Alexander Buchan, M. A., F. R. S. E., Secretary; Spain, by Antonio Aguilar, Director of the Royal Observatory at Madrid; Sweden, by Prof. R.

Rubenson, Director of the Royal Swedish Meteorological Institute at Stockholm, and by Prof. H. H. Hildebrandson, Director of the Meteorological Observatory at Upsala; Switzerland, by Prof. Rob. Billwiller, Director of the Central Meteorological Institute of Switzerland at Zurich, and Prof. E. Plantamour, Director of the Observatory at Geneva; Turkey, by A. Coumbary, Effendi, Directory of the Central Observatory at Constantinople, and Prof. C. V. A. Van Dyck, Superintendent of the Lee Observatory at Beirut; and the respective observers of each series; British Naval, by the Meteorological Council of London, through Robert H. Scott, Esq., F. R. S., Secretary; Portuguese Navy, by J. C. de Brito Capello, Directory of the Meteorological Observatory of the Infante Dom Luiz at Lisbon; Swedish Navy, by E. Molmberg, Director of the Nautical Meteorological Bureau of Stockholm; United States Navy, by the honorable Secretary of the Navy through Commodore John G. Walker, U. S. N., Chief of the Bureau of Navigation.

	Stations reporting.		Stations reporting.
Algerian series	11	Italian	18
Australian	1	Japanese	12
Austro-Hungarian	12	Mauritius	1
Belgium	3	Mexican	12
British	31	Netherlands	5
Canadian	34	Norwegian	5
Cape Colony	3	Portuguese	5
Chinese	3	Russian	22
Costa Rica	1	Scottish	3
Danish	6	Spanish series	11
French	45	Swedish	6
German	18	Swiss	2
Greek	1	Turkish	3
Indian	21	United States, sub-series	14

Total number of foreign stations reporting daily	309
United States series	183
Total number of daily reports received from local stations to June 30, 1882	492
Total number of daily reports received from local stations to June 30, 1881	466
An increase of	26

The office has the co-operation of the following steamship lines: Allan Line, through its agents, A. Schumacher and Company, of Baltimore, and H. and A. Allan, of Boston, Massachusetts, and Portland, Maine; American Line, through Peter Wright and Sons, agents; the Anchor Line, through Henderson Brothers, agents; the Atlas Line, through Pim, Forward and Company, agents; the Boston and Halifax Line, through F. W. Nickerson, agents; the Bristol City Line, through Arkell and Company, agents; the British Shipowners Company, of Liverpool, Peter Wright and Sons, agents;

Californian and Mexican Steamship Company, through J. Birmingham, agent; the Cromwell Line, through Clark and Seaman, agents; the Cunard Line, through Vernon H. Brown and Company, agents at New York, and P. H. Du Vernet, agent at Boston; the General Trans-Atlantic Company, through Louis De Bebian, agent; the Guion Line, through Williams and Guion, agents; the Hamburg American Packet Company, through Kuhnhardt and Company, agents; the Inman Line, through John G. Dale, agent; the Johnson Line, through Pattersen, Ramsey and Company, agents; the Leyland Line, through Thayer and Lincoln, agents; the Merchants' Express Line, through Funch, Edge and Company, agents; the Merchants' Steamship Company, through R. P. Borland, agent; the Morgan Line, through Bogert and Morgan, agents; the National Line, through F. W. J. Hurst, manager; the New York and Cuba Mail Steamship Company, through Jas. E. Ward and Company, agents; the New York, Havana and Mexican Mail Steamship Company, through F. Alexander and Sons, agents; the North German Lloyd Line, through A. Schumacher and Company, agents, Baltimore, and Oelrich and Company, agents, New York; the Occidental and Oriental Steamship Company, through George Young, agent; the Oregon Improvement Company, through John L. Howard, agent; the Oregon Railway and Navigation Company, through K. von Oterendorp, agent; the Pacific Coast Steamship Company, through Goodall, Perkins and Company, agents; Pacific Mail Steamship Company, through Williams, Diamond and Company, agents, San Francisco, and H. J. Bullay, superintendent at New York; the Quebec Steamship Company, through A. E. Outerbridge and Company, agents; the Red Star Line, through Peter Wright and Sons, agents at New York and Philadelphia; the Rotterdam Line, through L. W. Morris, agent; the Savannah Line Ocean Steamship Company, through F. W. Nickerson, agent; the State Line, through Austin, Baldwin and Company, agents; Texas Line, through C. H. Mallory and Company, agents; Thingralla Line, through Funch, Edge and Company, agents; the Warren Line, through Warren and Company, agents; the White Cross Line, through Funch, Edge and Company, agents; the White Star Line, through R. J. Cortis, agent; the Wilson Line, through Sanderson and Sons, agents; the Winsor Line.

Also, the co-operation of the New York Herald Weather Service.

Summary.

Total number of steamship lines reporting to June 30, 1882.....	43
Total number of steamship lines reporting to June 30, 1881.....	11
An increase of lines.....	32
Number of vessels reporting in the British Navy.....	93
United States Navy.....	45
Portuguese Navy.....	6
Swedish Navy.....	2
Marine reports furnished through the British Meteorological Office.....	25

Marine reports furnished through the New York Herald Weather Service	11
Steamships, sailing vessels, &c., reporting direct to this office	245
Total naval and marine reports June 30, 1882	427
Total naval and marine reports June 30, 1881	202
An increase of	225
Total number of reports received daily from land stations to June 30, 1882	429
Total number of naval and marine reports received daily to June 30, 1882	427
Total number of stations reporting daily to June 30, 1882	919
Total number of stations reporting daily to June 30, 1881	668
An increase of stations over 1881	251

Recapitulation.

	1881.	1882.	Increase.
Land stations	476	492	26
Naval reports	124	146	12
Steamship and miscellaneous marine reports	68	291	213
Total	668	919	251
Steamship lines	11	43	32

It will be seen from the above that all the principal nations are now co-operating in this important work of collecting meteorological data, which will represent the atmospheric conditions within the region of observation at the same instant of actual time; and this service, with the approval of the Secretary of War, has assumed the important task of collecting and publishing these observations, returning to each observer, in printed form, the bulletin which contains all simultaneous observations received. The synoptic charts accompanying this publication cover a wider field of observation than similar charts published by any other service, and with an increase in the number of observers they will prove of great value in the study of atmospheric phenomena. From the observations thus collected and published, the questions as to the translation of storms and the rate and direction of their movements, the movements of areas of high and low barometer, the conditions of temperature existing throughout the northern hemisphere from day to day, as well as questions of climatology, may be investigated; and it is hoped that the ultimate result of the work will enable this office to extend the time for which reliable forecasts of the weather are now made, and to give information as to the general character of months and seasons. From the simultaneous observations already collected and charted, atmospheric disturbances have been traced from the Pacific ocean eastward, over the United States, the north Atlantic and northern Europe, to northern Asia, thus settling the question of the translation of storms from continent to continent. Practical application of the values of this service to the shipping interests may be found in the determination of the movements and extent of storms in the north Atlantic. From the study of these charts,

ship-masters are frequently enabled to avoid the most severe storms, and, in many cases, from an understanding of the movement of winds about centers of barometric depression, actually turn them to advantage.

The establishment of meteorological stations in high latitudes by the International Polar Commission is a part of the general scheme of international meteorology, and, as all stations so established are required to take observations simultaneously with those of the bulletin, reports from them are looked for with great interest, for they will serve to determine many questions as to the movements of storms in high latitudes after they have passed beyond the limit of permanent stations.

The large increase in marine reports by the co-operation of the United States Navy, foreign navies, and the merchant marine, will lead to a knowledge of the movements of storm-areas over the ocean, and the location of these storms from day to day may be determined from such observations as accurately as barometric depressions are traced by reports from permanent stations.

This publication has been enlarged by the addition of a "Monthly Summary," which contains the monthly means of meteorological observations published in the INTERNATIONAL BULLETIN and a monthly mean chart. These summaries have been published each month during the past year. A sample of the bulletin and "Monthly Summary" will be found in appendices Nos. 59 and 60.

MARINE DIVISION.

The general interest now taken in the study of ocean meteorology, and the benefit to be derived from a thorough knowledge of the weather conditions, especially in the north Atlantic, at the several seasons of the year, convince me of the necessity of increasing this branch of the office work. I have therefore established a division of marine reports, in order to enlarge the collection of meteorological observations taken at sea by the merchant marine; to secure greater simultaneity in these observations; to make the study of meteorology and its relation to shipping interests, in this office, more useful to navigators and shipowners; to furnish additional facilities for comparing barometers in our seaports; to familiarize ship-masters with the signals displayed by this service to announce the approach of dangerous storms menacing vessels sailing near the coast of the United States, and to enable vessels in distress to call for prompt relief when in view of any signal station. As organized, the work of the division is performed under the supervision of an officer, by marine reporters and marine agents, who are assigned as needed.

Marine agents visit merchants' exchanges, boards of trade, captains, owners, and agents of vessels sailing from the United States, and explain the scope of the work and the purposes of this bureau, and endeavor to secure hearty co-operation therein. They solicit visits to the

signal stations in our ports; impart a knowledge of the nature, extent, value, and uses of the system of observations and reports of the Signal Service for the benefit of commerce, and encourage application to signal officers for meteorological information. They explain the different signals displayed to give warning of approaching storms, the methods by which inquiries may be made from vessels sailing near the coast, for special weather forecasts, or other information from shore stations, and the nature and extent of the relief which will always be furnished vessels when in distress. They encourage comparisons of ship's meteorological instruments with the standards at signal stations. Whenever possible they endeavor to interest ship-masters in taking simultaneous observations, and in special cases they may furnish ship-masters with good barometers and thermometers. Whenever simultaneous observations are promised for this office, blank forms are furnished, put up in convenient packages.

Marine agents submit monthly reports of the progress made in the work assigned them, and also inform this office at any time on any other subject of interest to the Signal Service coming to their notice in their travels and intercourse with the commercial world.

The marine reporters examine all publications relative to the naval and merchant marine co-operating in meteorological work, and report monthly and annually the statistics of storms, accidents, marine insurance, signals, marine weather services, marine legislation, and any other matter affecting the safety of the shipping of the United States from meteorological causes.

The marine reporters also prepare special papers for distribution by the Chief Signal Officer, containing changes or additions to the system of storm signals displayed at any of the ports visited by United States shipping.

A detailed tabular statement showing the vessels of the merchant marine, with their captains, on which simultaneous meteorological observations have been taken for the Signal Service during the past year, is given in appendix No. 62.

On the 1st day of July, 1881, the number of vessels of the merchant marine reporting to this bureau was sixty-eight; now the number is two hundred and fifty-nine.

The great increase of the number of observations taken at sea demonstrates the wisdom of establishing a marine division. The steam-ship lines have very generally responded to my request for co-operation.

A marine agency was established in the maritime exchange in New York city, and has proven to be a valuable adjunct to the work of the marine division. Through the courtesy of Mr. John Smith, superintendent, and Mr. F. W. Houghton, secretary of the Maritime Association, the marine agent of the service was given desk room in their reading room for the transaction of his business.

As not only captains, but vessel owners and others interested in

ocean meteorology visit the exchange in large numbers, it is a desirable center for the especial service of the marine agent.

Captains of vessels have their barometers compared here when in port with the United States Signal Service standard, which is located at the exchange for convenience of the shipping interests.

Since the establishment of the marine agency considerable improvement has been made at the exchange in the display of the Signal Service weather reports. A black-board has been placed in the most conspicuous part of the exchange, where every four hours during the day the meteorological conditions along the sea-coast from Wilmington, North Carolina, to Block Island, Rhode Island, are noted for the benefit of the coasting trade.

"New York Herald."

The friendly co-operation of the "New York Herald Weather Service" with the marine division has been very gratifying during the past year.

Mr B. A. Collins, the meteorologist in charge, has supplied this office with much valuable data in the shape of simultaneous observations at sea, logs of vessels, temperature charts, iceberg reports and other useful information.

"The New York Nautical Gazette."

This paper has commended the marine division in its labors to secure observations at sea. Captain Osborn, the editor, kindly keeps standing a notice in this paper to secure this end.

"The New York Maritime Register."

Through the columns of that journal the Signal Service has been enabled to reach parties who otherwise would not have been made acquainted with the work and needs of the service. It has I find a very extensive circulation in all parts of the world, and it reaches the classes that are specially interested in ocean meteorology better than other journals. Its influence is great in a large field, and I find that its advice and requests to ship-owners and ship-masters receive much consideration. Owing to these facts the reports and charts of the service published in its columns have thereby been widely disseminated.

"Useful Information to Ship-masters."

The pamphlet entitled "Useful Information to Ship-masters" has been widely circulated. Through the marine agency in New York city the merchant marine of every nationality has been reached and put in possession of this valuable publication.

Barometers compared.

Everywhere an increasing interest is manifested by ship-masters in regard to the condition of their barometers before proceeding to sea. As an evidence of this fact the marine agent alone has examined, com-

pared, determined error, and set over two hundred barometers for masters of vessels in his travels along the Atlantic coast. In connection with the work of the marine division there have been prepared and published in the MONTHLY WEATHER REVIEW of the Signal Service ice-charts for the different months, and a chart showing the tracks of the principal hurricanes for the years since the establishment of the weather bureau of the Signal Service. These charts have been reproduced in the Maritime Register of New York, and have very generally reached the shipping interests. The ice-charts have been made possible only by the great extension of the marine observations sent to this bureau.

PRINTING DIVISION.

The charts, bulletins, circulars, instructions, &c., necessary to supply the wants of this service at the central office and at the several stations have been printed at this office. Owing to the increase of work, additional material has been required and a new press purchased. Thus the office is enabled to issue the current publications with great promptness. The following is a summary of the work performed in this division during the year:

Bulletin of International Observations, quarto, 12 pages, daily edition of 600 copies	219,000
Monthly Summary, quarto, 10 pages	5,400
Monthly Weather Review, quarto, 20 pages	24,000
Farmers' Bulletin	143,144
Professional Papers	5,000
Signal Service Orders	71,078
Signal Service Instructions	22,380
Signal Service Circulars	11,640
Post-office wrappers	1,834,800
Envelopes	728,279
Forms	215,000
Letters and letter-heads	43,310
Miscellaneous	123,672
Total	3,238,641

The lithograph room has been supplied with a power press, which has proven satisfactory. The work performed during the year is as follows:

Base maps	306,692
Maps and charts	322,173
Forms and blanks	84,357
Letters and letter-heads	76,037
Total	708,259

TRI-DAILY METEOROLOGICAL RECORD OF OBSERVATIONS.

Preparation of data and charts for this publication has been continued during the year, and it is believed that with the force now engaged upon this work the office will be able to speedily resume the issue of this important publication.

The "Tri-daily Meteorological Record" is a continuation in a revised form of the publication previously known as the "Daily Bulletin of Synopses, Indications and Facts," which was begun in 1872, and of which thirty-six volumes with accompanying charts have already been issued.

This publication is designed to present a revised and corrected edition of the tri-daily bulletin and charts that are made up, primarily, in the current daily work of this office from telegraphic reports. This series is, therefore, to be distinguished from the series of "Daily Bulletin of Weather Reports," or of "Simultaneous Weather Reports" published monthly from January, 1872, to December, 1877, which was designed to present in permanent form the current daily work without revision or correction. This publication contains the original synopses, indications and verifications, without alteration, as made out three times a day at this office, from telegraphic reports, but revised and corrected editions of the bulletins and charts.

By the courtesy and co-operation of the superintendent of the Meteorological Service of the Dominion of Canada, the tables and charts given include data from such stations under his control as by comity of exchange send regular telegraphic reports to this office.

The bulletins, as now published, exhibit the record of simultaneous observations taken daily at 7.35 a. m., 4.35 p. m., and 11 p. m., Washington time. The observations are given as copied from the original manuscript reports of the observers. Stations whose reports were not received by telegraph in time to be available in the preparation of the current synopsis and indications are indicated by a star (*).

The chart accompanying each bulletin presents geographically a large part of the information contained therein. The isobars and isotherms have been specially drawn anew for use in this publication and are presumably free from the errors and omissions incident to telegraphic work.

The synopsis, indications, and cautionary signals accompanying each bulletin are copies, without alteration, of those issued tri-daily from this office, and which are based on the telegraphic reports received up to the moment of issue.

The labor of compiling detailed percentages of verification of predictions is performed daily and independently, and the general remarks on the respective predictions are published in each volume. The detailed percentage will be found in the MONTHLY WEATHER REVIEW of this office.

Each synopsis expresses in general terms the existing meteoric conditions and the changes that have taken place within the twenty-four hours preceding. The districts referred to in the synopsis and indications are defined on the district map which accompanies the publication. The indications relate in general to the weather of the twenty-four hours next following, and the verifications are compiled by a comparison with conditions exhibited on the corresponding charts.

The maps of this publication afford a meteorological record of especial value in the study of storm movements within the United States, and the whole publication furnishes a record more complete than any other now issued. The reduction of the barometric readings to sea-level are effected by the use of constants added to the actual barometric readings (*i. e.* corrected for temperature and instrumental error only). These constants have been determined for the special use of the Signal Service, and a description of the method of computing them will be found in appendix No. 61.

The tri-daily weather maps as charted from telegraphic observations are necessarily incomplete owing to the frequent failures to receive reports in time for the issue. The charts to accompany this record being based upon mail reports, will, therefore, be more complete, and with the improved method of reducing the barometer to sea-level, the isobarometric and isothermal lines will extend further to the westward.

INSTRUMENT ROOM.

In the instrument room of this office one thousand six hundred and one meteorological instruments have been carefully compared with the official standards during the year; eight hundred and forty-two have been purchased, and sixty-three repaired and manufactured by the instrument-makers employed in the office. Of the number compared, one thousand four hundred and twelve were issued, as follows: To regular stations five hundred and thirty-one; to cotton-belt stations three hundred and twelve; to private individuals two hundred and fifty-two; to Arctic expedition two hundred and four; to the Bureau of Navigation, Navy Department, eighteen, and to the Indiana and Kansas State Weather Services ninety-five. One hundred and eighty-four instruments were broken on station and turned in to the property and disbursing officer of the service to be repaired or condemned.

Several new self-registering instruments have been devised, and these, together with the other self-recording apparatus at this office, are being systematically compared with approved standards. Nearly all of the more delicate instruments are sent by mail, special arrangements having been made with the Postmaster General for such transmission. But few instruments are broken in transit owing to the careful management of the employés of the Railway Mail Service.

A new pattern of rain-gauge has been devised for the use of the state weather services and voluntary observers of the Signal Service.

Improvements have been made in the apparatus for comparing instruments with the standards, and the office is prepared to make comparisons of instruments purchased for private uses, or to furnish to individuals, at actual cost price, instruments which have been carefully compared with the standards. Special attention has been given to this subject as the value of all meteorological records depends upon the reliability of the instruments.

WATER TEMPERATURES.

The stations of the Signal Service located on the sea-coast and on rivers and lakes are supplied with special water thermometers, and the observers in charge are required to record daily the temperature of water both at the surface and at the bottom. These observations have been continued during the present year, and tables have been published in the MONTHLY WEATHER REVIEW showing the temperature of the water at each station. In the recent issues of the REVIEW comparisons have been made between the water temperature and air temperature at the several stations. These reports have been furnished to Prof. Spencer F. Baird, Secretary of the Smithsonian Institution, and Commissioners of Fish and Fisheries, for use in determining what waters are best for the different varieties of food fishes. These reports have been continued during the past nine years, and from the records thus furnished of extremes and means of water temperature for each month of the year, those interested in the culture of fish are enabled to correctly judge of the localities best suited for the several varieties of food fishes.

The Chief Signal Officer is pleased to co-operate in the development of this culture, and hopes to be able to render further assistance to the fisheries of the Atlantic coast by the pre-announcement of such atmospheric changes as may be found important to this industry.

NEWSPAPER WEATHER CHARTS.

The daily weather chart, which was first published on May 1, 1879, in "The Daily Graphic," a journal printed in New York city, has been continued. During the greater part of the year this chart was a fac-simile of the morning weather chart traced in this office, which was telegraphed in special cipher to the observer in charge of the New York station, who prepared the chart for publication. Recently the chart has been prepared by the observer in New York from reports received by him, thus saving the expense of telegraphing the chart from this office, and at the same time securing one which gives perfect satisfaction. Experiments have been made during the year with the view of securing the publication of similar weather charts in other journals, printed from stereotyped plates, and the results promise the solution of this difficult undertaking in the near future. Plates have already been prepared for the publication of a weather chart similar to that published in "The Daily Graphic," as a part of the Farmers' Bulletin, and when issued, the country will be supplied with weather charts based upon the midnight report, exhibiting the isobarometric and isothermal lines, with state of weather and wind-direction, at the principal stations. These charts will be engraved at the stations from which the Farmers' Bulletins are issued, and will present in a graphic form the several meteorological elements.

The cipher previously used in the transmission of the "Graphic" weather charts may be found useful in the transmission of outline charts showing general topography, lines of entrenchments, direction of movements, &c., by telegraph, in case of active military operations. This system may also be used for the rapid transmission of monthly mean charts to the various cities of the United States, or to foreign countries, should, at any time, such transmission be deemed advisable.

ARCTIC OBSERVATIONS AND EXPLORATION.

In my last annual report I discussed the fitting out of two expeditions for the Arctic regions, one for Lady Franklin bay, and the other for Point Barrow, Alaska, the object of the expeditions being the establishment and occupation of stations for meteorological observation and exploration. In view of the wide-spread feeling, now intensified by the sad fate of De Long and his men, that polar expeditions result in great danger to life without adequate return, it is proper to explain the objects of the expeditions sent out under the direction of this bureau.

These expeditions were sent to the Arctic regions to establish stations for the carrying out of the first systematic plan ever put in operation for the study of the meteorology of the extreme north.

In 1875, Lieutenant Karl Weyprecht, of the Austrian naval service, a scientist and explorer of high reputation, proposed a scheme of international meteorological observation in the polar regions, to be continued at least three years, at a line of stations encircling the pole, and as near to it as practicable.

An international geographical congress held at Hamburg in 1879, at which delegates were present from France, Germany, Russia, Austria and Hungary, Denmark; the Netherlands, and Norway and Sweden, a plan was adopted for this work. At a subsequent congress held at St. Petersburg, in August, 1881, the details were arranged, and assurances were given that the countries interested would co-operate.

It was originally intended to occupy the polar stations as early as August of last year, but delays prevented the establishment of any but those opened by the United States. It is now, however, definitely understood that the international series of observations will begin on August 1, 1882, and will be regularly continued thereafter.

Very valuable results are expected from this work, among which may be mentioned a more accurate knowledge of the conditions which govern the origin and paths of storms, the descent of polar waves of unusual cold, the irregular and uncertain movement of dangerous ice in the north Atlantic, the more northern phenomena of terrestrial magnetism, and terrestrial electric currents, the minute variations and dip of the magnetic needle, the better determination of the magnetic pole, and more definite knowledge of the conditions under which animal life, especially marine life, exists in high latitudes.

The following are the countries co-operating with the stations occupied by each:

Germany, at Pendulum island, north Atlantic, and at South Georgian island in the Antarctic ocean.

England and Canada, at Great Slave lake.

Russia, at mouth of the Lena, and at Müllers bay in Nova Zembla.

Austria, at Jan Mayen.

France, at Cape Horn.

Holland, at Dickson Haven, Siberia.

Finland, at Sodankyla.

Norway, at Bossekop.

Sweden, at Spitzbergen.

Denmark, at Godhaven, Disco island.

United States, at Lady Franklin bay, and Point Barrow, Alaska.

The station at Point Barrow is at the most northern point of Alaska, in latitude 71° 27′ N., longitude 156° 15′ W.

The party consists of 1st Lieutenant P. H. Ray, 8th infantry, one acting assistant surgeon, three enlisted men and five civilian employés. The expedition sailed from San Francisco on July 18, 1881, and reached the station on September 8th, following. The station is supplied with an abundance of stores, and everything needful for the prosecution of the work undertaken, provided the supplies shall be renewed each year.

The station at Lady Franklin bay is the most northern one in the chain of international posts of observation.

It is in latitude N. 81° 44′, W. 64° 30′. The party consists of three officers of the army, one acting assistant surgeon and naturalist, and eighteen enlisted men, and is under the command of 1st Lieutenant A. W. Greely, Fifth Cavalry, Acting Signal Officer and Assistant.

Besides the regular observations in meteorology and magnetism, it is hoped to make valuable explorations by means of sledging parties and by means of a steam-launch with which the station is supplied. A vein of coal discovered near the station is expected to afford sufficient fuel.

This expedition sailed from Saint John's, Newfoundland, on July 6, and after some serious encounters with ice in Smith's sound and Kennedy channel, during which the steamer was several times caught in the pack and drifted southward, succeeded in forcing a passage and in reaching Lady Franklin bay on August 11th, following.

The station has supplies for two years. A relief expedition has been sent this year, having left Saint John's, Newfoundland, on July 8th, with men to replace any of Lieutenant Greely's party who may have been disabled, and with all needful stores and supplies.

If this relief expedition cannot get through the ice, depots will be established, in pursuance of a concerted plan, at a point on the east coast of Grinnel Land and on Littleton island, where whale-boats and

provisions will be securely cached for Lieutenant Greely should it become necessary for him to retreat southward by land.

With the return of the relief vessels which have been sent to this station and to Point Barrow, information of the welfare of the officers and men and a full report of the work of the past year is expected.

The accompanying chart, No. 51, shows the location of stations comprising the international polar series.

In authorizing the Lady Franklin Bay expedition, it was the intention of Congress that the station established should be maintained for three years at least, and that the party there should be visited every year for supply and relief. In his report accompanying the original bill, Mr. Whitthorne, speaking for the Committee on Naval Affairs of the House of Representatives, said:

> In making this report, the committee respectfully state and report that the object of the bill, as is shown by its terms, is to authorize a temporary station to be selected within the Arctic circle, for the purpose of making scientific discoveries, explorations, and observations, obtaining all possible facts and knowledge in relation to the magnetic currents of the earth, the influence of ice-flows therefrom upon the winds and seasons, and upon the currents of the ocean, as well as other matters incidental thereto, developing and discovering at the same time other and new whale fisheries, now so material in many respects to this country.
>
> It is again the object of this bill that this expedition, having such scientific observations in view, shall be regularly made for a series of years, under such restrictions of military discipline as will insure regularity and accuracy, and give the fullest possible return for the necessary expenditure; and again, in view of the fact that either the governments directly, or scientific corps under their authority, of Germany, Holland, Norway, Sweden, Austria, Denmark, and Russia have concurrently agreed to establish similar stations, with like object, during the year 1880, it is believed that the interests and policy of our people concur in demanding that the United States should co-operate in the grand effort to be thus made for the solution of the mysteries and secrets of the north polar seas, upon which, in the opinion of scientists, depends so much that affects the health and wealth of the human race.

By a "temporary" station, it will be seen, was meant one to continue for a series of years. It was to be "temporary" in the sense of not being permanent as the regular stations of the service are. The intention was to send to the Arctic regions a body of intelligent and hardy men who should represent the United States in the work of international polar observations. Mr. Whitthorne further stated in his report that "the permanent stations should be furnished with provisions and other necessary supplies for three years. An annual visit should be made to the station to carry fresh food and supplies; to keep the members informed of events occurring in the outside world; and bear them news and letters from anxious relatives; to bring back news of progress made and of a private character to friends; also, if necessary, to bring back invalid members of the expedition and carry out fresh observers to take their places."

The report was followed by the passage of the act of May 1, 1880, authorizing the expedition to Lady Franklin bay. That act provided for the establishment of the station now at Lady Franklin bay. Lieutenant Greely was directed by the General of the Army (General Orders No. 35, Adjutant General's Office, April 12, 1881,) to take command of the expedition authorized by the act of March 3, 1881. That

act, as stated in the order referred to, provided for "observation and exploration in the Arctic sea; for continuing the work of scientific observations and explorations on or near the shores of Lady Franklin bay, and for transportation of men and supplies to said location, and return."

During the first session of the 47th Congress an act was passed (act of June 27th, 1882,) appropriating $33,000 for the supply and relief of Lieutenant Greely and party. This timely action enabled the supply expeditions for Lady Franklin bay and Point Barrow to sail at the time of the year when these remote stations could be reached. Similar action will be necessary during the coming year for the carrying out of the intention of the law establishing the Lady Franklin bay station.

The Point Barrow station, being on our own territory, was established under the general power of the Chief Signal Officer to establish stations in this country.

STUDY ROOM DIVISION.

The general organization of this division has remained as described in my last report. Two sections are recognized:

1. That of consulting specialists. These are not regularly employed by the office, but are consulted from time to time for advice in reference to important questions.

2. The Study Room, consisting of professors and computers regularly employed.

Consulting specialists.

The office has to acknowledge the courtesy of the following scientists, who have responded to requests for information upon their respective subjects:

Professor S. P. Langley, investigation into the quantity of solar heat.

Professor John Trowbridge, influence of terrestrial magnetism on clock rates.

Professor Henry Rowland, influence of terrestrial magnetism on clock rates.

Dr. Leonard Waldo, construction of standard thermometers.

Mr. C. A. Schott, on the construction and instruction in the use of magnetic apparatus.

Professor J. E. Hilgard, rate of expansion of steel bars.

Professor Arthur Wright, standard barometer; mercury distilling apparatus.

Study room.

This room has continued to be in charge of Professor Cleveland Abbe, who has been allowed the same number of assistants as enumerated in my last report, namely: One clerk (Private T. K.

Long) and three computers (Messrs. Winslow Upton, H. A. Hazen, and Frank Waldo). The work assigned to this room is enumerated in the following paragraphs:

Standard instruments.

The subject of standards to be adopted by the office as a uniform basis of reference for past and future work has received special attention.

1. Thermometers have been ordered from the best makers, as also the apparatus for comparisons. Special attention is being paid to the subject of standards for low temperatures.

2. In respect to a standard barometer, experimental work is still going on under the supervision of Prof. Arthur Wright. The substandards, for comparative purposes, have been ordered of Prof. H. Wild.

3. With reference to the standard of anemometry, apparatus has been ordered of Hagemann, and other has been designed preparatory to a comparison of methods of determining wind force at the highest velocities experienced at Mount Washington and Cape Hatteras.

4. With reference to a hygrometric standard, specimens have been ordered of the various improved forms of apparatus devised by Alluard, Edelman, Schwackhofer, Goldschmid, and others, and comparative observations will be instituted during the next year. An important change has been made in the Signal Service psychrometers by the substitution of thin muslin for the thick wicking hitherto employed.

6. With reference to evaporation, no apparatus has as yet been selected for daily use, owing to the diversity of opinion as to what constitutes the standard, but samples of the Piche evaporometer have been ordered and an investigation of the subject is in contemplation.

7. With reference to solar radiation, the apparatus mentioned in my report of last year as having been ordered for use at twenty stations has been received, but the decision as to what should be adopted as the standard has been allowed to wait until we know the results of Professor Langley's experience on Mount Whitney.

8. In order that we may have the means of determining at any moment the errors of the clocks at signal stations, and of securing the absolute simultaneity required in the observations about to be taken of atmospheric electricity, and other subjects requiring equally precise agreement in the matter of the time, I have ordered a standard clock of the highest accuracy, the completion of which is looked forward to with much interest. In this connection, I have to acknowledge the courtesy of Prof. J. E. Hilgard, who has kindly made a determination of the co-efficient of expansion of the pendulum rod.

9. In order to provide the purest possible mercury for use in barometers, thermometers, &c., one of Professor Wright's automatic distilling apparatus has been ordered, and works very successfully.

Tables.

Tables for the correction of barometric observations for instrumental errors due to temperature, &c., have remained in use as before, without change, but the question is under consideration whether or not to adopt the correction for force of gravity, reducing all measures to the standard latitude 45°.

The new tables for derivation of dew-points from the psychrometer observations went into effect July 1, 1881; several extensions have been made so as to include reported cases of remarkably dry air, otherwise the tables remain unchanged, and, although bulky, are yet as convenient as can be made consistently with accuracy.

Altitude of stations.

A revision of the altitudes of Signal Service stations was essentially completed in December, 1881, but as changes continually occur at the stations, this work is always kept in hand. The present condition of our knowledge of the altitudes of the Signal Service barometers is given in the accompanying appendix, No. 63—which also gives the latitudes and longitudes of the towns in which the stations are located. In this latter work, the map published by the Engineers' Department, 1879, has been adopted as the standard for the regions covered by it. The altitudes depend, when possible, on railroad and canal levels, and it is hoped that the definitive values of the altitudes of the local reference planes will eventually be furnished by the Superintendent of the Coast and Geodetic Survey. Nothing additional has been done in the determination of the altitudes of the stations of voluntary observers. The altitudes of Signal Service river gauges have also been determined.

Reduction of the barometer to sea-level.

The computation of monthly constants for reduction to sea-level by the use of the best altitudes and other data that were then available was finished in December, and the adopted constants went into use on the first of January. The revision of these constants as required by changes in altitude or other data is constantly kept in hand. A detailed description of the method adopted in the computation of these constants in execution of the recommendation of the board will be found in appendix No. 61, with the constants used at each station.

Atmospheric electricity.

On account of the delicate manipulation and special knowledge required in order to conduct observations of atmospheric electricity, it has not hitherto seemed practicable to engage in this class of work at Signal Service stations, but having received assurance of the hearty co-operation of the professional electricians at the schools of science, one set of the necessary apparatus has been ordered, and will be

established and worked under the care of one of our consulting specialists at one of the physical laboratories.

Prime meridians.

The adoption of one uniform time in all the records of this office will, it is conceived, facilitate some branches of work, but on account of the wide-spread interest expressed in this matter, especially by the Post Office Department and the railroad and telegraph service, and on account of some desire that any action taken by this office should harmonize with that taken by other governments throughout the world, I have deferred action on this subject and have concurred in the very general request that an international convention might be held to consider the subject. If the act of Congress recently approved by the President shall lead to a greater uniformity in the reckoning of longitude and time, it will undoubtedly be a boon to the civilized world and to science as great as the introduction of uniform standards of measures, of money, &c. The views presented by me in my last annual report were forwarded through Captain Geo. M. Wheeler, of the Engineer Corps, to the International Geographical Congress at Venice, which body recommended the calling of an international congress as above.

Library.

The science of meteorology is so intimately connected with other physical sciences that the collection of a comprehensive scientific library, arranged for convenient reference, is absolutely indispensable to the proper conduct of the work of this office.

Since the date of my last report one thousand eight hundred and twenty-seven volumes have been added to the office library, which now contains six thousand five hundred and seventy-nine bound volumes. Among the recent additions are many valuable mathematical works and special treatises on subjects connected with the more purely scientific work of the office.

Many foreign publications, both of societies and individuals, have been received as gifts or in courteous exchange for our publications. Steps have been taken toward securing complete series of the meteorological observations of all countries, and our library now contains a very choice collection which is constantly being enriched by further additions.

The books have been completely rearranged on the basis of a subject classification and are now in as satisfactory order as is attainable with the present accommodations. In connection with the extension of the library it has been found necessary to proceed at once to the preparation of a full and systematic catalogue. The form adopted is that known as the "dictionary catalogue," authors and subjects in one alphabet. Good progress on the preliminary card catalogue has

already been made, and during the coming year the work will be completed.

Bibliography.

Beside the complete catalogue and index to the scientific library of this office, great need is felt of a general index to the bibliography of meteorology. I have accordingly made arrangements to secure a complete copy of the card catalogue compiled by Mr. G. L. Symons, of London, M. Teisserenc du Bort and Professor Poey, of Paris, which, combined with those already in possession of this office, will constitute a very important contribution to this subject.

Professional Papers.

In order to diminish the bulk of the appendices to the annual report and to provide a proper mode of publishing the results of special work performed by this office in execution of the orders and the laws of Congress. I have inaugurated the publication of a quarto series to be styled "Professional Papers of the Signal Service." The first four papers of this series, mentioned in my last annual report as having been ordered, have already appeared, as also the following additional ones:

No. V.—"Information relative to the construction and maintenance of time balls," by Mr. Winslow Upton.

No. VI.—"The reduction of air pressure to sea-level at elevated stations west of the Mississippi river," by H. A. Hazen, A. M.

The following have been ordered to be published:

No. VII.—"The character of six hundred tornadoes," by John P. Finley, Sergeant, Signal Corps, U. S. A.

No. VIII.—"Recent mathematical papers concerning the motions of the atmosphere: Part I. The motions of fluids and solids on the earth's surface," by Prof. William Ferrel, reprinted, with notes by Mr. Frank Waldo.

No. IX.—"Charts and tables showing the geographical distribution of rainfall in the United States," by 1st Lieutenant H. H. C. Dunwoody, 4th Artillery, Acting Signal Officer and Assistant.

No. X.—"Signal Service tables of rainfall and temperature compared with crop production," by 1st Lieutenant H. H. C. Dunwoody, 4th Artillery, Acting Signal Officer and Assistant.

Signal Service Notes.

In addition to the publications referred to above as "Professional Papers," I have authorized the publication of a second series of papers, to be known as "Signal Service Notes," which are designed to contain results of such special work or investigation by the officers

and enlisted men of the Signal Service as may prove of general interest. The following Signal Service Notes have been published:

No. 1. Report on Michigan Forest Fires of 1881, by William O. Bailey, Sergeant Signal Corps, United States Army.

No. 2. Memoirs on the Use of Homing Pigeons for Military Purposes, by 1st Lieutenant William E. Birkhimer, 3d Artillery, Acting Signal Officer (see appendix No. 75).

Lectures at Fort Myer.

Owing to the proficiency in mathematical and physical studies of the class under instruction at Fort Myer, it was desirable to provide a course of instruction proper to fit the members to attain a high grade of usefulness in meteorology in addition to their regular duties as Signal Service observers. In the absence of any expert meteorologist in the corps of instructors at Fort Myer, and as a preliminary experiment, I have ordered a course of lectures to be delivered by each of the civilian members of the study room, to which were added a few by the commissioned officers. About one hundred such lectures were given by the members of the study room, abstracts of which are herewith appended (see appendices 3, 4, 5, 6 and 7).

Meteorological instruction, text book, and essays.

The necessity for special investigations of the numerous questions that continually recur in connection with the duties of this office, and especially those relating to the laws of climate, etc., seems to far surpass the working powers of the present limited force of this office, whose time is largely preoccupied by an imperative daily routine. I therefore hope for your approval of some plan by which those scientists and younger students not engaged in the service may be stimulated to devote their talents to meteorology. The establishment in our scientific schools of chairs or professorships devoted to this subject is a step very much to be desired. The study of meteorology and weather predictions is certainly of as great practical importance as that of astronomy, geology, or any other science. Perhaps the inherent difficulty of the study when conducted on a thorough basis should the more heartily commend it to the attention of our highest universities. I see no reason why the mathematical theory involved should not receive some slight attention in the course of instruction at West Point.

I have taken steps to secure the preparation of a suitable text book on this subject, which work will be entrusted principally to Professors William Ferrel and Cleveland Abbe, who will also derive assistance from the works of those Europeans who have devoted themselves to the mathematical theory, especially Messrs. Sprung of Hamburg, and Guldberg of Christiania. The admirable essays that have appeared in the new edition of the Encyclopædia Brittanica have attracted my attention, and negotiations are in progress looking to the providing special copies of these for the use of the Signal Service.

As an additional means of drawing out the meteorological talent of the country, I shall be pleased, with your permission, to offer rewards to the authors of essays upon selected subjects, such as were submitted to your consideration in my last annual report (see appendices 71 and 72 of that report).

In order that the service may avail itself of the latest improvement in physical research, I have addressed letters to the more prominent scientific schools, asking on what conditions the members of the Signal Corps may attend lectures and laboratory practice. The hearty response and cordial co-operation already manifested give me reason to hope that it will become possible for members of the Signal Service near such schools to more thoroughly fit themselves for independent research. The success of this plan of special studies will, it is believed, stimulate the progress of meteorology in this country.

For a list of colleges and scientific schools located near Signal Service stations see appendix No. 64.

It gives me pleasure to add that popular lectures on meteorology and the work of the Signal Service have been delivered during the year by Prof. H. A. Compton, of New York City, Prof. William H. Niles, of Cambridge, Massachusetts, Prof. A. S. Bickmore, of New York City, and regular instruction of an elementary character is regularly given by Prof. William M. Davis, of Harvard, and by Prof. M. Harrington, at the Martha's Vineyard summer school of science.

Danger line on rivers.

In order to properly issue the flood warnings required of this office by act of Congress, considerable attention has been given to the collection of data relative to so-called "danger lines," and the manuscript for a new edition of a pamphlet on this subject is nearly ready. A special collation of reports on the flood of the Mississippi river in the spring of 1882 has been made for the use of the officers in the Indication Room, and is herewith appended, as bearing upon a subject of general interest (see appendix No. 57).

Much attention has also been given to the determination of the altitudes of the zeros of the river gauges adopted in our river reports.

It is proper for me to call your attention to the fact that the act appointing the Mississippi River Commission does not appear in any way to have abrogated the duty of making river reports and flood warnings imposed upon this office annually since 1872, and the work that I am engaged in has always been performed in entire harmony with that commission.

International polar observations.

During the past year, as during the previous, the special instruction and outfit for scientific observations of the Signal Service parties established at the international polar stations at Lady Franklin bay

and Point Barrow have been entrusted to the study room. During the past spring parties have been despatched to these two stations for the purpose of supplying them with additional apparatus and other supplies, as well as observers to relieve those whom it may be necessary to send home. It is important to continue these observations to the full period of at least three years from the time of their beginning, as the results will undoubtedly be of great value in the study of American meteorology. The scientific outfit of these parties is enumerated in appendix No. 65.

The special instruction of Privates Maxfield and Palmarts was committed to the study room and the Superintendent of the Coast and Geodetic Survey.

In a portion of the scientific work to be done at these stations, the Coast and Geodetic Survey has as deep an interest as has the Signal Service. I am therefore pleased to state that that office has defrayed its share of the expenses of this international work, having taken especial charge of the magnetic, the pendulum, and the tidal work. The survey has further shown its appreciation of the importance of this matter by establishing at our joint expense a complete magnetic apparatus, registering by photography, at San Diego, California. The three United States stations, therefore, form the apexes of a triangle, whose sides are between two and three thousand miles long. The observations will at all the stations be timed by one standard, so that the exact simultaneity of the phenomena of magnetism, aurora, meteorology, and sun spots will at last be thoroughly tested.

The original expeditions of last year, as well as the relief expeditions of this, have afforded opportunity to determine the longitude of Point Barrow, and to make complete meteorological observations at sea.

Rain bands and spectroscopy.

During the past few years the attention of meteorologists has been, especially by Smyth and Lockyer, directed to the fact that the spectroscope offers us a method of approximately determining the amount of moisture in the atmosphere above us. In 1877, two of Hilger's rain-band spectroscopes were purchased, and a short series of unsatisfactory observations was made; but interest in this subject has been revived during the past year by the receipt of a special piece of apparatus ordered by my predecessor in 1878, and made under the special direction of Professor Lockyer. Observations with this apparatus and the ordinary spectroscope will be made regularly during the coming year.

Observations in balloons.

It has long been recognized as a matter of the highest importance to meteorology that the balloon should be utilized for the purpose of investigating those regions of the atmosphere that can not be otherwise reached. Aerial expeditions have been repeatedly made by

European investigators, and this country possesses in Prof. S. A. King a most acomplished and enthusiastic aeronaut, who has repeatedly signified his desire to utilize his art for the benefit of meteorology. I therefore committed to the study room the task of conducting the necessary observations on a voyage proposed to be made by Professor King, eastward from Minneapolis, on or about September 7, 1881. After an elaborate system of observations had been devised, Mr. Winslow Upton, computer in this office, proceeded to that city and started with Professor King. An abstract of his report is appended hereto (see appendix No. 66), from which it will be seen that although unfavorable weather made the aerial voyage a failure, yet interesting results were realized.

The thanks of the office are especially due to Prof. T. E. Edison, for his kindness in providing a portable electric light, by means of which it was hoped to take observations at night without in the least incurring the danger of an explosion of the hydrogen gas with which the balloon was filled.

On the completion of this voyage Professor King made provision for a second, to start from Chicago. Appendix No. 67 is a report of Private J. G. Hashagen, Signal Corps, who accompanied Professor King on this voyage, October 13th and 14th, 1881.

It is probable that by use of the captive balloon observations of temperature may be secured without the expense attendant on an extensive voyage, and by the use of the smallest kind of free balloons much may be learned in reference to direction and velocity of the upper air currents. Both of these applications of the balloon fall far short of the interest that attaches to a personal voyage over the land or ocean. The boldness of the project, explained at length in the accompanying appendix, No. 89, is equaled only by the confidence that we have been taught to place in the acknowledged skill of its enthusiastic proposer.

The use of the balloon in military signaling is another branch of this subject which I also desire to take up as soon as practicable.

Solar radiation.

As mentioned in my last report, an expedition to the summit of Mount Whitney, by Prof. S. P. Langley, for the purpose of determining, more accurately than is as yet known, the nature and amount of the selective absorption exerted by the atmosphere upon the solar rays has, with your permission, been furthered by all the means at my disposal, as this is to be considered the fundamental question in meteorology. Besides Professor Langley and four civilian assistants, there were detailed to accompany him, Captain O. E. Michælis, of the Ordnance Corps, Sergeant A. C. Dobbins and Private John J. Nanry, of the Signal Corps, and a military escort of six soldiers from the Division of the Pacific. Since the return of the expedition two pri-

vates of the Signal Corps have assisted in the clerical work incident to the preparation of a full report. An abstract of Professor Langley's report is appended herewith (see appendix No. 69), from which it will be seen that he has determined the total amount of heat received from the sun to be from 2.8 to 3.0 calories per minute per square centimeter, which figures agree closely with those of Forbes, 1842, and show that the figures hitherto adopted on the strength of the observations of Pouillet have been nearly fifty per cent. too small. Whether this absorption is due to aqueous vapor, as maintained by Tyndall, or to carbonic acid gas, or to the dry air, as maintained by others, is a matter of such importance to meteorology that it must demand further investigations, and to such work the bolometer invented by Professor Langley seems well adapted.

Military reservation on Mount Whitney.

The extreme value of retaining, for the use of the service in its future investigations, so desirable a location as Mount Whitney has induced me to concur in the recommendation of Professor Langley looking to the temporary retention of a military reservation including that site, and the necessary surveys have been ordered. It is to be hoped that this may be the first step toward the erection of an observatory on this mountain for the study of solar physics, in charge, if possible, of Professor Langley himself.

Miscellaneous information compiled in the study room.

In reply to inquiries from the officers and correspondents of this office, the following papers have been prepared in the study room.

(*a.*) List of ways in which the work of the Signal Office is known to have been made useful to the public, for the use of Professor Charles H. Wing, of Boston (see appendix No. 70).

(*b.*) List of the evidences of strength of wind in tornadoes, for the editors of the "American Architect and Building News" (see appendix No. 71).

(*c.*) List of persons and institutions designated as recipients of Signal Service publications, especially professional papers.

(*d.*) List of scientific books proper to be purchased for the library.

(*e.*) Translations from the German and French of the Instructions to International Polar Stations.

(*f.*) A collection of extracts relating to electricity on Pike's Peak, for the use of the editor of "Nature," London, England (see appendix No. 72).

Local time-balls.

In continuation of the policy of my predecessor, the office continues to co-operate with the local time services throughout the country in the distribution of standard time by means of time-balls. Such co-operation is now in force in the cities of Boston, Cincinnati, St. Paul, and

St. Louis. As the work involves the office in no appreciable expense, and is undertaken at the request of the respective localities, and is entirely in harmony with the other duties of the office, I have felt at liberty to accede to various requests for further co-operation at places where the erection of time-balls is in prospect.

Forestry.

The intimate dependence of forestry and agriculture upon meteorology rendered proper that the Signal Office should be represented in the American Forestry Convention held in Cincinnati in April, 1882, which was presided over by honorable George B. Loring, Commissioner of Agriculture. At this meeting, steps were taken to form a permanent organization. A paper, by Professor Abbe, on the subject of the relation between climate and the annual growth of trees, partially prepared for delivery at this meeting, will, perhaps, give us some general idea, based on annual rings of tree growth, of the climate that must have existed in past centuries.

Earth temperatures.

It seems to have been shown that the temperatures of the earth within a few feet of its surface have considerable importance both to the meteorolgist and the agriculturist. Thus Poisson, Smyth and others have shown that temperatures at great depths are an index of the secular changes in solar radiation and terrestrial weather; Boussingault and others show the temperatures at moderate depths to contribute to determine the character of the vegetation; Abbe and others have shown how from the temperatures of slight depths we can predict the hatching of the eggs of insect pests, such as locusts and others in the ground. I have therefore taken steps to make a selection of proper localities and to conduct the necessary observations which are, in fact, also considered by European weather services as a portion of their proper work.

Flood warnings.

The general system of river reports and predictions that has been conducted by this office for the past ten years has led to a request in certain quarters for the organization of a more detailed system. The preliminary plans for this work, prepared in the study room after the model of that adopted by the Iron, Coal and Manufacturing Association of Chattanooga, were committed to Lieutenant Birkhimer for execution, and will, it is hoped, prove acceptable to the community.

Co-operation with astronomers.

The great convenience to the astronomer that results from our ability to predict clear weather, favorable for his observations, has led me to respond favorably to a request for such daily predictions for the use of Prof. Asaph Hall, of the United States Naval Observatory. I

have also agreed upon a plan of co-operation with Prof. E. C. Pickering, Director of Harvard College Observatory, by which notice is sent him, when requested, of the occurrence of clear weather favorable to observations at certain observatories.

Numerous applications for information have been received relative to the chance of clear weather on the important occasion of the approaching transit of Venus, December 7, 1882, and considerable labor has been expended in the stations division in order to fully respond to the desires of astronomers.

The star charts supplied to Signal Service observers for observations of the aurora have also been freely supplied to astronomers interested in the observation of meteors and tails of comets and the zodiacal light, some of whom make monthly returns for the use of the WEATHER REVIEW.

Hourly observations at high stations.

An examination of the hourly observations made on Mount Washington and Pike's Peak has been made, and a number of corrections introduced, after which the hourly averages have been computed by Mr. H. A. Hazen, and the results are given in appendix No. 73.

METEOROLOGICAL PHENOMENA IN ALASKA.

For the information of those especially interested in the climatology, geography, and other features peculiar to Alaska territory, the following summary of report (now in course of preparation) of observations made by the Signal Service observer, Private E. W. Nelson, at St. Michael's, Norton Sound, Alaska, is presented:

Meteorology.

"An unbroken series of eight daily meteorological observations were taken, embracing the barometer, thermometer, hygrometer, velocity and direction of wind, cloudiness, and rain or snowfall. In addition, special attention was also directed to such incidental phenomena as occurred from time to time, the most noteworthy of these being the notes secured upon the auroral displays and the record of the 'polar band' cloud formation.

"About eighty auroras were noted in four years, very few of which were brilliant—the ordinary form being a low and rather pale arch or series of arches in the north. The cloud formation known as 'polar bands' was very common, and in a preliminary report upon my meteorological work, which has been furnished the Chief Signal Officer for publication in his annual report for the year 1881, a detailed list of these formations with accompanying phenomena is presented.

"In addition to the data secured at St. Michael's, where the station under my charge was located, I obtained some interesting thermometer and general weather observations from a fur trader stationed on

the head-waters of the Yukon river. My several sledge expeditions into the interior and along the coast to Behring's sea also furnished additional notes of value, though of a general rather than specific character. Several months passed on board the 'Jeannette' search ship 'Corwin,' cruising in Behring's sea and the Arctic ocean, were fruitful in the same manner, affording opportunity to obtain a more general and broader knowledge of the climatic conditions of still other and more remote parts of this region.

"At St. Michael's considerable attention was paid to the occurrence and character of storms and some peculiar and interesting observations were made upon the relationship of the land formation to local winds and rainfall. The material thus accumulated is to be elaborated into a general discussion of the climate of the region, covered by the writer's work while in the north, and as an inseparable subject will be treated the character of the country, its productions and capabilities of soil, with a general description of the topography and such physical characteristics as are of value and interest. A special point will be made of supplying information upon such subjects as the opening and closing of navigation in Behring's sea, the Arctic ocean and the large rivers of the interior. The little known on these points will render the additional data possessed regarding them of considerable practical value.

"The attention paid to various outside branches of inquiry, notably the zoology and ethnology, combined with the more strictly meteorological work, will all unite in completing the general description of the country and its physical peculiarities."

Geography.

"In the winter of 1878–'79 the writer secured a dog-sledge and team of nine dogs, with which, accompanied a portion of the distance by a fur-trader and the remainder by an Eskimo interpreter, he started from St. Michael's and traveled south across Yukon delta and along the sea-coast beyond to the estuary of the Kuskoquim river. Turning here, this stream was followed up some ninety miles from the sea and then a course was made across the intervening country to the lower Yukon in the vicinity of Mission Station, thence up this river about forty miles to the last Eskimo village, and then retracing the course down the Yukon to the sea and back to the starting point. Until the expedition was made, almost nothing was known of that large, somewhat triangular area inclosed on the north and south of the lower Yukon and Kuskoquim rivers and the west by Behring's sea. The maps of that region were blank, or a few imaginary streams were introduced to fill the map. The most valuable result of the expedition, therefore, consisted of the geographical data secured, and which were sufficient to construct an approximately correct map of this entire area.

"The sea-coast, as laid down in all the maps, is found to be erroneous, and Cape Vancouver was determined to be an island cut off from the mainland by an inlet, through the entrance of which the tide flows with considerable velocity. In most instances, the native (Eskimo) names have been retained to designate the prominent features. The original draft of this map has been furnished the Census Bureau in accordance with instructions from the Chief Signal Officer. In this map I have named a bay just north of Cape Vancouver in honor of General W. B. Hazen, Chief Signal Officer, under whose direction my work in the north was concluded. The inlet separating the island from the mainland is named for Prof. S. F. Baird, director of the United States National Museum. Upon this island is a low range of mountains, of which the most prominent peak, about 2,000 feet high, is to bear the name of honorable Robert Lincoln, the present Secretary of War. A bay on the coast, near Cape Romanzoff, is named for Captain C. L. Hooper, of the United States revenue steamer 'Corwin,' whose guest I was during the 'Jeannette' search expedition in the summer of 1881. Just south of Baird inlet is a lake which is named in honor of Mr. N. H. Dall, of the United States Coast Survey, whose work in this region is so well known. The Census Bureau has honored me by conferring my name on the island upon which is situated Cape Vancouver. The territory embraced between the two rivers and the coast, as mentioned, is mainly flat and very low for long distances along the coast. It is bare of trees, and bushes grow only along the sheltered banks of streams or on favorable slopes, where stunted willows and alders are found. The wood necessary for various purposes, to the people living there, is obtained along the sea-shore, where it is cast up after the spring freshets in the Yukon and Kuskoquim. It is loaded into umiaks or large seal-skin boats and taken up one of the streams which intersect the country.

"About 2,500 natives, all typical Eskimos in language, habits and life, were found inhabiting this region. These are among the most primitive Alaskans, and they offer a rich field for an ethnologist to study their primitive customs and beliefs. During the flying expedition I made through their country, enough was learned concerning them to reveal the extent and value of that left unlearned.

"Along the coast, fishing for salmon in summer, with seal, walrus and whale hunting in fall and spring, forms the main reliance of the natives. Those of the interior subsist mainly upon the several kinds of fish found in the ponds, lakes and streams which cover the country.

"Fur-bearing animals occur here in abundance, mainly red and white foxes, mink and land otter. In winter these animals, with rare herds of reindeers, are all the animal life to be found here. In summer, however, the whole region becomes a vast stretch of lake-dotted marsh, where millions of water-fowl congregate to breed, and the air is filled with mosquitos until it is almost impossible for white men to endure the torment they inflict.

"During the winter of 1879–'80, in company with a few traders, I traveled by dog-sledge north along the coast from Saint Michael's to Sledge island, just south of Behring's straits. Many interesting facts were obtained concerning the formation of the country traversed, and, as upon the former expedition, much attention was paid to the natives and the animal life. The location and course of several streams were corrected from the positions marked on former maps, and native villages located. We were received with great honor at Sledge island, as being the first white men to visit that place in winter, and, although the natives were suffering from hunger at the time, they begged us to stop all night. This we did, and a dance was given in our honor in the large *Kazhga* or council-house.

"From this point we retraced our course along the coast, and, after a severe experience, finally arrived at our starting point. This expedition was very hard upon both ourselves and the dogs, from the great scarcity of food. Two teams of dogs used in my sledge became unfit for use, owing to starvation; and the third team arrived at Saint Michael's so weak that they were barely able to advance at a small pace under the constant use of the whip. Our own experience included the use of raw, frozen fish and crabs, with seal meat, and our native interpreters boiled scraps of seal-skin, and took such other fragments as they could procure.

"From Saint Michael's north to Unalakleet the coast is bored by a series of volcanic hills and a rugged beach of dark basalt. The coast is bordered by hills, with many bold cliffs, thence all around to Cape Nome, but the rocks change to slates, and similar formations bearing galena and graphite in some places. The latter mineral is very abundant, but of a poor quality all through this region.

"From a few miles north of Unalakleet, all around the shore of Norton bay to the vicinity of Cape Darby, small spruces from ten to thirty feet high are found growing wherever the mountains or hills border the shore. The low coast in the vicinity of Shaktolik and the head of Norton bay, however, is bare of trees.

"During the winter of 1880–'81 an expedition was made into the interior from Saint Michael's. The mountains were crossed to the Anvik river, down which we passed to the fur-trading station of the same name. The country proved to be mountainous, but not very high, the entire distance. The valley of the Anvik, closely shut in by mountain slopes, is quite thickly wooded with small spruces, giving place to cotton woods, white birch and large alders where the valley becomes broader. At Anvik bad weather made a long delay in the journey, so that this expedition ended with the exploration of the two branches of the Innoko river, which flows into the south side of the Yukon above Anvik. The people living upon this stream are about one hundred and fifty in number and are the remnants of a once numerous and warlike tribe. Returning to Anvik we descended the Yukon to the sea-coast and thence to Saint Michael's again."

Ethnology.

"In this branch of research, the opportunity was excellent. During the entire period of my stay in the north and all the time which it was possible to spare from other duties was devoted to this subject. The entire Alaskan sea-coast from Kodiak island, north and including the Aleutian and other inhabited islands of Behring's sea, are peopled by Eskimo. This widely-spread and interesting people also occupy a small strip of coast along the Siberian shore from East Cape, in Behring's straits, south to some undetermined point on the coast of the Ochotsk sea. These Asiatic Eskimo are all alike in having a strong infusion of the customs, manners and blood of the neighboring inland race of natives known as Chukchees. These Asiatic Eskimo differ from their relatives of the American coast, in their lack of skill in working bone and ivory, and most work requiring expert handicraft. Their mode of life, however, is the same on both shores. The products of the sea, such as whales, walrus, seals and fish, affording the main source of food supply.

"Along the entire extent of coast occupied by the Eskimo, excepting only the Aleutian islands, there is a single language used, which alters by slow gradations from one dialect to another; but even between such extremes as Kodiak island and Greenland, two parallel lists of words are contained to show many words almost, or quite identical, and most of the roots are the same.

"Running like a connecting chain around the entire northern side of the continent extends, also, a connected and closely related or identical religious belief, with customs and observances strikingly the same.

"In Greenland and the adjoining main land the race appears to be, or to have been, in its least developed condition, owing, undoubtedly, to the rigorous climate and the consequent difficulty of sustaining life. The same causes, undoubtedly, go far to account for the short statue of most of the people inhabiting the northernmost shore of the continent and in Greenland. It is certain, that along the Alaska coast south of Point Barrow, the Eskimo are very commonly well-built men, nearly, and in some districts, quite equaling the average height of white Americans. About Kotzebue sound, some men six feet or more in height are not very uncommon, while nearly all are straight and well-built. In addition to the more robust physique possessed by the Eskimo of western Alaska, as compared with their northern and eastern brethren, there is a decided and striking improvement in the skill with which the bone, ivory and other materials used in their occupations and pursuits are worked. The west Alaskan Eskimo show great natural artistic skill in many of their productions, and strangely enough, this skill appears to increase as we proceed southward until the peninsula of Alaska is reached, the best workmanship coming from the head of Bristol bay. Joined with this increased artistic ability goes an increase in the complication and pomp of their religious festivals

and observances, some of which are very impressive. The folk-lore is also rich here in tales of various kinds, many of which bear a more or less poetical character, and frequently serve to point a moral.

Although along the inland border of the territory occupied by the Eskimo the Indians are found nearly everywhere, yet there appears to be an almost constant suspicion and enmity open or concealed between the two races. This is the more remarkable, considering the amicable relationship existing between the Eskimo of the Asiatic shore and their neighbors, the Chukchees. During the summer of 1881, however, while visiting the coast of Alaska, just north of Kotzebue sound, a large number of natives from the upper Nunatog river came on board, and among them were several who had labret holes in their lips, and had other evidences about them of having adopted many customs of their Eskimo neighbors. Nothing is known of the people living about the head waters of this river (the Nunatog), and an interesting problem awaits solution there as to the relationship existing between the Eskimo and Indians of that district.

"The existence of a totemic system, such as is so well known among the Indians, has been denied as existing among the Eskimo, but it is certainly universal among the Alaskan and Asiatic Eskimo with whom I came in contact.

"The right vocabularies obtained by me from material upon which to base definite conclusion as to the relationship between the people along a long extent of coast and the list of some 3,000 words and phrases from the people of Norton sound is the only extended list of words ever secured from the people of this region, and will form a basis for comparison with the existing dictionaries of Greenland Eskimo.

"The very large series of carvings, weapons, utensils and other articles brought back from widely-spread localities will show in a graded series the talent possessed by the inhabitants of different sections of the country."

Zoology.

"The fur-bearing mammals, as a matter of course, form the center of interest in northern Alaska, as they do in all fur countries. The distributions and abundance of these animals were studied and many notes secured regarding their habits. Combined with the study of those species of value to man, as fur-bearers, attention was also devoted to all the other species of mammals, and the distribution of several kinds studied beyond the limits before ascertained.

"The bighorn or mountain sheep is found among suitable mountains over nearly all the main land of Alaska, and even approaches the Arctic coast near Cape Tisburne, where a pair were seen by me in the summer of 1881. Reindeer are becoming very scarce, except in a few limited districts where they still exist in great abundance. The small rock hare (*lagomys princeps*), well known as a native of the Rocky

mountains extending into British America, was brought me from the upper Yukon, close to the Arctic circle, within which it undoubtedly occurs. It was also ascertained to occur in the mountains along the southern side of the Kuskoquim river, reaching within a comparatively short distance of Behring's sea.

"The series of mammal skins secured, and which are yet to be compared and studied, will undoubtedly afford some valuable results.

"Large series of skulls were secured from points along the coast and far into the interior.

"In this work, as in the other investigations conducted by me, I received continued aid from the fur-traders who did much to forward my plans. With the material in hand a complete list of the mammals of the territory will be arranged, in which will be introduced all the scientific information possible, while the more popular portion, regarding the habits and other points of more general interest, will form a leading part of the account.

"The birds of the territory received a large amount of study, and many interesting discoveries have resulted therefrom. The capture of the sharp-tailed sand-piper at Saint Michael's, where it is abundant in the fall, added a species to the North American fauna, and the single specimen of the beautiful Rosse's gull, *(Rhodostethia rosea,)* taken in autumn near the same place, furnishes the first record of this bird from Behring's sea, and the skin was the only one in any American collection until the naturalist of the 'Jeannette' brought three others back from the memorable cruise of that ship. The very large series of bird-skins secured afforded an excellent basis for comparison with the same or allied species from America and the old world. Careful comparisons were consequently instituted between them and the fine series of skins in the Smithsonian collection from various localities. Some extremely interesting facts bearing upon geographical variation and the relationship between birds of the two continents—the old and the new worlds—were obtained and new light thrown on old questions.

"A species of ptarmigan, from the eastern part of the continent, and ignored by all recent ornithologists, proves to be a valid geographical race at least, and thus adds a grouse to our fauna. Three geographical races of birds, new to science, are also among the results of the study given to the series in hand.

"Many plumages, before undescribed, are carefully noticed, and with the very full accounts of the habits and nesting, besides a variety of other interesting information, this portion of the report will be as nearly exhaustive of the subject as possible.

"In preparing the account of the birds it has been the writer's aim to render the subject as entertaining as possible, with the conviction that a subject does not suffer from being set before the reader in a palatable manner rather than in a continually prosy style.

"The time devoted to the fishes was necessarily limited, but a fine collection of the fresh-water species was secured from the rivers of the

interior, and, with the species taken at various coast localities, will serve to make a valuable contribution to the scanty stock of knowledge we now possess concerning the fishes of the north.

"The scope of this portion of the report is not fully determined yet, as the specimens still remain to be studied. There are undoubtedly several species new to science and others but little known. All the facts concerning distribution, abundance, their value as food to native and white population, with the mode of capturing the most important species, will go to make out this report. A series of water-color sketches taken from the fresh specimens will serve as originals for colored plates to accompany the report.

"As a whole, it is the writer's intention to attempt, at least, to prepare a report of exceptional value as regards the amount and worth of the material presented. The facts are at hand and it now requires their arrangement and publication."

AWARDS FROM INTERNATIONAL EXHIBITIONS.

I take pleasure in acknowledging the receipt, through the honorable Secretary of War, of awards for Signal Service displays at the International Exhibition of Electricity, held at Paris, France, and the Geographical Exhibition and Congress, held at Venice, Italy.

A "Diploma of Honor" was awarded by the Electrical Exhibition in acknowledgment of the quality of the electrical display presented by the Signal Service, the display consisting of one section of field telegraph train and electrical instruments, designed in this office with the view of securing continuous meteorological records.

Sergeant Adolf Eccard, Signal Corps, United States Army, who had immediate charge of the display, was personally awarded a silver medal for improvements and inventions.

Major D. P. Heap, United States Engineers, who had general charge of the War Department exhibits, reports that those of the Signal Service attracted great attention, and that the "Diploma of Honor" was the highest award granted.

The Signal Service also received a "Letter of Distinction" from the Geographical Exhibition and Congress for a display of tri-daily weather charts issued by this office from November 1, 1871, to December 31, 1879. The "Letter of Distinction" was the highest award conferred, the "Diploma of Honor," of first and second class, and "Honorable Mention" following successively.

PERMANENT ORGANIZATION.

In connection with the subject of permanent organization, I respectfully invite your attention to the report of the military committee of the House of Representatives on the bill for the organization of the Signal Corps:

The Committee on Military Affairs, to whom was referred the bill (H. R. 2253) to increase the efficiency of the Signal Corps of the Army, respectfully submit the following report:

The committee are forcibly impressed that an efficient and well-trained Signal Corps is absolutely essential to armies in time of war. No organization has done more with the same number of men and with the same expense than a corps of intelligent and educated signal officers.

The crude methods adopted by the ancients have been improved, until now an army without an efficient signal corps would labor under a disadvantage which would render it inefficient for a campaign.

The matter has received the careful attention of all European powers and should demand the serious consideration of Congress.

The corps should be composed of scientific men of high attainment, whose study of methods used by other armies, supplemented by their experience, would enable them to devise and invent plans of the highest superiority.

In times of peace the duties of the Signal Corps are of the highest importance to the whole people. They are daily notified of approaching storms, of probable changes in the weather, and such a corps as is proposed would by study and experience finally be enabled to predict the approach of cyclones, and it is not impossible that they could eventually devise means to prevent any serious damage by them.

In a country like ours, with a territory of 3,603,884 square miles, this bureau in time of peace should be under the War Department.

In Denmark, Sweden, and the Netherlands, which are so eminently maritime, it is very properly under the navy department.

In Austria it is independent or special.

In France it is controlled by the minister of the interior.

In England it is controlled by the Royal Society.

In Russia it is controlled by the Academy of Sciences.

In our country, with the Signal Corps properly organized and made a party of the army, we can have the aid of the army, and more than that, we can have that efficiency and promptness which is the result of military discipline.

The Signal Corps of the United States was first organized on June 27, 1860, by the appointment of Assistant Surgeon Albert J. Myer to the rank and position of major and Chief Signal Officer of the regular army. So efficiently was this service performed, and so essential was it to the army, that on March 3, 1863, the corps was increased and the chief promoted to the rank of colonel.

Section 22 of the act to increase and fix the military peace establishment of the United States, approved July 28, 1866, provided for one Chief Signal Officer, (a colonel,) and gave the Secretary of War authority to detail six officers, and not to exceed one hundred non-commissioned officers and privates, from the Battalion of Engineers.

The number of enlisted men was increased from time to time, and by act of Congress, approved June 20, 1878, was fixed at four hundred and fifty. By this act it was also provided that two sergeants of the Signal Corps might, each year, be appointed second lieutenants.

The act of Congress approved February 24, 1880, added to the Signal Corps fifty privates, and provided that, from and after the passage of the act, the Chief Signal Officer should have the rank and pay of a brigadier-general.

The Signal Corps therefore consists of one brigadier-general and four second lieutenants, appointed under the act of June 20, 1878, and five hundred enlisted men of the grade of engineer soldiers.

There has been no provision of law for any of the intermediate grades of officers of this corps, or for the promotion at any time of such second lieutenants as may be appointed under the existing law.

During the late war the duties of the Signal Corps were solely in connection with the armies, and comprised a system of communications by signals and by field telegraphs which had been invented and adapted by the late General Myer. It was used extensively by both armies, especially during the latter years of the war, and esteemed of great advantage. Similar systems have since that time been put in use in most of the great armies of Europe, and such means of communicating are now regarded as indispensable in modern warfare.

It was owing to this belief that the act of July 28, 1866, fixing the military peace establishment of the United States, provided for the position of Chief Signal Officer and for the detail of officers and enlisted men for that service.

At that time, and for some years subsequently, no meteorological work was contemplated by any corps or branch of the army, and the requirements of the case were sufficiently met by the plan adopted.

By joint resolution of Congress, approved February 9, 1870, the Secretary of War was authorized and required to provide for taking meteorological observations at the military stations in the interior of the continent and at other points in the states and territories of the United States, and for giving notice on the northern lakes and on the sea-coast, by magnetic telegraph and marine signals, of the approach and force of storms.

On June 27, 1872, the Secretary of War assigned this duty to the Chief Signal Officer of the army, under whose control it has since remained, and from this beginning the present system of observations and reports for the benefit of commerce and agriculture has grown up.

These reports have constantly increased in number and variety, are made three times each day, and include all conditions of weather, of temperature, of rainfall, and of barometric changes throughout the country, and are promptly given to the public, while special warnings of storms on the northern lakes and on the sea-coast are furnished as far in advance as possible, and save annually heavy losses to commerce. Approaching cold waves, known in the west as "northers," are predicted, warnings of frosts are sent out for the benefit of sugar planters and orange growers, and during the past year an extensive system of observations and reports for the benefit of cotton planters was put in operation, which it is contemplated to extend to the wheat-growing interests of the northwest as soon as possible.

Public confidence in these reports and in the weather forecasts has continually increased, and their character has improved yearly, until at present there are few, if any, classes of industry which do not receive large benefit from them. Statistics show that the storm warnings given on the lakes result in a saving to commerce of nearly $1,000,000 each year.

Not only has the work of this corps conferred large benefits upon the industries of the country, but it has given American meteorology a high standing in other countries.

The committee believe that this service is now indispensable to the public, and that it should be continued and improved as further observation and experience may suggest; that this can be best accomplished by the work remaining under military control and by a more complete organization of the Signal Corps, whereby the officers required to perform the duty may be placed where they will remain permanently upon it, and by means of which the present defective system of temporary detail may in future be avoided.

There are now on duty with the Signal Corps sixteen officers detailed from regiments, who are liable to be relieved and returned to their proper duties at any time. The course of preparatory study necessary before an officer is fitted for weather predictions requires two years, and even then subsequent experience is most valuable and necessary. The committee believe that the duty requires the best talent and training, and can be best performed by officers whose positions are permanent; that the value of the weather predictions is recognized by the country, as is evidenced by numerous resolutions of boards of trade, chambers of commerce, and similar organizations representing all sections; that the great industries of the people require and demand that this service shall be continued and improved, and that this can best be done by appointing into the Signal Corps the necessary officers and thus completing its organization.

The officers now on duty with the corps are not sufficient for the work demanded, and the number should be increased.

The committee, therefore, after a careful examination of the facts, and in view of the foregoing, recommend that the accompanying bill be passed, with an amendment.

It is necessary that some better grade and pay than that of sergeants be provided for the oldest and best men of this service. The higher grades of pay given to fourth, third, and second class clerks in the other bureaus at Washington draw from us our best men when they have become most valuable; and it cannot be expected they will remain here, but will be lost to the Signal Service unless their work is made as remunerative as in the other bureaus.

An increased force of fifty men is now imperatively needed to carry on the cotton-belt work, the display of frost warnings, the extension of telegraph lines, and other work; and I recommend that, instead of increasing the enlisted force, fifty additional clerks be authorized for the central office, preference in appointment to be shown to the oldest and most efficient men in the service.

This will release a corresponding number of enlisted men, and permit their assignment to station work, while it will advance to better pay men who have been mostly ten years in the service.

I recommend the grading of the fifty as follows: Five of class three, twenty of class two, and twenty-five of class one.

Appendix No. 74 contains a general summary of past legislation relating to, and the legal status of, the Signal Service.

NEW BUILDING.

The need for a new office, built with a direct view of the purposes of the Signal Corps, cannot be too strongly urged. The work of this bureau now necessarily occupies ten buildings on G and H streets and Pennsylvania avenue, at an annual rent of $6,379.96, while the cost for messengers and laborers over what it would be, were this work brought into a single convenient building, is about $2,500 a year. The cost of a new office, including the ground, would not exceed $150,000, the interest of which, at three per cent., would be $4,500. This would effect an annual saving of $4,379.96, while the building would be so placed that a large increase of value would arise upon the property. The very large and valuable collection of data and records now accumulating are greatly exposed to destruction by fire, while the work of the Signal Bureau would be rendered much more efficient and economical in every way if properly housed in a building suited to its purposes. There is no prospect of room being available in the new War Department building, and favorable action on a new office is earnestly recommended.

I am, sir, very respectfully, your obedient servant,

W. B. HAZEN,
Brig. and Bvt. Maj. Gen'l,
Chief Signal Officer, U. S. A.

Hon. ROBERT T. LINCOLN,
Secretary of War.

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PART II.

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APPENDIX 1.

FORT GRANT, ARIZ., *July* 24, 1882.

ASSISTANT ADJUTANT-GENERAL, DEPARTMENT OF ARIZONA,
Prescott, Arizona.

(Through commanding officer of scouting operations in Southern Arizona.)

SIR: I have the honor to report that on the 10th instant I left the post to establish heliograph line between Grant and Bowie, for practice, as required from your headquarters. The line was established with two intermediate stations, and messages were successfully transmitted for Colonel Brackett, commanding scouting operations, and returned by telegraph, and quite an amount of practice was had over the line. There being much difficulty in supplying the station with water, it was then closed, the object of its establishment being attained. The longest range on this line was about 25 miles, the flash at this distance being *perfectly clear and distinct to the naked eye;* in fact, but little different from that at 10 and 15 miles. On my return on the 20th and 21st instants, I ascended to the highest point of the Dos Cabezas, the distance of which, I should say, is at least 40 miles from Grant, and from here my flash at Grant was easily read, I being able to read *with the naked eye* and without difficulty the flash at Grant, and communication was easily had. The second day quite a number of messages were transmitted. The power of these small mirrors is quite a surprise to me, and I can safely say that 40 miles is a safe range, as proved, for the heliograph of the Grugan pattern, and I believe it can be used to advantage as far as 60 miles, being read by the unaided eye of any one with good sight. There is no doubt that the heliograph can be of great advantage in this country, and moving columns might communicate with posts at distances of 50 miles or more, thus saving much time in getting supplies, giving information, &c. The Morse code can be used equally well with heliograph, consequently any telegraph operator can read the messages without any practice, simply understanding that the *long* and *short flashes* take the place of the *dash* and *dot*. This being the wet season, I find that the afternoons are usually cloudy, but I understand that during the greater part of the year the weather is fair and light very good. As soon as possible I shall establish a line to camp on the Gila (near Clifton) from Bowie. This, Colonel Brackett, commanding scouting operations, thinks the more important line, as by means of it the people in the valley of the Gila can be warned of Indian trouble, in addition to its being a means of communication with the troops. He is giving me all the assistance possible to carry out the instructions of the department commander. The line between Bowie and this camp (on Gila) can be established with but one intermediate station, at Ash Butte, near the springs and about 10 miles from the Gila camp. Water can easily be supplied. The line from Bowie to Price can also be established with one station (intermediate) near Camp Rucker, and the water supply will be no difficulty. I would respectfully request that I be furnished with six (6) more heliographs; they are necessary for the line from Bowie to Price. I want those of the Grugan pattern; I find the other (the Garner) is perfectly unreliable and almost useless, except, with much work, an arrangement for keeping it in position is made. I would respectfully call attention to the fact that a great portion of my men belong to the Twelfth Infantry, and if they are to leave the department, I would request that there be detailed an equal number of men to be instructed as soon as possible. It will take at least six weeks to properly instruct them, and I respectfully request that the department commander be pleased to make the detail in time for their instruction. The knowledge they obtain of signaling cannot fail to be of advantage to the service. The supply of flags, telescopes, and field-glasses, I hope may soon be furnished, as they are much needed.

I am, sir, very respectfully, your obedient servant,

MARION P. MAUS,
First Lieutenant, First Infantry, A. S. O., in the Field.

APPENDIX 2.

FORT MYER, VA., *August* 19, 1882.

CHIEF SIGNAL OFFICER OF THE ARMY:

SIR: I have the honor to submit the following description of a form of heliograph devised with a view to its suitability to military service in the United States, and which has been subjected to such tests as could be made over the signal ranges at the Signal-Service School of Instruction at Fort Myer, Va., including the Sugar Loaf Mountain range, 32 miles in length. The instrument worked in a satisfactory manner, and has already been turned over to the government.

The heliograph, packed, consists of two pieces, viz, a leather satchel containing two mirrors and the screen, and a canvas case (3 feet 6 inches long, diameter 3 inches) containing two tripods, the legs of which interlock, and the bar. Total weight, 8¼ pounds. Both pieces may be carried slung over the shoulder, sling straps being provided for this purpose.

The instrument consists of seven constituent parts, viz: Two tripods, two mirrors, one bar, one screen, and one screen key.

The tripod legs are of hickory, the bar of phosphor bronze (16 inches long), the mirrors (3¼ by 3½ inches) in metal frames are plated with pure silver, which becomes whitish and opaque by exposure to the sun to a much less degree (if at all) than amalgam-backed mirrors. The screen frame is of brass, the screen of vulcanized rubber. The calculated range of the instrument is 76 miles.

When signalling, the bar is clamped at its center to the top of one of the tripods, the mirror to one of the extremities of the bar, the screen to the top of the other tripod. The other extremity of the bar has a clamping arrangement for the second mirror, used when the sun is behind the sending station, and also holds the sighting-rod.

The instrument is adjusted by looking through the hole in the center of the glass and turning the bar and raising or lowering the sighting-rod until its disk covers the distant station. By means of a tangent and a vertical screw attached, the one to the clamping arrangement on the bar, the other to the mirror frame, the shadow spot of the hole in the mirror is made to fall upon the sighting-rod disk.

As the flash from a plane mirror is a reflection of the sun's image, its greatest intensity lies along the axis of the cone of light, and as the axis of the cone of light coincides with the center of the mirror, it follows that the shadow spot is situated in the axis of the cone and therefore in the line of greatest intensity; and the center of the mirror, the disk of the sighting-rod, and the distant station being in line, the distant station receives the brightest reflection obtainable when the shadow spot is on the disk.

By working the telegraph key attached to the screen, this latter having been placed in position to intercept the flash, the flashes are made to appear and to disappear to the distant observer, and in this manner the letters of the alphabet are signaled. Either the Signal Service code or the Morse code may be used.

In connection with this subject, I would respectfully invite your attention to the two systems by which signalling may be carried on with the heliograph, viz:

1. By flashes of light.
2. By obscuration.

The former system is the one used by the Signal Service. The latter, however, is believed to be superior, and for the following reason: That it is easier for an observer to concentrate both sight and attention upon the motions of a fixed light that is rapidly covered and uncovered by a screen, than to wait for the appearance of a light which, so to speak, flashes out suddenly from space.

The English army has adopted the system of obscuration, and as it is probable that the heliograph will be generally used by troops in the field, it would appear advisable to adopt without delay that system which appears the better one. The screen which forms part of the heliograph referred to in this communication, may be used for either the flash or the obscuration system.

The principal objects kept in view in devising this instrument were, facility of adjustment and of repair in the field in case of accident, portability, strength, and as few constituent parts as possible.

There are several forms of instruments used in sun-signalling, the most prominent of which are the Mance heliograph, devised by Mr. H. C. Mance, and the Begbie heliostat, devised by Captain Begbie of the Madras Sappers and Miners. Both of these instruments appeared to have certain objectionable features which might be overcome. The Begbie consists of too many constituent parts; cannot be conveniently carried by a mounted man, and stands low when set up for working, the centre of the mirror being only 14 inches above the ground.

In working the Mance, owing to the movable mirror, the operator is liable to send flashes that vary in intensity, and which are trying to the reader's sight; to correctly maintain the adjustment is more fatiguing to the eyes of the operator than with a steady flash instrument, owing to the shadow spot being constantly in motion while sending a message; and the working of the button attached to the mirror is apt to disarrange the adjustment, especially in soft soil. Finally, with the Mance heliograph, no matter how many signal men may be on the station, the adjustment can only be attended to by the operator himself, who adjusts while signalling. This is a disadvantage. The advantage of having an adjuster and an operator cannot be overestimated. It facilitates the work both at the sending and at the receiving stations. The instrument should, however, be so constructed as to be capable of being worked successfully by a single operator.

The General of the Army having approved your application for my temporary detail on signal duty, I have been enabled to make such experiments as can be made in this section of the country. Over the 32-mile range, between Fort Myer, Virginia, and Sugar Loaf Mountain, Maryland, the flashes were full and distinct, and the alignment was easily maintained and the screw worked by a single operator. These experiments in the field during the present summer have led to several important changes in the instrument, which is now believed to be in condition for issue to troops in the field.

Very respectfully, your obedient servant,

F. C. GRUGAN,
First Lieutenant, Second Artillery.

APPENDIX 3.

LECTURES ON INSTRUMENTS AND METHODS.

By Professor CLEVELAND ABBE.

This course of lectures on meteorological instruments and methods was intended to give a basis for the exact study of the sources of error and to suggest to the best-prepared students the most recent methods of treatment of fundamental problems in meteorology.

The following is a synopsis of the contents of these lectures, as delivered by myself.

CLEVELAND ABBE,
Professor and Assistant.

LECTURE No. I.

(Begun January 12, 1882, and finished January 19, 1882.)

THERMOMETERS.

1. General ideas of heat and expansion, linear and cubic.
2. Relative expansion of air, mercury, brass, steel, and glass.
3. The air thermometer.
4. Absolute zero, Fahrenheit's zero, Centigrade zero.
5. Fahrenheit, Reaumur, Centigrade, absolute, and arbitrary millimeter scales.
6. Calibration—Bessel's, Oettingen's, Neumann and Thiesen's, and Russell's methods.
7. Determination of the freezing-point { Of pure water at 30 inches; 45° latitude; zero feet altitude.
8. Determination of the boiling-point }
9. Sudden and slow changes of the fiducial points of mercurial thermometers.
10. Comparison of thermometers.
11. Signal Service correction-cards.
12. Radiation; Dulong and Petit-Radiation $= m a^{\theta}$.
13. Refraction, dispersion, and wave length.
14. Absorption; Prevost's theory of exchanges.
15. Conduction.
16. Thermal properties of lamp-black, polished silver, mercury, glass, rock-salt, water, aqueous vapor, dry air.
17. Bright-bulb thermometers.
18. Black-bulb thermometers.
19. Bright and black-bulbs *in vacuo*.
20. Temperature of the air.
    - *a.* Ordinary Signal Service shelter: Wild's shelter and the English shelters.
    - *b.* Polished silver screens: Pouillet.
    - *c.* Joules's tube and spiral.
    - *d.* Abbe's method—black and bright-bulbs in the same shelter, and the reduction formula. $T_a = T_s + c\,(T_b - T_s)$.
    - *e.* Whirling thermometer.
21. Solar radiation: Relative observations.
    - *a.* Marié-Davy and his conjugate thermometers.
    - *b.* Violle and his conjugate bulbs.

LECTURE No. II.

(January 19, 1882.)

BAROMETERS.

1. Atmospheric pressure.
2. Siphon barometer.
3. Corrections for instrumental errors and peculiarities.
    - *a.* Graduation errors of the scale and elastic stretch or set.
    - *b.* Temperature of the scale.
    - *c.* Temperature of the mercury.
    - *d.* Impurity and density of the mercury.
    - *e.* Capillarity in the tube and in the cistern.
    - *f.* Imperfect vacuum (Arago's method) and tension of mercury vapor.
    - *g.* Verticality.
    - *h.* Variation of gravity with latitude (Wild's correction table).
    - *i.* Variation of gravity with altitude.

LECTURE No. III.

(January 26, 1882.)

BAROMETERS.

1. Aneroid barometers:
   a. Vidi, 1850.
   b. Naudet.
   c. Goldschmid.
2. Construction and handling.
3. Setting.
4. Corrections for—
   a. Scale, *a*.
   b. Time, bT.
   c. Temperature, $c\,(t-t_0)$.
   d. Pressure, $d\,(h-P)$.
   e. Gravity. (This correction is 0 if the standard barometer has been corrected for gravity.)
5. Comparisons of barometers:
   a. Reading forward and backward.
   b. Constant personal errors.
6. Signal Service barometer correction cards.

LECTURE No. IV.

(February 2, 1882.)

ANEMOMETERS.

1. Arbitrary wind scales:
   a. Mannheim, 0—4.
   b. French, 0—7.
   c. Beaufort, 0—12.
   d. Signal Service, 0—8.
   e. International, 0—10.
2. Wind velocity 1 mile per hour = 0.447032 meters per second.
3. Wind pressure. Rouse's formula, pressure (pounds per square foot) = $0.005 \times$ velocity^2 (miles per hour.)
4. Velocity anemometers:
   a. Robinson.
   b. Hagemann.
5. Pressure anemometers:
   a. Wild.
   b. Lind.
   c. Osler.

LECTURES Nos. V and VI.

(February 9 and 16, 1882.)

ANEMOMETERS.

1. Relations between pressure and velocity and shape of body:
   a. Hagen and plane surfaces.
   b. Robinson, Dohrandt, and Thiesen and hollow hemispherical cups.
2. Thiesen's formula for Robinson's anemometer.
3. Dohrandt's formula for Wild's tablet anemometer.
4. Lind and Hagemann anemometers.
5. Abbe's combined barometer and anemometer.

1. The pressure of the wind against thin plane discs cut into various shapes (circles, squares, triangles, &c.) is expressed by Hagen in a formula equivalent to the following:

$P = (0.0028934 + 0.0001403\,p)\,Av^2$ where A is the area of the plate in square feet, and v the velocity in miles per hour, p the perimeter of the disc in linear feet, and P the pressure in pounds per square foot.

2. Dohrandt, by studying a number of anemometers whose cups had various radii (R), and were attached to arms of various radii (r), finds the formula; wind velocity meters per second $= a_2 + B_1 \times 2\pi r$ where a_2 is generally about 1 meter per second and

B_1 can be computed with a mean error of + or — 3 per cent. from the following formula:

$$B_1 = +3.0133 - 53.7367\,\frac{R}{r}R + 1033.81\left(\frac{R}{r}\right)^2 R^2,$$

where R and r are to be expressed in meters.

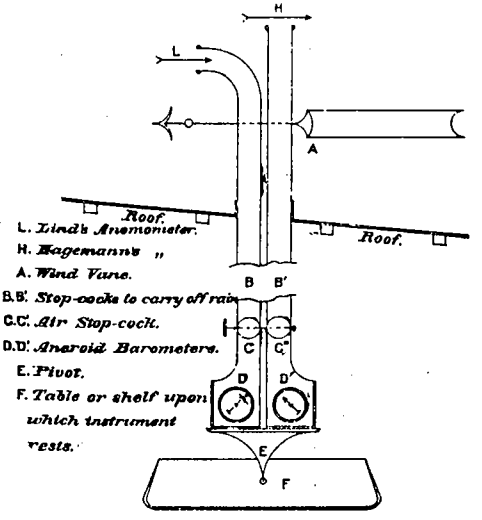
3. Comparisons of Wild's tablet anemometer with observations led Thiesen to a complicated formula, which, being applied to the special dimensions of these instruments as made for use in Europe, gave the following table:

Velocity, meters per second.	Angular deviation from the vertical.
	°
1	1.1
2	4.1
3	9.2
4	15.7
5	23.0
6	31.0
7	38.7
8	45.7
9	52.1
10	58.0
11	62.5
12	66.4
15	74.0
20	80.5

4 and 5. The Lind anemometer gives the pressure due to wind blowing into a horizontal end of a siphon tube; the Hagemann anemometer gives the draft up a vertical tube across the top of which the wind is blowing; barometers as usually read in closed rooms give pressures as affected somewhat by the draft up chimney and the currents penetrating doors and windows. The combination shown in the following figure gives the true wind-pressure P_w and barometric pressure P_b in the free air, as deduced from the readings B_1 and B_2 of the two aneroid barometers D and D^1:

$$P'_w = a\,(B_1 - B_2)$$
$$P'_b = b\,(B_1 + B_2).$$

FIG. 1.



Combination of Lind and Hagemanns' Anemometer with Aneroid Barometers, suggested by Professor Cleveland Abbe.

LECTURE NO. VII.

(February 23, 1882.)

AQUEOUS VAPOR AND HYGROMETERS.

1. The general functions and importance of aqueous vapor.
2. Dew-point; vapor tension, weight of vapor, relative humidity, evaporation.
3. Various methods employed and corresponding apparatus.

OBJECT TO BE DETERMINED.	APPARATUS.
Relative humidity	Saussure's hair hygrometer.
Absolute weight of moisture	Chloride of calcium absorption apparatus. Sulphuric-acid absorption apparatus. Sulphuric-acid absorption thermometer.
Absolute tension	Schwackhöfer volumetric method. Edelman's tension apparatus.
Dew-point	Daniell, Bache, Regnault, Alluard.
Wet-bulb	August psychrometer. Psychrometre à fronde.

LECTURE NO. VIII.

(March 2, 1882.)

HYGROMETRY.

1. Regnault's theory of the action of the wet-bulb thermometer, based on the consideration of the convection of heat by a gentle current of air.
2. The deduction of Regnault's formula from the following fundamental hypotheses:
   (*a*) That the thin layer of air that supplies heat to the wet-bulb thereby falls to the temperature t'.
   (*b*) That the heat used up in evaporation comes only from this thin layer.
   (*c*) That this layer is completely saturated at the temperature t'.
3. From the above is deduced the following formula:

$$x = f' - \frac{0.429\,(t-t')\,h}{610-t'}$$

But Regnault substitutes 0.408 instead of 0.429 in order to accommodate the above to actual observations.

LECTURE NO. IX.

(March 9, 1882.)

HYGROMETRY.

1. Maxwell's theory of the action of the wet-bulb thermometer, based on the consideration of the radiation, conduction, and diffusion of heat and moisture.
2. The deduction of Maxwell's formula from the following fundamental hypotheses:
   (*a*) That the thin layer of air is quiescent and supplies heat to the wet-bulb only by conduction and radiation.
   (*b*) That the moisture evaporates only by a process of diffusion.
3. From the above is deduced the following formula:

$$p_0 = p_1 - \left(\Theta_0 - \Theta_1\right)\frac{4\pi C K + A R}{4\pi c \frac{D}{K} L}$$

4. The similarity between Maxwell's and Regnault's results, showing that the same formula with somewhat different constants must very closely represent nature.

LECTURE NO. X.

(March 16, 1882.)

ACTINOMETERS.

1. Thickness of the atmosphere penetrated by the solar rays. Bouguer, Lambert, Pouillet, La Place,
2. Formula for intensity and absorption: $I=Ap^{\epsilon}$, $p=$ the coefficient of transparency varies between $\frac{4}{10}$ and $\frac{9}{10}$; $A=$ the solar constant may be assumed 100, in which case the value of I would be expressed in actinometric degrees, or it may be taken at 243, which gives I in terms of Herschell's actines per second per square foot, or if $A=1.763$, according to Pouillet, I would be expressed in calories per minute per square centimeter. One calorie is the amount of heat required to raise one kilogramme or liter of water one degree Centigrade.
3. For non-homogenous rays Violle's formula may be used: $I=A_0+A\,(\frac{3}{4})^{\epsilon}$; or Crova's formula $I=\frac{A}{(1+a\,\epsilon)^b}$.
4. Methods of observing solar radiation:
   (*a*) Heating effects: Saussure, helio-thermometer; Leslie, differential thermometer; Herschel, actinometer; Rumford, thermoscope; Pouillet, pyrheliometer; Gasparin, blackened copper globe; Melloni, thermo-electric pile; Violle, absolute actinometer; Langley, bolometer.
   (*b*) Optical effects: Photometers by Bouguer, Ritchie, Rumford, Bunsen, Arago.
   (*c*) Chemical effects: Draper, tithonoscope; Bunsen and Roscoe, chemical actinometer; Marchand, chlorine actinometer; Becquerel and Moser, Ball, Kuhne, and others, photo-chemical methods. The human eye is also a photo-chemical actinometer.

LECTURE NO. XI.

(March 23, 1882.)

INSOLATION.

This was an abstract of the results given by Meech in his work on intensity of sunlight.

LECTURE NO. XII.

(March 30, 1882.)

MAGNETIC APPARATUS.

1. General idea of terrestrial magnetism as presented by Gauss.
2. Formulæ for the action of the earth or other body upon magnetic needle.
3. General description of the declinometer or unifilar magnetometer; methods of making and reducing observations of declination and horizontal force.
4. General description of the vertical circle, methods of making and reducing observations of the inclination of the needle.

LECTURE NO. XIII.

(April 4, 1882.)

GRAPHIC METHODS.

1. Presentation of wind resultants and total movements.
2. Integration by means of the planimeter.
3. Methods of projection on geographical charts.
4. Possibility of representing graphic curves by means of a harmonic function.

LECTURE NO. XIV.

(April 6, 1882.)

PERIODIC FUNCTIONS, &C.

1. General account of the properties of the periodic formulæ invented by Fourier, Bessel, &c.

2. Propriety of considering them as interpolation formulæ only, and not adapted for extrapolation.
3. Corrections to daily, monthly, and annual means, as given by De Forrest, in order to obtain normal values.

LECTURE NO. XV.

(April 13, 1882.)

THE LAWS OF CHANCE AND PROBABILITY.

1. Theory of the accuracy of observations.
2. Relative chances of large and small errors.
3. Methods of calculating the probable error of the average of a number of observations.

LECTURE NO. XVI.

(April 18, 1882.)

FACILITY OF ERROR.

1. General deduction of the method of least squares (Hagen's demonstration).

LECTURE NO. XVII.

(May 4, 1882.)

DIURNAL VARIATION OF THE TEMPERATURE OF THE AIR DURING THE NIGHT-TIME.

(Lectures XVII and XVIII were an abstract of the memoir of Weilemann, Zurich, 1872.)

1. Mathematical theory of the laws of the variation of temperature in the absence of the sun, namely, from sunset to sunrise, taking account only of terrestrial and atmospheric radiation, and from the original differential equations deducing the final result, namely:

$$t = u + C\,b^z$$

The values of b shown to be uniform throughout the world and for all conditions of cloudiness.

LECTURE NO. XVIII.

(May 9, 1882.)

DIURNAL VARIATION OF THE TEMPERATURE OF THE AIR DURING THE DAY-TIME.

1. Mathematical theory of the laws of temperature variation taking solar radiation into account.
2. Differential equations are the same as before, adding a term for the sun, whence integration gives the following final result:

$$t = u + [c_1 + c_2\,(z + b^{z+\varepsilon})]\,b^z + p\,\varepsilon\,(\xi + \xi_2 \sin z + \xi_3 \cos^2 z).$$

LECTURE NO. XIX.

(May 11, 1882.)

VERTICAL DISTRIBUTION OF TEMPERATURE IN THE FREE AIR.

1. General ideas on the mechanical theory of heat.
2. Law of diminution of temperature in ascending dry air.
3. Law of diminution of temperature in ascending moist air when no condensation takes place.
4. Diminution of temperature when condensation takes place, namely, inside of cloud masses.
5. Law of warming in descending masses of air; explanation of the Föhn.

LECTURE NO. XX.

(May 15, 1882.)

GEOGRAPHICAL DISTRIBUTION OF ATMOSPHERIC TEMPERATURE.

1. Meech theoretical distribution of solar radiation.
2. Actual distribution of temperature by isotherms.
3. The analytical expressions for the annual mean temperature of any locality and of the whole globe.
   - (*a*) Brewster: $t = 1° + 81.8 \sin d$
   - (*b*) Kirwan: $t = 84° + 53 \sin^2 \phi$
   - (*c*) Schmidt: $t = 13.67 + 17.13 \cos 2\phi$
   - (*d*) Kämtz: $t = -18.22 + 50.92 \cos^2 \phi$ for the interior of the American continent.
   - (*e*) Forbes: $t = 12°.5 + 59.2 \cos \frac{3}{2} L + 38°.1 \lambda \cos 2L$
   - (*f*) Von Waltershausen: For ocean climate, $T = 9°.737 + 2°.511 \sin \phi + 11°.412 \cos 2\phi$; For continental climate, $T' = 6°.990 + 22°.055 \cos 2\phi$
   - (*g*) Schoch (1856): $T = 11°.99 + 31°.71 (\cos^2 \beta - \frac{1}{3}) + 2°.66 \sin \beta \cos \beta \cos \phi + 2°.49 \sin^2 \cos \beta 2\phi$ &c., &c., omitting small terms of the spherical harmonic functions.
   - (*h*) Ferrel (1872): $T = 8°.50 - 1°.75 \cos \theta - 20°.95 \cos 2\theta - 1°.00 \cos 3\theta - 2°.66 \cos 4\theta$
   - (*i*) Hann (1882): $T = 4°.86 + 6°.94 \sin \phi + 21°.14 \cos 2\phi$ for the southern hemisphere.
4. General average temperature of the whole globe:

	Ferrel.	Hann.
(*a*) Northern hemisphere	15.3	
(*b*) Southern hemisphere	16.1 (?)	15.4

Whence results the equality in temperature of both hemispheres.

5. The temperatures on the hypothesis that the earth's surface is uniformly all water or all land, as deduced from Forbes's formula:

Latitude.	Temperatures.	
	All water.	All land.
	° *F.*	° *F.*
0.	71.7	109.8
45	51.0	51.0
90	12.5	−25.6

Conclusion of the course.

APPENDIX 4.

LECTURES ON PRACTICAL ASTRONOMY.

By Mr. Winslow Upton.

War Department, Office of the Chief Signal Officer,
Washington, D. C., June 30, 1882.

Professor Cleveland Abbe:

Dear Sir: I have the honor to submit the following report upon the course of lectures in practical astronomy delivered by me before the class under instruction at Fort Myer, during the past winter and spring.

These lectures were given in accordance with instructions No. 11, issued January 18, 1882, which specified the subjects to be discussed in each of the twenty lectures, as previously suggested by myself. The order there given was strictly adhered to, and no changes or omissions were made during the course.

In the planning and carrying out of a series of lectures on astronomy before a class of men who were preparing for the duties of Signal Service observers, it was necessary to keep distinctly in mind the relations existing between the allied sciences of astronomy and meteorology, and also the possible benefit which students in the latter science may derive from a knowledge of the methods of the former. It would be of no direct benefit to observers of the service to study astronomy as a theoretical science, or to learn the minute details of the methods employed by astronomers in their special investigations, except as a means of individual culture. But it would be an advantage to them in their meteorological duties to understand the general methods of work adopted by astronomers in dealing with such practical problems as those of latitude, longitude, time, and determination of a meridian, for these problems are closely allied to the problems of meteorology, and are occasionally a direct part of the work of an observer in the Signal Service. In addition, the delicate adjustments and refined methods of work which are constantly required of the practical astronomer might well be copied by the meteorologist in his investigations. With these considerations in mind, and aiming to make the series of lectures as far as possible directly useful to the men under instruction, I followed no text-book, but adapted the course from various sources as seemed best for the objects in view.

The lectures were delivered extemporaneously, aided by a skeleton outline of the subject-matter of each lecture. At the beginning of each lecture, lithographed notes were furnished the students which contained a full outline of the lecture of the day nearly as complete as the notes prepared for my own use. These outlines, which are appended to this report, were not intended as an abstract of the lectures, but rather as a statement of the subjects treated and the order and method of their discussion, for the assistance of the men in following the lecturer. From them it will be seen that at the outset the fundamental conceptions of practical astronomy and the terms used were explained, and on subsequent days these were followed by a discussion of the subjects of time, longitude and latitude, and kindred topics. These were viewed from a practical standpoint, and suggestions as to the care of instruments and minor details in their use were frequently given. In some cases extra problems were assigned, and a sextant was placed at the disposal of the class for some weeks. The full benefit of a course in practical astronomy can only be obtained when a number of instruments, such as transits, sextants, and zenith-telescopes, are furnished the class and used under the immediate supervision of the instructor. As this was not possible, on account of the size of the class and the lack of instruments, the course of lectures was delivered under the disadvantage of offering but little practical experience in the use of instruments.

Special prominence was given to furnishing references to the authorities whose works might be consulted by the students. There are available for the use of students at Fort Myer several copies each of Chauvenet's Theoretical and Practical Astronomy, in 2 volumes, Newcomb & Holden's Astronomy, Bowditch's Useful Tables, and the American Ephemeris and Nautical Almanac for 1882. To these works frequent references were made, and where these were not sufficient others were mentioned, access to which might be obtained in the library of this office. In certain cases in which the subjects can be found treated only in pamphlets, or in which discussion is at the present going on, such as standard time and time-balls, it was the aim to present a careful statement of the topic as at the present time understood; and where it is the

subject of controversy, to give the various views advocated with the arguments advanced for each.

No regular recitations were required, but general questions were frequently asked upon previous lectures, and opportunity was always afforded for questions from any member of the class before and after the lecture, as also at any time during its delivery. The members of the class were required to take notes, and, in a large majority of cases, these show close attention to the lectures and that the subjects were well understood.

I take pleasure in referring to the excellent order maintained by the class, and the uniform attention and interest with which the lectures were received.

I am, very respectfully, yours,

WINSLOW UPTON,
Computer, O. C. S. O.

LECTURE No. I.

ASTRONOMICAL CONCEPTIONS—MOTIONS OF THE HEAVENLY BODIES.

In the problems of practical astronomy to be discussed in these lectures, the universe is regarded as a vast mechanism, the motions of which are regulated by fixed laws. The heavenly bodies are considered simply as parts of this mechanism, and the immutable working of the laws governing their motions enables us to solve problems of practical interest to men.

THE CELESTIAL SPHERE.

From this point of view the fundamental conception of astronomy is that of the celestial sphere, which is a sphere of *indefinite radius*. The elements of the celestial sphere are—

1. Its centre, which is the centre of the earth. This may usually be regarded as coincident with the position of an observer on any part of the earth's surface, but it is sometimes necessary to regard the relative positions of the observer and the earth's centre.

2. Portions of the radii of the sphere, drawn from its centre to the various heavenly bodies. The surface of the sphere has no real existence, but is simply a conception of the mind to aid it in conceiving of angular measurements. The celestial sphere enables us to regard the relative directions of the heavenly bodies, but not their distances either from the earth or from each other.

SPHERICAL CO-ORDINATES.

The relative directions of two points may be expressed by the angles between the lines of direction drawn from the observer. Since angles are measured by arcs on the surface of a sphere, angular measurements upon the celestial sphere are made by the aid of a system of circles, viz.—

1. The Primary Great Circle.
2. Great Circles *perpendicular* to the Primary and intersecting each other at its poles, called Secondaries.
3. Small Circles *parallel* to the Primary, called Tertiaries.

The position of any point on the Sphere is defined by two spherical co-ordinates—(*a*) the distance of the point from the Primary measured on a Secondary; (*b*) the arc of the Primary intercepted between this Secondary and some point of the Primary adopted as the origin of co-ordinates. The selection of the Primary and of the origin of co-ordinates determines three systems of co-ordinates used in Astronomy. These systems are the Horizontal, Equatorial, and Ecliptic systems. The names applied to the circles used in each system, together with the co-ordinates and origin of co-ordinates for each, are exhibited in the following scheme:

	Horizontal.	Equatorial.		Ecliptic.
		I.	II.	
Primary	Horizon	Celestial equator	Celestial equator	Ecliptic.
Secondaries	Vertical circles	Declination circles.	Hour circles	Circles of Latitude.
Tertiaries	Parallels of altitude.	Parallels of declination.	Parallels of declination.	Parallels of latitude.
Co-ordinates *a*	Altitude	Declination	Declination	Latitude.
Co-ordinates *b*	Azimuth	Right ascension	Hour angle	Longitude.
Origin of co-ordinates.	South point of horizon.	Vernal equinox	Intersection of equator and the meridian.	Vernal equinox.

The Ecliptic system is less frequently used than either the Horizontal or the Equatorial, and the Tertiaries of all three systems are rarely employed.

The poles of the horizon are known as the zenith and the nadir. The vertical circle, whose plane passes through the axis of the earth, *i. e.*, which passes through the zenith and the pole of the equator, is called the celestial meridian; it coincides with the declination circle passing through the zenith. The vertical circle, perpendicular to the meridian, is called the Prime Vertical.

The declination circle, passing through the vernal equinox, is the equinoctial colure. Azimuth is reckoned from the south towards the west. Hour angles are reckoned from that intersection of the meridian and equator which is *above* the horizon towards the west, right ascension from the vernal equinox towards the east. Both hour angles and right ascensions are generally expressed in time ($1^h=15^\circ$).

MOTIONS OF THE HEAVENLY BODIES.

Motion may be either apparent or real. In the problems before us apparent motions are almost exclusively considered. We consider—

1. The diurnal motion, caused by the rotation of the earth and made apparent by the seeming rotation of the heavens. The apparent diurnal motion is determined by the geographical position of the observer.

2. The annual motion, caused by the orbital motion of the earth around the sun, and made apparent by the movements of the sun and other heavenly bodies, as shown by a comparison of their positions from day to day.

3. The proper motions of the planets, especially of the moon, caused by their orbital motion, and made apparent by their motions relative to the fixed stars. Both the annual and proper motions are regarded as modifications of the apparent diurnal motion.

LECTURE NO. II.

(January 16, 1882.)

CELESTIAL MEASUREMENTS.

A great circle is one whose plane passes through the center of the sphere. Measurements upon the celestial sphere are made upon great circles.

The measurement of angles is the basis of astronomical work. This may be done in two ways:

(1.) By direct measurement with the aid of suitable instruments.

(2.) By indirect measurement through the diurnal motion of the heavens.

The direct measurement of an angle is made in one of the following ways:

1. By a graduated arc.

For the purpose of reading the graduations there are several devices employed:

(*a*) The magnifier, which enables the observer to distinguish the minute divisions of the graduation. The necessity of having the arc graduated into minute spaces is, however, obviated by the use of—

(*b*) The vernier;

(*c*) The reading microscope,

by the aid of which the observer can measure with precision fractional parts of a division of the graduated arc.

2. By a micrometer.

This instrument, like the reading microscope, measures small spaces by the revolutions of a finely cut screw, the head of which is divided into graduations.

3. By a spirit level.

This instrument measures small inclinations by the aid of graduations upon the glass tube of the level.

The indirect measurement of angles is effected by time-pieces and the observation of transits of heavenly bodies.

The solution of problems is accomplished by combining the observations of angles upon the principles of plane and spherical trigonometry.

References, lectures 1 and 2:

Chauvenet's Astronomy,—I; 1, §§ 1–9. II; 2, §§ 17–22, 40–42, 51–55.
Loomis' Practical Astronomy,—(37)—(41), (141)—(143).
Newcomb & Holden's Astronomy,—Int. 1, §§ 2–4, 7; 2, §§ 5, 6.

LECTURE NO. III.

(January 23, 1882.)

TIME.—CLOCKS AND CHRONOMETERS.

The diurnal combined with the annual motion furnishes the means of measuring time. There are in current use—

(1.) Sidereal time.

(2.) Mean solar time.

The sidereal day is the interval of time between two successive transits of the same star over the same meridian; it measures the true time of a revolution of the earth upon its axis, and is shorter by $3^m\ 56^s$ than the mean solar day used in ordinary life; the sidereal year contains one more day than the civil year. A sidereal clock indicates $0^h\ 0^m\ 0^s$ when the vernal equinox passes the meridian of the observer; sidereal time therefore differs for the various places on the earth by their difference of longitude. The sidereal time at any moment is identical with the right ascension of all stars that are at that moment crossing the meridian.

The apparent solar day is the interval of time between two successive transits of the sun over the same meridian; apparent solar time at any moment is the hour angle of the sun at that moment. The mean solar day is the average of the apparent solar days for a year. The difference between apparent and mean solar time is due to the fact that the sun does not move in right ascension with uniformity. This lack of uniformity is due to two causes:

(1.) The sun does not move in the equator, but in the ecliptic.

(2.) The sun's motion in the ecliptic is not uniform.

The difference between apparent and mean solar time is called the *Equation of Time;* its maximum value is $16^m.3$.

The conversion of mean solar to sidereal time is most readily made by the aid of the Nautical Almanac, which gives the sidereal time of mean noon for each day of the year, and also tables for the acceleration of sidereal over mean time.

Chronometers and clocks adjusted to either sidereal or to mean time are used to indicate the time. In their construction irregularities in running due to changes of temperature are guarded against as far as possible—in chronometers by the compensation balance, in clocks by the gridiron or mercurial pendulum.

References:

Chauvenet's Astronomy,—I, 2, §§ 37-56; II, 3.
Newcomb & Holden's Astronomy,—I, § 5; 2, § 3.

LECTURE NO. IV.

(January 30, 1882.)

OBSERVATIONS FOR TIME.

The local time at any place is readily found when the hour angle of any known heavenly body is given. The difference between the time thus obtained and the indication of the clock is the clock correction.

Let Θ = the sidereal time, α = star's right ascension, t = star's hour angle $\curlywedge$

Then $t = \Theta - \alpha$, or $\Theta = t + \alpha$.

The reduction to mean time is most readily made by means of the data furnished in the Nautical Almanac. If the body is the sun, the given hour angle is the apparent solar time, from which the mean solar time is obtained by applying the equation of time.

Observations for time are made to determine the clock correction at a given moment. The following are the methods:

1. By Transits — { (1.) Meridian transits. (2.) Extra-meridian transits.
2. By Altitudes — { (1.) Single altitudes. (2.) Equal altitudes.

The method of meridian transits in theory is the simplest, and is capable of the highest accuracy. The observation consists in noting by the clock the instant of a star's passage over the meridian. The local sidereal time is the star's right ascension (α) whence, if T is the observed time and $\triangle T$ the clock correction, $-\triangle T = \alpha - T$. If the clock is regulated to mean time, the sidereal time or star's right ascension must first be reduced to its corresponding mean time (T'), whence $\triangle T = T' - T$. The need of determining corrections for small deviations of the instrument from the meridian complicates the method in practice. When the instrument is far from the meridian (extra-meridian transits) the method is still further complicated.

In the method of single altitudes, the altitude of a star is measured at a time noted by the clock, and the hour angle computed by the aid of the spherical triangle between the star, the zenith, and the pole. If the times are noted when the altitudes are equal on both sides of the meridian, the mean of the two times is the clock-time of the meridian transit. This is the method of equal altitudes. When the sun or a planet is observed, its motion between the observations must be regarded.

The instruments employed in these observations are transit instruments—*e. g.*, meridian-circle, portable transit; altitude instruments—*e. g.*, universal instrument, sextant.

References:

Chauvenet's Astronomy,—I, V.
Loomis' Practical Astronomy,—V.

LECTURES, NOS. V AND VI.

(February 6 and 13, 1882.)

THE TRANSIT INSTRUMENT.

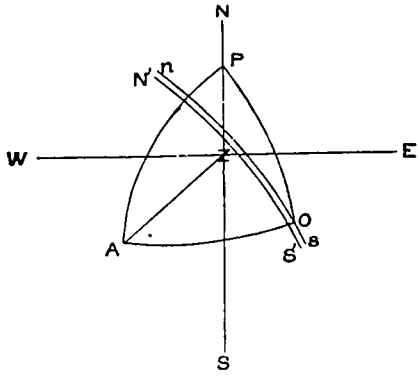
The transit instrument is made in various forms, but its essential parts are (1) the axis, (2) the telescope, which contains in its focus a system of vertical threads, by the aid of which transits are observed. The adjustments are effected by a *finder* (which is usually a graduated circle), a *spirit-level*, and *adjusting screws* for altering the inclination and azimuth of the instrument. A *reversing carriage* is added to all instruments except those of the smallest size.

The observation in all cases consists in noting by a time-piece the several instants at which a star crosses the threads in the field of the telescope. There are two methods:

a. By eye and ear.
b. By chronograph.

Formulæ.—The general problem to be solved is, to find the hour angle of a star observed on a given thread of the instrument.

FIG. 2.



Let P = pole of the heavens.
Z = zenith.
ϕ = latitude of observer.
A = point at which the axis of the instrument, if prolonged towards the *west*, would meet the celestial sphere.
O = star as it crosses a thread which would describe the circle $n\,s$ when the telescope is revolved.

Let the co-ordinates of the point A be as follows:

b = altitude.
$90 - a$ = azimuth (reckoned from the south).
n = declination.
$90 - m$ = hour angle.

In the triangle NZA we have—

$NZA = 90 + a$
$ZA = 90 - b$
$ZPA = 90 - m$
$PA = 90 - n$
$PZ = 90 - \phi$

(1) $\sin n = \sin b \sin \phi - \cos b \sin a \cos \phi$
(2) $\cos n \cos m = \cos b \cos a$
(3) $\cos n \sin m = \sin b \cos \phi + \cos b \sin a \sin \phi$

The *collimation axis* is a line drawn from the center of the object glass perpendicular to the rotation axis. It would describe in the heavens a great circle $N'S'$ when the telescope is revolved.

Let c = the angular distance from the thread upon which the star at O is observed to the collimation axis.

δ = declination of O.
τ = hour angle of O *east* of the meridian.

Then, in the triangle APO, we have—

$AP = 90 - n$
$AO = 90 + c$
$PO = 90 - \delta$
$APO = 90 - m + \tau$
$= 90 + (\tau - m)$

$$-\sin c = \sin n \sin \delta - \cos n \cos \delta \sin (\tau - m),$$
or
$$(4)\ \sin (\tau - m) = \tan n \tan \delta + \sin c \sec n \sec \delta.$$

The quantities designated by a, b, and c are called the azimuth, level, and collimation constants, respectively, and should be expressed in units of time. In the adjustment of an instrument to the meridian, it is the aim to make these constants as small as possible. We can then substitute the quantities themselves for their sines or tangents and put their cosines or secants equal to 1.

Equations (1), (3), and (4) will then become—

$$(5)\ n = b \sin \phi - a \cos \phi.$$
$$(6)\ m = b \cos \phi + a \sin \phi.$$
$$(7)\ \phi = m + n \tan \delta + c \sec \delta. \quad \text{(Bessel.)}$$

From (5) and (6) we have—

$$(8)\ b = m \cos \phi + n \sin \phi.$$
whence
$$(9)\ m = b \sec \phi - n \tan \phi.$$

Substituting (9) in (7), we have—

$$(10)\ \tau = b \sec \phi + n (\tan \delta - \tan \varphi) + c \sec \delta. \quad \text{(Hansen.)}$$

If we substitute in (7) the values of m and n from (5) and (6), we obtain—

$$(11)\ \tau = a \frac{\sin (\phi - \delta)}{\cos \delta} + b \frac{\cos (\phi - \delta)}{\cos \delta} + c \sec \delta. \quad \text{(Mayer).}$$

which is of the form—

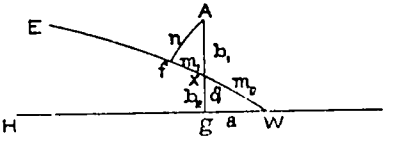
$$\tau = a A + b B + c C.$$

The clock correction is now easily obtained, for if α = star's right ascension, and T and $\triangle$ T = clock time as observed and clock correction respectively, then

$$\alpha = \mathrm{T} + \triangle \mathrm{T} + \tau; \text{ or, } \triangle \mathrm{T} = \alpha - (\mathrm{T} + \tau).$$

The relations of the co-ordinates of the point A are illustrated by the following diagram:

FIG. 3.



W = west point of horizon.
HW = horizon.
EW = equator.
$fW = m = m_1 + m_2$.
$gA = b = b_1 + b_2$.
$Af = n$.
$gW = a$.
$EWH = 90 - \phi$.
$Axf = Wxg = \phi$.

From the triangles *Afx* and *Wgx* it is easy to obtain the equations (5) and (6), if we regard these triangles as plane triangles and apply the formulæ of plane trigonometry.

The threads are usually spider-lines or lines ruled on glass, their number varying from 5 to 25. The *mean of the threads*, which nearly coincides with the middle thread, is the reference thread from which c is reckoned. The thread intervals are obtained from the formula—$I = i \sec \delta$, in which

i = the equatorial interval of a thread from the middle thread.
I = the interval for the declination δ.

The level constant (b) is determined by the spirit-level, the azimuth (a), and collimation (c) constants by computation from the observations.

References:

Chauvenet's Astronomy II, V.
Loomis' Astronomy, 2.
Newcomb & Holden's Astronomy, 2 § 4.

LECTURE No. VII.

(February 20, 1882.)

REDUCTION OF TRANSIT OBSERVATIONS.

In the selection of stars for observation, care should be taken—

(1.) That those stars are chosen whose positions have been well determined.

(2.) That those stars are chosen which will give the instrumental constants and clock correction with accuracy.

For the former purpose, stars whose coefficients (A and C) differ widely are needed, which necessitates the adoption of stars both north and south of the zenith; for the latter purpose stars whose coefficients (A, B, and C) are small are needed, which requires the rejection of stars that lie far north of the zenith. A suitable combination of stars and such a discussion of the equations as corresponds to the demands of each case is required.

EXAMPLE 1.

[From United States Coast Survey Report, 1866, Appendix 9.]

TELEGRAPH HILL,
San Francisco, Cal., June 19, 1853.

$\phi = 37° 48'.0$. 1 div. of level = 0s.0955.

Star.	α Virginis.	η Urs. Maj.	η Bootis.	1125, T.Y.C.	1131, T.Y.C.	α Bootis.
	° ′	° ′	° ′	° ′	° ′	° ′
Declination	−10 24	+50 3	+19 8	+65 7	−9 33	+19 57
Clamp	W.	W.	W.	E.	E.	E.
Level, E. & W.	22.2 26.6	20.7 29.6	.....	26.1 26.3	.....	23.7 29.3
	21.4 28.0	22.6 28.4	.....	23.7 29.3	.....	26.3 27.0
	h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.
Mean of transits	13 17 16.49	13 41 33.54	13 47 30.04	14 0 13.74	14 4 52.70	14 8 46.36
Right ascension	17 28.05	41 45.89	47 42.15	0 26.76	5 4.75	8 58.54
A	.76	−.33	.34	−1.09	.75	.83
B	.68	1.52	1.00	2.11	.69	1.01
C	1.02	1.56	1.06	2.38	1.01	1.06
b	.263	.351	.....	.138	.....	.151
bB	+.18	+.53	+.35	+.29	+.10	+.15

FORMULA: $a = T + \Delta T + aA + bB + cC$; or, $O = [T + bB - a] + aA + cC$.

				aA.	cC.	
				s.	s.	s.
(1.)	$O = -11.38 + \Delta T + .76a + 1.02c$	$\frac{(1)+(3)}{2}$	$O = -11.57 + \Delta T + .55a + 1.04c$	−.27	−.13	$\Delta T = +11.78$
(2.)	$-11.82 + \Delta T - .33a + 1.56c$	$\frac{(5)+(6)}{2}$	$O = -11.98 + \Delta T + .54a - 1.04c$	+.12	−.19	11.89
(3.)	$-11.70 + \Delta T + .34a + 1.06c$	(7.)	$O = -.25 - .88a + .52c$	−.12	−.13	12.01
(4.)	$-12.73 + \Delta T - 1.09a - 2.38c$	(8.)	$= -.75 - 1.63a - 1.34c$	+.39	+.30	12.04
			s.			
(5.)	$-11.65 + \Delta T + .75a - 1.01c$		$c = -.124.$	−.27	+.13	12.09
			s.			
(6.)	$-12.01 + \Delta T + .33a - 1.06c$		$a = -.358.$	−.12	+.13	12.00
	$(7.) = (2) - \frac{(1)+(3)}{2}$ $(8.) = (4) - \frac{(5)+(6)}{2}$					$\Delta T = +11.97$

EXAMPLE 2.

WASHINGTON, *June* 21, 1880.

$\phi = 38° 54'$ $c = -^s.061$ $b = -^s.112$.

		T.	a.	δ.	A.	B.	C.	aA.	bB.	cC.	ΔT.
		h. m. s.	m. s.	° ′				s.	s.	s.	s.
(1)	ϑ Bootis	14 21 37.44	21 9.73	+52 24	−.38	1.58	1.63	+.45	−.33	−.10	−27.73
(2)	ϵ^2 Bootis	40 16.12	39 47.95	+27 34	+.23	1.11	1.13	−.27	−.24	−.07	.59
(3)	α^2 Libræ	44 46.96	44 18.08	−15 33	+.84	.60	1.04	−1.00	−.13	−.06	.69
(4)	β Urs. Min	51 33.48	51 7.54	+74 38	−2.22	3.06	3.77	+2.64	−.05	−.23	.70
(5)	β Bootis	57 56.71	57 28.69	+40 51	−.05	1.32	1.32	+.06	−.28	−.08	.72
		a from (3) & (4) = −1.19.									$\Delta T = -27.69$

LECTURE NO. VIII.

(February 27, 1882.)

LONGITUDE.

The longitude of a place on the earth's surface is the angle included between the meridian of the place and the reference meridian. It is measured by the time required for a star to pass between the two meridians. The difference of longitude between two places equals the difference of their sidereal times, and also the difference of their mean solar times at the same absolute instant. As the local time is easily obtained by observation, the problem of determining the difference of longitude reduces itself to the determination of the corresponding time at the second place, or to the devising of means of communication between the places by which this time can be made known.

Astronomical methods of determining differences of longitude are of several classes:

1. Terrestrial signals.
   - (1.) Flashes or other signals visible at both places.
   - (2.) Telegraphic signals—either the transmission of clock beats or the record of star transits. This is the most accurate method known, and is applicable to the limits of telegraphic communication.
2. The transportation of chronometers. By this method longitudes at sea are mainly determined. It has also been successfully used in determining differences of longitude between observatories.
3. The observation of celestial phenomena which occur at an absolute instant, the time of which at Greenwich or other reference meridian is known.
   - (1.) Eclipses, occultations, or transits of Jupiter's satellites.
   - (2.) Eclipses of the sun or moon.
   - (3.) Occultations of stars by the moon.

   Eclipses of the sun and occultations are the most accurate of this class, but their infrequency and the laborious computations required prevent the general use of the method.
4. Observations of the moon.
   - (1.) Lunar altitudes.
   - (2.) Lunar culminations.
   - (3.) Lunar azimuths.
   - (4.) Lunar distances.

The method of lunar culminations is the most accurate of this class, but that of lunar distances is the most frequently employed, especially at sea, where the use of portable instruments, as the sextant, is a matter of necessity.

References:

Chauvenet's Astronomy, I, VII.
Loomis' Practical Astronomy, XII.
Newcomb & Holden's Astronomy, 1, § 6.

LECTURE NO. IX.

(March 6, 1882.)

DISTRIBUTION OF TIME-SIGNALS.

The automatic distribution of time is effected by means of electric attachments of the clock which transmits the signals. This clock is constantly corrected for its errors, as determined by observation, by the use of small weights applied to the pendulum, or by a magnet which hastens or retards its vibration. The electric attachments are of two kinds.

(.) External to the works of the clock, consisting of a knife-edge secured to the pendulum-rod, which makes electric contact by cutting through a globule of mercury contained in a cup fastened in an adjacent position.

(2.) Internal connections, consisting of one or more wheels in the clock-movement, whose teeth move a delicate spring and thus cause the breaking or closing of the circuit at definite intervals.

The communication of the signals by means of the telegraph is effected in the simplest way by sounders or galvanometers placed in the circuit.

The regulation of clocks is also directly secured by the electric signals in several ways:

(1.) The motive power of the clock may be the electric current.

(2.) The electric current may be used simply to control the motion of the pendulum or the movement of the clock.

(3.) The clock hands may be set at definite times by the action of the current.

The communication of time-signals is also effected by means of compressed air, which conveys impulses to the mechanism attached to the clock dials. This system is in successful operation in Vienna and Paris.

The distribution of electric time-signals takes place daily over extensive areas of country, the centres of distribution being in general the astronomical observatories. In England the signals are sent from Greenwich, and by the telegraph lines of the general post-office and the various railways is transmitted very extensively. In the United States the railways and the jewelers of many towns and cities receive the signals from some observatory. The leading centres of distribution are the United States Naval Observatory, Harvard College Observatory, Winchester Observatory, at New Haven, Conn., Allegheny Observatory, Dudley Observatory, at Albany, N. Y., Cincinnati Observatory, Chicago Observatory, Morrison Observatory, at Glasgow, Mo., Observatory at Carleton College, Northfield, Minn.

LECTURE NO. X.

(March 13, 1882.)

TIME-BALLS.

The public distribution of time-signals by the dropping of time-balls is of growing importance in this country. It deserves attention on account of the accuracy which it may attain, and its general usefulness. The essential parts of the time-ball equipments are—

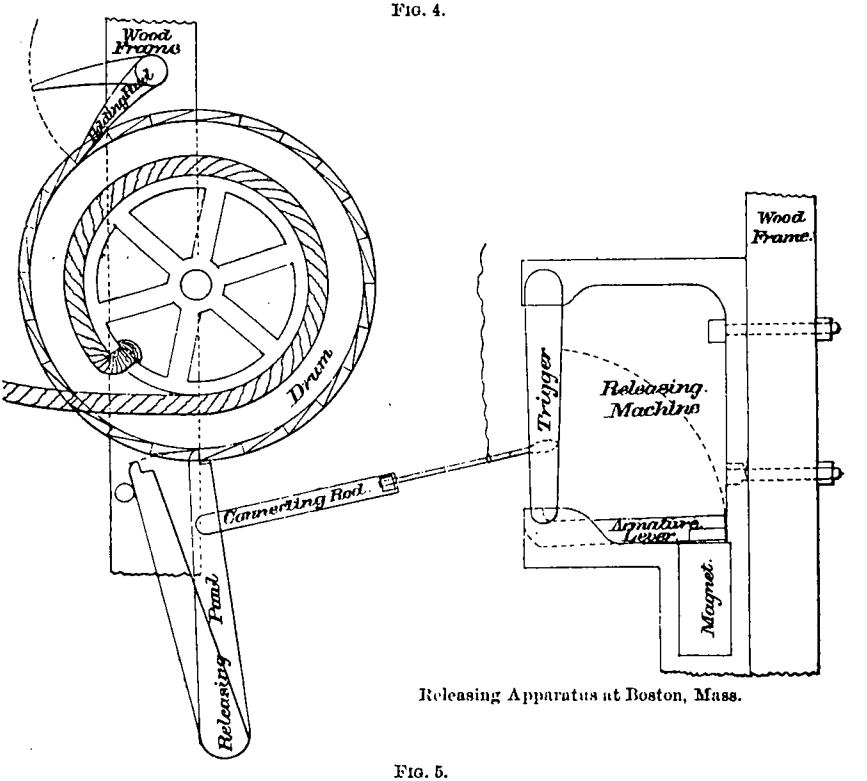
1. The *Ball*, which may be (1) a light framework covered with canvas; (2) a construction of vanes of copper, disposed radially, and having the appearance of a solid ball; (3) a heavy ball of metal, *e. g.*, of plates of sheet-copper. The ball must start promptly, the instant of the *start* being the time to be noted.

2. The *Mast*, which is usually encircled by the ball.

3. The *Hoisting* apparatus, usually a rope and windlass.

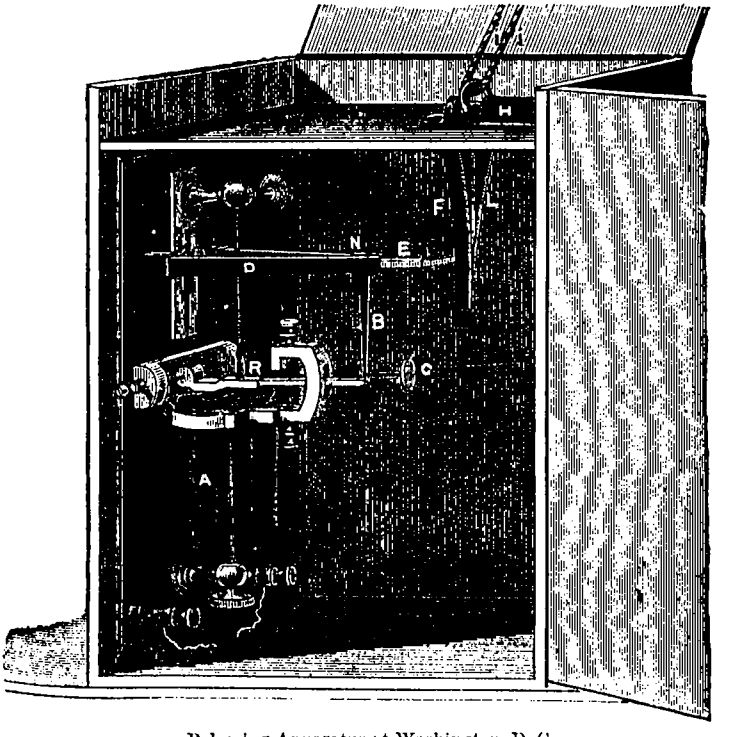
4. The *Releasing* apparatus, of which there are various kinds, which differ from each other only in the method employed for connecting the armature of the electro-magnet operated by the clock with the rope which detains the ball till its release.

FIG. 4.



Releasing Apparatus at Boston, Mass.

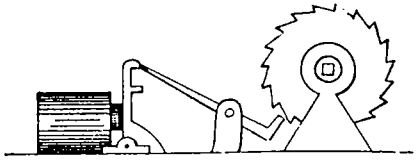
FIG. 5.



Releasing Apparatus at Washington, D. C.

5. The *Retarding* apparatus for checking the descent of the ball, such as hand-brakes, rubber buffers, air-cushions, brakes applied automatically by the ball as it falls.

FIG. 6.



Releasing Apparatus at New York.

The percentage of failure in dropping a time-ball varies from 1 to 5, due to breaks in the circuit, to storms, &c. In good weather the accuracy of the signal is within one-half a second.

LECTURE No. XI.

(March 20, 1882.)

STANDARD TIME.

The natural units of time are the *day* and *year*, depending upon the diurnal and annual motions of the earth, and the *lunar month*, depending upon the motion of the moon. Subdivisions of these, as the hour and week, are arbitrary, and have varied among different nations and in different ages.

The day, year, and month bear no simple relations to one another. The various attempts to unite them in a system have given rise to numerous calendars, of which the Julian and its modified form, the Gregorian, are best known. The ecclesiastical calendar in current use is a further modification of the Julian calendar, is ingenious but intricate, and seems an unnecessary addition to a system already too complicated.

The different times at which the day is considered to begin—noon, sunrise, sunset, midnight—are a source of confusion.

The simplification of the local times in daily use is a great need of modern times. This is attempted by two steps:

1. By the adoption of one standard for a large extent of country, as Greenwich time for the whole of England.

2. By such harmony among the adopted standards as to establish a system of international time.

The first step has already been taken in many regions, and is, in countries traversed by railways, not difficult of accomplishment, as railway times are extensively used by the people. The second step has provoked much discussion as to its details.

In the United States the problem resolves itself into two questions:

1. How few standards can be adopted with advantage?

2. What standard or standards shall be selected?

The answers to these questions are of four classes:

(1.) A system of standards differing by exactly one hour, which are preferably exact hours of longitude, and would be five in number.

(2.) A system of standards based upon the local times of a few commercial centres.

(3.) Two standards, one east, the other west, of the Mississippi River, or, of the Rocky Mountains.

(4.) One standard for the whole country, which shall be used by all the railways, and would eventually come into general use by the people. This standard might be that of Washington or of a meridian passing near the centre of the country, as the 6th meridian west of Greenwich. The central position of the latter and its simple relation to the time used by navigators are arguments in its favor.

LECTURE No. XII.

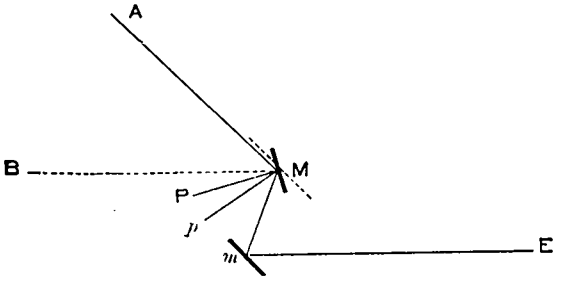
(March 27, 1882.)

THE SEXTANT.

The sextant is the most common form of a class of instruments known as reflecting instruments, the theory of which is based upon the following principle of optics:

"If a ray of light suffers two successive reflections in the same plane by two plane mirrors, the angle between the first and last directions of the ray is twice the angle of the mirrors."

FIG. 7.



To prove that $A\ M\ B = 2 \times P\ M\ p$

$p\ M\ m = p\ M\ B = P\ M\ p + P\ M\ B$

$P\ M\ m = P\ M\ A = A\ M\ B + P\ M\ B$

$P\ M\ p = A\ M\ B - P\ M\ p$

$A\ M\ B = 2 \times P\ M\ p$

The essential parts of the instrument are:

1. Two plane mirrors, viz, (1) a fixed mirror, the *horizon-glass*, one-half of which is silvered, which is secured perpendicularly to the frame of the instrument; (2) a movable mirror, the *index-glass*, which is attached to an arm having a motion parallel to the plane of the instrument.
2. The *index-arm*, to which the index-glass is secured.
3. The *graduated arc* for noting the positions of the index-arm.

The auxiliary parts of the instrument are the *telescope*, which is of low magnifying power; the *vernier* and *magnifier*, attached to the index-arm; *shade glasses* for use in observations of the sun.

In order to secure reliable results with the sextant, the following adjustments are necessary:

1. The horizon-glass must be parallel to the index-glass.
2. The index-glass must be perpendicular to the plane of the instrument.
3. The sight-line of the telescope must be parallel to the plane of the instrument.

Observations with the sextant are of three kinds:

1. To measure the angular distance between two objects.
2. To measure the altitude of a celestial body with the aid of an artificial horizon.
3. To measure the altitude of a celestial body from the sea-horizon.

References:

Chauvenet's Astronomy, II, IV.
Loomis' Practical Astronomy (131) (136).
Newcomb & Holden's Astronomy, 2, § 9.

LECTURE No. XIII.

(March 31, 1882.)

THE SEXTANT (continued).

Observations made with the sextant are subject to the following corrections:

1. The index correction, which is determined by the position of the zero of the vernier when the two mirrors are parallel. This correction varies from time to time, and should be found and applied at each observation.
2. The correction for eccentricity due to the lack of coincidence between the centre of the graduated arc and the centre about which the index-arm revolves. This correction is determined by measuring with the instrument angles whose values are already known.

The following additional corrections are needed for a complete discussion of the instrument:

(1.) For a prismatic form of the index-glass.
(2.) For the inclination of the index-glass.
(3.) For the inclination of the horizon-glass.
(4.) For the inclination of the sight-line to the plane of the sextant.
(5.) For a prismatic form of the shade glasses used in observations of the sun.
(6.) For a prismatic form of the glasses composing the roof of the artificial horizon.

Corrections (5) and (6) are eliminated by reversing the glasses during the observation and making half of the readings with them in each of their two positions.

If the instrument is well made and in proper adjustment, corrections (1)–(4) can be neglected. The correction for eccentricity is often also neglected, but it should be taken into account by an occasional investigation.

The accuracy attainable by the sextant varies with the instrument, the care taken in its adjustments, and the skill of the observer. Under the best circumstances an altitude depending upon six or eight readings is liable to an uncertainty of about 10″, and this is about the uncertainty of a determination of latitude. The uncertainty of a time determination rarely falls below 1ˢ.

References:

Chauvenet's Astronomy, II, IV.

Washington Astronomical Observations, viz: 1867, App. II; 1869, App. I.

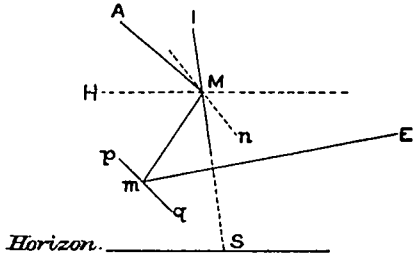
LECTURE No. XIV.

(April 3, 1882.)

THE SEXTANT (continued)—REDUCTION OF OBSERVATIONS.

Observations with an artificial horizon are attended with the difficulty of bringing into the field of view the reflected image, especially in the case of stars. This difficulty is lessened by the attachment of a small level to the index-arm at an angle with the index-glass equal to the constant angle between the sight-line of the telescope and the horizon-glass. When the bubble plays, the two images are in coincidence, for it can be proved that when the two images of a star—one reflected from the artificial horizon, the other from the sextant mirrors—are in coincidence, the inclination of the index-glass to the horizon is equal to the inclination of the sight-line of the telescope to the horizon-glass—a constant angle. Thus—

FIG. 8.



Let IM and mq = mirrors
AM and mE = first and last positions of the ray.
Mn be parallel to mq
HM be parallel to the horizon

Then $IMH = IMA + AMH$
$= mMS + SMn = mMn$
$= qmE$

Example: Observation for time. Washington observations, 1867, App. II, p. 34. Des Moines, Iowa, August 7, 1869. P. M. Object, Sun.

Double altitude.				Chronometer.			Index corr. On arc.		Index corr. Off arc.		
°	′			h.	m.	s.	′	″	°	′	″
85	0	} Lower limb.		9	30	8.5	−29	20	359	26	5
84	45				30	51.5		25			0
84	30				31	33.6		25			5
85	0	} Upper limb.			33	5.0					
84	45				33	47.1	−29	26.7		26	3.8
84	30				34	29.4				+33	56.7
										−29	26.7
Mean	84	45	0	9	32	19.2					
Index corr., &c.		+ 2	31.1	°						+ 4	30.0
	84	47	31.1	Therm.	74.0				Corr.	+ 2	15.0
App. alt.	42	23	45.6	Bar.	29.76				Eccentricity.		+16.1
Refraction		−	59.5	Att. therm.							
Parallax		+	0.3						Sum	+ 2	31.1
Semi-diam.			0.0								

	°	′	″		
h	42	22	52	log sin $(s-h)$	9.774104
ϕ	41	35	36	log cos s	9.285937
P	73	44	59	log sec ϕ	0.126171
$2s$	157	43	27	log cosec P	0.017707
s	78	51	44	log $\sin^2 \frac{1}{2} t$	9.204009
$s-h$	36	28	52	log $\sin \frac{1}{2} t$	9.602004

	°	′	″
$\frac{1}{2} t$	23	34	30
t	47	9	0

Formula, Chauv. Astron. I, p. 209.
t = hour angle.
h = true altitude.
ϕ = latitude. $s = \frac{1}{2}(h + \phi + P)$
P = polar distance.

$$\sin \tfrac{1}{2} t = \sqrt{\frac{\cos s \sin (s-h)}{\cos \phi \sin P}}$$

	$h.$	$m.$	$s.$
Local app. time (t)	3	8	36.0
Equation of time	8	+5	26.2
Local mean time	3	14	2.2
Chronometer	9	32	19.2
Chron. fast (local time)	6	18	17.0
Long. W. of Washington	1	6	16.0
Chron. fast (Wash'n time)	5	12	1.0

LECTURES NOS. XV AND XVI.

(April 10 and 11, 1882.)

LATITUDE.—OBSERVATIONS FOR LATITUDE.

The latitude of a place on the earth's surface may be defined in astronomical terms in two ways—(1), as the declination of the zenith, (2) as the altitude of the pole, at the given place. The *geographical* and *geodetic* latitudes equal the *astronomical* if the small abnormal deviations of the plumb-line are neglected. The *geocentric* latitude is the declination of the geocentric zenith or the point on the celestial sphere in the prolongation of the radius of the earth drawn through the place of observation. The geocentric and geographical latitudes are equal at the poles and the equator; at other places the former are less, the maximum deviation (11′ 30″) occurring at latitude 45°.

Astronomical methods of determining latitude may be classified as follows:

1. By meridian altitudes or zenith distances.

Methods of this class are based upon the relation $\phi = \delta + z$ in which ϕ = latitude, δ and z = declination and south zenith distance, respectively, of any star. Of this class are the methods of—

(1.) Meridian altitudes of any star of known declination.
(2.) Meridian altitudes of a circumpolar at both culminations.
(3.) Observed differences of zenith distance (Talcott's method).

2. By extra-meridian altitudes of zenith distances.

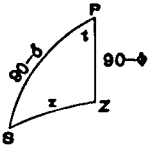
Methods of this class are based upon the relations of the spherical triangle connecting the pole, zenith, and star.

(See Figure 9.)

Of this class are the methods of—

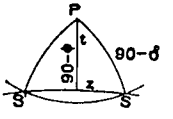
(1.) Single altitudes.
(2.) Circum-meridian altitudes.
(3.) Altitudes of the pole star.
(4.) Relations between two or more altitudes of the same star, or of two or more stars at the same altitude.

FIG. 9.



$$\cos z = \sin \delta \sin \phi + \cos \delta \cos \phi \cos t.$$

FIG. 9½.



$$\tan \phi = \tan \delta \sec t$$

3. By transits over vertical circles.

When the prime vertical is selected we have one of the most accurate of known methods, which rests upon the relations of the right-angled spherical triangle connecting the pole, zenith, and star on the prime vertical.

(See Figure 9½.)

References:

Chauvenet's Astronomy I, VI; II, §§ 174-193, 224-241.
Newcomb & Holden's Astronomy, VIII, § 3.
Clarke's Geodesy, XIII.

LECTURE NO. XVII.

(April 17, 1882.)

DETERMINATION OF THE MERIDIAN.

The accuracy with which the meridian line is desired will determine the method to be used in its determination. Of the various methods the following may be specified:

1. By a noon mark or by shadows made by the sun.
2. By a compass correcting for the magnetic declination.

This method implies that the variation of the compass is already known, and is, therefore, reliable only within the range of our knowledge upon that subject.

3. By measurement of the azimuth and altitude of a star and the determination of the correction to the azimuth reading by a solution of the triangle connecting the pole, zenith, and star.

$$\text{Formula: } \tan \tfrac{1}{2} A = \sqrt{\frac{\sin (s-\phi) \sin (s-h)}{\cos s \cos (s-p)}}$$

h = altitude of star.
ϕ = latitude.
p = polar distance of star.

A = azimuth of star.
$s = \tfrac{1}{2}(\phi + h + p)$

If the azimuths are observed when the star is at the same altitude on each side of the meridian, the mean of the two readings is the reading when the sight-line is in the meridian. When the sun is observed, a small correction for its motion between the two observations is required.

4. By observation of a close circumpolar star.

This method is extensively used in geodetic measurements. The most favorable time for the observation is when the star is at its greatest elongation.

$$\text{At elongation, } \sin A = \frac{\cos \delta}{\cos \phi}$$

5. By the methods explained under the transit instrument for determining the azimuth constant when the instrument is approximately adjusted in the meridian.

$$\alpha = t + \triangle T_o + a \sin (\phi - \delta) \sec \delta \text{ in which } t = T + b \cos (\phi - \delta) \sec \delta + c \sec \delta$$
$$\alpha' = t' + \triangle T_o + a \sin (\phi - \delta') \sec \delta' \text{ " " } t = T' + b \cos (\phi - \delta') \sec \delta' + c \sec \delta'$$

$$\text{whence } \alpha' - \alpha = t' - t + a \left[\frac{\sin (\phi - \delta')}{\cos \delta'} - \frac{\sin (\phi - \delta)}{\cos \delta} \right]$$

$$a = [(\alpha' - \alpha) - (t' - t)] \frac{\cos \delta \cos \delta'}{\cos \phi \sin (\delta - \delta')}$$

References:

Chauvenet's Astronomy, I, IX; II, 151.
Gillespie's Land Surveying, VII, VIII.
U. S. Coast Survey Report, 1866, App. 11; 1876, App. 21.
Clarke's Geodesy, VIII, 1, 7.

LECTURE NO. XVIII.

(April 24, 1882.)

SPECIAL PROBLEMS.

I.—*Problems due to the position of the observer.*

The methods of determining time and latitude heretofore explained are suited to observers in middle latitudes; some of them are inapplicable when the observer is in certain positions—

Thus:

1. An observer near the equator can obtain his time with greater accuracy than one in higher latitudes. For determining his latitude, methods involving observations of the pole star are not available, but the other methods of Lecture XV are applicable.

2. An observer in high latitudes can obtain his latitude without much difficulty, but his time determinations become less reliable as he proceeds north. At the pole itself any object may be chosen as an arbitrary point on the earth's surface to be called the south point and the day reckoned by referring the movements of the heavenly bodies to it.

3. An observer at an elevated position from the earth's surface must correct his altitudes for "dip" if he refers them to the sea horizon.

II.—*Observations in solar eclipses.*

The mathematical uses of solar eclipses are to determine longitudes and to furnish corrections to the lunar tables. Observations for these purposes are those of the times of contact of the limbs of the sun and moon, and, if the eclipse is total, of the duration of totality. In a total solar eclipse, observations of every sort are of value for solar studies.

III.—*Observations of transits of Mercury and Venus.*

Observations of the times of contact are available for determining corrections to the tabular places of these planets. Good opportunities are also afforded for determining their diameters. The use of transits of Venus for obtaining the solar parallax is dependent upon the extreme precision with which the observations can be made. The solar parallax is known at the present time with such accuracy that only the most refined observations can be made available for improving its value.

LECTURE NO. XIX.

(May 1, 1882.)

RELATIVE ACCURACY OF METHODS.

Astronomy is pre-eminently an exact science. It rests upon laws few in number, which are capable of rigid demonstration. It employs the most refined forms of mathematical research, and thus obtains results of the highest accuracy.

The accuracy attainable in the various methods of practical astronomy depends upon several conditions:

(1) The precision possible with the instrument employed.
(2) The skill of the observer.
(3) Personal peculiarities of the observer.
(4) The formulæ upon which the calculations depend.
(5) Atmospheric conditions.

Nos. (1) and (4) are capable of scientific discussion, and furnish the means of determining the relative merits of the various methods.

Nos. (2) and (3) are incapable of rigid treatment, but should be taken into account as far as possible.

No. (5) is variable, and therefore an uncertain element in the discussion of the methods.

All observations are affected by constant and accidental errors. The former may be—

(1) Theoretical.
(2) Instrumental.
(3) Personal.

These can be only in part determined beforehand. Observations are affected by unknown *constant* errors which are made apparent by repeating the observations under different conditions. On this account it is better to make observations at different times and under varied conditions than to make the same number of observations at one time.

Accidental errors are necessarily incapable of discussion apart from the observations, but the computations can be so made as to give the most probable values by the aid of the "method of least squares."

Reference: Chauvenet's Astronomy, II, App.

LECTURE NO. XX.

(May 8, 1882.)

THE ART OF COMPUTING.

Skill in computation is as essential as accuracy in observation for securing satisfactory results. In order to attain proficiency attention should be given to the following:

1. The significance of the quantities entering the formulæ.

This is necessary to secure intelligent calculation as opposed to mere mechanical computing. The frequent use of auxiliaries for convenience in computing requires additional precaution that the significance of the various quantities be not forgotten.

2. The arrangement of the work.

Facility in the computations is the aim; hence the work should be made systematic, orderly, and in convenient forms. It is best to adopt a scheme before beginning the calculations.

3. The use of tables or other helps.

Among these may be mentioned Crelle's Rechentafeln, logarithmic tables, and the Thomas and Grant calculating machines. Especial attention should be paid to the practical use of logarithms. Uncertainties of observation should be made to have the least possible influence upon the computation.

4. Check computations.

The work should be self-checking if possible; otherwise it may be verified by differences or by special check computations. If none of these are possible, unusual care in the work is requisite or the computation should be made in duplicate.

5. Saving of time.

Among the devices to secure this may be mentioned the use of separate pieces of paper upon which to place constants, in order to save rewriting; the avoiding of unnecessary additions, as in summing columns in which the left-hand figures are the same; the taking of means without summing; adding or subtracting from left to right; subtracting the upper from the lower quantity of the work when required; and primarily by a skillful arrangement of the work as above stated.

6. Husbanding of strength.

Continued computation is a mental strain which may be lessened by occasional changes from one class of operations to another. The important steps should be taken when the mind is fresh; a good precaution is to re-examine in the morning the work of the previous evening.

APPENDIX 5.

LECTURES ON METEOROLOGY.

By H. A. HAZEN.

STUDY ROOM, *August* 10, 1882.

Professor ABBE:

SIR: In compliance with your verbal instructions, I have prepared an abstract, with accompanying lithographic notes, of nineteen lectures on meteorology, delivered before the Signal Service class at Fort Myer, Va., during the winter and spring of 1882. As the class had never studied meteorology, it was found necessary to touch upon a great deal found in the works of Professor Loomis, A. Buchan, and others, though the general idea of the lectures was to supplement what is to be found in such treatises. The lectures were mostly from illustrations by diagrams on paper, or by drawings on the blackboard. The lithographic notes were prepared before each lecture, and were necessarily somewhat hurried in construction.

Very respectfully, yours,

H. A. HAZEN,
Computer, O. C. S. O.

METEOROLOGY.

LECTURE NO. I.

(January 11, 1882.)

Science of the weather.

Phenomena of meteorology exceedingly complex require faithful effort in making and recording observations.

A meteorologist's motto is, "Establish facts."

Importance of the science in its relation to—

1. Health of the inhabitants of the earth.
2. Farming communities.
3. Commerce.

Researches—

1. By observations at isolated stations.
2. By simultaneous observations at a great number of stations.

Air temperature.

Source of heat.

Radiant light and heat, probably effects due to the same physical agent.

Effects of heat as manifested—

1. In expansion by day and contraction by night.
2. In seasonal changes.
3. In permanent difference of temperature in equatorial and polar regions.
4. In evaporation and condensation.
5. Upon the land.
6. Upon the sea.
7. Upon the irregularities of the continents.

Temperature of the air.

1. Its fluctuations.
2. Its daily mean.
3. Its monthly mean.
4. Its annual mean.
5. Its distribution.
6. Its variation with the depth below the earth's surface.
7. Its variation with the height above the earth's surface.

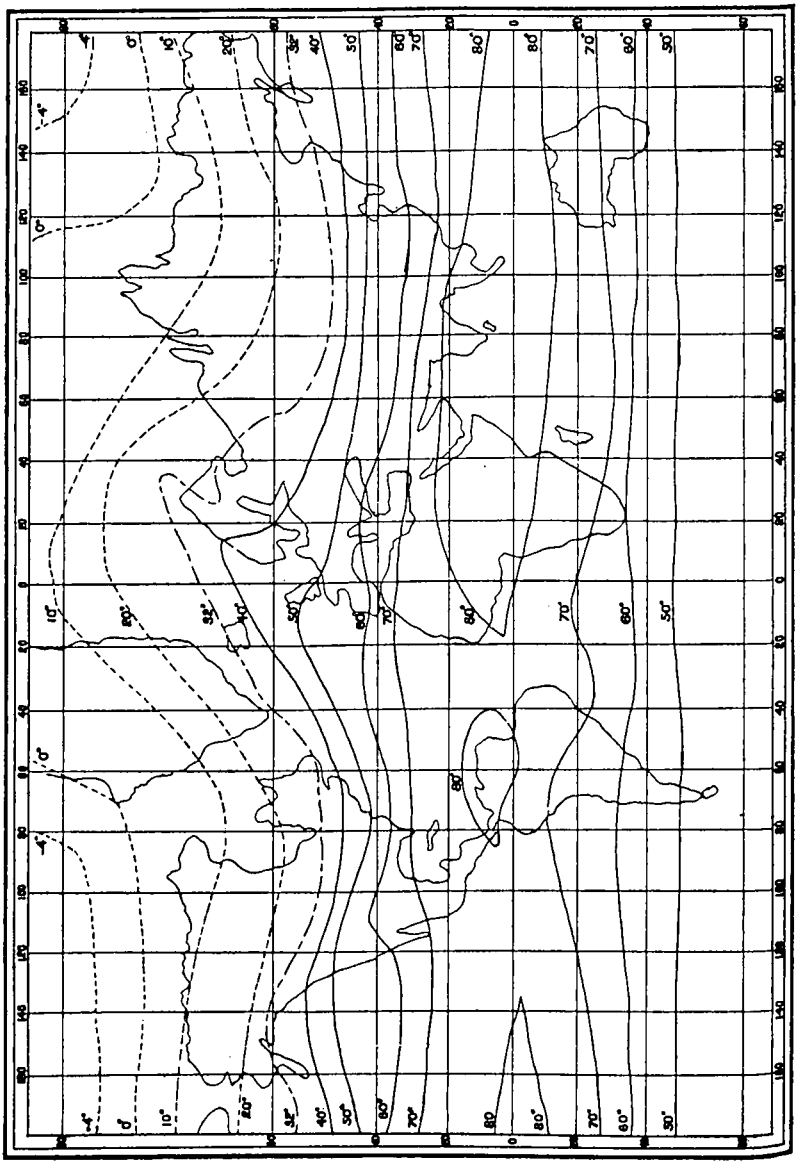


CHART No. 1.

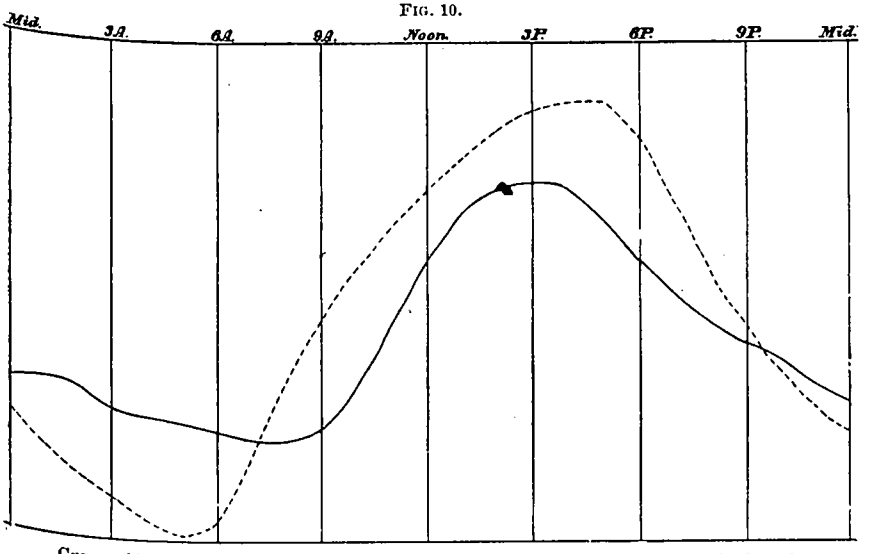
Mean Annual Isotherms.—Doce.

LECTURE NO. II.

(January 18, 1882.)

TEMPERATURE AND HUMIDITY.

FIG. 10.



Curve of Mean Hourly Temperature at Berne, Switzerland. January full, July dotted.

Decrease of temperature with elevation above the surface of the earth.

Balloon ascents, 1,000 feet to 20,000 feet, Glaisher. Temperature decreases about 1° Fahrenheit per 300 feet.

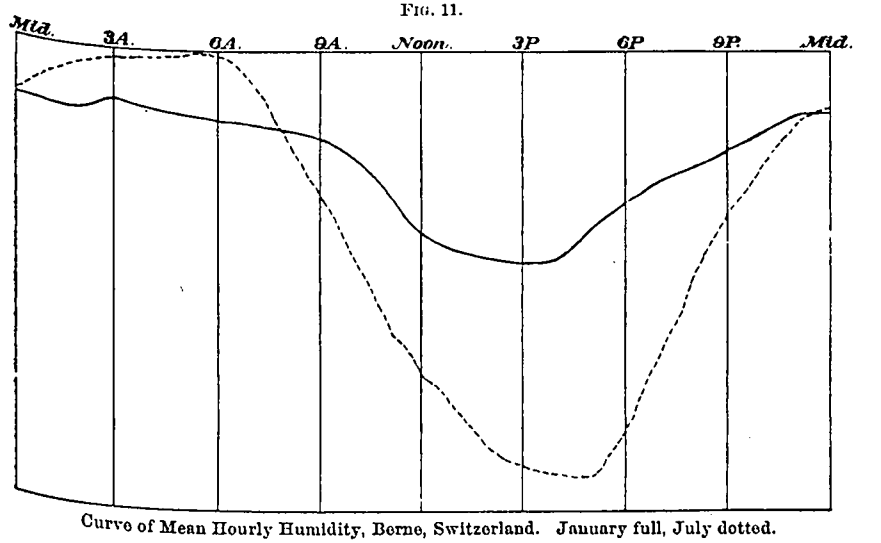
Pike's Peak and Denver, 8,869 feet, Professor Loomis. Temperature decreases about 1° Fahrenheit per 288 feet.

Mount Washington and mean of Burlington with Portland, 6,150 feet. Temperature decreases about 1° Fahrenheit per 311 feet.

Great St. Bernard and Geneva, 6,792 feet. Temperature decreases about 1° Fahrenheit per 336 feet.

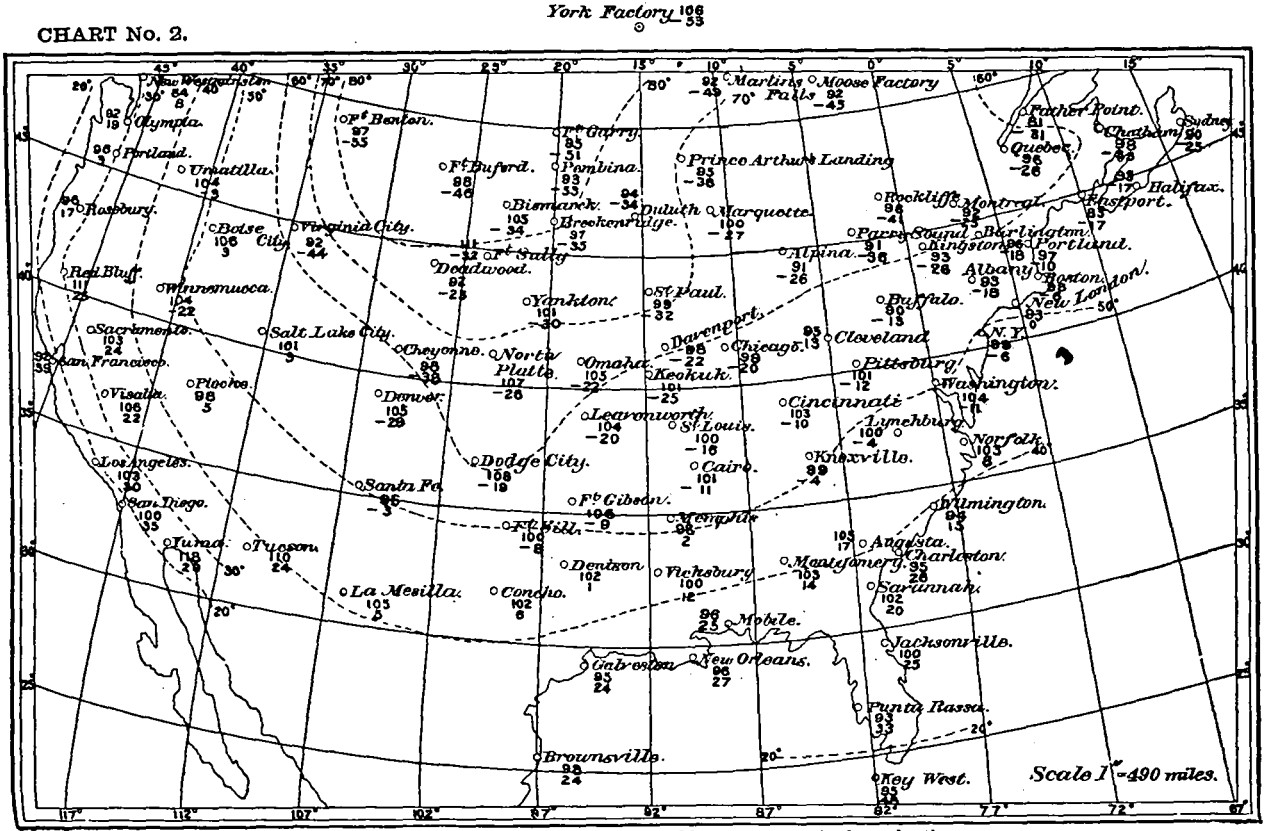
HUMIDITY.

FIG. 11.



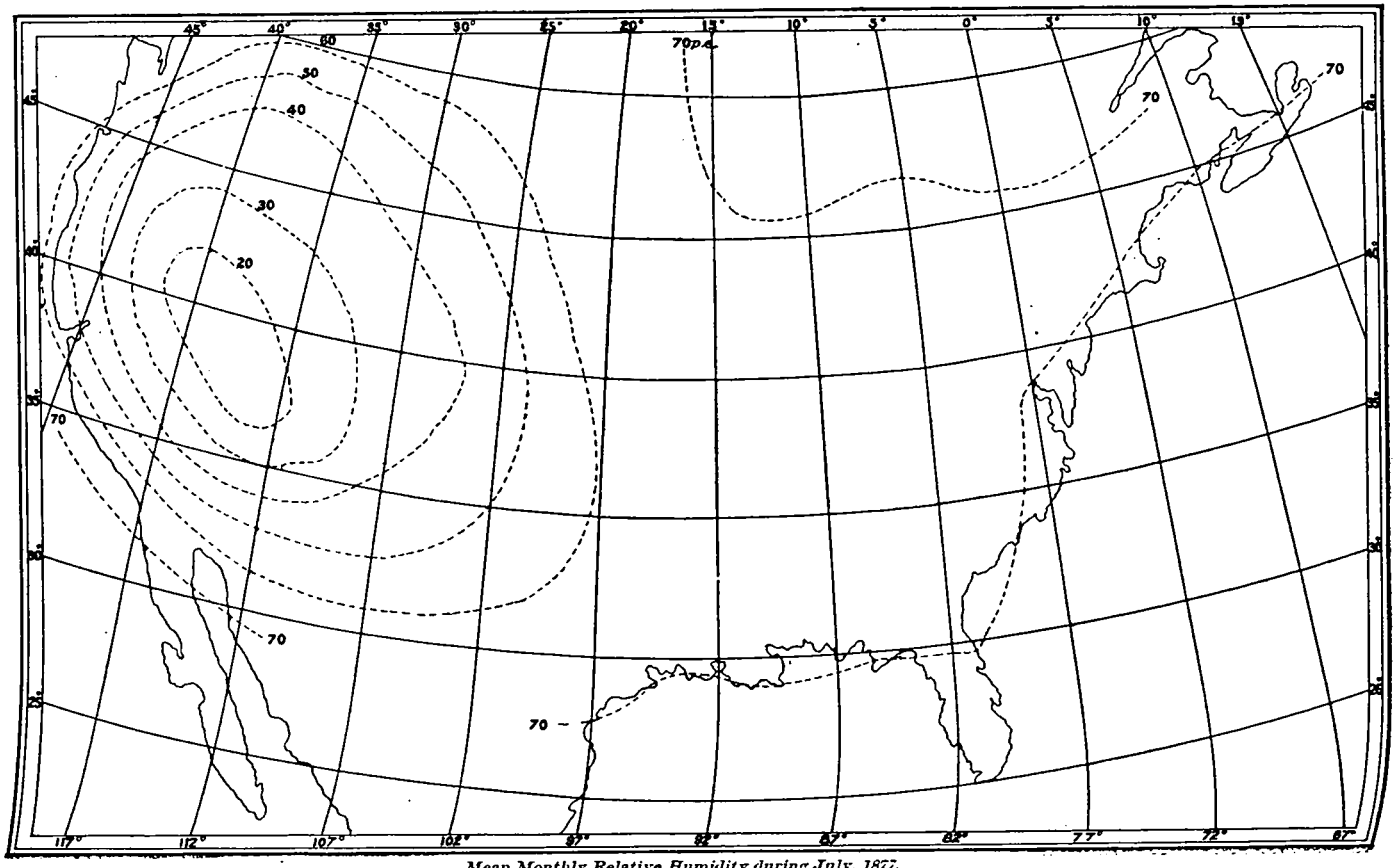
Curve of Mean Hourly Humidity, Berne, Switzerland. January full, July dotted.

CHART No. 2.



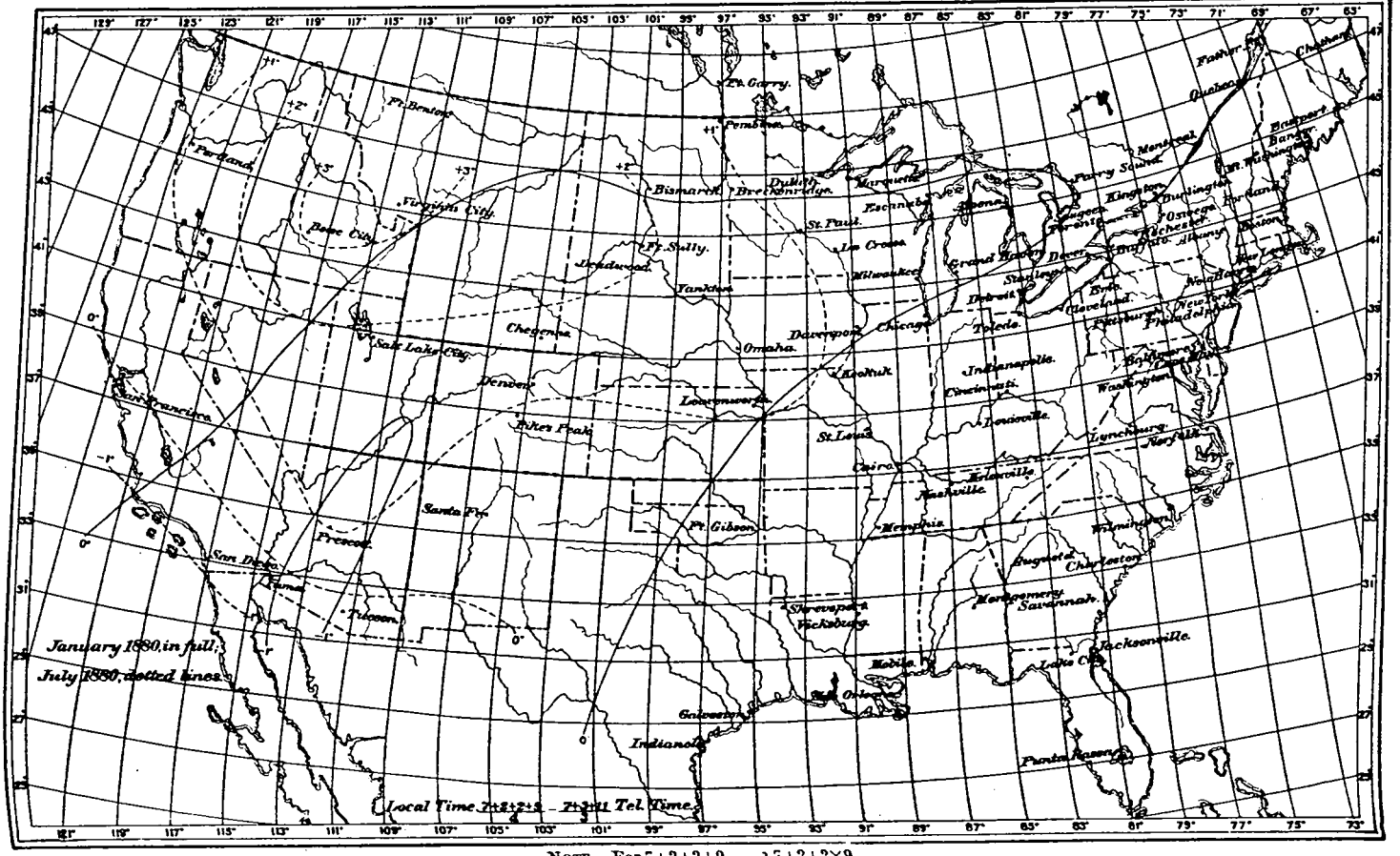
Difference between highest and lowest mean monthly temperature is shown by the curves.
The highest and lowest observed temperatures, from 1874 to 1879, are entered against each station.

CHART No. 3.



Mean Monthly Relative Humidity during July, 1877.

CHART No. 4.



NOTE.—For $7+\frac{2+2+9}{4}$, read $7+\frac{2+2\times 9}{4}$.

Chart showing the difference between Mean Monthly Temperatures determined from the Local and from the Telegraphic Observations of the Signal Service.

LECTURE NO. III.

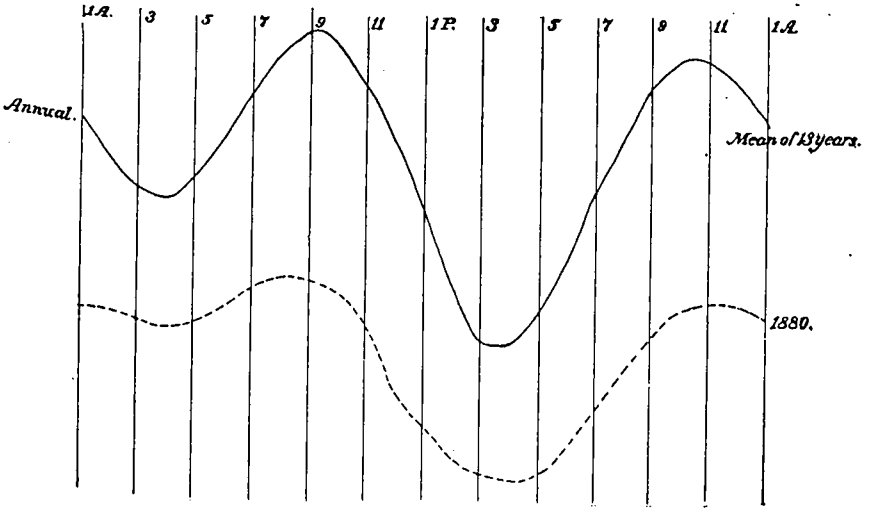
(January 25, 1882.)

PRESSURE OF THE AIR.

Height of the atmosphere:

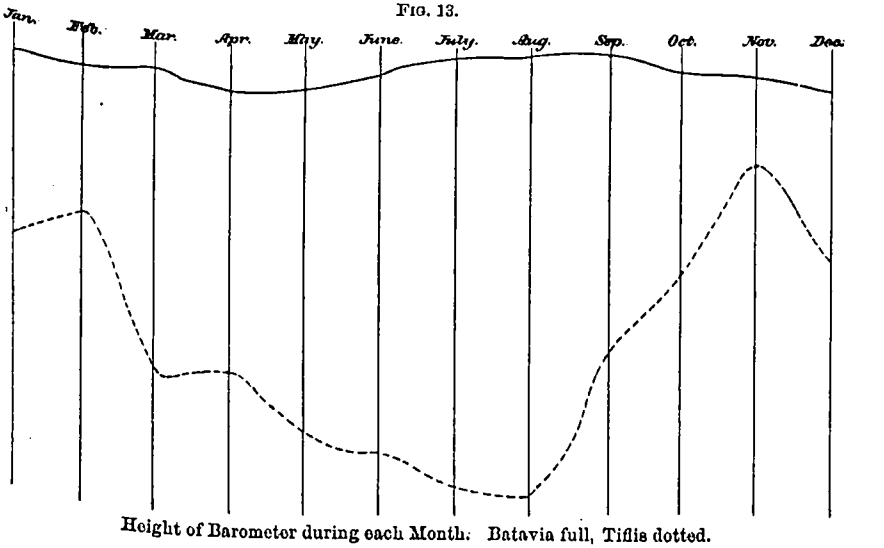
Air pressure, its
- Fluctuations, periodical and irregular.
- Diurnal range.
- Diminution with elevation above the earth.
- Distribution.
- Tides.

FIG. 12.



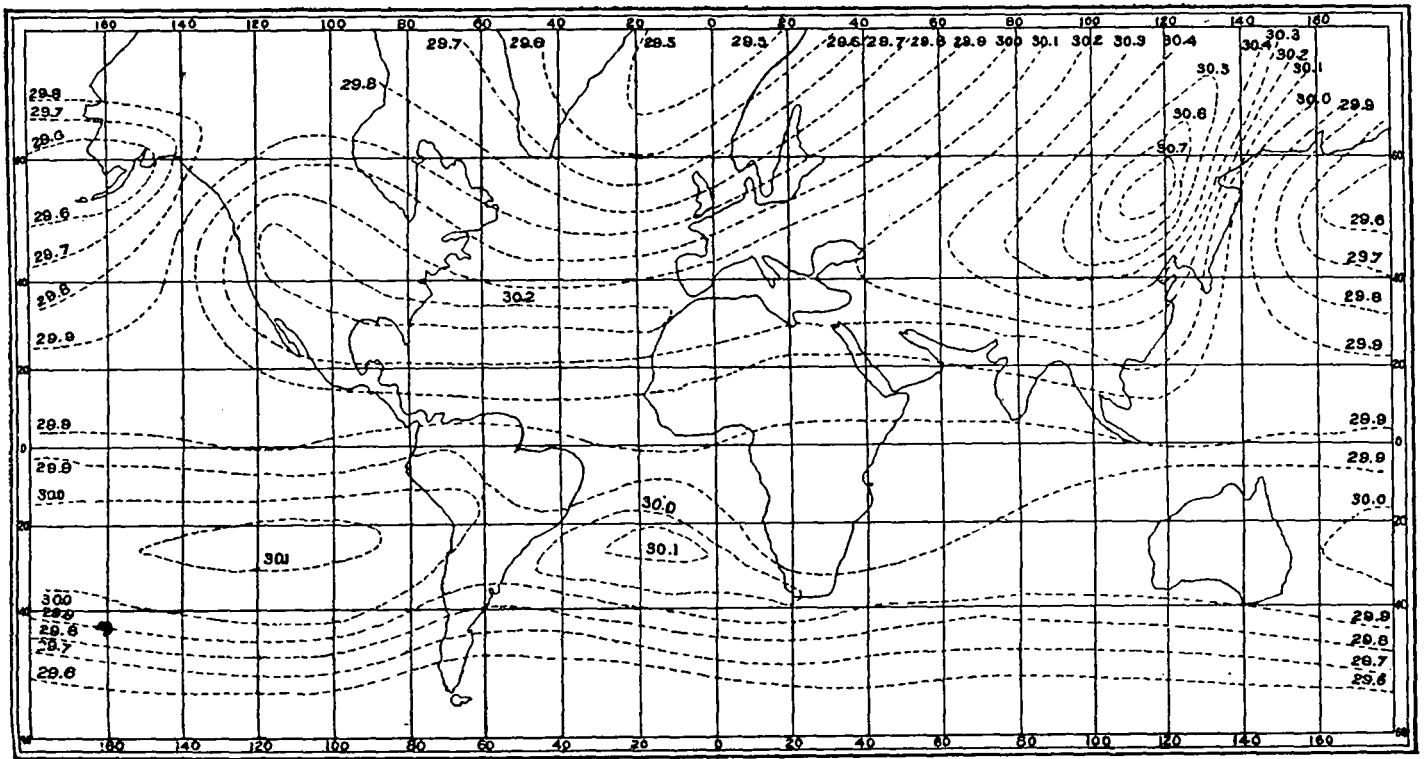
Diurnal Range of Air Pressure. Batavia full, Tiflis dotted.

FIG. 13.



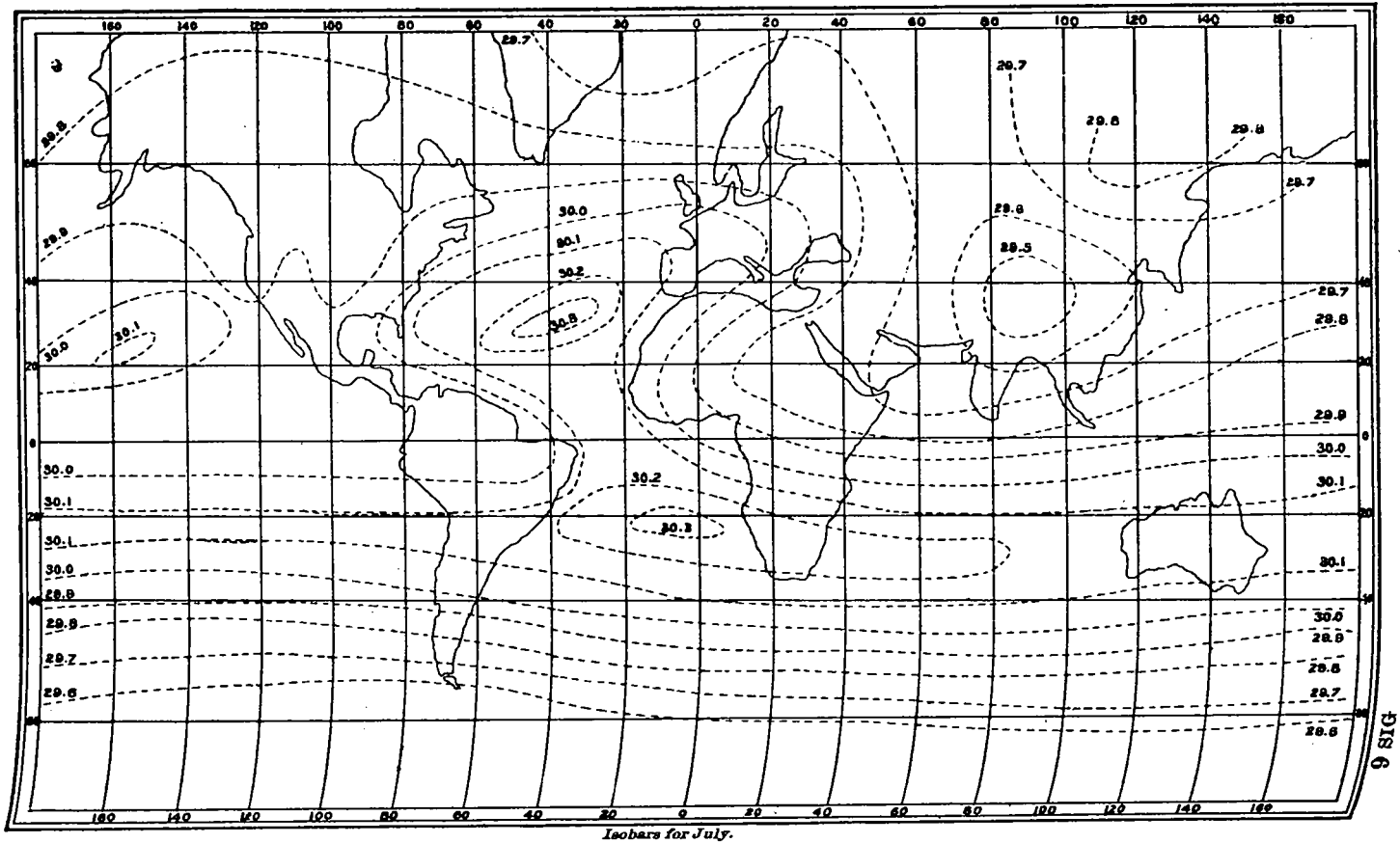
Height of Barometer during each Month. Batavia full, Tiflis dotted.

CHART No. 5.



Isobars for the month of January, from the researches of Ferrel, Buchan, and others.

CHART No. 6.



Isobars for July.

9 SIG

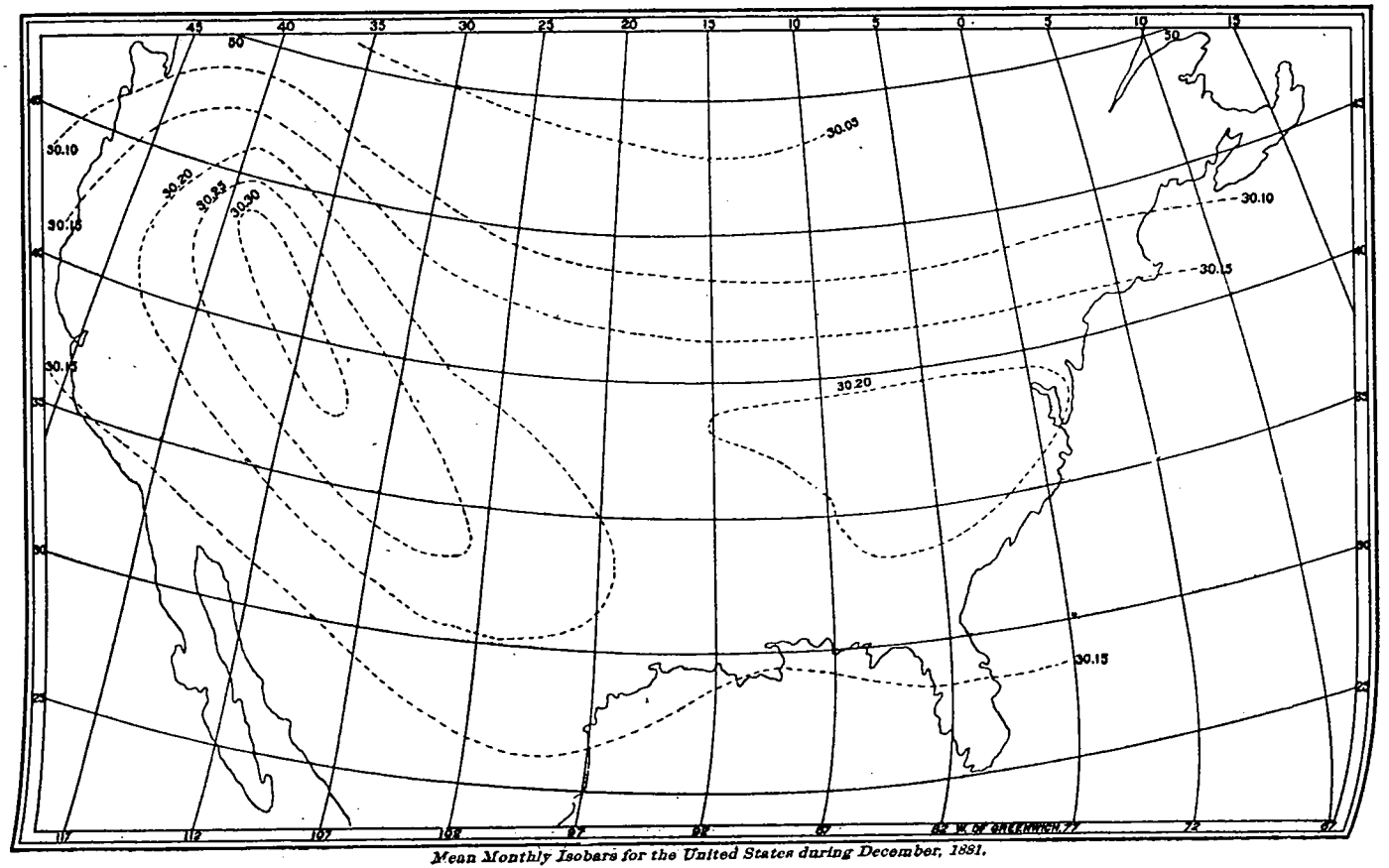
LECTURE No. IV.

(February 1, 1882.)

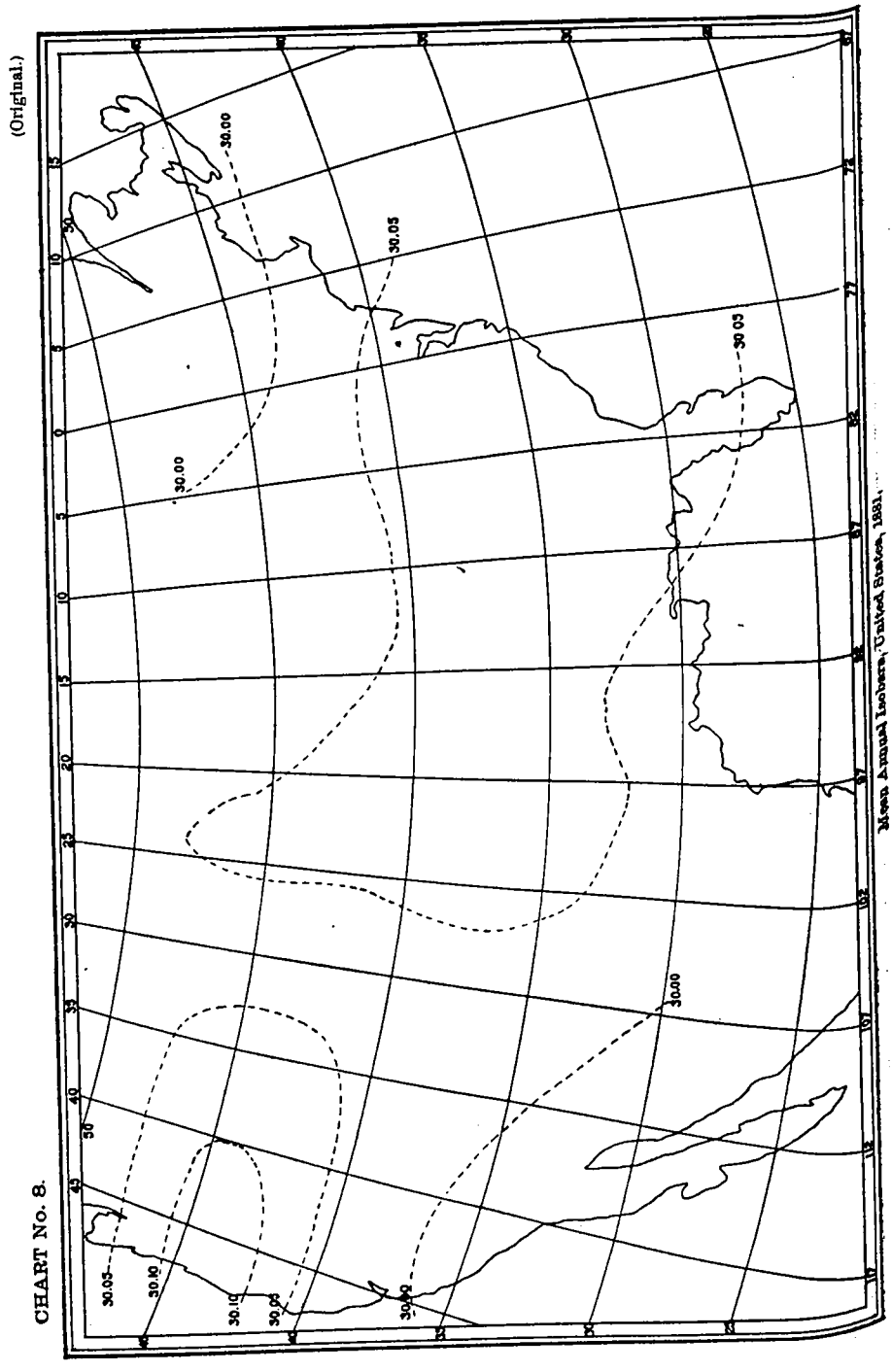
ELEVATIONS.

Importance of an accurate determination of the elevations of meteorological instruments.
The points on the instruments from which measurements should be made.
Elevation of the barometer cistern:
(1.) The universal fixed "base," mean low-tide, mean high-tide, or mean tide.
(2.) The "plane of reference," such as railroad track at depot, level of one of the great lakes, or some well-known and permanent point accepted by civil engineers.
(3.) A "fixed point" near the base of the building in which the office is located.
Elevations above ground of the thermometers, rain-gauge, anemometer, and anemoscope or wind-vane.
Leveling by—
Tape-line.
Spirit level.
Barometer.
Boiling-point of water.
Trigonometrical methods.

CHART No. 7. (Original.)



Mean Monthly Isobars for the United States during December, 1881.


(Original.)
CHART No. 8.
30.00
30.05
30.10
30.15
30.20
Mean Annual Isobars, United States, 1881.

LECTURE No. V.
(February 8, 1882.)
CLOUDS.

Fog, dry fog, mist, clouds. Kinds of clouds, as cirrus, stratus, cumulus and their combinations. Upper and lower clouds. Velocity, direction, and height of clouds. Various appearances due to clouds: Halos, coronæ, sun's drawing water, &c.

CHART No. 9. [Arrows fly with the clouds.]

Direction of motion of Upper Clouds, in the United States. 1877, April 28, 4.35 p. m., Washington time.

LECTURE No. VI.

(February 15, 1882.)

RAIN, SNOW, AND HAIL.

Cause of precipitation of the moisture of the air.
Its distribution over the earth's surface.

Influence on precipitation of { the ocean. / mountain ranges. / winds. / the seasons.

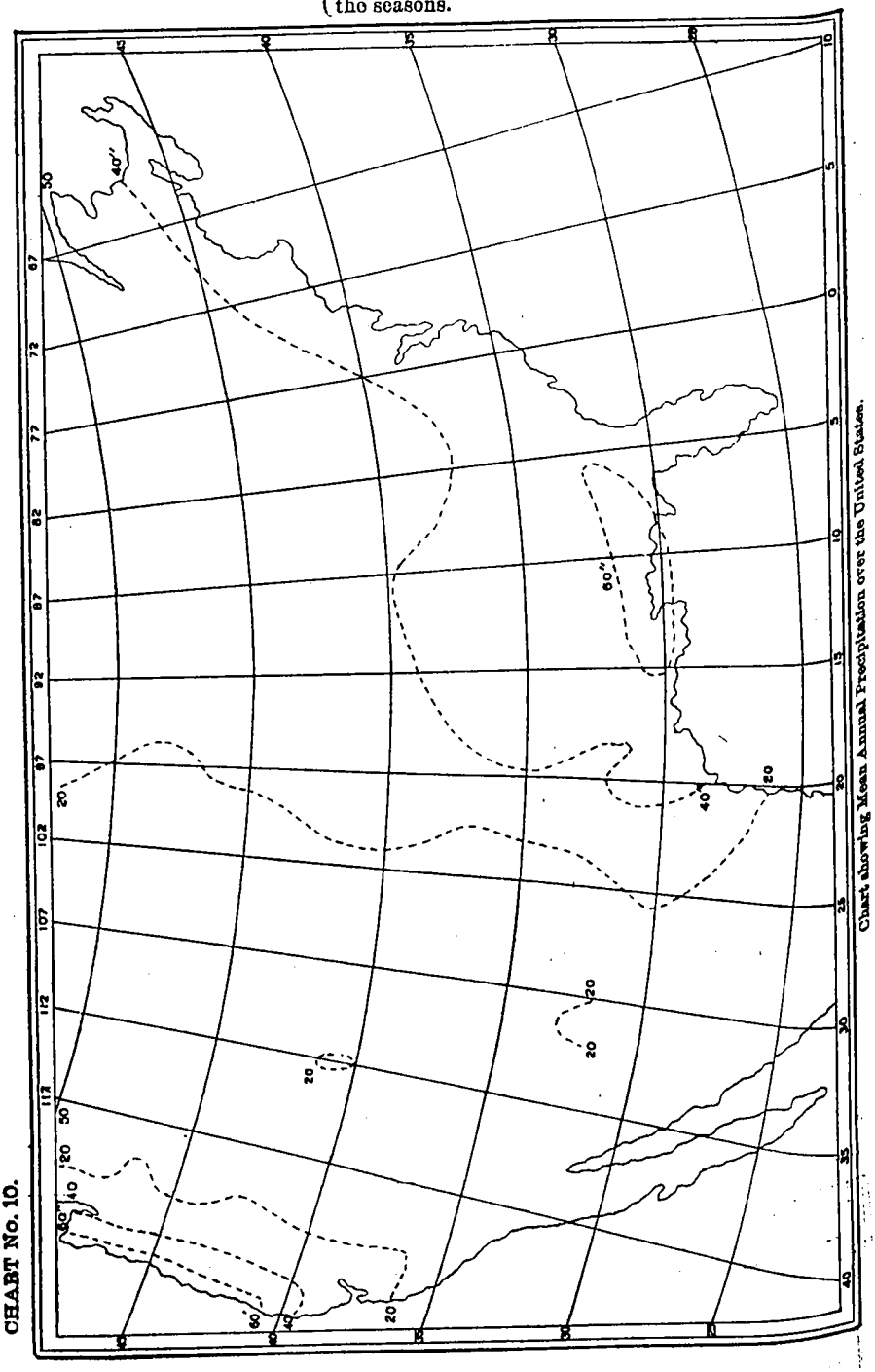


CHART No. 10.

Chart showing Mean Annual Precipitation over the United States.

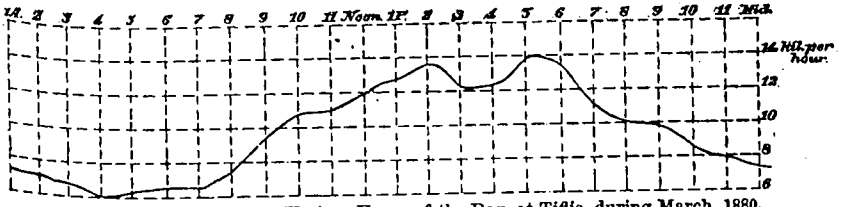
LECTURES NOS. VII and VIII.

(March 1, 1882.)

WIND, STORMS.

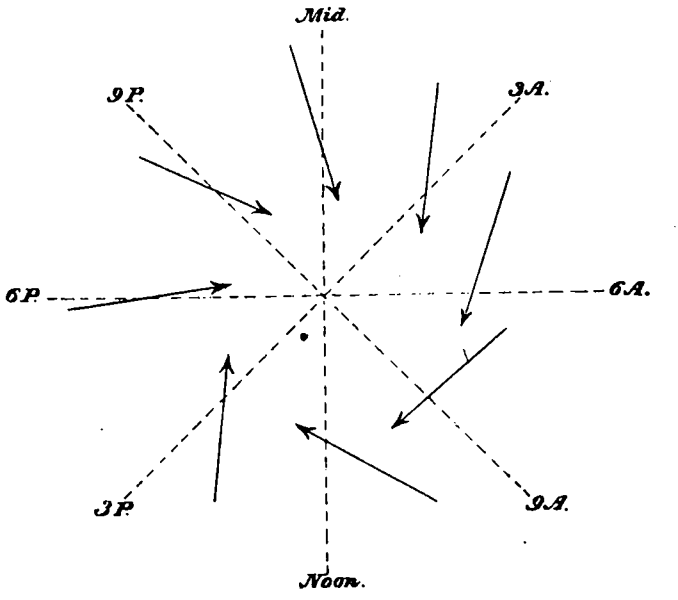
Cause of the motion of the air.
Constant and periodical winds.
Wind-direction.

FIG. 14.



Velocity of the Wind at Various Hours of the Day, at Tiflis, during March, 1880.

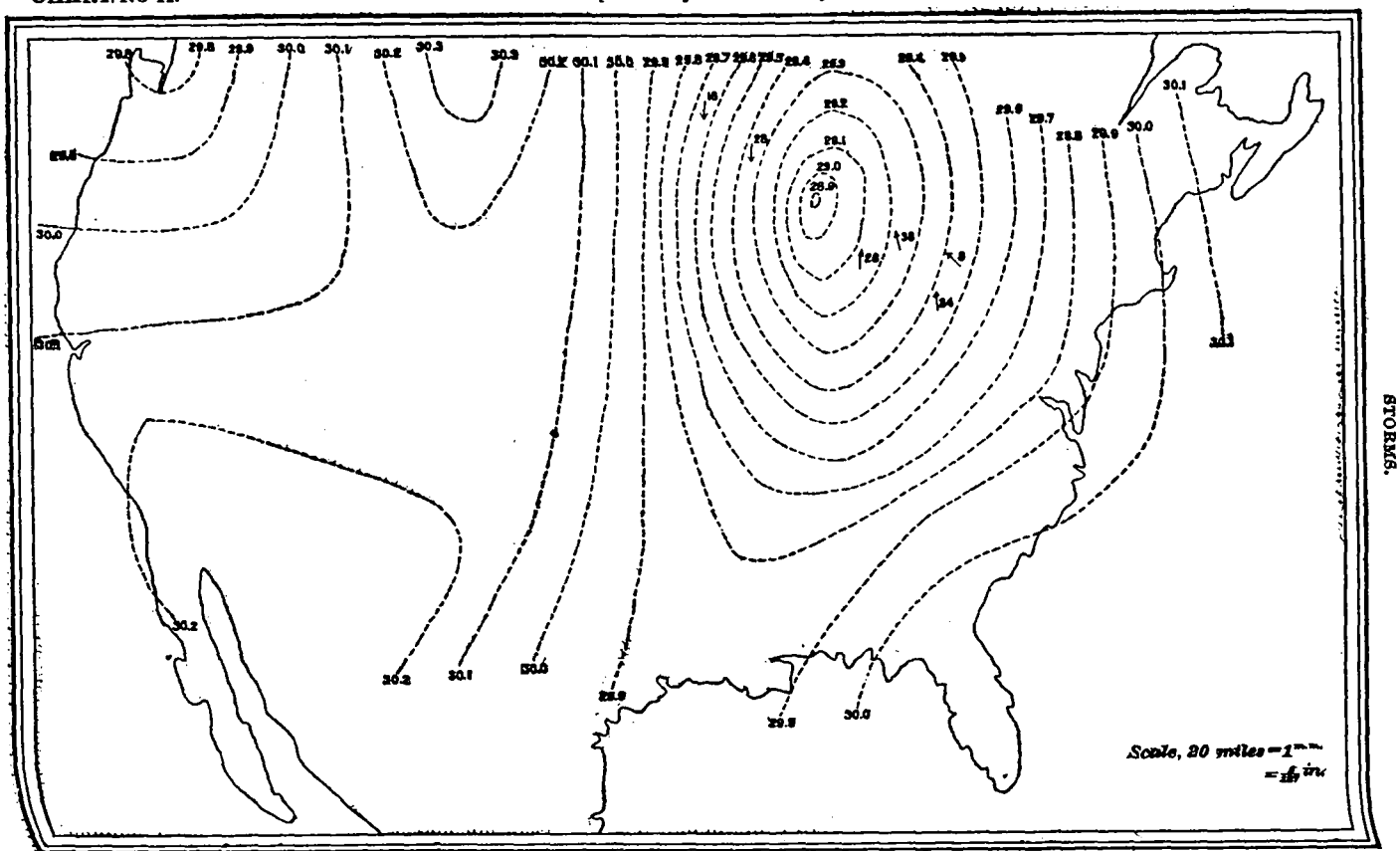
FIG. 15.



Direction of the Wind at Different Hours of the day, for 1875, at Madrid, Spain.

LECTURRE No. IX.
(March 8, 1882.)
STORMS.

CHART. No 11. [Arrows fly with the wind.]



Storm of December 5, 1880. Isobars 7 a. m., Washington time.

LECTURE No. X.

(March 15, 1882.)

TORNADOES AND HURRICANES.

A tornado is a form of storm of great intensity and generally short duration. Primary cause, "The production and ascent of a large quantity of vapor, which is

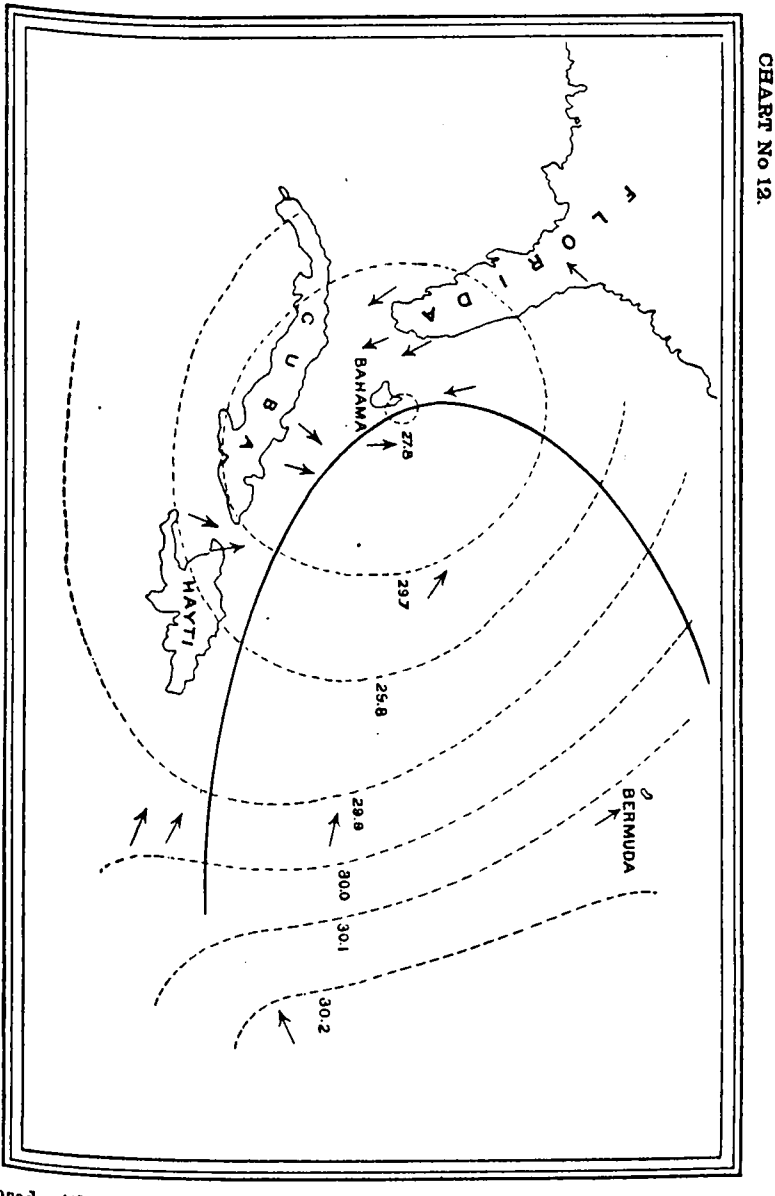


CHART No 12.

Hurricane in the West Indies, Oct. 1, 1866, 8 p. m.
(From Buchan's Meteorology, p. 264.)

condensed with the liberation of its latent heat over the place of its production instead of being carried away to some distant region" (Blanford). "Every great whirlwind is accompanied by an abundant condensation of aqueous vapor. The

latent heat liberated by this condensation causes a more rapid ascent of air over the whirlwind, and this induces beneath it an inflow of air from all sides" (Hann).

Caused by "Parallel currents in opposite directions" (Meldrum).

Pressure in center frequently falls to 2" below the mean in the case of tropical hurricanes.

Having given the difference of air-pressure for 100 miles or the barometric gradient, and the distance from the center, we may compute the velocity of the wind by Ferrel's formula:

$$V = \sqrt{\frac{Gr}{.01011} + (.262 \sin \phi r)^2} - .262 \sin \phi r.$$

If we have the pressure in pounds to the square foot, James's formula gives:

$$V = \sqrt{200 \times P}$$

Examples of the great force of the wind in tornadoes.

LECTURE NO. XI.

THE WALLINGFORD TORNADO.

(March 22, 1882.)

General conditions of the atmosphere preceding the tornado.

These conditions giving rise to tornado action over a narrow strip of country across the whole State.

Topography of the region about Wallingford.

First appearance of the tornado as dark clouds from northwest and southwest.

Destruction of houses; one of them destroyed as if by an explosion within.

Evidences of rotation in the prostration of trees.

Evidences of powerful indraughts from the southwest.

Extent of the current as displayed by the discovery of a paper blown into Rhode Island, 70 miles away.

Example of the terrific force of the wind, as follows: A monument was blown from its base without chipping either the monument or the pedestal. The dimensions of the block were 2 by 2 by 4 feet, its weight 2,688 pounds. The pressure required to lift it, at the lowest calculation, was 336 pounds to the square foot. This pressure, from James's formula, gives a velocity of 259 miles per hour.

LECTURE NO. XII.

(March 29, 1882.)

AREAS OF HIGH PRESSURE.

Origin.
Relations to waves of temperature.
Erratic course across the United States.
Winds near the center.
Permanency in the Sargasso sea.
Permanency along the parallel of 30° N.
Upper currents in their neighborhood.
Extraordinary magnitude in Siberia.

LECTURE NO. XIII.

(April 5, 1882.)

Observations on Mount Washington and other elevated stations.

Direction of winds often from "low" to "high." Effect of high winds upon the indications of barometers. Maxima and minima of air-pressure occur at the base earlier than at the summit of mountains, whether we consider the accidental fluctuations or the diurnal range. High winds and temperature as influencing such retardation.

Retardation of the minimum of air-pressure at Pike's Peak November 15 and 16, 1880:

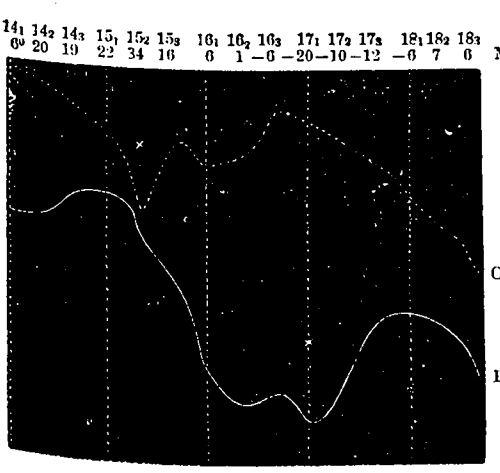


FIG. 16.

LECTURE No. XIV.

(April 7, 1882.)

METEOROLOGICAL OBSERVATIONS AT ELEVATED STATIONS.

Laws governing the winds at high and low stations.
Evidence of a continuous, or nearly continuous, current from the northwest in the upper atmosphere.
Diurnal range of the winds.

Table giving the diurnal range of the winds at Pike's Peak and Denver.

Hour.	Wind velocity, miles per hour.		Hour.	Wind velocity, miles per hour.	
	Pike's Peak.	Denver.		Pike's Peak.	Denver.
1 a. m.	575	185	1 p. m.	371	190
2	585	173	2	379	243
3	578	164	3	442	277
4	578	135	4	515	312
5	615	140	5	584	301
6	591	134	6	500	297
7	531	136	7	509	303
8	471	153	8	512	257
9	426	157	9	522	258
10	376	167	10	558	252
11	372	187	11	541	237
Noon	376	207	Midnight.	526	207

The fact that the maximum at Pike's Peak occurs at 5 a. m., while that is very near the time of minimum at the base, may be explained on the principle that the continuous upper current is not retarded by an upward rush of air in the morning, while this uprush producing the maximum at the base in the afternoon acts as a check to the upper current.

LECTURE No. XV.

(April 12, 1882.)

ELECTRICITY.

The presence of electrity recognized 600 B. C.
No connection surmised between electricity and lightning until 1720.
Conductors are as follows: Metals, charcoal, acids, water, and animals.

Insulators are ice, caoutchouc, dry air, silk, glass, wax, sulphur, and amber.
Positive and negative electricity—these always present together. Electricity always upon the surface, collected upon a cloud till its tension is sufficiently great to cause it to strike off. Atmospheric electricity, thunder-storms.

LECTURE NO. XVI.

(April 19, 1882.)

TERRESTRIAL MAGNETISM.

The loadstone.
Nature of the force called magnetism.
The poles of a magnet.

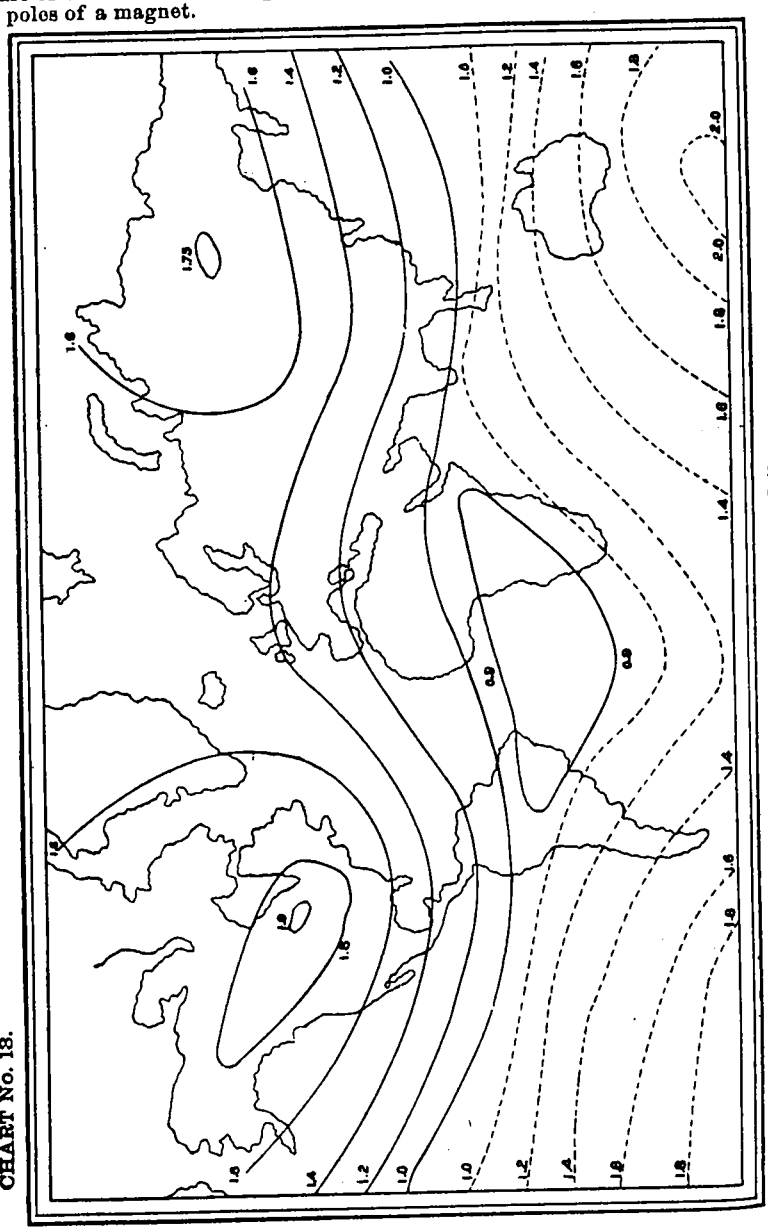


CHART No. 18.

Chart of Isodynamic Lines, 1837-40.

Like poles repel and unlike attract each other.
The earth a magnet.
Magnetic declination, inclination, and intensity.
Diurnal range of the magnetic needle.
Secular changes in magnetism.
Effect of the moon.
Effect of earth currents.
Magnetic storms.

LECTURE NO. XVII.

(April 20, 1882.)

SUN SPOTS.

The nature and probable cause of sun spots.
Theories of Herschel, Secchi, Young, and others.
Connection between sun spots and disturbances of the earth's magnetism.
Periodicity and apparent connection with the meteorology of the earth.

LECTURE NO. XVIII.

(April 26, 1882.)

AURORAS.

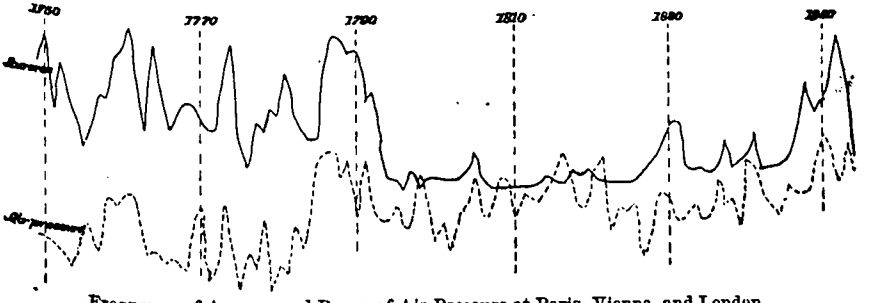
Description of the different appearances.
Connection with electricity and magnetism.
Height of the aurora.
Different explanations of the phenomenon adopted by scientists.

LECTURE NO. XIX.

(May 3, 1882.)

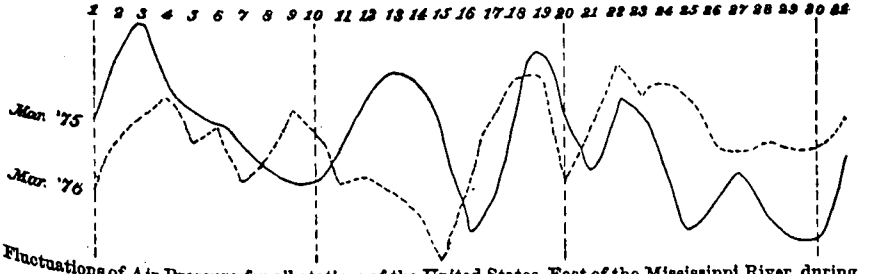
PERIODICITY IN METEOROLOGICAL PHENOMENA.

FIG. 17.



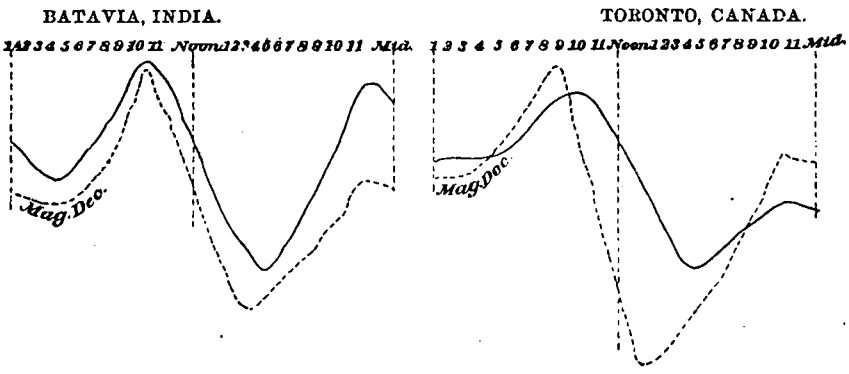
Frequency of Auroras and Range of Air-Pressure at Paris, Vienna, and London.

FIG. 18.



Fluctuations of Air-Pressure for all stations of the United States, East of the Mississippi River, during March of 1875 and 1876.

FIG. 19.



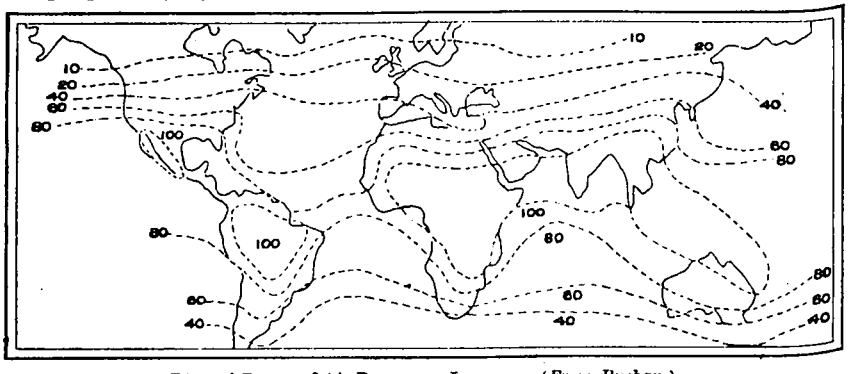
Diurnal Range of Air-Pressure and Magnetic Declination.

LECTURE No. XX.

(May 10, 1882.)

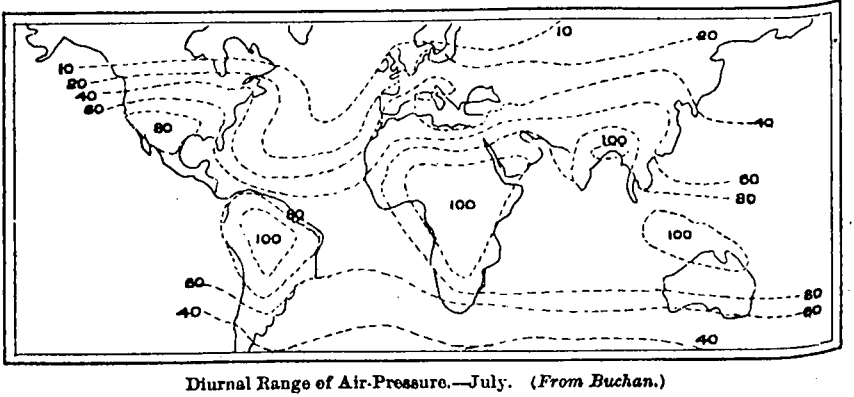
PERIODICITY IN METEOROLOGICAL PHENOMENA.

CHART No. 14.



Diurnal Range of Air-Pressure—January. (*From Buchan.*).

CHART No. 15.



Diurnal Range of Air-Pressure.—July. (*From Buchan.*)

APPENDIX 6.

Lectures on (1) Elementary mathematics; (2) Trigonometry; (3) Analytic geometry; (4) Calculus; (5) Differential equations; (6) Thermo-dynamics.

By Frank Waldo.

War Department,
Office of the Chief Signal Officer,
Study Room, Washington, D. C., June 8, 1882.

Prof. Cleveland Abbe:

Sir: In compliance with your request, I desire to make the following report on the mathematical lectures delivered by me at Fort Myer, Va., before the class whose course has just been completed.

As most of those under instruction were college graduates and were presumed to possess a considerable knowledge of mathematics, it was decided to make the regular course of lectures a review of logarithms, trigonometry, analytic geometry, and calculus.

After the first lecture, however, it became evident that there were those present who were perfectly familiar with subjects covered by the proposed lectures. An examination of the filed records showed that fourteen had studied calculus, and would probably be able to take an "advanced course."

Upon due consideration it appeared best to lecture to the advanced division on differential equations and thermo-dynamics, the first of these coming next in order in pure mathematics to what they had already studied, and the second being a subject that they must become acquainted with in order to comprehend meteorological theories.

The advanced course consisted of ten lectures on each of the subjects, and I endeavored in this brief space to point out the nature of the line of study they ought to take up subsequently if they wished to make progress. Before the completion of these lectures I was enabled to judge pretty well of the relative merits of the men, and think that as large a proportion were benefited by the course, as in any scientific school.

The men in the regular course were not required to take notes, as most of the lithographed synopses of the lectures were made full. By this means they were enabled to pay attention to the *meaning* of the lecture and not obliged to spend most of the time of the lecture in writing. In the advanced course no lithographed notes were furnished, and consequently the men were obliged to take their own notes.

When the students of the regular course had advanced far enough to take up calculus, I gave each man an oral examination, and divided the class into three sections. The first section was composed of those who had received no instruction in elementary mathematics, and they were to form a class in algebra. The second were those who felt the need of a more thorough course in algebra and trigonometry before studying calculus: This section was given in charge of Assistant Instructor Lieutenant Bailey, who gave them numerous problems selected by me, and his verbal report of their progress was very satisfactory. The third section met for their lecture at the hour usual for that course. The lecture before the first section came immediately after the third section had finished theirs, but I was enabled to give them but twenty minutes on each lecture day because the dinner hour interfered.

The lecture for the advanced course was from 8.30 to 9.25 a. m., and for the regular course from 10.45 to 11.45 a. m., on Tuesday and Friday.

The following mathematical text-books were placed in the post library for consultation by any of the students:

Loomis's Algebra, with key.
Peck's Algebra.
Todhunter's Algebra, with key.
Todhunter's Algebra for Beginners.
Loomis's Geometry.
Peck's Geometry.
Chauvenet's Geometry.
Church's Descriptive Geometry.
Todhunter's Plane and Spherical Trigonometry.
Chauvenet's Trigonometry.
Loomis's Trigonometry.
Peck's Analytical Geometry.
Briggs's Analytical Geometry.
Davies's Analytic Geometry and Calculus.
Howison's Analytic Geometry.

Todhunter's Conic Sections.
Todhunter's Differential and Integral Calculus.
Williamson's Differential and Integral Calculus.
Byerly's Differential Calculus.
Peck's Calculus.
Church's Calculus.
Loomis's Calculus.
Bartlett's Analytical Mechanics.
Peck's Elements of Mechanics.
Todhunter's Mechanics for Beginners.

A copy of each of the following books was placed in each of the rooms occupied by the students:

Loomis's Logarithms.
Todhunter's Algebra.
Williamson's Differential and Integral Calculus.
Chauvenet's Geometry and Trigonometry.
Howison's Analytic Geometry.

The bearing of the students has been without exception more gentlemanly and dignified than I have seen in most college classes. That this was from their own choice is shown by the fact that no military officer was present at lectures of the advanced course.

It is peculiarly gratifying that the Chief Signal Officer has been able to obtain students who are capable of receiving such instruction as is usually given to post-graduate students in our best colleges. With such men available, a high class of work may be expected.

The accompanying notes on logarithms, trigonometry, analytic geometry and calculus were lithographed and distributed to each man of the advanced course as well as the regular course.

The notes on differential equations and thermo-dynamics not being lithographed, I have given an abstract of them. The former were founded on Boole's Differential Equations, and the latter on part of the course on thermo-dynamics as given at Harvard College.

Very respectfully,

FRANK WALDO, *Computer O. C. S. O.*

LECTURE No. I.

LOGARITHMS, THEORY AND USE.

The exponential equation is one in which the unknown quantity occurs as an exponent, $b^x = m$. The root of the equation $b^x = m$ is called the logarithm of m, usually written $\log m$ or $l\,m$. The value of the logarithm varies with the value of b, which is called the base of the system of logarithms.

The logarithm of a number may be defined as the exponent of the power to which the base of the system must be raised in order to produce this number.

When the base is greater than unity, the logarithms of all numbers greater than unity are positive, while those of all numbers less than unity are negative. Since $b^0 = 1$, it follows that the log of unity is zero in all cases.

Theorem. The sum of the logarithms of several numbers is the log of their continued product. Proof. Let the numbers be m, m', m'', &c., and let b be the base of the system; we have, then,

$$b^{\log m} = m$$
$$b^{\log m'} = m'$$
$$b^{\log m''} = m'', \text{ \&c.}$$

By algebra we have $b^{\log m + \log m' + \log m''} = m\,m'\,m''$.

Hence, by our definition, $\log m + \log m' + \log m'' = \log (m\,m'\,m'')$.

Corollary I. If the number of factors $m\,m'$, &c., is n, and if they are all equal to each other, we have $\log m\,m\,m$, &c., $= \log m + \log m + \log m$; &c.; or $\log (m^n) = n \log m$; that is, the log of any power of a number is equal to the logarithm of the number multiplied by the exponent of the power.

Corollary II. If we substitute $P = m^n$ or $m = \sqrt[n]{P}$ in the above equation, we have $\log P = n \log \sqrt[n]{P}$ or $\log \sqrt[n]{P} = \frac{\log P}{n}$; that is, the logarithm of any root of a number is equal to the log of the number divided by the exponent of the root.

Corollary III. The equation $\log m\,m' = \log m + \log m'$ gives $\log m' = \log m\,m' - \log m$; that is, the log of one factor of a product is equal to the log of the product diminished by the log of the other factor; or, in other words, the log of the quotient is equal to the log of the dividend diminished by the log of the divisor.

Corollary IV. From Corollary III we have $\log \frac{1}{n} = \log 1 - \log n$, but since $\log 1 = 0$, then $\log \frac{1}{n} = -\log n$ or the log of the reciprocal of a number is the negative of the log of the number.

Corollary V. Since 0 is the reciprocal of ∞, we have $\log 0 = -\log . \infty = -\infty$; that is, the log of zero is negative infinity.

Corollary VI. Since we have $b^1 = b$, the log of the base of a system is unity.

Theorem. If the logs of all numbers are calculated in a given system, they can be obtained for any other system by dividing the given logs by the log of the base of the required system taken in the given system.

Proof: Let b be the base of the given system, and b' that of the required system, and denote by log the logarithm in the given system, and by log' the logarithm in the required system. Taking, then, any number m we have, by previous definition, $b^{\log m} = m$ and $b'^{\log' m} = m$, whence $b' \log m = b^{\log' m}$.

If we take the logarithm of each member of this equation in the given system, we have, by Corollary I, $\log' m \times \log b' = \log m \times \log b = \log m$ (because $\log b = 1$ by Corollary VI); or, dividing by $\log b'$ we have $\log' m = \frac{\log m}{\log b}$.

COMMON LOGARITHMS AND THE USE OF TABLES.

The base of the system in common use is 10. Hence, as $b^0 = 1$, we have $log\ 1 = 0$; also, by Corollary VI, we have

$log\ 10 = 1$
$log\ 100 = log\ 10^2 = 2\ log\ 10 = 2$
$log\ 1{,}000 = log\ 10^3 = = 3$
$log\ 10{,}000 = log\ 10^4 = = 4$
$log\ 100{,}000 = log\ 10^5$, &c.

Also, $log\ 0.1 = log\ \frac{1}{10} = log\ 10^{-1} = -1.$
$log\ .01 = log\ \frac{1}{100} = log\ 100^{-1} = log\ 10^{-2} = -2.$
$log\ .001 = log\ \frac{1}{1000} = log\ 1{,}000^{-1} = log\ 10^{-3} = -3.$

For a number between	1 and	10 its *log* is between	0 and	1.
	10 and	100 its *log* is between	1 and	2.
	100 and	1,000 its *log* is between	2 and	3.
	.1 and	1 its *log* is between	−1 and	0.
	.1 and	.01 its *log* is between	−1 and	−2.

Hence, if the greatest integer contained in a logarithm is called its characteristic, the characteristic of the log of a number is equal to the number of places by which its first significant figure on the left is removed from the unit's place, the characteristic being positive when the figure is to the left of the unit's place, negative when it is to the right of the unit's place, and zero when it is in the unit's place.

Logarithms are usually given to 5, 6, or 7 places of decimals. For all ordinary purposes 5-place logarithmic tables are sufficiently accurate. We have now to find the logarithm of a given number. First find the characteristic by means of the rule just given. Second, to find the decimal part of the logarithm. In doing this the decimal point of the given number is to be wholly disregarded, and any ciphers which may precede its first significant figure on the left, or following its last significant figure on the right, are to be omitted.

When the number thus simplified is contained within the limits of the tables, which we shall regard as extending to numbers of four places, the decimal part of its logarithm is found in a horizontal line with its first three figures, and in the column below its fourth figure; the second, third and fourth figure when wanting being supposed to be ciphers.

Sometimes the number consists of more than four places, and is therefore beyond the limits of the table. We must then interpolate, relying on the following law:

If several numbers are nearly equal, their differences are proportional to the differences of their logarithms.

EXAMPLE.

To find the number corresponding to the given logarithm. When the decimal part of the given logarithm is exactly contained in the tables, its corresponding number can be immediately found by inspection. The position of the decimal point of the required number depends altogether upon the characteristic of the given logarithm.

When the given log is not exactly contained in the tables. the number corresponding to the logarithm which is next below gives the four first places on the left of the required number. One or two more places are found by dividing the difference between the given logarithm and the log of the tables next below it by the difference between the log of the tables next below and *next* above the given logarithm.

EXAMPLE.

To find the product of two or more factors by means of logs. Find the sum of logs of factors. The required number corresponds to this sum.

To find any power of a given number by means of logs. Multiply the log of the given number by the exponent of the required power, and the number of which this product is the log is the required number.

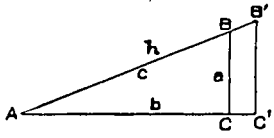
To find any root of a given number by means of logs. Divide the log of the given number by the exponent of the required root, and the number of which this quotient is the log is the required number.

To find the quotient of one number divided by another by means of logs. Subtract the log of the divisor from that of the dividend, and the number of which the remainder is the log is the required quotient.

LECTURE No. II.

PLANE TRIGONOMETRY.

FIG. 20.



$BC : AB :: B'C' : AB'$. $\frac{BC}{AB} = \frac{B'C'}{AB'}$.

Similarly, $\frac{BC}{AC} = \frac{B'C'}{AC'}$; also, $\frac{AB}{AC} = \frac{AB'}{AC'}$.

Hence, the ratios of the sides to each other are the same in all right triangles having the same acute angle.

There are six ratios existing between the three sides. These ratios are called the trigonometric functions. Let us consider A.

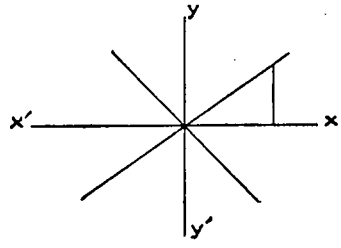
The sine $= \frac{\text{opposite leg}}{\text{hypotenuse}} = \frac{a}{h}$, tangent $= \frac{\text{opposite leg}}{\text{adjacent leg}} = \frac{a}{b}$,

secant $= \frac{\text{hypotenuse}}{\text{adjacent leg.}} = \frac{h}{b}$. The cosine, cotangent, and cosecant of one oblique angle are the sine, tangent, and secant of its complement. Then we have,

$$\text{cosine } A = \frac{b}{h}, \quad \text{cotangent } A = \frac{b}{a}, \quad \text{cosecant } A = \frac{h}{a}.$$

It is evident that (sin and cos) <1. (sec and cosec) >1. (tan and cot) $\lessgtr 1$.

FIG. 21.



Extension of functions to angles of any magnitude, by using opposite signs to denote opposite directions.

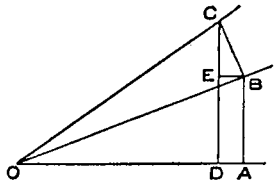
	First quadrant.	Sec. quad.	Third quad.	Fourth quad.
sin	+	+	−	−
cos	+	−	−	+
tan	+	−	+	−

A positive arc is measured from x around toward the left.

A negative arc is measured from x around toward the right.

To find the sin of the sum of two angles.

FIG. 22.



AOB and BCO are the two angles.

BCE and AOB are mutually equiangular, because the sides of the triangles are mutually perpendicular.

$\therefore \angle BCE = \angle AOB$. Let $x = AOB$. and $y = BOC$.

Then $x+y = COD$. $\sin(x+y) = \frac{CD}{CO} = \frac{BA+CE}{CO}$

$= \frac{BA}{CO} + \frac{CE}{CO}$. But $\frac{BA}{CO} = \frac{BA}{BO} \times \frac{BO}{CO} = \sin x \cos y$.

$\frac{CE}{CO} = \frac{CE}{CB} \times \frac{CB}{CO} = \cos x \sin y$. $\therefore \sin(x+y) = \sin x \cos y + \cos x \sin y$.

It can be shown that,

$$\sin(x-y) = \sin x \cos y - \cos x \sin y.$$
$$\cos(x+y) = \cos x \cos y - \sin x \sin y.$$
$$\cos(x-y) = \cos x \cos y + \sin x \sin y.$$

There are two trigonometric tables. Tables of natural sines, &c., and tables of logarithmic sines, &c. The log tables are used principally in trigonometric work.

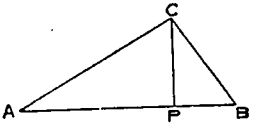
There are four cases in the solution of right triangles, and these can all be solved by means of the formulæ given in the definitions of the trigonometric functions:

Case I. Given the hypotenuse and one acute angle. To find the other parts.
Case II. Given the hypotenuse and one side. To find the other parts.
Case III. Given an acute angle and adjacent side. To find the other parts.
Case IV. Given an acute angle and opposite side. To find the other parts.

Theorems concerning the general plane triangle.

Theorem I. The sides of a plane triangle are proportional to the sines of their opposite angles.

Fig. 23.



Proof: We have the triangle ABC. Draw CP perpendicular to AB. Call CP, p. Then we have $p = b \sin A$, and $p = a \sin B$, whence $b \sin A = a \sin B$, which converted into a proportion gives $a : b :: \sin A : \sin B$.

Theorem II. The sum of any two sides of a plane triangle is to their difference as the tangent of half the sum of the opposite angles is to the tangent of half their difference.

Proof: $a : b :: \sin A : \sin B$, or $a+b : a-b :: \sin A + \sin B : \sin A - \sin B$.

$\sin(x+y) + \sin(x-y) = 2 \sin x \cos y$. $\sin(x+y) - \sin(x-y) = 2 \cos x \sin y$.

Also, $\cos(x+y) + \cos(x-y) = 2 \cos x \cos y$. $\cos(x+y) - \cos(x-y) = -2 \sin x \sin y$.

Suppose we let $x+y = x'$, and $x-y = y'$. Then $2x = x' + y'$ $x = \frac{1}{2}(x'+y')$; also, $2y = x' - y$, $y = \frac{1}{2}(x'-y')$. Then our first equation will become, $\sin x' + \sin y' = 2 \sin \frac{1}{2}(x'+y') \cos \frac{1}{2}(x'-y')$; and the second equation, $\sin x' - \sin y' = 2 \cos \frac{1}{2}(x'+y') \sin \frac{1}{2}(x'-y')$. Dividing one by the other, we get

$$\frac{\sin x' + \sin y'}{\sin x' - \sin y'} = \frac{\tan \frac{1}{2}(x'+y')}{\tan \frac{1}{2}(x'-y')}.$$

We can change the x', &c., to A, &c., because it can have any value. We can say, then, $\sin A + \sin B : \sin A - \sin B :: \tan \frac{1}{2}(A+B) : \tan \frac{1}{2}(A-B)$. Hence we have, by combining this proportion with one previously given, $a+b : a-b :: \tan \frac{1}{2}(A+B) : \tan \frac{1}{2}(A-B)$.

Lectures Nos. III and IV.

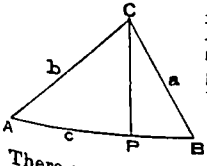
(January 20, 1882.)

Plane and spherical trigonometry. Plane trigonometry—Continued.

Theorem III.—The square of any side of a triangle is equal to the sum of the squares of the other two sides, diminished by twice the rectangle of these sides, multiplied by the cosine of their included angle. Chauvenet, page 59.

Proof of Theorem III.

Fig. 24.



$BP = a - AP$

$\overline{BP}^2 = \overline{AP}^2 + a^2 - 2a \times AP$. Add aP^2 to both members, and substituting we have $a^2 = b^2 + c^2 - 2a \times AP$, but the triangle ACP gives $AP = b \cos A$. Substituting this in the preceding equation we get $a^2 = b^2 + c^2 - 2bc \cos A$ as was to be proved, then $\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$.

There are four cases in oblique triangles.

Case I.—Given two angles, A and B, and one side, c,

$$C = 180^\circ - (A+B)$$

$$b = \frac{a \sin B}{\sin A} \qquad a = \frac{a \sin c}{\sin A}$$

Case II.—Given two sides (a and b) and one angle (A)

$$\sin B = \frac{b \sin A}{a} \qquad C = 180^\circ - (A+B) \qquad c = a \sin c \operatorname{cosec} A.$$

Sometimes two solutions.

Case III.—Given two sides (a and b) and the included angle (C)

$$A + B = 180^\circ - C$$

$$(a+b) : (a-b) :: \tan \tfrac{1}{2}(A+B) : \tan \tfrac{1}{2}(A-B)$$

from which can be found A and B, having given the sum and difference.

$$c = \frac{a \sin C}{\sin A}$$

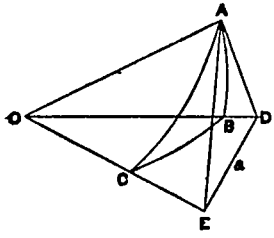
CASE IV.—Given the three sides, a, b, and c,

$$\cos A = \frac{b^2+c^2-a^2}{2bc} \qquad \cos B = \frac{a^2+c^2-b^2}{2ac} \qquad \cos C = \frac{a^2+b^2-c^2}{2ab}$$

SPHERICAL TRIGONOMETRY.

Spherical trigonometry investigates the relations which subsists between the angles of the plane faces which form a solid angle and the angles at which the plane faces are inclined to each other. We will consider angles less than 180° only.

FIG. 25.



Let O be the center of a sphere and suppose a solid angle formed at O by the meeting of three plane angles. Let the lines bounding the sides of the angles cut the sphere at the points A, B, and C. Then A, B, C will be a spherical triangle, if we join the points by great circles of the sphere.

Let the tan at A to the arc $A\,C$ meet $O\,C$ produced at E.

Let the tan at A to the arc $A\,B$ meet $O\,B$ produced at D.

Then join $E\,D$. Then the angle $E\,A\,D$ is the angle A of the spherical triangle, and the angle $E\,O\,D$ measures the side a. From the triangles $A\,D\,E$ and $O\,D\,E$ we have

$$\overline{D\,E}^2 = \overline{A\,D}^2 + \overline{A\,E}^2 - 2\,A\,D.\ A\,E\cos A$$

$$\overline{D\,E}^2 = \overline{O\,D}^2 + \overline{O\,E}^2 - 2\,O\,D.\ O\,E\cos a$$

The angles $O\,A\,D$ and $O\,A\,E$ are right angles, so that

$$\overline{O\,D}^2 = \overline{O\,A}^2 + \overline{A\,D}^2, \text{ and } \overline{O\,E}^2 = \overline{O\,A}^2 + \overline{A\,E}^2$$

Hence by substitution and subtraction we have

$$0 = 2\,\overline{O\,A}^2 + 2\,A\,D.\ A\,E\cos A - 2\,O\,D.\ O\,E\cos a$$

Therefore

$$\cos a = \frac{O\,A}{O\,E}\cdot\frac{O\,A}{O\,D} + \frac{A\,E}{O\,E}\cdot\frac{A\,D}{O\,D}\cos A$$

That is

$$\cos a = \cos b\cos c + \sin b\sin c\cos A$$

$$\cos A = \frac{\cos a - \cos b\cos c}{\sin b\sin c}$$

Theorem. The sines of the angles are proportioned to the sines of the opposite sides.

Proof. We have

$$\cos A = \frac{\cos a - \cos b\cos c}{\sin b\sin c}$$

Therefore,

$$\sin^2 A = 1 - \left(\frac{\cos a - \cos b\cos c}{\sin b\sin c}\right)^2$$

$$= \frac{(1-\cos^2 b)(1-\cos^2 c) - (\cos a - \cos b\cos c)^2}{\sin^2 b\sin^2 c}$$

$$= \frac{1-\cos^2 a - \cos^2 b - \cos^2 c + 2\cos a\cos b\cos c}{\sin^2 b\sin^2 c}$$

$$\therefore \sin A = \frac{\sqrt{(1\cos^2 a - \cos^2 b - \cos^2 c + 2\cos a\cos b\cos c}}{\sin b\sin c}$$

Then

$$\frac{\sin A}{\sin a} = \frac{\sqrt{(1-\cos^2 a - \cos^2 b - \cos^2 c + 2\cos a\cos b\cos c)}}{\sin a\sin b\sin c}$$

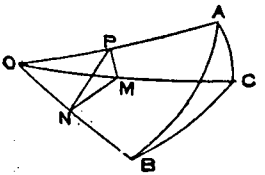
But it can be shown in a similar way that

$$\frac{\sin B}{\sin b} = \frac{\sqrt{(1-\cos^2 a - \cos^2 b - \cos^2 c + 2\cos a\cos b\cos c)}}{\sin a\sin b\sin c} \text{ &c.}$$

$$\frac{\sin A}{\sin a} = \frac{\sin B}{\sin b} = \frac{\sin C}{\sin c}$$

In every spherical triangle there are six elements, namely, three sides and three angles, besides the radius, which is constant. When three parts are given the remaining three can be found. Let C be a right angle in the triangle $A\,B\,C$. From any point P on $O\,A$, draw $P\,M$ perpendicular to $O\,C$; then draw $M\,N$ perpendicular to $O\,B$. Then $P\,M$ is perpendicular to $M\,N$.

FIG. 26.



$$\overline{P\,N}^2 = \overline{P\,M}^2 + \overline{M\,N}^2 = \overline{O\,P}^2$$
$$-\overline{O\,M}^2 + \overline{O\,M}^2 - \overline{O\,N}^2 = \overline{O\,P}^2 - \overline{O\,N}^2.$$
$$\therefore P\,N\,O \text{ is a right angle and,}$$

$$\frac{O\,N}{O\,P} = \frac{N\,O}{O\,M} \cdot \frac{O\,M}{O\,P}; \text{ that is, } \cos c = \cos a \cos b \quad (1)$$

$$\frac{P\,M}{O\,P} = \frac{P\,M}{P\,N} \cdot \frac{P\,N}{O\,P}; \quad \begin{matrix}\text{that is, } \sin b = \sin B \sin c \\ \text{similarly } \sin a = \sin A \sin c\end{matrix} \Big\} (2)$$

$$\frac{M\,N}{O\,N} = \frac{M\,N}{P\,N} \cdot \frac{P\,N}{O\,N}; \quad \begin{matrix}\text{that is, } \tan a = \cos B \tan c \\ \text{similarly } \tan b = \cos A \tan c\end{matrix} \Big\} (3)$$

$$\frac{P\,M}{O\,M} = \frac{P\,M}{M\,N} \cdot \frac{M\,N}{O\,M}; \quad \begin{matrix}\text{that is, } \tan b = \tan B \sin a \\ \text{similarly } \tan a = \tan A \sin b\end{matrix} \Big\} (4)$$

Multiply together the two formulæ (4) thus:

$$\tan A \tan B = \frac{\tan a \tan b}{\sin a \sin b} = \frac{1}{\cos a \cos b} = \frac{1}{\cos c} \text{ by (1)}$$

therefore

$$\cos c = \cot A \cot B \quad (5)$$

Multiply crosswise the second formula in (2) and the first in (3) thus:

therefore

$$\sin a \cos B \tan c = \tan a \sin A \sin c$$

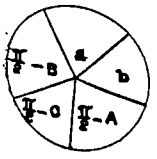
$$\cos B = \frac{\sin A \cos c}{\cos a} = \sin A \cos b \text{ by (1)}$$

$$\begin{matrix}\text{thus } \cos B = \sin A \cos b \\ \text{similarly } \cos A = \sin B \cos a\end{matrix} \Big\} (6)$$

These formulæ provide for all cases of right spherical triangles.

NAPIER'S CIRCULAR PARTS.

FIG. 27.



Any one of these parts may be called the middle part. The two parts next to it are called the adjacent parts, while the remaining two parts are called the opposite parts. Then Napier's rules are the following:

Sine of the middle part = product of tangents of adjacent parts.
Sine of the middle part = product of cosines of opposite parts.
Napier's analogies are,

$$\tan \tfrac{1}{2}(A + B) = \frac{\cos \frac{1}{2}(a - b)}{\cos \frac{1}{2}(a + b)} \cot \frac{c}{2}$$

$$\tan \tfrac{1}{2}(A - B) = \frac{\sin \frac{1}{2}(a - b)}{\sin \frac{1}{2}(a + b)} \cot \frac{c}{2}$$

$$\tan \tfrac{1}{2}(a + b) = \frac{\cos \frac{1}{2}(A - B)}{\cos \frac{1}{2}(A + B)} \tan \frac{c}{2}$$

$$\tan \tfrac{1}{2}(a - b) = \frac{\sin \frac{1}{2}(A - B)}{\sin \frac{1}{2}(A + B)} \tan \frac{c}{2}$$

There are six cases of the general spherical triangle:
Case I.—Having given the three sides; we have:

$$\cos A = \frac{\cos a - \cos b \cos c}{\sin b \sin c}, \text{ and similar formulae for cos } B \text{ and cos } C.$$

Case II.—Having given the three angles; we have shown that

$$\cos A = \frac{\cos a - \cos b \cos c}{\sin b \sin c} \text{ similarly for } \cos B \text{ and } \cos C.$$

Then $\cos A + \cos B \cos C =$

$$\frac{(\cos a - \cos b \cos c) \sin^2 a + (\cos b - \cos a \cos c)(\cos c - \cos a \cos b)}{\sin^2 a \sin b \sin c}$$

In the numerator of this fraction write $1 - \cos^2 a$ for $\sin^2 a$; thus the numerator will be found to reduce to $\cos a\,(1 \cos^2 a - \cos^2 b - \cos^2 c + 2 \cos a \cos b \cos c)$, and this is equal to $\cos a \sin B \sin C \sin^2 a \sin b \sin c$ by what has been shown before.

$\cos A + \cos B \cos C = \cos a \sin B \sin C$.

Similarly the two corresponding formulæ may be proved.

Case III.—Having given two sides and the included angle (a C b). By Napier's analogies

$$\tan \tfrac{1}{2}(A+B) = \frac{\cos \frac{1}{2}(a-b)}{\cos \frac{1}{2}(a+b)} \cot \tfrac{1}{2} C. \quad \text{Also } \tan \tfrac{1}{2}(A-B) = \frac{\sin \frac{1}{2}(a-b)}{\sin \frac{1}{2}(a+b)} \cot \tfrac{1}{2} C.$$

These determine A and B. Also, $\sin C = \dfrac{\sin a \sin c}{\sin A}$.

Case IV.—Given two angles and the included side (A c B). By Napier's analogies

$$\tan \tfrac{1}{2}(a+b) = \frac{\cos \frac{1}{2}(A-B)}{\cos \frac{1}{2}(A+B)} \tan \tfrac{1}{2} c. \quad \text{Also } \tan \tfrac{1}{2}(a-b) = \frac{\sin \frac{1}{2}(A-B)}{\sin \frac{1}{2}(A+A)} \tan \tfrac{1}{2} C.$$

These determine a and b. Also $\sin C = \dfrac{\sin A \sin C}{\sin a}$.

Case V.—Having given two sides and the angle opposite one of them (a b A)

$$\sin B = \frac{\sin b}{\sin a} \sin A. \quad \text{Then } C \text{ and } c \text{ can be found by Napier's analogies}$$

$$\tan \tfrac{1}{2} C = \frac{\cos \frac{1}{2}(a-b)}{\cos \frac{1}{2} a + b} \cot \tfrac{1}{2}(A+B). \quad \text{Also } \tan \tfrac{1}{2} c = \frac{\cos \frac{1}{2}(A+B)}{\cos \frac{1}{2}(A-B)} \tan \tfrac{1}{2}(a+b).$$

Case VI.—Having given two angles and the side opposite one of them (A B a)

$$\sin b = \frac{\sin B \sin a}{\sin A}. \quad \text{Also } C \text{ and } c \text{ are determined as in Case V.}$$

The cases of ambiguity arising have not been considered.

LECTURE No. V.

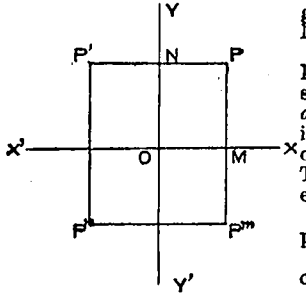
(January 24, 1882.)

ANALYTIC GEOMETRY.

INTRODUCTION—THE POINT.

We will assume that the algebraic signs + and − express the upward and downward directions of vertical lines, the directions from left to right and from right to left of horizontal lines, and in general distinguish between the opposite directions of lines which have the same general direction.

FIG. 28.



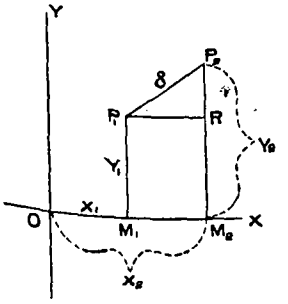
In this diagram the position of P is determined if we know NP and MP. Call NP and MP x and y, or abscissa and ordinate. For the point P, $x=a$, $y=b$; for P' $x=-a$, $y=b$, &c. The signs of the co-ordinates of a point show in which quadrant the point lies, while the magnitudes of the co-ordinates locate the point in that quadrant. This system of co-ordinates is called rectangular. (Take examples of locating points and plotting figures.)

PROBLEM.—To find the distance between two given points in terms of their co-ordinates.

Let P_1 with co-ordinate $x_1 = OM_1$ $y_1 = M_1 P_1$ and P_2 with co-ordinates $x_2 = OM_2$ $y_2 = M_2 P_2$ be the given points.

Let δ represent the required distance between P_1 and

FIG. 29.



P_2. Through P_1 draw a parallel to $O\times$ and let it meet M_2P_2 in the point R. Now we know that P_1RP_2 must be a right triangle, and therefore

$$\delta^2=\overline{P_1R}^2+\overline{P_2R}^2$$

We may write

$$P_1R=M_1M_2=M_1O+OM_2=OM_2-OM_1=x_2-x_1$$
$$RP_2=RM_2+M_2P_2=M_2P_2-M_2R=M_2P_2-M_1P_1=y_2-y_1$$

We have then

$$\delta^2=(x_2-x_1)^2+(y_2-y_1)^2, \text{ or } \delta=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$

LECTURE No. VI.

(January 27, 1882.)

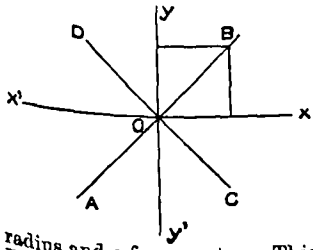
ANALYTIC GEOMETRY.

LOCAS OF AN EQUATION.

We will now consider the point when it is not limited to a single position, but is confined to a series of positions, any one of which it may take, and at the same time have its cordinates satisfy the conditions imposed upon them. When $x=o$ is the given data, then P lies on $O\,Y$. When $x=a$ the distance of P from $O\,Y$ must be a. Similarly we can have values for y only.

Suppose $x=y$, then P must lie on the line $A\,B$. When $x=-y$, P must lie on the line $C\,D$. The locus of an equation is the path of a point which moves in the plane so that at each instant its co-ordinates satisfy that equation when substituted therein for $x\,y$, the variables in that equation. The equation of a curve is the expression in an equation of the relation which exists between the co-ordinates of every point of that curve and of no other points.

FIG. 30.



We may obtain, by observing its geometric properties, the locus of $x^2+y^2=a^2$. We know that x^2+y^2 represents the square of the distance of the point P, which has x and y for its co-ordinates, from the origin $O\,P^2=a^2$, $O\,P=a$; P then moves in a circle with a for a radius and o for a center. This circumference is the locus of the equation $x^2+y^2=a^2$. We can also get the geometrical construction of the equation by assuming a value for one of the variables and solving the equation for the other. If we repeat this operation several times we can obtain several points on the locus. The distance from the origin along the axis of x to a point where any curve cuts the axis is called an intercept of that curve on $O\,X$, similarly on $O\,Y$. These intercepts are found if we first put $y=o$ in the equation and find the value of x, then put $x=o$ and find the value of y. We may find the intersection of two curves by considering that the point of intersection is a point of each curve; therefore its co-ordinates must satisfy each equation. We solve the two equations for x and y and the resulting values of the unknown quantities are the co-ordinates of the point or points of intersection.

LECTURE No. VII.

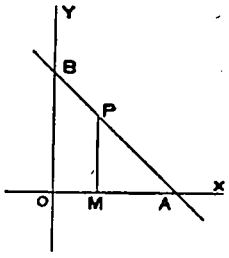
(January 31, 1882.)

ANALYTIC GEOMETRY.

A STRAIGHT LINE.

The loci of many equations are straight lines. Find the equation of a straight line which cuts $O\,X$ at A and $O\,Y$ at B. The lines $O\,A$ and $O\,B$ are the intercepts of $A\,B$ and will be called a and b respectively. Let P represent any point on $A\,B$ and draw its co-ordinates $O\,M=x$ and $M\,P=y$, we have

FIG. 31.



$$\frac{MP}{MA}=\frac{OB}{OA}=\frac{b}{a}\quad(1)$$

But $MP=y$ and $MA=OA-OM=a-x$.
Substituting these values in (1) we have

$$\frac{y}{a-x}=\frac{b}{a}$$

or $a\,y=a\,b-b\,x$
or

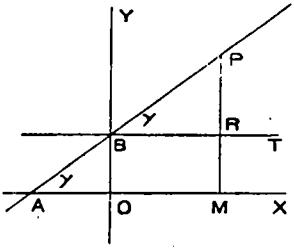
$$\frac{b\,x}{a\,b}+\frac{a\,y}{a\,b}=\frac{a\,b}{a\,b}$$

or

$$\frac{x}{a}+\frac{y}{b}=1.$$

This last equation is called the equation of the straight line in terms of its intercepts. A straight line is determined if we know where it cuts $O\,Y$ and also its direction. The first of these is given by the intercept on $O\,Y$, b. The second is expressed by the angle which the line makes with $O\,X$, which we will call γ.

FIG. 32.



The tangent of γ, which is called the slope of the line, we will indicate by λ. We have

$y=MP=MR+RP=OB+RP$, but $OB=b$ and $TBQ=XAQ=\gamma$

$$\frac{RP}{BR}=\tan\gamma=\lambda \text{ or}$$

$RP=BR\times\lambda$ or $RP=\lambda\,x$. We have then $y=b+\lambda\,x$ or $y=\lambda\,x+b$; the equation of the straight line in terms of the intercept and slope. Given the co-ordinates of the point $P_1\,(x_1\,y_1)$ on a line and the slope of the line λ we can deduce from $y=\lambda\,x+b$ the equation of the line, if we can find such a value for b that the line with that intercept and the slope λ shall pass through P. We can have $y_1=\lambda\,(x_1+b)$, in which x_1 y_1 and λ are arbitrary constants, then $b=x_1-\lambda\,x_1$. Substituting this in $y=\lambda\,x+b$, and we get $y-y_1=\lambda\,(x-x_1)$ (1), the required equation. We can make this line pass through the point $P_2\,(x_2\,y_2)$ by giving an appropriate value to λ. We must have

$$y_1-y_1=\lambda\,(x_2-x_1) \text{ or } \lambda=\frac{y_2-y_1}{x_2-x_1}.$$

Substituting this in (1) we get $y-y_1=\frac{y_2-y_1}{x_2-x_1}\,(x-x_1)$ or $\frac{y-y^1}{y_2-y_1}=\frac{x-x_1}{x_2-x_1}$ the equation of a line passing through $P_1\,P_2$.

LECTURE NO. VIII.

(February 3, 1882.)

ANALYTIC GEOMETRY.

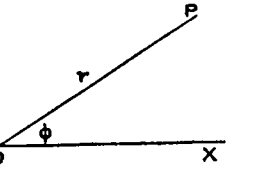
$A\,x+B\,y+C=0$ $\quad y=-\frac{A}{B}\,x-\frac{C}{B}$ $\quad p=x\cos\alpha+y\sin\alpha$. Express a and b in terms of p and α. Where $p=$ perpendicular distance of the line from O and α the angle this perpendicular makes with $O\,X$. To find the angle between two straight lines given by their equations. $y=\lambda\,x+b$ (1) and $y=\lambda_1\,x+b_1$ (2). Let θ be the angle which (2) makes with (1). Then $\gamma+\theta=\gamma_1$; whence $\theta=\gamma_1-\gamma$.

$$\text{Tan }\theta=\frac{\tan\gamma_1-\tan\gamma}{1+\tan\gamma_1\tan\gamma} \text{ or } \tan\theta=\frac{\lambda_1-\lambda}{1+\lambda_1\times\lambda}$$

If (1) and (2) are parallel, then $\theta=0°$ or $180°$ and $\tan\theta=0$. $\lambda_1=\lambda$. If the lines are perpendicular $\tan\theta=$ Infinity. $\lambda_1=-\frac{1}{\lambda}$. Parallel lines have the same slope. Lines at right angles to each other must have the slope of the one equal to the nega-

tive of the reciprocal of the slope of the other. $Ax+By+C=0$ and $A^1x+B^1y+C^1=0$. When the lines are parallel $\frac{-A^1}{B^1}=-\frac{A}{B}$. Therefore $Ax+By+C^1=0$ represents a line parallel to the given line. If the lines are perpendicular $A\,A^1=-B\,B^1$. Therefore $Bx-A^1y+C=0$ is the perpendicular to the given line.

FIG. 33.



Polar co-ordinates. Direction and distance from a fixed point.

Let $O\,X$ be a fixed line and O a fixed point. The position of P is given by the angle $X\,O\,P=\phi$ and the distance $O\,P=r$. O = pole. r = radius vector. ϕ = vectorial angle. $O\,X$ = the initial line.

LECTURE NO. IX.

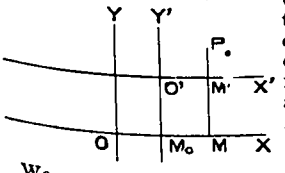
(February 7, 1882.)

ANALYTICAL GEOMETRY.

TRANSFORMATION OF CO-ORDINATES.

Compare the co-ordinates of a point referred to one set of axes with the co-ordinates of the same point referred to a parallel set. Let $O\,X$ and $O\,Y$ be the original set of axes; $O'\,X'$ and $O'\,Y'$ the new set parallel respectively to the old. O' the new origin has co-ordinates in the old system which we will call x_0 and y_0; then $x_0=O\,M_0$ and $y_0=M_0\,O'$. Let P represent any point; the co-ordinates referred to $X\,O\,Y$ are $x=O\,M$ and $y=M\,P$. The co-ordinates referred to $X'\,O'\,Y'$ are $x'=O'\,M'$ and $y'=M'\,P$. Then $O\,M=O\,M_0+M_0\,M=O\,M_0+O'\,M'$; also $M\,P=M\,M'+M'\,P=M_0\,O'+M'\,P$, or $x=x_0+x'$ and $y=y_0+y'$. Example.

FIG. 34.



We can change from one rectangular system to another keeping the same origin.

To change from a rectangular to a polar system with the origin for the pole and the axis of x for the initial line.

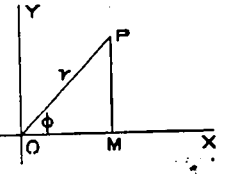
Let P be any point;

$x=O\,M$, $y=M\,P$, or $r=O\,P$; $\phi=X\,O\,P$

Then $O\,M=(O\,P)\cos\phi$ or $x=r\cos\phi$

$M\,P=(O\,P)\sin\phi$ or $y=r\sin\phi$. Examples.

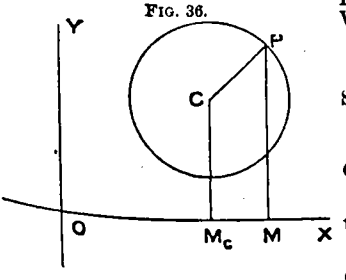
FIG. 35.



THE CIRCLE.

A circle is the path of a point that moves in a plane so that its distance from a fixed point in that plane is constant. Let C be the fixed point with co-ordinates x_c and y_c. P a point on the curve with co-ordinates x and y. Let a represent the constant distance of P from C. We have then

FIG. 36.



$$C\,P=a\,(1);\quad C\,P=\sqrt{\left((x-x_c)^2+(y-y_c)^2\right)}$$

Substituting this value in (1) we have

$$\sqrt{\left((x-x_c)^2+(y-y_c)^2\right)}=a$$

Or

$$(x-x_c)^2+(y-y_c)^2=a^2$$

the equation of the circle.

When C is the origin $x_c=O$ and $y_c=O$ and the equation becomes $x^2+y^2=a^2$.

LECTURE NO. X.

(February 10, 1882.)

ANALYTIC GEOMETRY.

We use the term secant in analytics to denote a straight line which cuts a curve in two points. When the points are coincident we call the secant a tangent. A normal

to a curve is a straight line perpendicular to the tangent. We have $x^2 + y^2 = a^2$ (1). Let P_1 be the given point. Equation of any line through P_1 may be written

$$y - y_1 = \lambda (x - x_1) \quad (2)$$

This equation will represent a secant, tangent, or a normal, according to the value given to λ. Let λ_s be the slope of a secant, cutting the curve in P_1 and P_2; λ_t the slope of the tangent at P_1; λ_n the slope of the normal at P_1. Determine λ_s, λ_t, and λ_n and substitute the values in (2).

$$\lambda_s = \frac{y_2 - y_1}{x_2 - x_1}$$

We have

$$x_1^2 + y_1^2 = a^2 \text{ and } x_2^2 + y_2^2 = a^2$$

Or $$x_1^2 + y_1^2 = x_2^2 + y_2^2, \text{ or } y_2^2 - y_1^2 = -(x_2^2 - x_1^2,$$

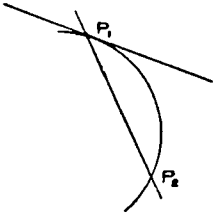
Or $$(y_2 - y_1)(y_2 + y_1) = -(x_2 - x_1)(x_2 + x_1)$$

Or $$\frac{y_2 - y_1}{x_2 - x_1} = -\frac{x_2 + x_1}{y_2 + y_1} \quad \therefore \quad \lambda_s = -\frac{x_2 + x_1}{y_2 + y_1}$$

In the case of a tangent $x_2 = x_1$ and $y_2 = y_1$; λ_s becomes λ_t and we have

$$\lambda_t = -\frac{x_1 + x_1}{y_1 + y_1} = -\frac{x_1}{y_1}$$

FIG. 37.



For the normal we have

$$\lambda_n = -\frac{1}{\lambda_t} = \frac{y_1}{x_1}$$

The equations of the required tangent and normal are

$$y - y_1 = -\frac{x_1}{y_1}(x - x_1) \text{ and } y - y_1 = \frac{y_1}{x_1}(x - x_1)$$

Clearing of fractions and remembering that $x_1^2 + y_1^2 = a^2$ we have $x_1 x + y_1 y = a^2$ the equation of the tangent, and $y_1 x - x_1 y = 0$ the equation of the normal. Examples.

LECTURE No. XI.

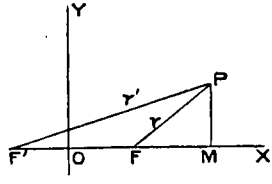
(February 14, 1882.)

ANALYTIC GEOMETRY.

An ellipse is a curve generated by a point moving in a plane so that at each instant the sum of its distances from two fixed points in that plane is constant.

An hyperbola is a curve generated by a point moving in a plane so that at each instant the difference of its distances from two fixed points in that plane is constant.

FIG. 38.



A parabola is a curve generated by a point moving in a plane so that at each instant its distances from a fixed point and a fixed line in that plane are equal.

The three curves are called the conic sections.

To find the equation of an ellipse. The two fixed points are called foci. Take the straight line joining them for the axis of x, and the point midway between them for the origin. The focal radii measure the distance of the point from the two fixed points. Let $2c$ = the constant distance between the foci and $2a$ = the sum of the focal radii. Let r and r' be the distance of P from F and F_1. Co-ordinates of F' and F are $(-c, o)$ and (c, o), and the equation which expresses the definition of the locus is

$$r' + r = 2a \quad (1)$$

Expressing r' and r in terms of x, y, and c we have

$$r' = \sqrt{(x + c)^2 + y^2} \text{ and } r = \sqrt{(x - c)^2 + y^2}$$

Substituting these values in (1) we have

$$\sqrt{(x + c)^2 + y^2} + \sqrt{(x - c)^2 + y^2} = 2a$$

Or

$$(x+c)^2+y^2=2a-\sqrt{(x-c)^2+y^2}$$

Or

$$(x+c)^2+y^2=4a-4a\sqrt{(x-c)^2+y^2}+(x-c)^2+y^2$$

$$4a\sqrt{(x-c)^2+y^2}=4a^2-4cx$$

Dividing by 4 and squaring again we get

$$a^2x^2-2a^2cx+a^2c^2+a^2y^2=a^4-2a^2cx+c^2x^2$$

Or

$$(a^2-c^2)x^2+a^2y^2=a^2(a^2-c^2)$$

Represent a^2-c^2 by b^2.
Then we have

Or

$$b^2x^2+a^2y^2=a^2b^2$$

$$\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$$

LECTURE No. XII.

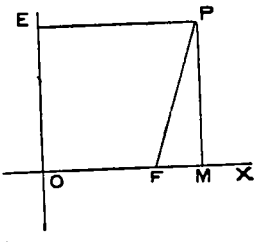
(February 17, 1882.)

ANALYTIC GEOMETRY.

THE HYPERBOLA.

We have $r'-r=2a$. Then $(a^2-c^2)x^2+a^2y^2=a^2(a^2-c^2)$. But as in this case we represent the constant difference between the focal radii by $2a$ and between the foci by $2c$ we have c less than a. Therefore c^2-a^2 is negative; consequently b^2 is negative and we have

FIG. 39.



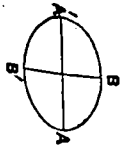
$$-b^2x^2+a^2y^2=-b^2a^2 \text{ or } b^2x^2-a^2y^2=a^2b^2$$

$$\frac{x^2}{a^2}-\frac{y^2}{b^2}=1 \text{ the equation of the hyperbola.}$$

PARABOLA.

Take $O\,Y$ as the fixed straight line called the directrix, and $O\,X$ the perpendicular upon the directrix from the fixed point or focus F. Let P be any point on the curve. Let m = constant distance of the focus from the directrix.

FIG. 40.



$$F\,P=E\,P \qquad F\,P=\sqrt{(x-m)^2+y^2} \qquad E\,P=O\,M=x.$$

Then $(x-m)^2+y^2=x^2$ or $y^2-2mx+m^2=0$ the equation to the parabola. When the origin is midway between the focus and directrix the equation becomes $y^2=2mx$.

Major axis is $A\,A'$ minor axis $B\,B'$. The parameter is the breadth of the curve through the focus. The eccentricity of an ellipse $=\frac{c}{a}$.

LECTURE No. XIII.

(February 21, 1882.)

The hour was occupied in examining and making a new classification of the men under instruction preparatory to the further course in analytics and calculus.

LECTURE No. XIV.

(February 24, 1882.)

CALCULUS.

Functions.
Dependent and independent variables, constants.
Algebraic and transcendental functions.
Increments and differentials.

Limiting ratios and derived functions.
Differential and differential coefficient.
Algebraic illustration.
Trigonometrical illustration.
Geometrical illustration.
Examples.

LECTURE No. XV.

(February 28, 1882.)

CALCULUS.

Limit of a variable magnitude.
Definition of a limit.
Examples.
An inscribed and circumscribed polygon.
Length of a curve.
Area of a circle.
The limit of a product is the product of the limits.
The limit of a quotient is the quotient of the limits.
Differentiation of algebraic monomials.

LECTURE No. XVI.

(March 3, 1882.)

CALCULUS.

Differentiation of the algebraic sum of a finite number of terms
Examples.
Differentiation of the product of two functions.
Examples.
Differentiation of the product of any number of functions.
Examples.
Differentiation of a quotient.
Examples.

LECTURE No. XVII.

(March 7, 1882.)

CALCULUS.

1. Differentiation of an integral power.
2. Differentiation of a fractional power.
3. Differentiation of a negative power.
4. Differentiation of sin x.
5. Differentiation of cos x.
6. Differentiation of tan x.
7. Differentiation of sec x.
8. Differentiation of cotan x.
9. Differentiation of cosec x.

LECTURE No. XVIII.

(March 10, 1882.)

CALCULUS.

$$y = \frac{x}{x+\sqrt{1-x^2}} \quad \therefore \quad dy = \frac{(x+\sqrt{1-x^2})\,dx - x\,d(x+\sqrt{1-x^2})}{(x+\sqrt{1-x^2})^2}$$

$$dy = \frac{(x+\sqrt{1-x^2})\,dx - xdx - \frac{x(-2xdx)}{2\sqrt{1-x^2}}}{(x+\sqrt{1-x^2})}$$

Multiplying by $\sqrt{1-x^2}$ and dividing by the same, we have

$$dy = \frac{(1-x^2)\,dx + x^2\,dx}{(\sqrt{1-x^2})\,(x+\sqrt{1-x^2})^2} = \frac{dx}{(x^2+2x\sqrt{1-x^2}+1-x^2)\,\sqrt{1-x^2}}$$

$$= \frac{dx}{\sqrt{1-x^2}+2x\,(1-x^2)}$$

$$y = x^{x^x} \qquad ly = x^x\,lx \qquad \frac{dy}{y} = x^x\,dlx + lx dx^x \qquad \frac{dy}{y} = x^x\,\frac{dx}{x} + lx dx^x$$

Let $z = x^x$ Then $lz = xlx$

$$\frac{dz}{z} = xdlx + lxdx = \frac{xdx}{x} + lxdx$$

$$dz = z\,(1+lx)\,dx$$

Then

$$\frac{dy}{y} = x^x\,\frac{dx}{x} + x^x\,lx\,(1+lx)$$

$$\frac{dy}{y} = x^x\,\frac{dx}{x} + x^x\,lx + x^x\,(lx)^2 \text{ but } y = x^{x^x}$$

$$\therefore dy = x^{x^x} x^x \left(\frac{1}{x} + lx + (lx)^2\right) dx$$

LECTURE No. XIX.

(March 14, 1882.)

CALCULUS.

Successive differential coefficients.

The slope of a curve at any point is shown by the first differential coefficient of the ordinate at that point.

$$\tan\theta = \frac{dy}{dx}$$

Find the second differential coefficient of the ordinate at the point; if this is negative, the curve is concave downward; if positive, it is concave upward. Take the case of a parabola:

$$y^2 = 2px; \quad y = \sqrt{2px}$$

$$\frac{dy}{dx} = \frac{2p}{2\sqrt{2px}}; \quad \frac{d^2y}{dx^2} = -\frac{2pd\,(2\sqrt{2px})}{4\,(2px)} = \frac{-2p2.2p}{2\sqrt{2px}\,4\,(2px)} = \frac{p^2}{y^3};$$

$$x = \frac{y^2}{2p}; \quad \frac{dx}{dy} = \frac{2y}{2p} = \frac{y}{p}; \quad \frac{d^2x}{dy^2} = \frac{1}{p}$$

The first differential coefficient must be either 0 or ∞ at either a maximum or minimum state. Find the first diff. coeff. of the function, set it equal to 0 and ∞, we shall have the two equations which will give all the values of the variable that belong either to a maximum or a minimum state of the function.

Examples:

I. $y = 3 + (x-2)^2$; $\frac{dy}{dx} = 2\,(x-2) = 0 \therefore x = 2$; $y = 3$

$$\left.\begin{array}{ll} \frac{dy}{dx} = 2\,(2+dx-2) & \frac{dy}{dx} = +2\,dx \\ \frac{dy}{dx} = 2\,(2-dx-2) & \frac{dy}{dx} = -2\,dx \end{array}\right\} \text{Min.}$$

II. $y = 4\,(x-3)^{\frac{3}{2}}$ $x = 3$, $y = 4$. Max.

III. $y = 3 + 2\,(x-1)^3$ $x = 1$, $y = 3$. Neither max. or min.

LECTURE NO. XX.

(March 17, 1882.)

CALCULUS.

When the first diff. coeff. = 0, as it is in most cases, the following practical rule can be given for the solution:

Place the first differential coefficient of the function equal to zero; substitute each root in the successive differential coefficients of the function until one is found that does not reduce to 0; if this is of an even order and negative the root corresponds to a maximum, if of an even order and positive, to a minimum; but if of an odd order it corresponds to neither maximum nor minimum.

EXAMPLE.

$$y = x^2 - 3x + 2;\ \frac{dy}{dx} = 2x - 3 = 0;\ x = \tfrac{3}{2}$$

$$\frac{d^2y}{dx^2} = 2;\ \left(\frac{d^2y}{dx^2}\right) = +2 \text{ when } x = \tfrac{3}{2}$$

$$y = \tfrac{9}{4} - \tfrac{9}{2} + 2 = -\tfrac{1}{4}$$

Here $x = \frac{3}{2}$ corresponds to a minimum state which is $y = -\frac{1}{4}$.

EXAMPLE.

Find a cylinder whose surface is equal to s and whose volume is a maximum.

Let x = radius of base, y = altitude. v = volume.

Then $v = \pi x^2 y \quad s = 2\pi x^2 + 2\pi xy$

Then $v = \pi x^2 \cdot \frac{s - 2\pi x^2}{2\pi x} = \frac{1}{2}(sx - 2\pi x^3)$

$$v = \tfrac{1}{2}(sx - 2\pi x^3);\ \frac{dv}{dx} = \tfrac{s}{2} - 3\pi x^2 = 0;\ x^2 = \frac{s}{6\pi};\ x = \pm\sqrt{\frac{s}{6\pi}}$$

$$s = 2\pi\frac{s}{6\pi} + 2\pi\sqrt{\frac{s}{6\pi}}\,y;\ \ \tfrac{2}{3}s = 2\pi\sqrt{\frac{s}{6\pi}}\,y$$

$$y = \frac{\frac{s}{3}}{\pi\sqrt{\frac{s}{6\pi}}} = \frac{2s\sqrt{6\pi}}{6\pi\sqrt{s}} = \frac{2\sqrt{s}}{\sqrt{6\pi}} \quad \therefore\ y = 2\sqrt{\frac{s}{6\pi}} = 2x$$

The altitude equals twice the radius of the base

DIFFERENTIAL EQUATIONS.

[NOTE.—The following course on differential equations is based on Boole's Treatise, and was delivered by Mr. Waldo to a select portion of the class at Fort Myer.]

LECTURES NOS. I AND II.

A differential equation is an expressed relation involving differential coefficients, with or without the primitive variables from which those differential coefficients are derived.

The species of differential equations are determined either by the mode in which the differential coefficients enter into their composition or by the nature of the differential coefficients themselves. Two great classes: 1°. Ordinary differential equations are those in which all differential coefficients involved have reference to a single independent variable. 2°. Partial differential equations are characterized by the presence of partial differential coefficients, and therefore indicating the existence of

two or more independent variables with respect to which these differential coefficients have been formed. General form of 1° class,

$$f\left(x, y, \frac{dy}{dx}, \frac{d^2y}{dx^2} \cdots \frac{d^ny}{dx^n}\right) = 0$$

The order of a differential equation is the same as the order of the highest differential coefficient which it contains. The degree is the same as that of the differential coefficient which marks its order when rationalized.

EXAMPLES.

When a differential equation can be expressed in the form

$$\frac{d^ny}{dx^n} + X\frac{d^{n-1}y}{dx^{n-1}} \cdots + X_ny = X$$

in which $X X_1 X_2$, &c., are constants or functions of x only, the equation is linear. When $x_1 x_2$ &c., referred to the general type, are constant, the equation is a linear differential equation with constant coefficients; when they are not constant, the equation is a linear differential equation with variable coefficients. The solution of an equation is the determination of the relation existing among the variable quantities.

Example:

$$x\frac{dy}{dx} + y = \cos x.$$

Multiplying by dx we have $x\,dy + y dx = \cos x\,dx$. Integrating, $xy = \sin x + c$.

Example:

$$x\frac{dy}{dx} - y + x e^x = 0$$

Multiplying by dx, dividing by x^2, and transposing, we have

$$\frac{x dy - y dx}{x^2} = \frac{e^x dx}{x}$$

Integrating

$$\frac{y}{x} = \int \frac{e^x dx}{x} + c$$

The relation among the variables which constitutes the general solution of a differential equation is termed its complete primitive. Example:

$$y = cx\ (1) \qquad \frac{dy}{dx} = c\ (2)$$

Substituting value of c from (2) in (1), and we have

$$y = \frac{dy}{dx}x\ (3)$$

Take

$$\frac{y}{x} = c$$

Differentiate

$$\frac{x dy - y dx}{x^2} = 0, \text{ or } x dy = y dx \qquad y = x\frac{dy}{dx}$$

this is the same as (3). ∴. To remove the constants from an equation we differentiate the equation and then eliminate the constant. If $y = ce^{ax}$, $\log y = \log c + ax \log e$.

$$\frac{dy}{y} = 0 + a dx; \quad \frac{dy}{dx} = ay$$

[NOTE.—A portion of the first lecture hour was taken up in explaining to the class the nature of the higher mathematics that would be needed in meteorological work.]

LECTURE NO. III.

If we differentiate an equation containing both x and y and combine the differential equations with the primitive, we can eliminate all the constants. $y = ax^2 + bx$ (4)

$$\frac{dy}{dx} = 2ax + b\ (5) \qquad \text{From (4) } b = \frac{y - ax^2}{x} = \frac{y}{x} - ax$$

Substitute this value in (5) and we get

$$\frac{dy}{dx} - 2ax = \frac{y}{x} - ax, \text{ or } y = x\frac{dy}{dx} - ax^2 \quad (6)$$

This is free from b. Differentiating (6) we get

$$\frac{dy}{dx} = x\frac{d^2y}{dx^2} + \frac{dy}{dx} - 2ax \text{ whence } 2a = \frac{d^2y}{dx^2}$$

Substituting this value of a in (6) we have

$$\frac{x^2d^2y}{dx^2} - 2x\frac{dy}{dx} + 2y = 0 \quad (7) \text{ which is now}$$

free of constants. We can eliminate a first and b afterwards and the result will be the same. The order in which the constants are eliminated does not affect the final differential equation.

$$y = ce^{ax} + c^1e^{bx} \quad (8) \qquad \frac{dy}{dx} = ace^{ax} + bc^1e^{bx} \quad (9)$$

$$ay = ace^{ax} + ac^1e^{bx}$$

Subtracting, we get

$$\frac{dy}{dx} - ay = (b - a)\, c^1e^{bx} \quad (10)$$

Again differentiating, we have

$$\frac{d^2y}{dx^2} - a\frac{dy}{dx} = b\,(b - a)\, c^1e^{bx}$$

$$\text{But from (10) } \frac{bdy}{dx} - aby = b\,(b - a)\, c^1e^{bx}$$

Subtracting, we get

$$\frac{d^2y}{dx^2} - (a + b)\frac{dy}{dx} + aby = 0 \quad (11)$$

LECTURE No. IV.

$y = ax + b$ (1), the equation of a right line. $\frac{dy}{dx} = a$ (2) shows the inclination of the line to the axis of x. Combining the two equations, we have

$$\frac{dy}{dx} = \frac{y - b}{x} \qquad \text{Or, } y - x\frac{dy}{dx} = b \quad (3)$$

Differentiating (2), we have

$$\frac{d^2y}{dx^2} = 0$$

showing that there is no maximum or minimum. Diagram. Other inferences.

The general form of a diff. eq. of the first order and degree between two variables is $Mdx + Ndy = 0$, where M and N are functions of x and y. Let V and v be explicit functions of the two variables x and y. Then if V be expressible as a function v, the condition

$$\frac{dV}{dx}\frac{dv}{dy} - \frac{dV}{dy}\frac{dv}{dx} = 0 \quad (1)$$

will be identically satisfied. And conversely. 1st. Suppose $V = \phi(v)$. Then

$$\frac{dV}{dx} = \frac{d\phi(v)}{dv}\frac{dv}{dx}; \qquad \frac{dV}{dy} = \frac{d\phi(v)}{dv}\frac{dv}{dy}$$

Multiply the first by $\frac{dv}{dy}$ and the second by $\frac{dv}{dx}$, and subtracting, we have

$$\frac{dV}{dx}\frac{dv}{dy} - \frac{dV}{dy}\frac{dv}{dx} = 0$$

The equation

$$M + N\frac{dy}{dx} = 0 \quad (1)$$

always involves the existence of a primitive relation between x and y of the form $f(x, y) = c$, in which c is an arbitrary constant. Examine first

$$M + N\frac{\Delta y}{\Delta x} = 0 \quad (2)$$

Then

$$\frac{\Delta y}{\Delta x} = \phi(x, y) \quad (3)$$

Assign a series of values to x, as x_0, x_1, x_2, &c. Let y_0 correspond to x_0. Then

$$\Delta y_0 = \phi(x_0, y_0) \wedge x_0 \quad \therefore y_0 + \Delta y_0 = y_0 + \phi(x_0 y_0)\Delta x_0$$

Then $y_1 = y_0 + \phi(x_0 y_0)\ (x_1 - x_0)$. In like manner y_2 may be found.

LECTURE No. V.

Example applied to last lecture:

$$x_0 = 0,\ x_1 = 1,\ x_2 = 2,\ x_3 = 3,\ \&c.$$
$$y_0 = 1,\ y_1 = 2,\ y_2 = 5,\ y_3 = 13,\ \&c.$$

Two distinct complete primitives of $Mdx + Ndy = 0$ cannot exist.
Suppose there are two, $u = c$, $v = c^1$. Then

$$\frac{du}{dx} + \frac{du}{dy}\frac{dy}{dx} = 0$$

and

$$\frac{dv}{dx} + \frac{dv}{dy}\frac{dy}{dx} = 0$$

eliminating $\frac{dy}{dx}$, we have

$$\frac{du}{dx}\frac{dv}{dy} - \frac{du}{dy}\frac{dv}{dx} = 0.$$

We may have, then, $f(u) = c^1$, which is resolvable into equations of the form $u = c$.

Example:

$$\int (xdx + ydy) = 0;\ \frac{x^2 + y^2}{2} = c^1;\ \text{or } x^2 + y^2 = c.$$

Example:

$$\frac{dx}{1+x} + \frac{dy}{1+y} = 0;\ \log(1+x) + \log(1+y) = c;\ \text{or, } (1+x)(1+y) = e^c).$$

Example:

$$\frac{dx}{\sqrt{1-x^2}} + \frac{dy}{\sqrt{1-y^2}} = 0$$

$$\sin^{-1}x + \sin^{-1}y = c;$$

$$\sin \sin^{-1}x \cos \sin^{-1}y + \cos \sin^{-1}x \sin \sin^{-1}y = \sin c;\ \text{or}$$

Example: $$x\sqrt{1-y^2} + y\sqrt{1-x^2} = C,\ \text{where } C = \sin c.$$

$$\frac{-dx}{\sqrt{1-x^2}} + \frac{-dy}{\sqrt{1-y^2}} = 0;$$

$$\int -\frac{dx}{\sqrt{1-x^2}} = \cos^{-1}x + \text{const.};\quad \int -\frac{dy}{\sqrt{1-y^2}} = \cos^{-1}y + \text{const.}$$

$$\cos(\cos^{-1}x + \cos^{-1}y) = \cos\cos^{-1}x \cos\cos^{-1}y - \sin\cos^{-1}x \sin\cos^{-1}y;$$

$$\text{or } xy - \sqrt{(1-x^2)(1-y^2)} = C$$

LECTURE NO. VI.

$xy-\sqrt{(1-x^2)(1-y^2)}=\cos C_1$ may be reduced to form $x\sqrt{(1-y^2)}+y\sqrt{(1-x^2)}=\sin C_1$. This agrees with the results of last lecture if $C=\sin C_1$. In general, the test of the accordance of two solutions of a differential equation, each involving an arbitrary constant is, that on eliminating one of the variables the other variable will disappear also, and a relation between the arbitrary constants alone result. Sometimes the work may be simplified by dividing or multiplying the equation by a factor. Let, $\frac{xdx}{1+y}-\frac{ydy}{1+x}=0$. Multiplying by $(1+x)(1+y)$ and we have $x(1+x)\,dx-y(1+y)\,dy=0$.

Integrating, we have

$$\frac{x^2}{2}+\frac{x^3}{3}-\frac{y^2}{2}-\frac{y^3}{3}=C$$

General form is

$$x_1\,y_1\,dx+x_2\,y_2\,dy=0 \qquad \frac{x_1}{x_2}\,dx+\frac{y_2}{y_1}\,dy=0$$

Example:

$$x\sqrt{1+y^2}\,dx+y\sqrt{1+x^2}\,dy=0$$

Dividing by $\sqrt{1+y^2}\,\sqrt{1+x^2}$ we have

$$\frac{xdx}{\sqrt{1+x^2}}+\frac{ydy}{\sqrt{1+y^2}}=0$$

Integrating, we have

$$\sqrt{1+x^2}+\sqrt{1+y^2}=C$$

Sometimes a simplification must be made before separation. Examples:

$$(x-y^2)\,dx+2xydy=0$$

Here first assume $y=\sqrt{(xz)}$. Example:

$$(y-x)\,(1+x^2)^{\frac{1}{2}}\,dy-n\,(1+y^2)^{\frac{3}{2}}\,dx=0$$

Here assume $x=\tan\theta$, $y=\tan\phi$. Then $\phi-\theta=\psi$.

Homogeneous equations: $Mdx+Ndy=0$ is homogeneous when M and N are homogeneous functions of x and y, and are of the same degree.

Example:

$$(y+\sqrt{x^2+y^2})\,dx-xdy=0$$

Assume $y=vx$. We can obtain

$$\log x-\log\left(\frac{y+\sqrt{x^2+y^2}}{x}\right)=C$$

LECTURE NO. VII.

General demonstration: Let M and N be homogeneous functions of x and y of the nth degree. Then,

$$M=x^n\phi\left(\frac{y}{x}\right) \qquad N=x^n\psi\left(\frac{y}{x}\right)$$

Then $Mdx+Ndy=0$ becomes

$$\phi\left(\frac{y}{x}\right)dx+\psi\left(\frac{y}{x}\right)dy=0$$

Let $y=vx$, then $dy=vdx+xdv$. We have, then,

$$\phi(v)\,dx+\psi(v)\,(vdx+xdv)=0$$

Or

$$\Big(\phi(v)+v\psi(v)\Big)\,dx+\psi(v)\,xdv=0$$

Therefore

$$\frac{dx}{x}+\frac{\psi(v)\,dv}{\phi(v)+v\psi(v)}=0$$

Integrating we have

$$\log x+\int\frac{\psi(v)\,dv}{\phi(v)+v\psi(v)}=C$$

Examples:

$$(x-\sqrt{xy}-y\,)dx+\sqrt{xy}\,dy=0$$

Here $M=x-\sqrt{xy}-y$; $n=1$. $N=\sqrt{xy}=x\sqrt{v}$, and $M=x\,(1-\sqrt{v}-v)$, where $y=vx$. Then

$$\phi(v)=1-v^{\frac{1}{2}}-v \qquad \psi(v)=v^{\frac{1}{2}}$$

Substituting the values in the last general equation we have

$$\log x+\int\frac{v^{\frac{1}{2}}dv}{1-v^{\frac{1}{2}}-v+v^{\frac{3}{2}}}=C$$

To integrate this, let $v=t^2$. Then

$$\int\frac{2t^2\,dt}{1-t-t^2+t^3}=\int\frac{2t^2\,dt}{(1-t)-t^2(1-t)}=\int\frac{2t^2\,dt}{(1+t)\,(1-t)\,(1-t)}$$

$$\frac{2t^2}{(1-t)^2\,(1+t)}=\frac{A}{(1-t)^2}+\frac{B}{(1-t)}+\frac{C}{(1+t)}$$

We find that $A=1$, $B=-\frac{3}{2}$, $C=\frac{1}{2}$. Then

$$\int\frac{2t^2\,dt}{(1-t)^2\,(1+t)}=\int\frac{dt}{(1-t)^2}-\int\frac{3}{2}\frac{dt}{(1-t)}+\int\frac{1}{2}\frac{dt}{(1+t)}$$

$$=\frac{1}{1-t}+\frac{3}{2}\log(1-t)+\tfrac{1}{2}\log(1+t)$$

But

Hence $\quad \frac{3}{2}\log(1-t)+\frac{1}{2}\log(1+t)=\log(1-t)+\frac{1}{2}\log(1-t^2)$

$$\int\frac{2t^2\,dt}{(1-t)^2\,(1+t)}=\frac{1}{1-t}+\log(1-t)+\tfrac{1}{2}\log(1-t^2)+C$$

Hence we have, replacing t by $\frac{y^{\frac{1}{2}}}{x^{\frac{1}{2}}}$,

$$\int(x-\sqrt{xy}-y)\,dx+\sqrt{xy}\,dy)=\log x+\frac{x^{\frac{1}{2}}}{x^{\frac{1}{2}}-y^{\frac{1}{2}}}+\log\left(\frac{x^{\frac{1}{2}}-y^{\frac{1}{2}}}{x^{\frac{1}{2}}}\right)$$

$$+\tfrac{1}{2}\log\left(\frac{x-y}{x}\right)+C$$

Lecture No. VIII.

General case: $(ax+by+c)\,dx+(a^1x+b^1y+c^1)\,dy=0$. Let $x=x^1-\alpha$, $y=y^1-\beta$. Substituting these values we have, $(ax^1+by^1-a\alpha-b\beta+c)\,dx^1+(a^1x^1+b^1y^1-a^1\alpha-b^1\beta+c^1)\,dy=0$; whence if α and β be determined by the conditions $a\alpha+b\beta=c$; $a^1\alpha+b^1\beta=c^1$, we shall have the homogeneous equation $(ax^1+by^1)\,dx^1+(a^1x^1+b^1y^1)\,dy^1=0$, making $y^1=vx^1$, dividing through by x^1, and expanding we can obtain $\frac{dx^1}{x^1}+\frac{(a^1+b^1v)\,dv}{a+(b+a^1)v+b^1v^2}=0$, which may be integrated. We might assume $ax+by+c=x^1$ and $a^1x+b^1y+c^1=y^1$. Then $adx+bdy=dx^1$ (1), and $a^1dx+b^1dy=dy^1$ (2); multiply (1) by a, and (2) by b; subtracting we get $dy=\frac{a^1dx^1-ady^1}{a^1b-ab^1}$. Simi-

larly $dx = \frac{b^1dx^1 - bdy^1}{ab^1 - a^1b}$. Substituting these in $x^1dx + y^1dy = 0$, and reducing we have $(b^1x^1 - a^1y^1)\,dx^1 - (bx^1 - ay^1)\,dy^1 = 0$. This can easily be reduced and the integral of the original equation derived.

General case: $\frac{dy}{dx} + Py = Q$. P and Q being functions of x. First let $Q = 0$. Then

$$\frac{dy}{dx} + Py = 0. \qquad \frac{dy}{y} = -Pdx.$$

$$\log y = -\int Pdx + c \therefore y = e^{-\int Pdx + c} = Ce^{-\int Pdx}$$

When Q is not equal to 0, then solve by last form and suppose C some function of x.

Then $$\frac{dy}{dx} = \frac{d}{dx}(ce^{-\int Pdx}) = \frac{dc}{dx}e^{-\int Pdx} - CPe^{-\int Pdx}$$

Then $$\frac{dc}{dx}e^{-\int Pdx} = Q \qquad \frac{dc}{dx} = e^{\int Pdx}Q$$

$$C = \int e^{\int Pdx}Qdx + c$$

Substituting this value of C in the value of y, supposing $Q = 0$, and we have

$$y = e^{-\int Pdx}\left(\int e^{\int Pdx}Qdx + c\right)$$

LECTURE No. IX.

Example:

$$\frac{dy}{dx} - \frac{2y}{x+1} = (x+1)^3 \qquad P = \frac{-2}{x+1} \qquad Q = (x+1)^3 \qquad \int Pdx = -2\log(x+1)$$

$$E^{\int Pdx} = (x+1)^{-2} \qquad \int E^{\int Pdx}Qdx = \int (x+1)\,dx = \frac{(x+1)^2}{2} + c$$

$$\therefore y = (x+1)^2\left\{\frac{(x+1)^2}{2} + c\right\}$$

Example:

$$\frac{dy}{dx} - \frac{ny}{x+1} = E^x(x+1)^n \qquad P = -\frac{n}{x+1} \qquad Q = E^x(x+1)^n$$

$$\int Pdx = -n\log(x+1) \qquad E^{\int Pdx} = (x+1)^{-n} \qquad \int E^{\int Pdx}Qdx = \int E^x dx = E^x$$

$$\therefore y = (x+1)^n(E^x + c)$$

Discovery of a factor which will make $Mdx + Ndy = 0$ an exact differential. Proposition: The one necessary and sufficient condition under which the first member of the equation $Mdx + Ndy = 0$ (1) is an exact differential is $\frac{dM}{dy} = \frac{dN}{dx}$.

Proof:

Let $\frac{dV}{dx} = M$ (2) $\qquad \frac{dV}{dy} = N$ (3) $\qquad \frac{d^2V}{dydx} = \frac{dM}{dy} \qquad \frac{d^2V}{dxdy} = \frac{dN}{dx}$ (4) $\qquad \therefore \frac{dM}{dy} = \frac{dN}{dx}$ (5)

We must show this to be sufficient.

$$V = \int Mdx + c\ (6) \qquad \frac{dc}{dx} = 0$$

c may vary with y.

$$\therefore V = \int Mdx + \phi(y)\ \ (7)$$

V must satisfy (3). Substituting in (3) the value of V given in (7), and reducing, we have

$$\phi(y) = \int \left(N - \frac{df\,Mdx}{dy} \right) dy + C \quad (8)$$

If the coefficient of dy is a function of y only, we may write

$$\frac{dN}{dx} - \frac{d}{dx}\frac{df\,Mdx}{dy} = 0 \quad (9) \qquad \text{Or } \frac{dN}{dx} - \frac{dM}{dy} = 0 \quad (10)$$

LECTURE No. X.

Substitute in (7) the value of $\phi(y)$ found in (8)). Then

$$V = \int Mdx + \int \left(N - \frac{df\,Mdx}{dy} \right) dy + C \quad (11)$$

Then supposing (10) to be true—

$$\int Mdx + \int \left(N - \frac{df\,Mdx}{dy} \right) dy = C \quad (12)$$

Practical rule: To solve the equation $Mdx + Ndy = 0$, when the first member is an exact differential, integrate Mdx with respect to x, regarding y as constant, and adding instead of an arbitrary constant an arbitrary function of y, which must afterwards be determined by the condition that the differential coefficient of the sum with respect to y shall be equal to N. Then the sum equated to an arbitrary constant will be the solution.

Example:—$(x^2 - 4xy - 2y^2)\,dx + (y^2 - 4xy - 2x^2)\,dy = 0$.

Here $M = x^2 - 4xy - 2y^2$; $N = y^2 - 4xy - 2x^2$. We may also divide $Mdx + Ndy = 0$ into two parts, one of which is an exact differential. Then we must examine the other part.

Example:

$$\left(x + \frac{1}{\sqrt{y^2 - x^2}} \right) dx + \left(y - \frac{x}{y\sqrt{y^2 - x^2}} \right) dy = 0$$

When the first member of $Mdx + Ndy = 0$ can be rendered an exact differential by multiplying by a factor, this factor is termed an integrating factor.

Example: $(1 + y^2)\,dx + xydy = 0$

Multiply by $2x$ and it can then be integrated. There always exists a great number of these factors. Proof that they always exist.

THERMODYNAMICS.

[NOTE.—The following course of lectures is based upon Mr. Waldo's notes of the course delivered by Prof. Wolcott Gibbs, of Harvard College.]

LECTURE No. XI.

In studying the effect of heat, the body is supposed to be at rest. Physical state defined by weight, volume, and pressure. Unit of weight is one kilogram. Specific volume v, any other volume V. Pressure normal to the surface and equal at every point; p is the specific pressure or pressure on the unit of surface. A knowledge of energy and entrophy required to determine the complete physical state. Add to the unit of weight of a body k_1 from without, a small quantity of heat $d\,Q$. The following changes take place: Increase of living force of molecular motion dw: Change of position of the atoms and molecules dI: Change in volume of the body and consequently pressure overcome $d\,L$. And since unit of work $= \frac{1}{424}$ part of a unit of heat, which we will call A, we may write $dQ = A\,(dw + d\,I + dL)$ (1). In a solid $dw = 0$. Make $dI + dL = dH$, then $dQ = A\,(dw + dH)$. AdH is the heat of disgregation. Let $dw + dI = du$. Then $dQ = A\,(du + dL)$ (2); du represents the whole work consumed within the body; u is the whole mechanical work accumulated in the body. We must know it for some initial condition of the body; $u = F(v, v)$.

$$\Delta u = F(p_2 v_2) - F(p_1 v_1)$$

$$du = \frac{du}{dp}dp + \frac{du}{dv}dv$$

Putting

$$\frac{du}{dp} = X\,;\ \frac{du}{dv} = Z$$

$$du = X\,dp + Z\,dv \quad (3)$$

Equation (3) is a complete differential

$$\therefore \frac{dX}{dv} = \frac{dZ}{dp}$$

External work.—The term dL of (2) gives the work corresponding to change in volume. Pressure may remain constant or vary. Pressure upon the body = pressure of the body.

Regard the external pressure as a *property* of the body.

$$dL = pdv \quad (8)$$

$$\therefore dQ = A\,(du + pdv) \qquad (9)$$

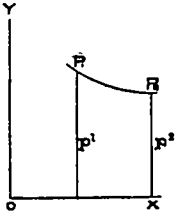
LECTURE No. XII.

If we integrate this equation, considering $u = F(pv)$ to be known, and represent the initial and final conditions by $v_1 p_1$ and $v_2 p_2$, we have

$$Q = AF(p_2 v_2) - AF(p_1 v_1) + A\int_{v_1}^{v_2} pdv \quad (10)$$

We must know how p varies with v in order to determine Q. Represent the relation between p and v by a curve $P_1 P_2$, it is clear that the integral $\int_{v_1}^{v_2} pdv$ will be expressed by the area $P_1 P_2 V_2 V_1$ which will also represent the external work done.

FIG. 41.



An infinite number of curves in which P_1 and P_2 may be points. When a body passes from one state to another by the addition or removal of heat, the change in the internal work is completely determined by the initial and final states of the body. The external work depends on the law connecting pressure and volume. Let the pressure remain constant; then $P_2 P_1$ becomes a straight line, parallel to axis of abscissas. Then

$$\int_{v_1}^{v_2} pdv = p\,(v_2 - v_1)$$

Let the volume remain constant. Then the curve $P_2 P_1$ becomes a straight line parallel to axis of ordinates. In this case the whole heat is expended upon internal work. When the transformation takes place without addition or removal of heat $Q = 0$. Then $pdv = -du$, and

$$\int_{v_1}^{v_2} pdv = F(p_1 v_1) - F(p_2 v_2)$$

The external work is equal to the variation of the internal work. When external work is done in the passage from $(p_1 v_1)$ to $(p_2 v_2)$, it is at the expense of the internal work. The curve $P_2 P_1$ gives for this special case the law according to which the pressure varies with the volume, and it is called the *adiabatic* curve.

LECTURE No. XIII.

We have $du = Xdp + Zdv$. Equation (9) becomes $0 = Adu + Apdv$, whence $Xdp = -(Z + p)\,dv$. If we know the form of the function, $u = F(v, p)$, we could integrate and obtain the equationof the adiabatic curve.

Suppose the internal work to remain constant, then $du = 0$, and we have $0 = Xdp + Zdv$. Integrating this and we have the isodynamic curve. (9) Gives $dQ = Apdv$. All the heat is converted into external work. When the temperature remains constant during the changes, the curve expressing the relation between p and v is called an isothermal line. When $p =$ the pressure of the body itself, $dL = pdv$ gives the external work for increase of heat dQ; also $du = Xdp + Zdv$. Substitute these two values in (2) and we have $dQ = A\,(Xdp + (Z+p)\,dv)$. Putting $Z + p = Y$ (11.), then $dQ = A\,(Xdp + Ydv)$ (12.) From (11) we have

$$\frac{dZ}{dp} + 1 = \frac{dY}{dp}, \text{ or } \frac{dY}{dp} - \frac{dZ}{dp} = 1$$

But

$$\frac{dZ}{dp} = \frac{dX}{dv} \therefore \frac{dY}{dp} - \frac{dX}{dv} = 1 \qquad \text{I.}$$

The first principal equation of the mechanical theory of heat, $Xdp + Ydv$, is an incomplete differential. The heat Q is not determined by the initial and final states.

Equation (12) may be made integrable by means of an integrating factor of the form $\frac{1}{T}$. T is a new function of p and v.

$$dQ = AT\left(\frac{X}{T}dp + \frac{Y}{T}dv\right) \quad (13)$$

$$dF(p, v) = \frac{dF}{dp}dp + \frac{dF}{dv}dv$$

would be the form of a complete differential. X and Y must be determined as functions of p and v.

Lecture No. XIV.

If the expression within the parenthesis be a complete differential, we have

$$\frac{d}{dv}\left(\frac{X}{T}\right) = \frac{d}{dp}\left(\frac{Y}{T}\right) \text{ whence } T\left(\frac{dX}{dv}\right) - X\left(\frac{dT}{dv}\right) = T\left(\frac{dy}{dp}\right) - Y\left(\frac{dT}{dp}\right)$$

Or

$$T\left(\frac{dY}{dp} - \frac{dX}{dv}\right) = Y\left(\frac{dT}{dp}\right) - X\left(\frac{dT}{dv}\right)$$

Combining with

$$\frac{dY}{dp} - \frac{dX}{dv} = 1 \quad \text{(I)}$$

We have

$$T = Y\left(\frac{dT}{dp}\right) - X\left(\frac{dT}{dv}\right) \quad \text{(II)}$$

The second principal equation of the mechanical theory of heat.

By means of I and II we can put (12) into other forms. Since $T = F(p, v)$, then

$$dT = \frac{dT}{dp}dp + \frac{dT}{dv}dv \quad (14)$$

In (II) find value of Y, then of X, and substitute these in (12) and reducing by means of (14) we have

$$\left.\begin{aligned} dQ &= A\,(xdp + ydv) \\ dQ &= \left(\frac{A}{\frac{dT}{dp}}\right)\{\, xdT + Tdv \,\} \\ dQ &= \left(\frac{A}{\frac{dT}{dv}}\right)\{\, ydT - Tdp \,\} \end{aligned}\right\} \text{ III. Identical equations.}$$

$$dQ = x^1dp + y^1dv\,(\beta), \text{ where } x^1 = Ax,\ y^1 = Ay.$$

The second member can be made a complete differential by means of an integrating factor. Suppose the integral of $X^1dp + Y^1dv = 0$ to be, $F(v, p) = \mu$. Differentiating we have

$$F^1vdv + F^1pdp = 0 \qquad \text{Or } \frac{dp}{dv} = -\frac{F^1v}{F^1p}$$

We then have

$$\frac{y^1}{x^1} = \frac{F^1v}{F^1p}$$

Then

$$\frac{y^1}{F^1v} = \frac{x^1}{F^1p} = \lambda$$

Where λ is a function of v and p

$$\frac{y^1}{\lambda} = F^1v \qquad \frac{x^1}{\lambda} = F^1p$$

Divide (β) by λ and we have

$$\frac{dQ}{\lambda} = \frac{x^1}{\lambda}dp + \frac{y^1}{\lambda}dv \qquad \text{Or, } \frac{dQ}{\lambda} = F^1pdp + F^1vdv$$

Put

$$\frac{dQ}{\lambda} = d\mu$$

in which λ and μ are functions of p and v. There is a function, λ, of two independent variables such that

$$\frac{dQ}{\lambda}$$

becomes a complete differential. An infinite number of such functions.

LECTURE No. XV.

Representing the transformation from v_1p_1 to v_2p_2 by a curve, we have for any infinitely small change, $\frac{dQ}{\lambda} = \mu$. When the body passes from state (1) to state (2) the quantity of heat given out or absorbed is:

$$Q = \int_1^2 \lambda d\mu$$

also,

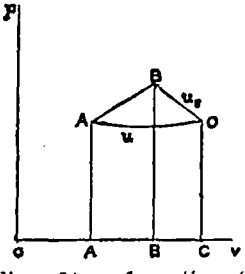
$$\int_1^2 \frac{dQ}{\lambda} = \mu_2 - \mu^1$$

If the body returns to its first state, we have

$$\int \frac{dQ}{\lambda} = 0$$

Carnot's theorem: When a body undergoes any series of transformations accompanied by changes of volume, pressure, and temperature, it sometimes happens that the inverse changes may take place under the same circumstances, and the transformation is then said to be reversible. We have a large body K, a good conductor of heat in communication with the body to be studied. The bodies are always at the same temperature. The transformation will be reversible. Another condition is necessary; the pressure exerted by the body p_1 must always equal p. The equations for isothermal, isodynamic, and adiabatic lines, are as follows:

FIG. 42.



$$t = f(v, p) \qquad u = F(v, p) \qquad \mu = \phi(v, p)$$

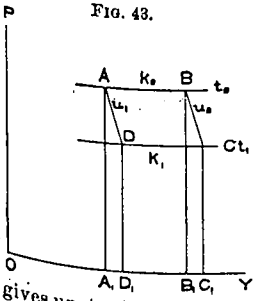
Suppose a body passes from (v_1p_1) to (v_2p_2) according to line of transformation AB. Draw through A the isodynamic line u_1 and through B the adiabatic u_2. They intersect at C.

For this case the equation of energy $EQ = \Delta u + s$ (another form of 10) becomes $EQ = u_2 - u_1 + s$. The external work done by the body is represented by the area AA_1BB_1. The variation of the internal energy $\Delta u = v_2 - u_1$ is represented by BB_1CC_1 $Q = 0$, and we have $u_1 - u_2 + s^1 = 0$, $u_2 - u_1 = s^1$. The whole quantity of heat Q communicated to the body during the transformation is represented in mechanical units of work by the sum of the two areas $AA_1BB_1 + BB_1CC_1$. (See Fig. No. 42.)

LECTURE No. XVI.

A cycle is a series of transformations in which a body returns to its initial state. Carnot's cycle is formed of two adiabatic and two isothermal lines. Two isotherms, DC and AB, corresponding to t_1 and t_2, and two adiabatic lines, AD and BC, corresponding to μ_1 and μ_2. The instrumental body passes through AB, BC, CD, and DA.

FIG. 43.



The body is in contact with K_2 at temperature t_2, a perfect conductor. During CD the body is in contact with K_1 at t_1. During AB the body receives a quantity of heat, Q_2, producing positive external work represented by the area $AA_1\,BB_1$, $Q = A\,(\triangle u + s)$. During BC the internal energy is transformed into positive external work $BB_1\,CC_1$. During CD a certain quantity of heat, Q_1, is disengaged. No heat gained or lost from D to A, but the internal energy is increased to its initial state A.

The quantity of heat $Q = Q_2 - Q_1$ gained by the machine is changed into external work S. Suppose the machine works from D along DC. It takes from K_1 a quantity of heat Q_1. It undergoes a variation of internal energy and produces the external work $DC\,C^1D^1$. Along CB it receives the external work $CB\,B^1C^1$. Along BA it gives up to the body K_2 the quantity of heat Q_2. Along AD there is a diminution of external energy. In this reverse process the machine takes from K_1 heat Q_1 and gives to K_2 a larger quantity of heat Q_2. A quantity of heat $Q_2 - Q_1$ is created; at the same time it has received a greater quantity of work than it has done. The quantity of work, S, *done upon* the machine is transformed into an equivalent amount of heat. Then $S = E_2\,(Q_2 - Q_1)$.

LECTURE No. XVII.

The machine creates heat by means of work. It is assumed that it is impossible to convey heat from a colder to a warmer body without the expenditure of work. When different bodies act directly according to Carnot's cycle, the forms of the isotherms will depend upon the nature of the bodies employed. Let $Q_2\,Q'_2\,Q_2''$ &c., correspond to heat taken from K_2, and $Q_1\,Q_1'\,Q_1''$, &c., correspond to heat given to K_1, then we can show that

$$\frac{Q_2}{Q_2 - Q_1} = \frac{Q'_2}{Q'_2 - Q'_1} = \frac{Q''_2}{Q''_2 - Q''_1}, \text{ &c.}$$

If they are not equal, heat can be conveyed from a colder to a warmer body without an expenditure of work. Suppose

$$\frac{Q_2 - Q_1}{Q'_2 - Q'_1} = \frac{m}{n} \quad \text{also} \quad \frac{Q_2}{Q'_2} < \frac{m}{n}$$

A and B are two bodies operating according to cycles (A) and (B). A goes n times around direct, and B m times in the reverse direction. A does an amount of work $n\,E\,(Q_2 - Q_1)$. B absorbs a quantity of work $m\,E\,(Q'_2 - Q'_1)$. The total work is $n\,E\,(Q_2 - Q_1) - m\,E\,(Q'_2 - Q'_1) = 0$, because $\frac{Q_2 - Q_1}{Q'_2 - Q'_1} = \frac{m}{n}$. A takes from K_2 the heat $n\,Q_2$, and gives to K_1 the heat $n\,Q_1$. The body B takes from K_1 the heat $m\,Q'_1$, and gives K_2 the heat $m\,Q'_2$. K_2 then receives $m\,Q'_2 - n\,Q_2$ and K_1 has lost $m\,Q'_1 - n\,Q_1$. These two quantities are equal, and $m\,Q'_2 - n\,Q_2 > 0$ as found before. $\therefore$ The machine would transfer a quantity of heat $(m\,Q'_1 - n\,Q_1)$ without an expenditure of work. But this cannot be. It can be proven that the second ratio cannot be greater than the first. It is therefore equal. From

$$\frac{Q_2 - Q_1}{Q_2} = \frac{Q'_2 - Q'_1}{Q'_2}$$

we can get

$$\frac{Q_1}{Q_2} = \frac{Q_1^1}{Q'_2}$$

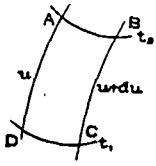
The ratio of the quantity taken from the upper source to the quantity given to the lower source is constant, when the bodies operate between the same limits of temperature.

LECTURE No. XVIII.

This ratio is the same for all bodies. It is independent of the adiabatic lines and depends only on the temperature. Suppose a machine operates according to a Carnot cycle A, B, C, D, so that we have $\mu_1 = \mu$; $\mu_2 = \mu + d\mu$. Then for every small transfor-

mation $dQ = \lambda d\mu$, when λ and μ are functions of p and v. λ, the value of the function at D and λ_2 at A. Then for DC, $Q_1 = \lambda_1 d\mu$, and for AB $\frac{Q_2}{Q} = \frac{\lambda_2}{\lambda_1}$. Then the ratio $\frac{\lambda_2}{\lambda_1}$ is independent of μ and is for all bodies the same function of t_1 and t_2. Then λ is for all bodies the same function $f(t)$ multiplied by an arbitrary function, so that we have

FIG. 44.



$$\lambda = f(t) \times \phi(\mu)$$

If this is so, then

$$\lambda_1 = f(t_1) \times \phi(\mu);\ \lambda_2 = f(t_2) \times \phi(\mu)$$

whence

$$\frac{\lambda_2}{\lambda_1} = \frac{f(t_2)}{f(t_1)}$$

If $\frac{\lambda_2}{\lambda_1}$ depends only on t_2 and t_1 the same is true for $\frac{\lambda_2 - \lambda_1}{\lambda_1}$ and also for $\frac{\frac{\lambda_2 - \lambda_1}{t_2 - t_1}}{\lambda_1}$. Suppose t_2 becomes $t + dt$. Determine the state of the body by the intersection of the isothermal t and the adiabatic μ. λ is a function of t and μ.

Limit $$\frac{\frac{\lambda_2 - \lambda_1}{t_2 - t_1}}{\lambda} = \frac{d\left(\frac{d\lambda}{dt}\right)}{\lambda}$$

This ratio is the same function of t for all bodies; we may therefore write

$$\frac{\frac{d\lambda}{dt}}{\lambda} = \frac{d \log \lambda}{dt} = \psi(t)$$

$$\log \lambda = \int \psi(t)\, dt + \log \phi(\mu)$$

or

$$\lambda = \phi(\mu)\, \epsilon \int \psi(t)\, dt$$

Place

$$\int \psi(t)\, dt = F(t) \quad \therefore \ \lambda = F(t)\, \phi(\mu)$$

Let $\phi(\mu) = 1$. Then $\lambda = F(t)$, or a function of the temperature,

$$\frac{v}{v_0} = \frac{p_0}{p} \frac{1 + at}{1 + at_0}$$

where $a = .00367$; writing for $\frac{1}{a}$ its value, 273, we can get

$$\frac{v}{v_0} = \frac{p_0}{p} \frac{273 + t}{273 + t_0}$$

and therefore

$$\frac{pv}{273 + t} = \frac{p_0 v_0}{273 + t_0}$$

A form of the laws of Boyle and Charles.

LECTURE No. XIX.

For any permanent gas $\frac{pv}{273+t}$ is constant, and if we denote $\frac{p_0 v_0}{273+t_0}$ by R we have

$pv = R(273 + t) = RT$. The temperature $T = 273 + t$ is called the absolute temperature in Centigrade degrees. Show that in $\lambda = F(t)$. $F(t) = T$, or $\lambda = T$. Based on experiment. Specific heats, whether under constant pressure or volume, are proportional to the temperature alone. We have, therefore,

$$dQ = c_v dt \text{ and } dQ = c_p dt \qquad dt = dT$$

Hence

$$Q = c_v T. \qquad Q = c_p T$$

Hence

$$\frac{Q'_2}{Q'_1} = \frac{T_2}{T_1}$$

but

$$\frac{Q_2}{Q_1} = \frac{Q'_2}{Q'_1}$$

Hence

$$\frac{Q_2}{Q_1} = \frac{T_2}{T_1}$$

for all bodies.

When we are considering μ and $\mu + d\mu$, then

$$\frac{Q_2}{Q} = \frac{\lambda_2}{\lambda_1}$$

We have, therefore,

$$\frac{\lambda_2}{\lambda_1} = \frac{T_2}{T_1}$$

or

$$\frac{\lambda_2}{T_2} = \frac{\lambda_1}{T_1}$$

Hence we can have

$$\lambda = T\,\phi(\mu)$$

Dividing this last by an arbitrary function of μ and we have $\lambda = T$, as a function of integrability. The absolute temperatures of the perfect gas thermometer form a natural scale for all bodies. The existence of a function of integrability λ which is the same for all bodies, constitutes a fundamental principle in the mechanical theory of heat.

$$\frac{dQ}{T} = d\mu$$

where μ is $\phi(pv)$ peculiar to each body.

$$\int_1^2 \frac{dQ}{T} = \mu_2 - \mu_1$$

In an isothermal T is constant, and we have

$$\frac{Q}{T} = \mu_2 - \mu_1$$

or

$$Q = (\mu_2 - \mu_1)T$$

Whence we have

$$\frac{Q_2}{T_2} = \frac{Q_1}{T_1} = \mu^2 - \mu_1$$

or

$$\frac{q_2 - Q_1}{Q_2} = \frac{T_2 - T_1}{T_2}$$

The ratio of the quantity of heat transformed into work to the quantity taken from the higher source. It is independent of the nature of the instrumental body employed. We have for an ideal gas $pv = RT$. In this equation the quantity R is for each gas a constant, the numerical value of which can be easily determined.

LECTURE No. XX.

If we replace the volume of the unit of weight v by the weight of the unit of volume or by the density γ we have $v\gamma = 1$. $\therefore \frac{p}{\gamma} = RT$. Also $\frac{p}{\gamma_1} = R_1 T$. $\therefore \frac{\gamma_1}{\gamma} = \frac{R}{R_1}$.

Put $\frac{\gamma_1}{\gamma} = \varepsilon$. Then $R = R_1\varepsilon$, which is constant for permanent gases. R is the constant for air, then for another gas $pv = \frac{p}{\gamma} = \frac{R}{T}$. Regnault found for air at 0° C. and 760^{mm} that γ=1.29318 kilog. Then for air $R = 29.272$. For other permanent gases—

	γ	ε	R
Air	1.29318	1.0000	29.272
Nitrogen	1.25616	0.97137	30.134
Oxygen	1.42980	1.10563	26.475
Hydrogen	0.08957	0.06926	422.612

$$dQ_p = C_p dT. \quad dQ_v = C_v dT.$$

These may also be expressed by (III) already given.

When p is constant $dp = 0$, and the the 3d equation of III becomes

$$dQ_p = \left(\frac{\frac{Ay}{dT}}{\frac{dv}{}}\right) dT.$$

When v is constant the second equation of III becomes

$$dQ_v = \frac{Ax\ dT.}{\left(\frac{dT}{dp}\right)}$$

Then

$$c_p = \frac{Ay}{\left(\frac{dT}{dv}\right)}$$

and

$$c_v = \frac{Ax}{\left(\frac{dT}{dp}\right)}$$

Whence

$$X = \frac{c_v}{A}\frac{dT}{dp} \qquad Y = \frac{c_p}{A}\frac{dT}{dv} \qquad pv = RT \qquad \frac{dT}{dp} = \frac{v}{R} \qquad \frac{dT}{dv} = \frac{p}{R}$$

Then

$$X = \frac{c_v v}{AR} \qquad Y = \frac{c_p p}{AR} \qquad \frac{dy}{dp} - \frac{dx}{dv} = 1. \qquad \frac{dy}{dp} = \frac{c_p}{AR} \qquad \frac{dx}{dv} = \frac{c_v}{AR}$$

Whence $c_p - c_v = AR$. If $\varepsilon c_p = W_p$ and $\varepsilon c_v = W_v$ then $W_p - W_v = AR\varepsilon$. $R\varepsilon$ is constant for all gases. Hence the difference between the specific heats of equal volume for all gases is the same. A determines the mechanical equivalent of heat.

For air, $R = 29.272$, $c_p = 0.23751$, $c_v = 0.16844$, and $\therefore \frac{1}{A} = \frac{R}{c_p - c_v} = 423.80$ kilogs.

Putting Kc_v for c_p equations III become

$$dQ = \frac{c_v}{R}(vdp + xpdv)$$

$$dQ = c_v dT + \frac{ART}{v}dv$$

$$dQ = Kc_v dT - \frac{ART}{p}dp$$

We have also

$$c_v(K-1) = AR \therefore K = \frac{AR + c_v}{c_v}$$

APPENDIX 7.

APPENDIX No. (3e.)

LECTURES DELIVERED BY COMMISSIONED OFFICERS BEFORE THE CLASS UNDER INSTRUCTION AT FORT MYER.

I. Lectures by Lieut. J. P. Story:—
   1. History of Signal-Service Weather Work.
   2. The Work of the Indications Room.

II. Lectures by Lieut. H. H. C. Dunwoody:—
   1. Graphic Chartings in Meteorology.
   2. Signal-Service Indications.
   3. Signal-Service International Meteorology.

III. Lectures by Lieut. W. E. Birkhimer:—
   1. The Use of the Galvanometer.
   2. The Use of the Signal-Service Telescopes.

APPENDIX 8.

HEADQUARTERS FORT MYER, VA., *August* 15, 1882.

The CHIEF SIGNAL OFFICER, *Washington, D. C.:*

GENERAL: In compliance with your instructions I have the honor to submit the following report for the year ending June 30, 1882:—

During the past year the courses of instruction, as prescribed by the Chief Signal Officer, have been closely and carefully followed in the cases of both officers and enlisted men.

The commanding officer in addition to his appropriate duties has had immediate charge of all instruction at the post, and has attended personally to all matters of detail as far as has been practicable.

The number of men for duty has varied from 27 to 73, and the number of officers from 2 to 11. The average number of men for the year was 57. The morning report of June 30, 1882, shows 3 officers and 56 men for duty, but of this number 32 belong to the permanent party; the remainder being the men under instruction.

Much embarassment has been caused by the frequent changes made in the instructors during the year. First Lieut. B. H. Gilman, Thirteenth Infantry, Acting Signal Officer, was relieved from the duty November 1, 1881, and ordered to his regiment.

First Lieut. A. L. Myer, Eleventh Infantry, and Second Lieut. H. L. Bailey, Twenty-first Infantry, were on duty as assistant instructors in military signaling and meteorology, from January 14, 1882, until May 1, 1882. These two officers, together with Lieutenant Walker, Sixth Infantry, and Lieutenant Baird, Sixth Cavalry acted as instructors in tactics.

Second Lieut. James A. Swift, Signal Corps, has continued as instructor in telegraphy and other branches, and has also performed the duties of Acting Assistant Quartermaster and Acting Commissary Subsistence. Excellent progress has been made in telegraphy by the enlisted men while under the charge of this officer.

The class of officers detailed for instruction under General Orders No. 26, War Department, 1881, reported for duty during the month of May, and at once entered upon its course. It comprised First Lieut. T. W. Morrison, Sixteenth Infantry, First Lieut. G. P. Cotton, First Artillery, First Lieut. O. L. Hein, First Cavalry, First Lieut. A. L. Myer, 11th Infantry, First Lieut. M. P. Maus, First Infantry, First Lieut. G. B. Walker, Sixth Infantry, First Lieut. Wm. Baird, Sixth Cavalry, and Second Lieut. H. L. Bailey, Twenty-first Infantry.

Lieutenants Cotton and Hein were relieved and ordered to their regiments February 2, 1882. Lieutenant Morrison was also relieved March 10, 1882. These officers did not complete the course of instruction.

The remainder of the class completed the full course excepting the long-range signaling. The entire class was examined at the Signal Office upon the first half of the course, but no final examination was made before they were relieved May 9, 1882.

Second Lieut. W. D. Wright, Signal Corps, U. S. A., reported for duty at this post June 13, 1882, and has commenced his course of instruction. (See Inclosure 1.)

During the year 68 men have been fully instructed in station duties. Of this number, 42 have been ordered to duty on station, leaving 26 awaiting orders. Four men were discharged before completing the course.

The new class of 40 men organized in January, 1882, are included in the above number of men who have been instructed. This class contained many superior men, and conducted itself in a manner deserving the warmest commendation. It is believed that no better class has ever been instructed at this post. The course of instruction to which they were subjected was very confining during the whole of the six months. At the final examination one man failed, and he only in telegraphy. (See Inclosure 2.)

Instruction has been given in the regular drills of the Signal Corps, including torch, flag, permanent-line and train drills, and in ordinary cavalry drills, mounted and dismounted.

The practice line and sea-coast loop referred to in my last report have been completed and are now in successful operation.

A series of interesting and experiments have been made over the range between this post and Sugar Loaf Mountain, Maryland, a distance of thirty-two miles, with the

Grugan heliostat. Several changes have been made which have greatly improved the instrument, which is now believed to be perfect. Lieutenant Grugan, who had charge of the station at Sugar Loaf Mountain, will submit a detailed report of the experiments and changes that have been made.

The barracks have been greatly improved. The south room has been subdivided into eight rooms, each 10 by 22 feet. Each room is arranged for four men and contains four single bunks, four chairs, two tables, wardrobe, stationary washstand, with water supply, looking-glass, window-shades and lamp. Each man is supplied with sheets, pillows, pillow-cases, and clothes-bags. The rooms are all heated by a furnace, and the ventilation is excellent.

The south half of the mess-hall has been arranged as a lecture-room, and provided with all the necessary school furniture to accommodate forty men. The building has been raised and the cellar excavated, giving a large room with ceiling 9 feet in height, which is now available for use.

The train-shed has been raised upon a brick foundation and a plank floor has been put in. The reservoir has been completed. New fences have been built about the officers' quarters, and a suitable building has been erected for the storage and protection of fuel.

A green-house has been constructed (mainly by the labor of the post), of sufficient size for the propagation of plants for decorating the grounds of the post.

A new spring has been developed which, it is believed, will duplicate the water supply heretofore furnished.

A large portion of the reservation has been inclosed with a substantial barbed-wire fence.

The old building used as a carpenter shop has been removed to the rear of the stables, and the one formerly adjacent to the quartermaster's storehouse has been moved on the line of the laundress' quarters. The appearance of the post has been greatly improved by these changes.

The quartermaster and commissary storehouse has been lined throughout, and the spaces between the foundation piers filled in with brick.

Much work has been accomplished in grading the parade-ground, building roads, clearing up underbrush, &c. The post gardens are in good order, and are furnishing a liberal supply of vegetables for the garrison. A fine orchard has been set out, and in a few years will be the source of an abundant supply of fruit.

There have been no desertions during the year, and but one death—that of Private Edward Murphy, who died of aneurism of the aorta January 2, 1882. The health of the post is excellent. Acting Assistant Surgeon L. W. Ritchie continues on duty as medical officer.

On the 10th of October, 1881, the commanding officer, accompanied by Lieutenants Cotton and Swift, and thirty enlisted men, with one section of field-telegraph-train, in compliance with your orders, proceeded to Yorktown, Va., and reported for duty to Major-General W. S. Hancock, U. S. A. Field-telegraph lines were erected from General Hancock's headquarters at Yorktown to the camp grounds, a distance of about three miles, and five stations were opened on the line. Connection was made with the Western Union telegraph office at Yorktown, and a large amount of work was done over the line which was of much service to the commanding-general.

Flag-signal stations were established connecting the end of the field-telegraph line with a tug which cruised in the lower harbor about 5 miles from Yorktown. By this means the arrival of distinguished guests on the different vessels was reported to Major-General Hancock in time to have the proper salutes fired as the vessels entered the harbor. Owing to the small number of men, and the fact that the stations were kept open from 7 a. m. until midnight, the labor was very severe. The detachment performed its duties in a very satisfactory manner, and received the thanks of General Hancock for its services. At the close of the ceremonies the detachment was relieved from duty at Yorktown, Va., and returned to this post October 24, 1881.

Before closing this report, I would invite the attention of the Chief Signal Officer to the fact that at this date there are but two officers on duty here in addition to the commanding officer. One of these, Lieutenant Swift, is required to be present from four to six hours daily in the telegraph rooms, and in addition to perform the duties of Acting Assistant Quartermaster and Acting Commissary of Subsistence. The other, Lieutenant Wright, has been recently appointed, and is under instruction, his time being fully occupied with his studies.

The new class of forty men, to be organized next month, will be divided into five sections, which must be instructed separately, and will require the whole time of one officer.

If the school of instruction is to be maintained it should be furnished with the full complement of officers.

Very respectfully, your obedient servant,

R. P. STRONG,

Brt. Capt. U. S. A., A. S. O., Commanding.

[Inclosure 1 to Appendix No. 8.]

Officers instructed during the year ending June 30, 1882.

Name.	Rank and corps.	Reported for instruction.	Relieved from instruction.	Remarks.
Morrison, T. W ..	First lieutenant, Sixteenth Infantry.	May 20, 1881	Mar. 9, 1882	Relieved before completing course.
Cotton, G. P	First lieutenant, First Artillery.	May 20, 1881	Feb. 2, 1882	Do.
Hein, O. L	First lieutenant, First Cavalry.	May 20, 1881	Feb. 2, 1882	Do.
Myer, A. L.....	First lieutenant, Eleventh Infantry.	May 20, 1881	May 9, 1882	Completed full course, except field signaling over long ranges.
Maus, M. P	First lieutenant, First Infantry.	May 20, 1881	May 9, 1882	Do.
Walker, G. B.....	First lieutenant, Sixth Infantry.	May 20, 1881	May 9, 1882	Do.
Baird, W	First lieutenant, Sixth Cavalry.	May 20, 1881	May 9, 1882	Do.
Bailey, H. L.....	Second lieutenant, Twenty-first Infantry.	May 20, 1881	May 9, 1882	Do.
Wright, W. D....	Second lieutenant, Signal Corps.	June 19, 1882	.....	Still under instruction.

Amount of field practice had by each officer during the year ending June 30, 1882.

Name.	Rank and corps.	Number days flag practice.	Number nights torch practice.	Number days heliograph practice.	Number days surveying.
Morrison, T. W	First lieutenant, Sixteenth Infantry.....	34	15	11	15
Cotton, J. P.....	First lieutenant, First Artillery.....	36	14	11	13
Hein, O. L	First lieutenant, First Cavalry	32	11	9	18
Myer, A. L.....	First lieutenant, Eleventh Infantry	35	11	9	18
Maus, M. P	First lieutenant, First Infantry	18	5	12	18
Walker, G. B	First lieutenant, Sixth Infantry.....	33	14	13	17
Baird, W	First lieutenant, Sixth Cavalry.....	31	10	14	19
Bailey, H. L.....	Second lieutenant, Twenty-first Infantry.....	38	15	10	

[Inclosure 2 to Appendix No. 8.]

Enlisted men instructed for the position of assistant on station from July 1, 1881, to June 30, 1882.

Name.	Placed under instruction for assistant.	Reported qualified as assistant.	Ordered on station.	Remarks.
Guzman, J. A	Jan. 24, 1881	June 24, 1881	July 9, 1881	
Weaver, C	Jan. 24, 1881	July 15, 1881	July 26, 1881	
Meekins, E. N	Jan. 24, 1881	June 24, 1881	July 9, 1881	
Knabe, H. F	Jan. 24, 1881	June 24, 1881	July 5, 1881	
Perry, E. E	Jan. 24, 1881	Aug. 4, 1881	Aug. 30, 1881	
Dent, H. C	Feb. 16, 1881	July 15, 1881	.....	Discharged July 27, 1881.
Boynton, H. R	Feb. 16, 1881	Aug. 4, 1881	Aug. 30, 1881	
Dent, W. W	Feb. 16, 1881	Aug. 4, 1881	Aug. 30, 1881	
Crawford, R. M	Mar. 28, 1881	Aug. 4, 1881	Sept. 17, 1881	
Koonce, G. W	Mar. 28, 1881	Aug. 4, 1881	Aug. 12, 1881	
Kerkam, R. E	Feb. 16, 1881	July 15, 1881	July 23, 1881	
Berryman, S	Mar. 28, 1881	Aug. 4, 1881	Aug. 9, 1881	
Kemp, H. L	June 16, 1881	Nov. 9, 1881	Nov. 12, 1881	
Chappell, G. M	June 16, 1881	Nov. 9, 1881	Nov. 30, 1881	
Stewart, J. C	June 16, 1881	Nov. 9, 1881	Nov. 12, 1881	
Davis, G. W	June 16, 1881	Nov. 9, 1881	Nov. 30, 1881	
Pratz, F. C	June 20, 1881	Nov. 12, 1881	Dec. 26, 1881	
Williams, F. T	July 14, 1881	Nov. 21, 1881	Dec. 22, 1881	
Long, T. K	July 14, 1881	Nov. 21, 1881	Nov. 27, 1881	
Morgan, T	July 14, 1881	Nov. 21, 1881	Dec. 22, 1881	
Penrod, G. H	July 14, 1881	Dec. 9, 1881	Feb. 6, 1882	
Concannon, F. D	July 14, 1881	.....	.....	Discharged September 8, 1881.
Weber, G. A	July 14, 1881	Dec. 9, 1881	Dec. 31, 1881	
Morrison, S. W	June 2, 1881	Nov. 12, 1881	Dec. 26, 1881	
Knowles, E. C	July 14, 1881	Dec. 9, 1881	Jan. 25, 1882	
McCann, W. R	Aug. 4, 1881	.....	.....	Discharged August 27, 1881.
Read, C. A	Aug. 4, 1881	Jan. 14, 1882	Jan. 26, 1882	
Curtis, G. F	Aug. 4, 1881	Jan. 14, 1882	Feb. 14, 1882	
Boyer, H. B	Aug. 4, 1881	Jan. 14, 1882	Mar. 9, 1882	
Carter, C. E	Aug. 4, 1881	Jan. 14, 1882	Feb. 6, 1882	
Baldwin, H. M	Aug. 4, 1881	Jan. 14, 1882	Apr. 6, 1882	
Doyle, W. E	June 20, 1881	Nov. 12, 1881	Nov. 28, 1881	
Corbin, C. C	June 24, 1881	Nov. 12, 1881	Nov. 30, 1881	
Geddings, R. M	Nov. 8, 1881	Feb. 25, 1882	Apr. 15, 1882	
Merrill, G. W	Nov. 8, 1881	Feb. 25, 1882	Mar. 12, 1882	
Coburn, F. A	Nov. 8, 1881	Feb. 25, 1882	Apr. 6, 1882	
Mellen, F. A	Nov. 8, 1881	Feb. 25, 1882	Apr. 6, 1882	
Clarke, P. J	Nov. 8, 1881	Feb. 25, 1882	Apr. 6, 1882	
Dickens, G. F	Nov. 8, 1881	Feb. 25, 1882	Apr. 15, 1882	
Hopkins, T. R	Jan. 9, 1882	May 9, 1882	May 27, 1882	
White, A. L	Jan. 9, 1882	May 9, 1882	June 5, 1882	
Hill, G. A	Jan. 9, 1882	May 9, 1882	May 27, 1882	
Langhorne, J. M	Jan. 9, 1882	June 16, 1882	.....	Awaiting orders.
Lamar, W. H	Jan. 9, 1882	June 16, 1882	.....	Do.
McAdie, A	Jan. 9, 1882	June 16, 1882	.....	Do.
Martin, G. A	Jan. 9, 1882	June 16, 1882	.....	Do.
Delano, W. S	Jan. 9, 1882	June 16, 1882	.....	Do.
Dilley, C. B	Jan. 9, 1882	June 16, 1882	.....	Do.
Crawford, J	Jan. 9, 1882	June 16, 1882	.....	Do.
Ellis, F. W	Jan. 9, 1882	June 16, 1882	.....	Do.
Fickett, F. W	Jan. 9, 1882	June 16, 1882	.....	Do.
Fitzmaurice, P. H	Jan. 9, 1882	June 16, 1882	.....	Do.
Frankenfield, H. C	Jan. 9, 1882	June 16, 1882	.....	Do.
Leitzell, S. M	Jan. 9, 1882	June 16, 1882	.....	Do.
Maxfield, J. E	Jan. 9, 1882	June 16, 1882	.....	Do.
Morrill, P	Jan. 9, 1882	.....	May 9, 1882	Ordered to Point Barrow.
McRae, A. L	Jan. 9, 1882	June 16, 1882	.....	Awaiting orders.
Mitchell, A. J	Jan. 9, 1882	June 16, 1882	.....	Do.
Pagne, B. S	Jan. 9, 1882	June 16, 1882	.....	Do.
Pulliam, R. H	Jan. 9, 1882	June 16, 1882	.....	Do.
Simpson, E. E	Jan. 9, 1882	June 16, 1882	.....	Do.
Worrill, W	Jan. 9, 1882	May 9, 1882	May 27, 1882	
Johnson, F. L	Jan. 9, 1882	June 16, 1882	.....	Awaiting orders.
Spedden, W. E	Jan. 9, 1882	June 16, 1882	.....	Do.
Hilton, E. H	Jan. 9, 1882	May 9, 1882	May 21, 1882	
Hinman, R. E	Jan. 12, 1882	June 16, 1882	.....	Awaiting orders.
Townsend, T. S	Jan. 20, 1882	June 16, 1882	.....	Do.
Gates, I. W	Jan. 20, 1882	June 16, 1882	.....	Do.
Glass, E. J	Jan. 20, 1882	.....	.....	Discharged March 24, 1882.
McCoy, J	Jan. 23, 1882	June 16, 1882	.....	Awaiting orders.
Walker, B. L	Jan. 30, 1882	June 16, 1882	.....	Do.
Ready, G	Feb. 27, 1882	June 16, 1882	.....	Do.
	Mar. 3, 1882	June 16, 1882	.....	Do.

APPENDIX 9.

Exhibiting the communications sent from and received at the office of the Chief Signal Officer (exclusive of telegrams), from July 1, 1881, to June 30, 1882.

SENT.

Division of telegrams and reports for the benefit of commerce and agriculture.

To heads of departments and bureaus	1,343
To non-commissioned officers in charge of stations in reference to their duties	9,070
In reply to applications for stations and others similar	214
To telegraph companies in reference to transmission of weather reports and the erection of telegraph lines, &c	289
To boards of trade, chambers of commerce, &c	713
To foreign correspondents relating to simultaneous reports	891
To foreign correspondents relating to this division in general	622
To manufacturers and others in reference to instruments, equipments, &c	367
To steamship companies, &c	275
To voluntary observers throughout the United States	899
General and special orders and circulars with reference to this division	37,831
Miscellaneous	8,942
Total	61,456

Signal Division.

To heads of departments and bureaus	48
Relating to duties and discipline at Signal Service school of instruction and post of Fort Myer, Va	25
Relating to recruiting and enlistment	1,040
General and special orders and circulars with reference to this division	17,614
Miscellaneous	614
Total	19,341

Property Division.

To heads of departments and bureaus	2,518
To manufacturers and others in reference to instruments, equipments, &c	4,080
To non-commissioned officers in charge of stations and other enlisted men in reference to property and money accounts	10,278
In reference to quarterly returns of officers	1,512
Regarding property transferred to stations	3,488
Miscellaneous	3,461
Total	25,337
Aggregate	106,134

RECEIVED.

Division of telegrams and reports for the benefit of commerce and agriculture.

From heads of departments and bureaus	551
Applications for the establishment of new stations	115
From telegraph companies in reference to the transmission of weather reports and the construction of telegraph lines, &c	203
From non-commissioned officers in charge of stations in reference to their duties	20,797

From boards of trade, chambers of commerce, &c	239
From foreign correspondents, relating to simultaneous weather reports	5,507
From voluntary observers throughout the United States relating to observations and reports	3,902
From foreign correspondents relating to this division in general	329
Reports relative to instruction of non-commissioned officers and assistants	1,286
Mailed reports from non-commissioned officers in charge of stations	254,425
From United States naval vessels and stations (received through the Navy Department)	2,081
Reports from railroad stations throughout the United States in reference to weather reports received and posted by them	39,792
Meteorological forms, &c., received from non-commissioned officers in charge of stations	211,742
From commercial steamship companies	559
Reports from postmasters throughout the United States in reference to weather bulletins received and posted by them	95,448
Miscellaneous	6,762
Total	643,738

Signal Division.

From heads of departments and bureaus	667
Relating to duties and discipline at Signal Service school of instruction and post of Fort Myer, Va	73
Relating to instruction in signaling at Fort Myer, Va., and in different military departments	221
Relating to recruiting and enlistment	126
Applications for enlistment in the Signal Corps, United States Army	607
Miscellaneous	2,502
Total	4,196

Property Division.

From heads of departments and bureaus	1,280
From manufacturers and others relating to instruments, equipments, &c	1,441
From officers concerning property, quarterly returns, &c	3,204
From non-commissioned officers in charge of stations and other enlisted men relating to property and money accounts	44,331
Regarding property transferred to stations	6,489
Miscellaneous	4,337
Total	61,082
Aggregate	709,016
Aggregate sent	106,134
Aggregate received	709,016
Aggregate sent and received	815,150

Table showing the number of cipher words and messages sent and received by telegraph at the central office, Washington, D. C., from July 1, 1881, to June 30, 1882.

Cipher-words of weather reports sent	31,300
Telegraphic messages, other than weather reports, sent	8,610
Cipher-words of weather reports received	652,952
Cipher-words of special river reports received	2,190
Telegraphic messages, other than weather reports, received	15,980

APPENDIX 10.

Table showing meteorological data furnished from the records of the Office of the Chief Signal Officer of the Army, upon request of the applicants named, during the fiscal year ending June 30, 1882.

Mr. Otto Lachenmeyer, shipping and commission merchant, 129 Walnut street, Philadelphia, Pa., furnished July 9, 1881, with an extract from the daily journal of station at Portland, Me., for month of May, 1881, May 4 to 14, 1881, inclusive. Professor Albert R. Leeds, Institute of Technology, Hoboken, N. J., furnished, July 9, with a statement showing the daily precipitation in inches and hundredths, for the six weeks preceding June 28, 1881, at Albany, N. Y., Boston, Mass., Baltimore, Md., Cincinnati, O., Philadelphia, Pa., New York City, N. Y., Rochester, N. Y., Washington, D. C., Wilmington, N. C.

General Woodhull, 2033 G street n. w., Washington, D. C., furnished July 11, 1881, with a statement showing the amount of precipitation at Bismarck and Fort A. Lincoln, Dak., from June, 1880, to June, 1881.

Mr. Joseph B. Updegraff, Practical School, Hagerstown, Md., furnished July 15, 1881, with a statement showing the maximum temperature on the warmest days and the mean temperature of the warmest months of 1878, 1879, and 1880, at Washington, D. C.

Mr. J. H. Gill, assistant engineer, United States Engineer Office, No. 1907 Pennsylvania avenue, Washington, D. C., furnished July 27, 1881, with a statement showing the amount of snow-fall at Washington, D. C., from November 13, 1880, to March 31, 1881.

Mr. Dwight Porter, special agent Census Office, Interior Department, No. 773 Fourth avenue, New York City, furnished July 29, 1881, with a statement showing amount of precipitation and maximum, minimum, and mean temperature for each month, and prevailing direction of wind for each season at Dodge City, Kans., from 1875 to 1880, inclusive.

Mr. R. A. Laughridge, special agent Tenth Census, Berkley, Cal., furnished July 30, 1881, with a statement showing the mean, maximum, and minimum temperature, and the amount of precipitation for each month of 1880, at Brackettville, Brownsville, Castroville, Fort Concho, Fort Davis, Denison, Eagle Pass, Fort Elliott, Fredericksburg, Galveston, Tex., Fort Gibson, Ind. T., Laredo, Mason, Fort McKavett, Pilot Point, Rio Grande City, San Antonio, Tex., Fort Sill, Ind. T., Fort Stockton, and Corsicana, Tex.

Mr. G. W. Adair, Georgia land agency, No. 6 Wall street, Atlanta, Ga., furnished July 30, 1881, with a statement showing the maximum temperature for each day from June 1, to July 23, 1881, inclusive, at Savannah, Augusta, and Atlanta, Ga., and Cincinnati, Columbus, and Cleveland, Ohio.

Mr. Edwin Taylor, Armstrong, Kans., furnished July 30, 1881, with a statement showing the amount of precipitation for each month from January 1, 1875, to July 11, 1881, at Dodge City, Kans.

Mr. Dwight Porter, special agent Census Office, 773 Fourth avenue, New York City, furnished August 1, 1881, with a statement showing mean, maximum, and minimum temperature, amount of rainfall and prevailing winds for each month from January, 1872, to June, 1881, inclusive, at Keokuk, Iowa.

Mr. Dwight Porter, 773 Fourth avenue, New York City, furnished August 11, 1881, with a statement showing the maximum, minimum, and mean temperature for each month; prevailing winds for each season, total monthly rainfall and greatest daily rainfall at Davenport, Iowa, from May 24, 1871 (date of opening station), to July 31, 1881, inclusive.

Mr. Thomas R. Tannatt, general agent Oregon Improvement Company, Walla Walla, Wash., furnished August 11, 1881, with a statement showing the maximum and minimum temperature; the mean temperature and precipitation, annual mean temperature and total precipitation for 1879, 1880, and 1881, to date, at Portland and Roseburg, Oreg.; Olympia, Dayton, Spokane Falls, Almota, and Colfax, Wash., and Lewiston, Idaho.

Mr. Dwight Porter, 773 Fourth avenue, New York City, furnished August 11, 1881,

with a statement showing the mean, maximum, and minimum temperature, prevailing direction of wind, and total monthly rainfall at Des Moines, Iowa, from August 1, 1878, to July 31, 1881, inclusive.

Mr. James Lobb, 56 Front street, Toronto, Ontario, furnished August 17, 1881, with a statement showing the mean temperature and humidity for each month of the years 1878, 1879, and 1880 at San Diego, Cal., Denver, Colo., Dodge City, Kans., Pioche, Nev., Jacksonville, Fla.

Mr. Dwight Porter, 773 Fourth Avenue, New York City, furnished August 17, 1881, with a statement showing mean, maximum, and minimum temperature, prevailing direction of wind, and total rainfall for each month from September 1, 1874, to July 30, 1881; also, total annual rainfall and mean annual temperature for the years above mentioned at North Platte, Nebr.

Mr. W. N. Burton, Grand Haven, Mich., furnished August 17, 1881, with a statement showing the direction and velocity of wind, state of weather, rainfall at 6.23, 7, 10.23 a. m., and 2, 2.23, 9, and 10.23 p. m., on October 11 and 12, 1880, at Grand Haven, Mich., duly authenticated under seal of the War Department.

Mr. G. W. Adair, No. 6 Wall street, Atlanta, Ga., furnished August 23, 1881, with a statement showing the maximum temperature for each day from July 24-31, 1881, inclusive, and the maximum temperature for each day of January and February, 1881, at Savannah, Augusta, and Atlanta, Ga., Cincinnati, Columbus, and Cleveland, Ohio.

Mr. Dwight Porter, special agent Tenth Census, 773 Fourth avenue, New York City, furnished August 23, 1881, with a statement showing the maximum, minimum, and mean monthly temperature, monthly and annual rainfall, and prevailing direction of wind for each season and for each year at Saint Louis, Mo., from January 1, 1871, to August 1, 1881.

Mr. G. K. Gilbert, United States geologist, United States Geological Survey, Department of the Interior, Washington, D. C., furnished August 24, 1881, with a statement showing the barometer (corrected for temperature and instrumental error only), exposed thermometer, relative humidity, direction and velocity of the wind at each observation during the month of July, 1881, at Salt Lake City, Utah.

Mr. Dwight Porter, special agent Tenth Census, 773 Fourth avenue, New York City, furnished August 25, 1881, with a statement showing the mean maximum and minimum temperature, and total rainfall for each month, and the prevailing direction of wind for each season at Fort Gibson, Indian Territory, from April 1, 1873, to August 1, 1881.

Mr. A B. Johnston, chief clerk Light-House Board, Treasury Department, Washington, D. C., furnished August 26, 1881, with a statement showing the barometer and thermometer readings at each observations taken on August 9 and 10, 1881, and the mean, maximum, and minimum for each day at New London, Conn.

Mr. S. T. Abert, United States civil engineer, 1907 Pennsylvania avenue, Washington, D. C., furnished August 30, 1881, with a statement showing the direction and velocity of the wind at Washington, D. C., for each observation taken from 7 a. m. to 7 p. m. for the week ending Friday, August 26, 1881.

Mr. G. W. Adair, No. 6 Wall street, Atlanta, Ga., furnished September 2, 1881, with a statement showing the minimum temperature for each day during January and February, 1881, at Savannah, Augusta, and Atlanta, Ga., and Cincinnati, Columbus, and Cleveland, Ohio.

Mr. G. K. Gilbert, United States Geological Survey, Washington, D. C., furnished September 2, 1881, with a statement showing the observed readings of the barometer and attached thermometer at Burlington, Vt., at 7 a. m., 2 and 9 p. m. (local time), June 21-30, 1873, inclusive.

Messrs. Strauss & Co., Savannah, Ga., furnished September 3, 1881, with a statement showing the maximum and minimum temperature, state of weather, and amount of rainfall in inches and hundredths at New York City, at each observation from August 4-11, 1881, inclusive.

Mr. S. T. Abert, United States civil engineer, 1907 Pennsylvania avenue, Washington, D. C., furnished September 3, 1881, with a statement showing the direction and velocity of the wind at Washington, D. C., at observations taken between 7 a. m. and 7 p. m. of Friday, September 2, 1881.

Messrs. F. B. Squire & Co., 159 Front street, New York City, furnished September 8, 1881, with a statement showing the direction of wind at New York City at 7.12 and 11.12 a. m., and 3.12, 9.00, and 11.12 p. m., each day from January 1 to August 20, 1881, inclusive.

Quartermaster-General United States Army, furnished September 10, 1881, with a statement showing the maximum temperatures during the months of June, July, August, and September, 1879, 1880, and 1881, at Florence, Fort Apache, Fort Grant, Fort Verde, Fort Mojave, Fort McDowell, Fort Prescott, Camp Thomas, Phœnix, Tucson, Wickenburg, and Yuma, Ariz.

Mr. S. T. Abert, United States civil engineer, 1907 Pennsylvania avenue, Washington, D. C., furnished September 12, 1881, with a statement showing the direction and

velocity of wind at Washington, D. C., at 7 and 11 a. m. and 3 and 7 p. m. on September 3–9, 1881, inclusive.

Mr. George W. Carhart, foreign freight agent New York, Lake Erie, and Western Railroad Company, No. 3 Bowling Green, New York City, furnished September 16, 1881, with a statement showing the minimum temperature at New York City during the months of November and December, 1880, and January, 1881, duly authenticated under the seal of the War Department, for use as evidence in court.

Mr. S. T. Abert, United States civil engineer, 1907 Pennsylvania avenue, Washington, D. C., furnished September 17, 1881, with a statement showing the direction and velocity of the wind at Washington, D. C., at each observation taken from 7 a. m to 7 p. m. for the week ending at 7 p. m. of Friday, September 16, 1881.

Messrs. McAfee Bros., real-estate brokers, 202 Sansome street, San Francisco, Cal., furnished September 17, 1881, with a statement showing the mean temperature for January and July; the minimum for January, April, and May; the maximum for July; mean annual precipitation of 1877, 1878, 1879, 1880, and 1881; also the mean for the number of years, latitude of station, elevation of cistern of barometer above mean sea-level during period from July, 1877, to date, at Red Bluff, Cal.

Messrs. McAfee Bros., real-estate brokers, 202 Sansome street, San Francisco, Cal., furnished September 17, 1881, with a statement showing the mean temperature for January and July, the minimum for January, April, and May, and the maximum for July; the mean annual amount of precipitation, in inches and hundredths, latitude of station, elevation of cistern of barometer above mean sea-level during the period from July 1, 1877, to September 1, 1881, at Sacramento, Cal.

Messrs. McAfee Bros. real-estate brokers, 202 Sansome street, San Francisco, Cal., furnished September 17, 1881, with a statement showing the mean temperatures for January and July; minimum for January, April, and May; maximum for July; mean annual precipitation, latitude of station, elevation of cistern of barometer above mean sea-level during period from November 1, 1870, to September 1, 1881, at New York City, N. Y.

Mr. Albert G. Heminway 11 Wall street, New York City, furnished September 29, 1881, with a statement showing the precipitation in inches and hundredths which fell at New York City, on July 30, 1881.

Messrs. W. B. Dana & Co., New York City, furnished September 29, 1881, with a statement showing the amount of rainfall, number of days on which rain fell, maximum, minimum, and mean temperature during July, 1881, at Jacksonville, Fla.

Messrs. McAfee Bros., real-estate brokers, 202 Sansome street, San Francisco, Cal., furnished September 29, 1881, with a statement showing the mean temperature of January and July; the lowest recorded temperature of January, April, May, and July, and the mean annual rainfall at Jacksonville, Fla.

Mr. Frank Loomis, attorney New York Central and Hudson River Railroad, Albany, N. Y., furnished October 3, 1881, with a statement showing the maximum and minimum temperature at Albany, N. Y., for each day during November, 1880, duly authenticated under the seal of the War Department, to be used as evidence in court.

Mr. D. C. Robinson, Lake street, corner Market, Elmira, N. Y., furnished October 4, 1881, with a statement showing the amount of precipitation at Litchfield and Wellsborough, Pa., and Ithaca and Starkey, N. Y., from the commencement of observation to date.

Mr. J. B. Updegraff, Hagerstown, Md., furnished October 4, 1881, with a statement showing the amount of rainfall, in inches and hundredths, at Washington, D. C., during August of 1875, '76, '77, '78, '79, '80, and '81.

Mr. Henry Major, 81 Cedar street, New York City, furnished October 5, 1881, with a statement showing the local time of commencement and ending, and amount of precipitation in inches and hundredths, and the state of the weather at New York City, at each observation, from September 27, 1880, to December 28, 1880, both inclusive, duly authenticated under the seal of the War Department.

Mr. Henry Davies, No. 84 Taylor street, Newport, Ky., furnished October 10, 1881, with a statement showing the mean monthly and annual mean temperature and relative humidity at Cincinnati, Ohio, and Galveston, Tex., for each month and year since the commencement of observations by the Signal Service, U. S. Army, at these places.

Messrs. Strauss & Co., Savannah, Ga., furnished October 17, 1881, with a statement showing the state of the weather and amount of rainfall at each observation at New York City from June 4 to 11, 1881, inclusive.

Mr. J. Jackson, superintendent United States tea farm, Summerville, S. C., furnished October 17, 1881, with a statement showing the mean temperatures and total rainfall at Punta Rassa, Fla., from January, 1871, to August, 1881, inclusive.

Mr. R. S. Tracey, box 21, Washington, D. C., furnished October 19, 1881, with a statement showing the dates during the month of October upon which the first frosts occurred at Washington, D. C., 1872, to 1881, inclusive.

Mr. A. Broaddus, acting general freight agent, Louisville and Nashville Railroad, Louisville, Ky., furnished October 20, 1881, with a statement showing the observed

temperatures at Buffalo, N. Y., Cleveland, Ohio, Indianapolis, Ind., at each observation from November 15 to 28, 1880, inclusive.

Prof. S. P. Langley, director Allegheny Observatory, Allegheny, Pa., furnished October 22 with a statement showing the barometer and attached thermometer readings at San Francisco and San Diego, Cal., from July 24 to September 16, 1881.

Mr. Harry Hammond, special agent Tenth Census, Beach Island, S. C., furnished October 25, 1881, with a statement showing the mean highest and lowest and absolute range of temperature, the prevailing wind, total precipitation in inches and hundredths, and number of rainy days, at Augusta, Ga., for each month from January, 1874, to December, 1880, inclusive.

Mr. John Adams, general superintendent Fitchburg Railroad, Boston, Mass., furnished October 27, 1881, with a copy of the daily journals of Springfield and Boston, Mass., of February 28 and March 1, 2, and 3, 1881.

Mr. Dwight Porter, special agent Tenth Census, New York City, furnished October 27, 1881, with a statement showing the mean maximum and minimum temperatures, amount of precipitation in inches and hundredths, and the prevailing winds at Yankton, Dak., for each month and year from the commencement of observations by the Signal Service, U. S. Army, to September 30, 1881.

Editor American Architect and Building News, Boston, Mass., furnished October 31, 1881, with a memorandum by Professor Abbe on "The Destructive Forces attending Tornadoes."

(For above memorandum see page — this report.)

Mr. J. H. Turner, editor Western Farmers' Almanac, Louisville, Ky., furnished November 3, 1881, with a statement showing the daily mean barometer, daily mean, maximum, and minimum temperature, prevailing direction of wind, and character of day for each day of September, 1881, at New Orleans, La.

Mr. A. H. Boies, Federalsburg, Md., furnished November 4, 1881, with a statement of rain and wind data for November and monthly barometric means for Baltimore, Md.

Messrs. Martin & Lackland, attorneys at law, 203 Pine street, Saint Louis, Mo., furnished November 14, 1881, with a true copy of the anemometer record-sheet at Saint Louis, Mo., from 12 m, October 16, 1880, duly authenticated under the seal of the War Department.

Prof. S. F. Baird, Secretary Smithsonian Institution, Washington, D. C., furnished November 18, 1881, with copies of journal at Leavenworth, Kans., from October 1 to 5, 1871, from November 15 to 25, 1871, and from November 15 to 18, 1872.

Mr. James A. Davis, Manayunk, Philadelphia County, Pennsylvania, furnished November 18, 1881, with a statement showing the maximum, minimum, and mean temperatures at Philadelphia, Pa., of each day from October 11, 1880, to April 18, 1881, inclusive, duly authenticated under the seal of the War Department.

Mr. J. Norman Lockyer, editor "Nature," Bedford street, Strand, London, England, furnished November 28, 1881, with extracts relating to electrical phenomena, taken from Pike's Peak Monthly Abstract Journals, from November 23, 1873, to August 21, 1881, inclusive.

Mr. N. M. Edwards, Appleton, Wis., furnished, November 29, 1881, with a statement showing the precipitation at Madison, La Crosse, and Milwaukee, Wis., and Saint Paul, Minn., for each month from the commencement of observations to October, 1881.

Mr. F. C. Cantine, P. O. box 2939, New York City, furnished December 2, 1881, with a statement showing mean, maximum, and minimum temperatures for each month from the commencement of observations to October 31, 1881, at Portland, Roseburg, and Umatilla, Oreg., Olympia, Dayton, and Spokane Falls, Wash.

Mr. Dwight Porter, agent Tenth Census, 773 Fourth avenue, New York City, furnished December 5, 1881, with a statement showing the precipitation for each month of 1879 and 1880, at Omaha, Nebr., Saint Louis, Mo., Fort Benton, Mont., Helena, Mont., Denver, Colo., Dodge City, Kans.

Messrs. Sharp & Hughes, attorneys at law, Norfolk, Va., furnished December 7, 1881, with a copy of the daily bulletin of Synopses, Indications, and Facts for October 22, 23, and 24, 1879, duly authenticated under the seal of the War Department.

The editor "Connecticut Almanac," New Haven, Conn., furnished December 8, 1881, with a statement showing the mean highest and lowest barometer and temperature, mean relative humidity, total precipitation in inches and hundredths, number of days on which rain and snow fell, prevailing wind with highest velocity in miles per hour, and number of fair and cloudy days, at New Haven, Conn., for each month from January, 1873, to October, 1881.

Mr. James W. Philips, No. 1205 Pennsylvania avenue, Wilmington, Del., furnished December 12, 1881, with a statement showing the mean, maximum, and minimum temperatures, precipitation in inches and hundredths, number of cloudy days, and days on which rain or snow fell, at Albany, N. Y., for the months of May, June, July, August, and September of the years 1880 and 1881, compiled from the records on file at the office of observation of the Signal Service, United States Army, at Albany, N. Y., and

verified and corrected at the Chief Signal Office, United States Army, at Washington, D. C.

Dr. H. P. Gatchell, jr., box 190, Charlotte, N. C., furnished December 14, 1881, with a statement showing the mean, maximum, and minimum barometer reading, mean, maximum, and minimum temperature, mean relative humidity, mean of the dew-point, prevailing wind, maximum velocity of the wind, number of clear, fair, foggy, and cloudy days, and number of days on which rain or snow fell, for month of November, 1881, at Savannah, Ga., and the maximum velocity of the wind at Charlotte, N. C., for same month.

Messrs. Shipman, Barlow, Larocque & Choate, No. 35 William street, New York City, furnished December 14, 1881, with a copy of the original record of observations taken at New York City at 7.12 and 11.12 p. m., July 26, 1881, and at 9.12 a. m., July 27, 1881, duly authenticated under the seal of the War Department.

Dr. H. P. Gatchell, jr., Charlotte, N. C., furnished December 15, 1881, with a statement showing the mean, maximum, and minimum barometer and temperature, mean relative humidity and dew point, prevailing direction of wind, number of clear, fair, and cloudy days, and days on which rain or snow fell, for November, 1881, at Atlanta and Augusta, Ga., Charlotte, N. C., Charleston, S. C., Chicago, Ill., Denver, Colo., Jacksonville and Pensacola, Fla., Knoxville, Tenn., New York City, N. Y., and Saint Paul, Minn.

Miss Austine Snead, 307 F street, northwest, Washington, D. C., furnished December 17, 1881, with a statement showing the commencement and ending of snow-storms which occurred at Washington, D. C., during the winter of 1880–'81, with the amount of melted snow in inches and hundredths registered during each.

Messrs. Auchencloss Bros., 47 and 49 White street, New York City, furnished December 20, 1881, with a statement showing the amount of rainfall, maximum and minimum temperature, and state of weather for each day of April, May, June, July, and August, 1881; also means for each month at Jacksonville, Punta Rassa, Key West, Pensacola, and Cedar Keys, Fla., Augusta, Savannah, and Atlanta, Ga.

Mr. John Moll, care of Messrs. Thomas May & Co., P. O. box 2058, Montreal, Canada, furnished December 20, 1881, with a statement showing the mean precipitation in inches and hundredths, and lowest recorded temperature, during the years 1877 to 1881, inclusive, at Boston, Mass., Eastport and Portland, Me., for each month from November to March, inclusive.

Mr. J. W. Coulston, attorney at law, 221 South Sixth street, Philadelphia, Pa., furnished December 21, 1881, with a copy of the original record of observations taken at Atlantic City and Barnegat, N. J., on November 19 and 20, 1881.

The president Northern Pacific Railroad Company, 20 Nassau street, New York City, furnished December 22, 1881, with a statement showing the annual average precipitation in inches and hundredths at Albany, Alpena, Baltimore, Bismarck, Boisé City, Boston, Breckinridge, Cheyenne, Chicago, Cleveland, Columbus, Davenport, Deadwood, Denver, Des Moines, Detroit, Dubuque, Duluth, Escanaba, Fort Benton, Fort Buford, Fort Custer, Fort Keogh, Fort Shaw, Fort Bennett, Fort Stevenson, Grand Haven, Helena, Keogh, La Crosse, Madison, Marquette, Milwaukee, North Platte, Omaha, Pembina, Port Huron, Sacramento, Salt Lake City, San Diego, Sandusky, San Francisco, Toledo, Visalia, Winnemucca, Yankton, Philadelphia, and Lynchburg.

Mr. L. S. Dabney, 30 Court street, Boston, Mass., furnished December 22, 1881, with a copy of the original record of observations taken at Wood's Holl, Mass., for March 23 and 24, 1881; copy of the abstract of journal for March 23 and 24, 1881, and copy of the anemometer sheets from 12 midnight March 22 to 12 midnight March 24, 1881, duly authenticated under the seal of the War Department.

Mr. John C. Smock, box 282, New Brunswick, N. J., furnished December 27, 1881, with a statement showing the meteorological record at Cape May, N. J., during the months of October and November, 1881, computed from the records on file at the office of observation of the Signal Service, United States Army, at that place, and verified at the Office of the Chief Signal Officer, United States Army, Washington, D. C.

The Commissioner of Agriculture, Department of Agriculture, Washington, D. C., furnished December 27, 1881, with a statement showing the mean temperature and total precipitation recorded at the station of observation of the Signal Service, United States Army, at Washington, D. C., for each day from May 1 to November 30, 1881.

Messrs. W. B. Dana & Co., Commercial and Financial Chronicle, 79 and 81 William street, New York City, furnished December 29, 1881, with a statement showing the amount of rainfall, number of days on which rain fell, maximum, minimum, and mean temperature for each month from January, 1880, to November, 1881, inclusive, at Castroville, Decatur, Denison, and San Antonio, Tex., Charlotte, Kittyhawk, and Portsmouth, N. C.

Houston and Texas Central Railroad, Galveston, Tex., furnished December 29, 1881, with a statement showing the mean, maximum, and minimum temperatures and the precipitation for the year ending December 30, 1880, at Galveston, Corsicana, Indianola, San Antonio, Brownsville, Denison, Fort Griffin, and Mason, Tex.

Mr. Thomas D. Hawley, No. 68 First street, Detroit, Mich., furnished December 31, 1881, with a statement showing the mean temperature and total precipitation in inches and hundredths for each of the spring and summer months of 1873 to 1880, inclusive, at Grand Haven, Detroit, and Port Huron, Mich., Cleveland, Toledo, and Cincinnati, Ohio, Pittsburg and Erie, Pa., Chicago, Ill., Indianapolis, Ind., and Milwaukee, Wis.

Dr. Mary Pratt, No. 322 Hamilton street, Camden, N. J., furnished December 31, 1881, with a statement showing the amount of precipitation in inches and hundredths which fell at Atlantic City, N. J., on December 14 and 15, 1881.

Col. C. E. Bowman, State commissioner of agriculture, Frankfort, Ky., furnished December 31, 1881, with a table showing the daily mean barometer; maximum, minimum, and daily mean temperature; daily mean relative humidity; prevailing direction of wind; rainfall or melted snow (in inches), and the character of the day, from November 1, 1880, to November 1, 1881, at Louisville, Ky., compiled from the records of the Signal Service, United States Army.

Mr. Edward O. Forney, 514 E street northwest, Washington, D. C., furnished December 31, 1881, with a statement showing the mean monthly temperature at Philadelphia, Pa., for each month of 1873, 1874, 1875, 1876, 1877, 1878, 1879, and 1880, and and for the first 11 months of 1881.

Mr. E. Hills, treasurer, The Norwalk Iron Works Company, South Norwalk, Conn., furnished January 4, 1882, with a statement showing the annual barometer reduced to sea-level at stations of the Signal Service United States Army, at Denver and Pike's Peak, Colo., Santa Fé, La Mesilla, and Silver City, N. Mex.

Mr. A. L. Reed, 511 Pennsylvania avenue, Washington, D. C., furnished January 5, 1882, with a statement showing the weather at Baltimore, Md., July 26, 1881.

Capt. Thomas Turtle, United States Engineer Office, 70 Saratoga street, Baltimore, Md., furnished January 4, 1882, with a statement showing the amount of precipitation in inches and hundredths, for the years ending June 30, 1880, and June 30, 1881, at Smithville, Wilmington, and Charlotte, N. C.

Mr. Enoch Totten, counselor at law, Washington, D. C., furnished January 7, 1882, with the dates, commencement and ending of all rain and snow storms which occurred at Washington, D. C., from November 1, 1880, to January 31, 1881, with the amount of precipitation in inches and hundredths registered during each day, duly authenticated under the seal of the War Department.

Messrs. Morse & Allen, Boston, Mass., furnished January 7, 1882, with a copy of the original record of observation taken at Boston, Mass., on January 1–February 3, both dates inclusive, duly authenticated under the seal of the War Department.

Messrs. Moore, Canfield & Warner, 556 Moffat Building, Detroit, Mich., furnished January 7, 1882, with a copy of the original record of observations taken at Grand Haven, Mich., on October 21, 22, 23, and 24, 1879; daily bulletin of synopses, indications, and facts for same dates, duly authenticated under the seal of the War Department.

Mr. A. G. Riddle, attorney at law, Washington, D. C., furnished January 10, 1882, with a copy of the original record of observations (excepting the barometer readings) taken at Washington, D. C., on December 18–26, inclusive, duly authenticated under the seal of the War Department.

Messrs. Maynard & Swan, 53 Seitz Block, Detroit, Mich., furnished January 10, 1882, with a statement showing the velocity of the wind in miles per hour at Erie, Pa., at each hour from 12 noon of November 20 to 6 p. m. of November 21, 1880, duly authenticated under the seal of the War Department.

Mr. F. S. Carter, Mount Holly, N. J., furnished January 11, 1882, with a statement showing the direction and velocity of the wind at 7 and 11 a. m. and 11 and 7 p. m. (Washington mean time), direction of wind at time of maximum velocity, and maximum velocity in past eight hours on September 26, 1881, at Philadelphia, Pa., Atlantic City and Sandy Hook, N. J.

The Chief of Engineers, Washington, D. C., furnished January 11, 1882, with a statement showing the amount of precipitation in inches and hundredths, registered at Escanaba, Mich., La Crosse, Madison, and Milwaukee, Wis., for each, from the commencement of observations to December 31, 1881.

Mr. A. C. DeMerritt, assistant engineer, department of city works, Brooklyn, N. Y., furnished January 12, 1882, with a statement showing the amount of precipitation in inches and hundredths registered at New York City, and Sandy Hook, N. J., during each month of the year 1881.

Messrs. Moore, Canfield & Warner, attorneys at law, Detroit, Mich., furnished January 12, 1882, with a statement showing the times cautionary signals were ordered to be displayed, when lowered, and the maximum velocity of the wind during the display at Grand Haven, Mich., and Milwaukee, Wis., from October 21–24, 1879, inclusive; copy of daily bulletin of synopses and facts for October 21 to 24, 1879; copy of original record of observations (excepting barometer) taken at Grand Haven and Milwaukee on October 21–24, 1879, duly authenticated under the seal of the War Department.

Mr. Henry F. Knapp, National Hotel, Washington, D. C., furnished January 12, 1882, with a statement showing the highest and lowest stages of water in the Mississippi river at Vicksburg, Miss.; Memphis, Tenn.; Cairo, Ill.; Saint Louis, Mo., and Saint Paul, Minn., for each year from 1875 to 1880, inclusive.

Mr. de B. Randolph Keim, Washington, D. C., furnished January 12, 1882, with a statement showing the mean, maximum, and minimum temperatures; mean relative humidity; precipitation in inches and hundredths; prevailing direction of wind; and number of days on which rain or snow fell at Philadelphia, Pa., for each month of the years 1880 and 1881.

Messrs. Reithmann & Woodhall, 249 Fifteenth street, Denver, Colo., furnished January 12, 1882, with a statement showing the temperature at 7 a. m., 3 and 11 p. m., and the mean temperature on November 28 and 29, 1881, at Leavenworth, Lawrence, Topeka, and Manhattan, Kans.

Mr. John Tatlock, jr., Williams College Observatory, Williamstown, Mass., furnished January 14, 1882, with a statement showing the mean temperature and relative humidity at Boston, Mass., Burlington, Vt., and Mount Washington, N. H., the former from January, 1873, to December, 1875, inclusive, and the latter from July, 1873, to December, 1877, inclusive.

Messrs. H. and D. S. Riker, 45 Cedar street, New York City, N. Y., furnished January 16, 1882, with a statement showing the state of the weather and the precipitation in inches and hundredths, registered at the station of observation of the Signal Service U. S. Army, at New York City, N. Y., for each day from June 7 to July 15, 1880, and from November 8 to 14, 1881.

The Chief Signal Officer, U. S. Navy, furnished January 17, 1882, with records of observations taken at the stations of the Signal Service, U. S. Army, New York City.

Messrs. Moore, Canfield & Warner, attorneys at law, Detroit, Mich., furnished January 17, 1882, with a statement showing the movement of the wind in miles at Erie, Pa., and Buffalo, N. Y., for each hour from 10 a. m. November 19, to 10 a. m. November 21, 1880; statement showing the time of hoisting and lowering cautionary signals, &c., at Erie, Pa., and Buffalo, N. Y., on days named, in November, 1880; statement showing the direction of the wind at Buffalo, N. Y., and Erie, Pa., at each observation from 7 a. m. of November 19 to 10 p. m. of November 21, 1880, all duly authenticated under the seal of the War Department.

Mr. L. L. Slyfield, Erie, Pa., furnished January 17, 1882, with a statement showing the direction and velocity of the wind at Erie, Pa., at 6.45 and 11 a. m., 2, 2.47, 9, and 10.47 p. m., on November 19 and 20, 1880, duly authenticated under the seal of the War Department.

Mr. W. A. Scott, attorney at law, Springfield, Ohio, furnished January 17, 1882, with a statement showing the thermometer readings at Pittsburg, Pa., at 6.48, 7, and 10.48 a. m., 2, 2.48, 9, and 10.48 p. m., and the maximum, mean, and minimum for each day from February 10–16, 1881, inclusive, duly authenticated under the seal of the War Department.

Mr. Chas. B. Lothrop, Detroit, Mich., furnished January 18, 1882, with a statement showing the direction and velocity of the wind at Milwaukee, Wis, at each observation during October 20, 21, and 22, 1879; statement showing the time of hoisting and lowering signals, with commencement and ending of gale, and maximum velocity of the wind in miles per hour during the display at Grand Haven, Escanaba, and Milwaukee, from November 18–25, 1879; statement showing the direction and velocity of the wind in miles per hour at Escanaba and Grand Haven, Mich., and Milwaukee, Wis., at each observation during November 20, 21, 22, 23, 24, and 25, 1879, all duly authenticated under the seal of the War Department.

Dr. H. B. Horlbeck, secretary board of trade, Charleston, S. C., furnished January 18, 1882, with a copy of the meteorological summary at Charleston, S. C., for 1881.

Mr. Geo. H. Morgan, secretary Merchants' Exchange, Saint Louis, furnished January 19, 1882, with a set of charts showing the temperature at 6.07 a. m., 2.07 and 10.07 p. m., rainfall and stage of water for each day of each month of 1881.

Mr. E. S. Reese, attorney at law, 51 West Fayette street, Baltimore, Md., furnished January 27, 1882, with a copy of the original record of observations taken at Baltimore, Md., on July 30, 1880, and a copy of abstract of journal for July 20, 1880, at same place, duly authenticated under the seal of the War Department.

Mr. W. B. Beach, 29 Weybosset street, Providence, R. I., furnished January 27, 1872, with a statement showing the state of weather on July 6–13, 1877, inclusive, at Boston, Thatcher's Island, and Wood's Holl, Mass., Burlington, Vt., Eastport and Portland, Me., New Haven and New London, Conn., and Newport, R. I., duly authenticated under the seal of the War Department.

Prof. S. F. Baird, Secretary of the Smithsonian Institution, Washington, D. C., furnished January 28, 1882, with a statement showing precipitation in inches and hundredths at North Platte, Nebr., for December, 6, 1879, and average daily rainfall for June, 1880.

Mr. D. C. Chase, superintendent Delaware and Raritan Canal, 377 West street, New

York City, furnished February 1, 1882, with a statement showing the velocity of the wind in miles per hour at New York City, at half-hourly intervals from 5.30 p. m. to 10 p. m. of March 27, 1877, duly authenticated under the seal of the War Department.

Mr. William Manning, Hays City, Ellis County, Kansas, furnished February 2, 1882, with a statement showing the precipitation for each month from the commencement of observations to January 1, 1882, at Atlanta, Buffalo, Chicago, Denver, Fort Sill, Galveston,, Leavenworth, Mobile, New Orleans, Oswego, Portland, Oreg., Portland, Me., Boston, New York City, Salt Lake City, San Francisco, Saint Louis, Saint Paul, Wilmington, and Yuma.

Mr. Raphael Pumpelly, director Northern Trans-continental Survey, Newport, R. I., furnished February 2, 1882, with a statement showing the barometric observations taken at Olympia and Dayton, Wash., from September 9 to November 6, 1881.

Dr. Irving Rosse, Willard's Hotel, Washington, D. C., furnished February 2, 1882, with a meteorological summary of observations taken at the Signal Service station at Fort Saint Michael's, Alaska, from July to December, 1880, inclusive, made from he records on file at the Office of the Chief Signal Officer.

Lieut. Col. C. B. Comstock, Detroit, Mich., furnished February 3, 1882, with a statement showing the number of times during the years 1878, 1879, and 1880, the velocity of the wind at 7.35 a. m. exceeded 15 miles per hour at Smithville, N. C.

Prof. Elias Loomis, Yale College, New Haven, Conn., furnished February 6, 1882, with a statement showing the annual amount of rainfall for 1878 and 1879 at the following stations: San José, Zi-ka-wei, Hiroshima, Nagasaki, Tokei, Wakayama, Colima, Guadalayara, Guanarnto, Lein, Mazalin, Mexico, Pueblo, Pabellon, San Luis Potosi, Hacelulpam, Vera Cruz, Lacutecus, Havana, San Fernando, San Juan de Porto Rico, Manilla, York Factory, Kingst n, Navassa, Paramaribo, Batavia, Medellin, St. Thomas, W. I.

Mr. W. E. Cass, No. 2 Summer Place, Newark, N. J., furnished February 6, 1882, with a statement showing the mean maximum and minimum temperature and precipitation in inches and hundredths at Cape May, N. J., for each month of the year 1881.

Mr. William Thompson, President, Inland and Seaboard Coasting Company, 613 Fifteenth street, Washington, D. C., furnished February 7, 1882, with a copy of the observations taken at Delaware Breakwater at 7.08 and 11.08 a. m., 3.08 and 11.08 p. m., on January 1 and 2, 1882, duly authenticated under the seal of the War Department.

Mr. E. B. Hagar, Assistant City Collector, 26 Pemberton Square, Boston, Mass., furnished February 7, 1882, with a copy of the original record of all observations taken at Boston, Mass., January 3, 1881, with the exception of the barometer, duly authenticated under the seal of the War Department.

Mr. John L. Hammer, Collector of Customs, Philadelphia, Pa., furnished February 7, 1882, with a statement showing the maximum and minimum temperature, state of weather, and precipitation at Philadelphia, Pa., for each day from November 22, 1879, to January 9, 1880, inclusive, duly authenticated under the seal of the War Department.

Mr. Samuel Little, Mustopha, Algiers, Algeria, furnished February 8, 1882, with a statement showing the normal temperature at Colorado Springs, Colo., for the months March to July, inclusive.

Mr. E. R. Sharwood, secretary Maritime Exchange, Philadelphia, Pa., furnished February 8, 1882, with a statement showing the direction and velocity of the wind at Cape Henry and Norfolk, Va., at the 7 a. m. and 3 p. m. (Washington time) observations of November 1–4, inclusive.

Mr. J. Emory Owen, Detroit, Mich., furnished February 9, 1882, with a statement showing the direction and velocity of the wind for every half hour at Detroit, Mich., on October 1, 1881; also the times of hoisting and lowering of the cautionary signal from September 29 to October 1, 1881, duly authenticated under the seal of the War Department.

Mr. Robert Bell, Pittsburg, Pa., furnished February 10, 1882, with a statement showing the temperature and state of weather at 6.48, 10.48 a. m., 2.48, 6.48, and 10 48 p. m., and the maximum and minimum temperature for each day from December 1, 1881, to January 31, 1882 inclusive, at Pittsburg, Pa., duly authenticated under the seal of the War Department.

Messrs. I. & C. Moore & Co., Donnell Building, Baltimore, Md., furnished February 10, 1882, with a copy of the original record showing the temperature and wet-bulb, dew-point, relative humidity, clouds, rain, or snow, and state of weather at each observation at Baltimore, Md., on January 3, 4, and 5, 1882, duly authenticated under the seal of the War Department.

Messrs. Thorp & Hughes, 106 Main street, Norfolk, Va., February 13, 1882, furnished with a copy of the original record of observations taken at Hatteras, N. C., on November 24–December 3, 1881, inclusive, duly authenticated under the seal of the War Department.

Mr. Frank E. Velzy, 216 Washington street, Buffalo, N. Y., furnished February 13,

1882, with a statement showing the days between October 1, 1881, and January 16, 1882, on which rain or snow fell, and on which the temperature of the air did not rise to 32°, and also all days on which it fell below 32° at Buffalo, N. Y., duly authenticated under the seal of the War Department.

Mr. Norman D. Sampson, appraiser's office, custom-house, New York City, furnished February 13, 1882, with a statement showing the rainfall and state of weather at each observation at New York City on March 22, 23, and 24, 1881, duly authenticated under the seal of the War Department.

Messrs. W. B. Dana & Co., No. 79 and 81 William street, New York City, furnished February 13, 1882, with the monthly reports of rainfall and temperature for December 1881, at Castroville, San Antonio, Denison, and Decatur, Tex.; Portsmouth, Kitty-hawk and Charlotte, N. C.; Charleston, S. C.; and Mobile, Ala.

Messrs. J. C. Dodge & Sons, 85 Milk street, Boston, Mass., furnished February 20, 1882, with a copy of the original record of observations taken at Thatcher's Island, Mass., November 30, December 1 and 2, 1881, duly authenticated under the seal of the War Department.

Mr. W. C. Whitney, Staats-Zeitung Building, New York City, furnished February 21, 1882, with a statement showing the precipitation at New York City from November 20 to December 28, 1880; also thermometric readings at each observation, and daily maximum and minimum temperature at same place from December 25 to 28, 1880.

Messrs. Sharp & Hughes, 106 Main street, Norfolk, Va., furnished February 21, 1882, with a copy of the original record for January 21 to 24, 1882, from stations at Kitty-hawk and Cape Hatteras, N. C.

Messrs. Dexter, Herrick & Allen, 23 Portland Block, Chicago, Ill., furnished February 23, 1882, with a statement showing the amount of clouds and state of weather January 17, 18, and 19, 1881, at Chicago, Ill.

Mr. R. C. Wilbur, Aurora, Ind., furnished February 23, 1882, with a statement showing the mean temperature at Moorhead, Minn., for the months of June, July, and August.

Mr. W. A. Everman, secretary Board of Mississippi Levee Commissioners, Greenville, Miss., furnished February 23, 1882, with a statement showing the highest water in the rivers and dates of same at Cairo, Chattanooga, Cincinnati, Davenport, Helena, Leavenworth, Little Rock, Louisville, Memphis, New Orleans, Saint Paul, Saint Louis, Vicksburg, and Nashville.

Mr. R. C. Richards, general claim agent, Chicago and Northwestern Railroad, Chicago, Ill., furnished February 23, 1882, with a statement showing the temperature at Chicago, Ill., from November 13 to 15, 1881, inclusive.

Mr. H. J. Fallon, Cotton Exchange, Hanover Square, New York City, furnished February 25, 1882, with a statement showing the average precipitation for each month of 1881 at Atlanta, Augusta, Baltimore, Charleston, Charlotte, Chattanooga, Corsicana, Denison, Galveston, Indianola, Jacksonville, Key West, Knoxville, Louisville, Memphis, Mobile, Montgomery, Morgantown, Nashville, New Orleans, Norfolk, Punta Rassa, Saint Louis, San Antonio, Savannah, Vicksburg, Washington, and Wilmington.

Prof. Simon Newcomb, superintendent Nautical Almanac, Washington, D. C., furnished February 27, 1882, with a statement showing the average cloudiness (on a scale of 1 to 10) at noon at the places named from December 1 to 15: Augusta, Cairo, Charlotte, Memphis, Montgomery, New York, Pittsburg, and Washington.

Mr. Julius Fellner, 129 Federal street, Boston, Mass., furnished February 28, 1882, with a statement showing the monthly temperature at Jacksonville, Fla., and Los Angeles, Cal., from 1876 to 1881, inclusive.

Mr. Charles C. Davis, No. 58 West Third street, Cincinnati, Ohio, furnished March 1, 1882, with a statement showing the maximum, minimum, and mean temperature, rainfall, number of days on which rain or snow fell, and the total movement of the wind at Santa Fé and Socorro, N. Mex., and Bismarck, Dak., for each month from January, 1879, to February, 1882, inclusive.

Mr. R. H. Tucker, 361 Columbus avenue, Boston, Mass., furnished with a copy of the original record of observations taken at Boston, Thatcher's Island, and Portland, on September 7-20, 1881, inclusive (excepting the barometer, wet-bulb, dew-point, relative humidity, and cloud observations), duly authenticated under the seal of the War Department.

Mr. Wm. Brown, Saint Louis, Mo., furnished March 6, 1882, with a statement showing the direction and velocity of the wind at each observation taken at Toledo, Ohio, on February 11, 1881, duly authenticated under the seal of the War Department.

Messrs. John C. Dodge & Sons, No. 85 Milk street, Boston, Mass., furnished March 6, 1882, with a copy of the anemometer sheets of Thatcher's Island, Mass., for November 30, December 1 and 2, 1881, duly authenticated under the seal of the War Department.

Mr. J. Herrick Henry, No. 52 William street, New York City, furnished March 9, 1882, with a copy of the original record of observations taken at New York City on July 29 and 30 and August 9 and 10, 1879; March 15 and 16, 1880, with the exception

of the barometer and the thermometer readings, duly authenticated under the seal of the War Department.

Mr. Raphael Pumpelly, director Northern Transcontinental Survey, Newport, R. I., furnished March 11, 1882, with a statement showing the readings of the attached and exposed thermometers at 3.56 and 11.56 a. m. and 7.56 p. m. observations on September 9–November 6, 1881, inclusive, taken at Olympia and Dayton, Wash.

Dr. John G. Lee, No. 129 South Thirteenth street, Philadelphia, Pa., furnished March 13, 1882, with a statement showing the highest and lowest range of the barometer, and maximum and minimum and range of temperature, precipitation, number of days on which rain or snow fell, and prevailing wind at Philadelphia, Pa., for each month from January, 1873, to December, 1881, inclusive.

Mr. Charles E. Buell, 1524 G street northwest, Washington, D. C., furnished March 13, 1882, with a statement showing the monthly and annual movement of the wind for 1881 at Boston, Buffalo, New Orleans, Omaha, San Francisco, and Washington.

Mr. John Tatlock, jr., Williamstown, Mass., furnished March 15, 1882, with a statement showing the mean relative humidity at Portland, Me., for the years 1873, 1874, 1875, 1876, and 1877.

Anglo-American Packing and Provision Company, Kansas City, Mo., furnished March 15, 1882, with a statement showing the highest temperature of the Missouri river at Omaha, Nebr., and Yankton, Dak., during the months of June, July, and August, 1877.

Messrs. Spaan & Heiner, Indianapolis, Ind., furnished March 17, 1882, with a statement showing the maximum temperature, the time of beginning, ending, and amount of precipitation in inches and hundredths, which fell at Indianapolis, Ind., each day from November 1 to 24, 1880.

John R. Page, M. D., University of Virginia, Charlottesville, Va., furnished March 18, 1882, with a statement showing the temperature and precipitation at Lynchburg, Va., for each month from January, 1873, to December, 1881.

Quartermaster-General, United States Army, furnished March 20, 1882, with a statement showing the mean daily barometer and mean thermometer at Washington, D. C., from observations taken at 7 a. m., 2 and 9 p. m., on July 23, 25, 28, 29, August 11, 12, 13, December 13, 15, 16, and 17, 1880; also showing the monthly mean thermometer from observations taken at 7 a. m., 3 and 11 p. m., from July 1, 1881, to March 1, 1882.

Mr. Michael Moran, 13 and 14 South street, New York City, furnished March 21, 1882, with an extract from the original records of observation taken at New Haven, Conn., February 10, 1882.

Messrs. Morse & Allen, counsellors at law, Boston, Mass., furnished March 24, 1882, with a statement showing the condition of the weather at each observation taken at Boston, Mass., on July 27, 1880; also copy of anemometer sheet from midnight of July 26, 1880, to midnight of July 27, 1880, duly authenticated under the seal of the War Department.

Mr. Erastus New, 140 Nassau street, New York City, furnished March 24, 1882, with a statement showing the record of precipitation at New York City from December 1, 1880, to January, 1881, duly authenticated under the seal of the War Department.

The president, West Virginia University, Morgantown, W. Va., furnished March 27, 1882, with a statement showing the annual means at Morgantown, W. Va., for the year 1881.

Editor, Globe-Democrat, Saint Louis, Mo., furnished March 28, 1882, with a statement showing the depth of unmelted snow lying on the ground on March 1 of years 1878–1882, inclusive, at Bismarck, Fort Benton, Fort Buford, Fort Stevenson, Leavenworth, Omaha, Saint Louis, and Yankton.

Mr. Thomas Pinckney, general agent East Tennessee, Virginia and Georgia Air-Line, 303 Broadway, New York City, furnished March 28, 1882, with a statement showing temperature observations made by the observer of the Signal Service, U. S. Army, at Lynchburg, Va., on December 29, 30, and 31, 1880.

Messrs. Peabody, Baker & Peabody, 110 Broadway, New York City, furnished March 29, 1882, with a statement showing the minimum temperature at New York City on each day, from October 1, 1880, to May 1, 1881.

Quartermaster-General, U. S. Army, furnished March 29, 1882, with a statement showing the mean daily barometer and mean daily thermometer at Washington, D. C., from observations at 7 a. m., 3 and 11 p. m. for each day from July, 1881, to March 1, 1882.

Mr. John B. Freeman, civil engineer, Essex Company, Lawrence, Mass., furnished March 30, 1882, with a statement showing the rainfall in inches and hundredths at Forts Concho, Davis, Elliott, and Griffin, Tex., from the commencement of observations to and including December, 1881.

Mr. George J. Young, 642 Second avenue, New York City, furnished March 31, 1882, with a copy of the original record of observations taken on February 25, 1882, at New York City, duly authenticated under the seal of the War Department.

Mr. Thomas Pinckney, general agent East Tennessee, Virginia and Georgia Air-Line,

303 Broadway, New York City, furnished March 31, 1882, with a statement showing the thermometer readings at Norfolk, Va., from December 24–28, 1880, both dates inclusive.

Mr. J. Connor, chief of the Indiana State Bureau of Statistics, Indianapolis, Ind., furnished April 5, 1882, with a statement showing the annual mean of barometer and thermometer, and relative humidity, highest and lowest temperatures, prevailing direction of wind, number of clear, fair, and cloudy days, average amount of cloudiness, number of days on which 0.01 inches or more of rain or snow fell, total rainfall, greatest rainfall in 24 consecutive hours, number of days on which maximum and minimum temperature was below freezing-point, and number of days on which temperature rose above 90 degrees; also statement showing monthly mean barometer and thermometer and total amount of rain or melted snow, highest and lowest thermometer, highest and lowest barometer for each year of the decade ending December 31, 1881, at Indianapolis, Ind.

Mr. Alex. Heron, secretary, Indiana State Board of Agriculture, Indianapolis, Ind., furnished with a statement showing daily and monthly mean barometer, daily and monthly mean temperature for each day and each month, and mean barometer, thermometer, and relative humidity, maximum and minimum temperature, prevailing direction of wind, number of clear, fair, and cloudy days, average amount of cloudiness, number of days on which 0.01 inches or more rain or snow fell, total amount of rainfall, and number of days on which temperature fell below freezing point at Indianapolis, Ind.

Mr. L. W. Madarasz, San Antonio, Tex., furnished April 11, 1882, with a statement showing temperature at Fort Davis from April, 1878, to February, 1882.

Mr. C. S. Dewey, city attorney, Indianapolis, Ind., furnished April 11, 1882, with a statement showing the temperature and rainfall at Indianapolis, Ind., from January 31 to February 3, 1881.

Messrs. Goodrich, Deady & Platt, 59 and 61 Wall street, New York City, furnished April 11, 1882, with a copy of anemometer sheets from Newport, R. I., for March 26 to 29, 1882.

Messrs. Goodrich, Deady & Platt, 59 and 61 Wall street, New York City, furnished April 12, 1882, with a statement showing direction and velocity of the wind at New London, Conn., and Newport, R. I., March 27 and 28, 1882.

Messrs. Pritchard & Wolfe, 5½ North Park street, Mansfield, Ohio, furnished April 13, 1882, with a statement of annual and mean annual amount of precipitation at Bellefontaine, Cincinnati, Cleveland, Columbus, Hillsborough, Ringgold, Ruggles, Sandusky, and Toledo, Ohio, for years 1871 to 1879, inclusive.

Lieut. Smith S. Leach, secretary of Mississippi River Commission, 2828 Washington avenue, Saint Louis, Mo., furnished April 13, 1882, with a statement showing precipitation at Cairo, Cincinnati, Columbus, Indianapolis, Little Rock, Louisville, Memphis, New Orleans, Pittsburg, and Vicksburg from December 1, 1881, to April 1, 1882.

Messrs. P. S. Chappell & Son, Baltimore, Md., furnished April 15, 1882, with a statement showing direction of wind at Baltimore, Md., August to December, 1879.

Messrs. Goodrich, Deady & Platt, 59 and 61 Wall street, New York City, furnished April 15, 1882, with a statement showing meteorological observations taken at Newport, New London, and Fall River stations for March 27 and 28, 1882.

Mr. Edward McKinley, 291 Broadway, New York City, furnished April 17, 1882, with a statement showing weather record at New York City from January 31 to February 6, 1882.

Mr. Jno. A. Starin, Pier 18 North River, New York City, furnished April 17, 1882, with a statement showing temperature at New York from March 8 to 19, 1881.

Mr. Frank Huger, superintendent transportation, Norfolk and Western Railroad, Lynchburg, Va., furnished April 19, 1882, with a copy of the original record at Lynchburg, Va., for December 2 and 3, 1881.

Col. Geo. E. Waring, jr., special agent, Census Office, Newport, R. I., furnished April 24, 1882, with a statement showing the highest and lowest temperatures recorded at Philadelphia, Pa., for each year from 1871 to 1881 inclusive.

Messrs. Sharp & Hughes, Norfolk, Va., furnished April 24, 1882, with a statement showing the direction and velocity of wind at Chincoteague, Va., and Delaware Breakwater, Del., on March 23–26, 1882, inclusive, at each observation, duly authenticated under the seal of the War Department.

Messrs. Wm. and Lew. Wallace, attorneys at law, Indianapolis, Ind., furnished April 24, 1882, with a statement showing the temperature and precipitation at Indianapolis, Ind., for each observation from November 20, to December 31, 1879, duly authenticated under the seal of the War Department.

Mr. S. T. Abert, United States civil engineer, Washington, D. C., furnished April 24, 1882, with a statement showing the amount of precipitation which fell at Washington, D. C., during November, 1877, and February, 1881.

Mr. Chas. A. Fisher, secretary of State Board of Health, Providence, R. I., furnished April 26, 1882, with a statement showing the mean, maximum, and minimum

temperatures, monthly range, greatest average daily range of temperature, total amount of rainfall, and prevailing direction of wind for each month of 1881 at Newport, R. I.

Messrs. Pritchard & Wolfe, Mansfield, Ohio, furnished May 1, 1882, with a statement showing the precipitation at Hillsborough, Ringgold, and Ruggles, Ohio, for each month from the commencement of observations to December, 1880; also showing the amount of precipitation at Cincinnati, Cleveland, Sandusky, and Toledo, Ohio, for each month from January, 1871, to January, 1882, duly authenticated under the seal of the War Department.

Mr. George L. Buzey, secretary, Philadelphia Board of Trade, Philadelphia, Pa., furnished, May 6, 1882, with a copy of the original record of observations taken at Delaware Breakwater, Del., April 10 and 11, 1882.

Mr. E. C. Morrison, civil engineer, Morrisania Station, New York City, furnished May 8, 1882, with a statement showing amount of precipitation at Marquette, Mich., for each month from June, 1871, to April 1, 1882.

Messrs. Goodrich, Deady, & Platt, 59 and 61 Wall street, New York City, furnished May 8, 1882, with a statement showing the direction and velocity of the wind at New York City and Sandy Hook, at each observation taken on September 15, 1881, duly authenticated under the seal of the War Department.

Mr. A. N. Fuller, Hermosa, La Plata County, Colorado, furnished May 8, 1882, with a statement showing the mean annual temperature and precipitation (as deduced from the average of many yearly means) for New York City, Chicago, Saint Louis, Denver, Santa Fé, Leavenworth, and San Francisco.

Messrs. John Livermore & Co., 24 West Front street, Cincinnati, Ohio, furnished May 12, 1882, with a statement showing temperature, dew-point, humidity, direction, and velocity of winds, clouds, precipitation, and state of weather at New York City, April 11 to 15, 1882.

Capt. W. S. Stanton, engineer barracks, West Point, N. Y., furnished May 13, 1882, with a statement showing the barometer readings, the wet and dry-bulb thermometers at Salt Lake City, Cheyenne, and Yankton for each day from July 13 to August 31, 1881, inclusive.

Mr. John K. Mac Iver, secretary Detroit Board of Trade, Detroit, Mich., furnished May 15, 1882, with a statement showing the mean, maximum, and minimum temperatures at Chicago, Detroit, Indianapolis, Cincinnati, Louisville, and Toledo.

Mr. C. G. Dillon, Zanesville, Ohio, furnished May 22, 1882, with a statement showing the precipitation, in inches and hundredths, at stations at Fort Benton, Fort Custer, Fort Keogh, Fort Shaw, and Helena, Mont., Fort Buford, Dak., and Virginia City for each month from commencement of observations to April, 1882.

Mr. Jerome T. Johnson, Detroit, Mich., furnished May 22, 1882, with a statement showing state of weather in that city Saturday, January 11, 1879.

Mr. A. B. Jackson, Oshkosh, Wis., furnished May 22, 1882, with a statement showing the monthly precipitation, in inches and hundredths, at Milwaukee and Madison, Wis., for the months of June to December, 1875–1880, also at voluntary stations at Embarrass, Manitowoc, and Ripon, Wis., for same periods.

Mr. William E. Cass, Newark, N. J., furnished May 23, 1882, with a statement showing mean annual temperature and rainfall for a number of years and for 1881 at New York, Philadelphia, Cape May, Sandy Hook, Barnegat, and Atlantic City.

Mr. William A. Dodge Stokes, 37 Madison avenue, New York City, furnished May 23, 1882, with a statement showing thermometer readings, and state of the weather at New York City during the months of May, June, and July, 1881.

Mr. H. Constable, office general superintendent, Lake Erie and Western Railroad, New York City, furnished May 25, 1882, with a statement showing the movement of the wind at New York City for 1880.

Mr. Julius A. Dowling, 1129 Thirteenth street northwest, Washington, D. C., furnished May 27, 1882, with a statement showing the condition of the weather in Washington City March 30 and 31, and April 1, 1882.

Messrs. Moore, Canfield & Warner, Detroit, Mich., furnished May 27, 1882, with a statement showing direction and velocity of the wind at Cleveland, Ohio, October 3 to 5, inclusive; also when storm signals were raised and lowered on those dates.

Mr. A. H. Garrettson, Keokuk, Iowa, furnished May 27, 1882, with a statement showing river record during September, October, and November, 1881, at Keokuk, Iowa.

Messrs. Goodrich, Deady & Platt, 59 and 61 Wall Street, New York City, furnished May 29, 1882, with a statement showing direction and velocity of the wind at New York City on March 5, 1880.

Messrs. Martin & Smith, 50 Wall street, New York City, furnished May 29, 1882, with a statement showing mean temperature and precipitation from all stations of the Signal Service for years 1879, 1880, and 1881.

Messrs. Coloney, Talbot & Co., Jacksonville, Fla., furnished May 31, 1882, with a statement showing the character of the weather at Jacksonville, Fla., for year 1881.

Mr. Thomas H. Brents, 933 K street, Washington, D. C., furnished June 3, 1882, with

a statement showing temperature and precipitation at Portland, Oreg.; Almota, Colfax, Dayton, and Olympia, Wash.; and Lewiston, Idaho, for each month from January, 1879, to April, 1882.

Mr. J. B. Collier, care of Collier, Budd & Co., Cincinnati, Ohio, furnished June 3, 1882, with a statement showing precipitation at Pittsburg, Pa., from November 1, 1870, to April 30, 1882; also record of river observations at Pittsburg from February 1, 1881, to May 1, 1882.

Mr. J. B. Baird, general office, C., St. P., M. & O. R. R., Saint Paul, Minn., furnished June 5, 1882, with a statement showing highest and lowest temperatures at stations in California from commencement of operations to April 30, 1882.

Mr. A. L. Philips, Washington, D. C., furnished June 5, 1882, with a statement showing average precipitation at Washington for each month from November 1, 1870, to May, 1881, and actual precipitation from November, 1881, to May, 1882.

M. D. Youngman, M. D., Atlantic City, N. J., furnished June 5, 1882, with a statement showing means of barometer, temperature, rainfall, and total movement of wind at Atlantic City, Barnegat, Cape May, and Long Branch, N. J., Boston, Mass., Charleston, S. C., Chicago, Ill., Cleveland, Ohio, Jacksonville, Fla., New York City, Nashville, Tenn., New Orleans, La., Saint Louis, Mo., Savannah, Ga., Wilmington, N. C., Philadelphia, Pa., and Washington, D. C.

Mr. J. W. Powell, Director, Geological Survey, Washington, D. C., furnished June 6, 1882, with a statement showing barometer, temperature, and humidity at Santa Fé, N. Mex., from August 1 to October 3, 1881.

The Graphic Company, Mr. P. Girard, editor, New York City, furnished June 10, 1882, with a statement showing mean temperature at Chicago, Cincinnati, New York, Saint Louis, and Saint Paul, for the month of May, 1880, 1881, and 1882.

Mr. W. C. Williamson, 46 Court street, Boston, Mass., furnished June 12, 1882, with a statement showing temperature, direction and velocity of wind, clouds, rainfall, and state of weather at Thatcher's Island, Mass., May 9, 1882.

Mr. Chas. P. Dillaway, Roxbury, Mass., furnished June 14, 1882, with a statement showing temperature at Atlantic City, N. J., and Norfolk, Va., at 7 and 11 a. m., and 3 p. m. from March 1 to May 1, 1882.

Mr. Chas. A. Elliott, 408 Fifth street northwest, Washington, D. C., furnished June 14, 1882, with a statement showing temperature at Washington from October 7 to 15, 1877, and from March 20 to April 12, 1878.

Mr. W. H. Shellman, office of Fuller & Fuller, 20 to 28 Market street, Chicago, Ill., furnished June 14, 1882, with a statement showing mean temperature and amount of rainfall at stations in Dakota from commencement of observations to May 31, 1882.

Mr. George E. Walton, 224 Laurel street, Cincinnati, Ohio, furnished June 15, 1882, with a statement showing mean relative humidity at Saint Paul, Minn., and San Antonio, Tex., at the three telegraphic observations for each month of the years 1877, 1879, 1880, and 1881.

Sergeant N. B. Conger, Signal Corps, U. S. Army, Duluth, Minn., furnished (for attorneys at above-named place) with a statement showing direction and velocity of wind and state of weather at Duluth, Minn., at 6 and 10 a. m. and 10 p. m. for each day from May 1 to December 31, 1881, duly authenticated under the seal of the War Department.

Mr. J. W. Sneed, attorney-at-law, Knoxville, Tenn., furnished June 21, 1882, with a copy of the original record of observations taken at Washington, D. C., on August 7, 1880, duly authenticated under the seal of the War Department.

Mr. George S. Hale, 39 Court street, Boston, Mass., furnished June 23, 1882, with a statement showing average precipitation at Eastport and Portland, Me., for each month from April to September, inclusive.

Mr. G. R. Talcott, superintendent, C. C. and A. R. R., Columbia, S. C., furnished June 24, 1882, with a statement showing the amount of rainfall and state of weather at each observation taken at Charlotte, N. C., on January 24 to 28, 1881, duly authenticated under the seal of the War Department.

Managing editor, Galveston News, Galveston, Tex., furnished June 24, 1882, with a statement showing the mean annual rainfall at Brackettville, Brownsville, Castroville, Concho, Corsicana, Decatur, Denison, Eagle Pass, El Paso, Fort Davis, Fort Elliott, Fort Griffin, Fort McKavett, Fredericksburg, Galveston, Indianola, Jacksborough, Laredo, Mason, Rio Grande City, San Antonio, Stockton, Uvalde, and Shreveport.

Mr. Lewis S. Ware, editor, The Sugar Beet, 810 Walnut street, Philadelphia, Pa., furnished June 24, 1882, with a statement showing the mean temperature, rainfall, number of days on which rain or snow fell at Delaware Breakwater and Dover, Del., for April, May, June, July, August, September, and October, 1880 and 1881.

Sergeant N. B. Conger, Signal Corps, U. S. Army, Duluth, Minn. (for United States attorney at Saint Paul), furnished, June 27, 1882, with a statement showing the temperature at 7 and 11 a. m., 7, 3, and 11 p. m., on November 3 to 16, 1881, at Duluth, Minn., duly authenticated under the seal of the War Department.

Messrs. J. C. Dodge & Sons, 85 Milk street, Boston, Mass., furnished, June 29, 1882, with a copy of original record of observation (excepting barometer), taken at Boston, Mass., on October 15, 1881, duly authenticated under the seal of the War Department.

Maj. C. B. Comstock, Corps of Engineers, U. S. Army, Detroit, Mich., furnished weekly, during the year, with a report of the stage of water in river at the following stations:—

REGULAR STATIONS.	SPECIAL STATIONS.
Cairo, Ill.	Boonville, Mo.
Cincinnati, Ohio.	Brunswick, Mo.
Davenport, Iowa.	Evansville, Ind.
Dubuque, Iowa.	Helena, Ark.
Keokuk, Iowa.	Hermann, Mo.
La Crosse, Wis.	Jefferson City, Mo.
Leavenworth, Kans.	Kansas City, Mo.
Louisville, Ky.	LeClaire, Iowa.
Memphis, Tenn.	Lexington, Mo.
New Orleans, La.	Little Rock, Ark.
Omaha, Nebr.	Marietta, Ohio.
Pittsburg, Pa.	Paducah, Ky.
Shreveport, La.	Plattsmouth, Nebr.
Saint Louis, Mo.	Saint Joseph, Mo.
Saint Paul, Minn.	Warsaw, Ill.
Vicksburg, Miss.	
Yankton, Dak.	

Mr. J. H. Turner, editor, Western Farmers' Almanac, Louisville, Ky., furnished monthly during the year with a report of the daily mean, and the daily maximum and minimum temperature; daily mean relative humidity, rainfall in inches; total movement of wind, and character of day at Savannah, Ga.; Cleveland and Toledo, Ohio; Shreveport and New Orleans, La.; Montgomery, Ala.; Saint Paul, Minn.; Salt Lake City; Omaha, Nebr.; Nashville and Memphis, Tenn.; Milwaukee, Wis.; Marquette, Mich.; Galveston, and Fort Elliott, Tex.; Fort Benton, Mont.; Louisville, Ky.; Chicago, Ill.; Denver, Colo.; and Bismarck, Dak.

Engineer in charge, Port Eads, South Pass, La., furnished weekly during the year with a report of the stage of water in river at the following stations: Cairo, Ill.; Cincinnati, Ohio; Keokuk, Iowa; Leavenworth, Kans.; Little Rock, Ark.; Louisville, Ky.; Nashville, Tenn.; New Orleans, La.; Pittsburg, Pa.; Saint Louis, Mo.; Shreveport, La.; Vicksburg, Miss.; and Yankton, Dak.

Capt. A. Mackenzie, Corps of Engineers, United States Army, Rock Island, Ill., furnished weekly during the year with a report of the stage of water in river at the following stations: Dubuque, Iowa; La Crosse, Wis.; Saint Louis, Mo.; Saint Paul, Minn.

The cotton exchanges at Nashville, Tenn.; Saint Louis, Mo.; Memphis, Tenn., and Boston, Mass., furnished each, every week during the year, with a report of the daily rainfall and a total for the week from the following stations: Atlanta, Ga.; Augusta, Ga.; Baltimore, Md.; Cedar Keys, Fla.; Charleston, S. C.; Cincinnati, Ohio; Corsicana, Tex.; Denison, Tex.; Fort Gibson, Ind. T.; Galveston, Tex.; Indianola, Tex.; Jacksonville, Fla.; Knoxville, Tenn.; Little Rock, Ark.; Louisville, Ky.; Lynchburg, Va.; Memphis, Tenn.; Mobile, Ala.; Montgomery, Ala.; Nashville, Tenn.; New Orleans, La.; Norfolk, Va.; San Antonio, Tex.; Savannah, Ga.; Shreveport, La.; Vicksburg, Miss., and Wilmington, N. C.

Messrs. W. B. Dana & Co., 79 and 81 William street, New York City, furnished, monthly during the year, with a report of the mean temperature, total rainfall, and anything that will affect the crops, such as drought, &c., from the following stations: Augusta, Ga.; Cedar Keys, Fla.; Charleston, S. C.; Galveston, Tex.; Indianola, Tex.; Jacksonville, Fla.; Memphis, Tenn.; Mobile, Ala.; Montgomery, Ala.; Nashville, Tenn.; New Orleans, La.; Norfolk, Va.; Savannah, Ga.; Shreveport, La.; Vicksburg, Miss.; Wilmington, N. C.; Charlotte, N. C.; Decatur, Tex.; Denison, Tex.; Kittyhawk, N. C.; Portsmouth, N. C.; Palestine, Tex., and San Antonio, Tex.

Prof. Chas. Carpmael, Toronto, Canada, furnished monthly, during the year, with a report of barometric and thermometric means deducted from the three telegraphic observations (7 a. m., 3 p. m., and 11 p. m., Washington time), from all stations which take those observations.

The observers at the following stations—Atlanta, Ga.; Augusta, Ga.; Baltimore, Md.; Charleston, S. C.; Cincinnati, Ohio; Denison, Tex.; Galveston, Tex.; India-

nola, Tex.; Jacksonville, Fla.; Knoxville, Tenn.; Little Rock, Ark.; Louisville, Ky.; Lynchburg, Va.; Memphis, Tenn.; Mobile, Ala.; Montgomery, Ala.; Nashville, Tenn.; New Orleans, La.; New York City; Norfolk, Va.; Pensacola, Fla.; San Antonio, Tex.; Savannah, Ga.; Shreveport, La.; Vicksburg, Miss., and Wilmington, N. C.—furnished weekly, during the year, with a report of the average rainfall in districts of the cotton belt.

The secretary of the National Board of Health, Washington, D. C., furnished weekly during the year with the average rainfall in the districts of the cotton-belt.

Mr. John F. Wheless, Cotton Exchange, Nashville, Tenn., Commercial Bulletin, Boston, Mass., and Mr. C. W. Simmens, secretary and treasurer Cotton Exchange, Saint Louis, Mo., furnished weekly during the year with the average rainfall in the districts of the cotton-belt.

Health officer of the District of Columbia furnished with a daily report of the tri-daily observations, daily means, and daily maximum and minimum temperatures for Washington City; also a copy of Form 113 A (monthly meteorological report), each month.

APPENDIX II.

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, D. C., August 28, 1882.

The CHIEF SIGNAL OFFICER OF THE ARMY, *Washington, D. C.*

SIR: I have the honor to submit the following report of the work accomplished in the telegraph division in connection with the system of cotton-belt reports for the year ending June 30, 1882.

This service was not commenced practically until September, 1881, and continued until November 1, 1881. It was inaugurated at the earnest solicitation of many prominent citizens, especially cotton-growers, and others interested, and with the co-operation of railroad and telegraph officials of the southern states. A number of stations were selected and the agents or telegraph operators instructed by experienced men of the Signal Service in the taking and sending of observations of rainfall and maximum and minimum temperatures. These duties were performed by the observers gratuitously, and the reports sent over the wires of the different railroad companies free of charge.

Reports were continued in 1881 during September and October. In the former month 83 stations were in operation, but this number was increased during the latter to 103 stations, including the subcentres.

Owing to the short time that this system was put into active operation, to the inexperience of the observers upon whom this duty devolved, in addition to the fact that agents and operators were doing their work without compensation, satisfactory results could hardly be expected. Yet they were such as to encourage this office to begin the system anew by the 1st of April of the present year, with a view to correct and overcome the difficulties encountered in the establishment of that service during its short period. In this connection the following extracts from the ninth annual report of the presidents and directors of the Savannah Cotton Exchange may be of interest:—

"A request from the Chief Signal Officer, asking co-operation in the matter of establishing new signal stations in the cotton-growing section, was referred with the strongest indorsement this Board could give, recognizing the importance of the same to the managers of railroads centering here; and it is our pleasure to report that the officers of those lines have responded in rendering the necessary assistance for accomplishing the desired object. The result has been the establishment of stations at Millen, Griffin, Davisborough, Waycross, Bainbridge, Macon, Eufaula, Columbus, Jesup, Live Oak, and Albany—the district tributary to the signal office at Savannah—from which reports are received daily of rainfall and temperature during a certain period of the year, the government furnishing the necessary outfit and the railroad agents performing the service of taking observations and making the reports. These reports are posted daily in the Exchange, and are of much importance and value.

* * * * * * * *

"The special cotton-belt service of the Signal Bureau for furnishing average rainfalls and mean temperatures throughout this region has been in operation for one month, viz, October. Its purpose is to furnish such data from April 1 to October 31, inclusive.

"While the short period in which it has been in operation has hardly been of sufficient length to demonstrate its full value to the cotton interest, yet enough has been shown to prove without a doubt that this work of the Signal Service will be a most important addition to its other regular reports.

"It is recommended that the Exchange adopt resolutions approving its workings and encouraging its continuation in its next season.

"This work, in this section, is done by the co-operation of the railways leading to Savannah, and we would mention in this connection that the Savannah, Florida, and Western Railway have in particular responded most cheerfully in this matter, and met the service half way at all times in its endeavors to obtain regular, accurate, and prompt reports.

"Respectfully,

"C. M. HOLST,
"*Chairman of the Meteorological Committee.*"

The following is substantially the result of the cotton-belt work in 1881:—

1st. That 80.7 per cent. of possible reports were received at the subcentres from stations.

2d. Of these reports so received 83.2 per cent. were received at the subcentres the day observations were taken; 16.8 per cent. were received the next day.

3d. 7h 07m p. m. was the average time of receipt at subcentres the same day; 9h 27m. a. m. was the average time of those arriving the next morning.

4th. As great an average percentage of Sunday reports was received at subcentres from stations as of week-day reports.

5th. 81.1 per cent. of all possible reports were sent from subcentres to main centres (exclusive of Saint Louis, which sent none).

6th. 7h 51m p. m. was the average time of sending said reports.

7th. 74.53 per cent. of all possible reports were sent from main centres to subcentres.

8th. The average time of receipt of these reports from main centres was 10h 30m p. m. of the day of making the observations, or 8h 51m a. m. of the next day.

9th. 6.6 per cent. of the total number of reports received came to subcentres by mail only.

After the completion of all preliminary arrangements, this cotton-belt service was renewed in 1882, to be in operation from April 1 to November 1, 1882.

From experiences gained during 1881, the following principal changes were made in perfecting the system, and avoiding the difficulties encountered:—

1st. The agents are to receive 25 cents for each observation promptly taken and transmitted.

2d. The change in time of taking observations from 6 to 5 p. m.

3d. The discontinuance of the interchange of reports and the adoption of placing them on the circuit at 11 p. m. This change greatly reduced the expense for telegraph work, and insured the prompt transmission of reports. It was adopted at the suggestion of Sergeant Albrecht.

4th. The discontinuance of the Saint Louis district.

The changes were made from experience of signal observers in the cotton-belt and with the consultation of railroad officials, cotton exchanges, and others interested.

Reports were promptly commenced on the first of April last, except in a few instances, notably that of the New Orleans district. This district was suffering during that month from destructive floods; in consequence, mostly all the telegraph lines were down, and but a few reports could be received. The observers, however, claim to have taken mostly all the observations, and to have fulfilled their obligations to the government. In the following table, showing the cotton-belt reports received at the district centres, therefore, the reports of the New Orleans district for the month of April, 1882, are not included:—

Report of the cotton-belt work for the months of April, May, and June, 1882.

Districts and centres.	Stations established, district centres included.	Stations actually reporting to centres.	Number of reports possible to receive.	Number of reports actually received.	Percentage of reports received at district centre.	Average time of receipt of reports.
						P. M.
Savannah	16	13	1,170	1,135	97.0	5.40
Charleston	8	7	592	573	96.8	5.10
Wilmington	9	8	728	681	93.5	5.45
Augusta	10	9	819	815	99.5	5.30
Atlanta	10	9	819	774	94.5	5.30
Montgomery	12	11	1,001	957	95.6	5.30
Mobile	8	7	637	621	97.5	6.00
New Orleans	16	13	778	624	80.2	6.00
Galveston	20	19	1,662	1,515	91.2	5.20
Little Rock	14	13	1,142	923	80.8	5.30
Vicksburg	5	4	364	351	96.4	5.40
Memphis	16	15	1,365	1,348	98.8	
Sums	144	123	11,077	10,317	93.5	5.35

In the New Orleans district no reports were received from Coushatta and Minden, they having no telegraphic connection.

From the above table it is seen that 93.5 per cent. of possible reports were received at the district centres, and that these reports arrived generally at 5.35 p. m., giving the Signal Service observer ample time to prepare the district mean before placing it on the circuit. With the exception of a few isolated cases, all reports were received on the same day the observation was taken. While 6.5 per cent. of the reports were not received at the centres, yet the observers took their observation in mostly every instance, and the non-transmittal of same was due to trouble on the telegraph lines. Some delay was also encountered where reports had to be transferred. This, however, time itself will remedy as the operators become more familiar with the system and know what to do with reports at transfer stations.

The following is a list of cotton-belt stations in operation during 1882, arranged by districts:

Districts and centres.	Stations.	
	Where.	On what railroad.
Savannah	Cedar Keys, Fla	Atlantic, Gulf, and West India Transit. These reports are concentrated at Cedar Keys and telegraphed to Savannah, Ga.
	Fernandina, Fla	
	Waldo, Fla	
	Jesup, Ga	Savannah, Florida, and Western.
	Way Cross, Ga	
	Live Oak, Fla	
	Quitman, Ga	
	Thomasville, Ga	
	Bainbridge, Ga	
	Albany, Ga	
	Smithville, Ga	Southwestern.
	Fort Gaines, Ga	
	Millen, Ga	Central of Georgia.
	Allapaha, Ga	Brunswick and Albany.
Charleston	Eastman, Ga	Macon and Brunswick.
	Jacksonborough, S. C	Charleston and Savannah.
	Yemassee, S. C	
	Hardeeville, S. C	
	St. Georges, S. C	South Carolina.
	Branchville, S. C	
	Saint Matthews, S. C	
Wilmington	Kingstree, S. C	Northeastern.
	Weldon, N. C	Wilmington and Weldon.
	Goldsborough, N. C	
	Lumberton, N. C	Carolina Central.
	Wadesborough, N. C	
	Charlotte, N. C	
	Salisbury, N. C	Richmond and Danville Line.
	Cheraw, S. C	Cheraw and Darlington.
Augusta	Florence, S. C	Wilmington, Columbia, and Augusta.
	Chester, S. C	Charlotte, Columbia, and Augusta.
	Columbia, S. C	
	Allendale, S. C	Port Royal and Augusta.
	Macon, Ga	Georgia.
	Columbus, Ga	Southwestern.
	Athens, Ga	Georgia.
	Covington, Ga	
	Madison, Ga	
Atlanta	Union Point, Ga	
	Newman, Ga	Atlanta and West Point.
	West Point, Ga	
	Gainesville, Ga	Richmond and Danville Line.
	Toccoa, Ga	
	Spartansburgh, S. C	
	Cartersville, Ga	Western and Atlantic.
	Calhoun, Ga	
	Dalton, Ga	
Montgomery	Griffin, Ga	Central of Georgia.
	Opelika, Ala	Western of Alabama.
	Troy, Ala	Mobile and Girard.
	Greenville, Ala	Mobile and Montgomery.
	Pine Apple, Ala	Pensacola and Selma.
	Uniontown, Ala	Alabama Central.
	Demopolis, Ala	
	Tuscaloosa, Ala	Alabama Great Southern.
	Selma, Ala	Louisville and Nashville.
	Birmingham, Ala	
	Calun, Ala	
Mobile	Talladega, Ala	Selma Division, East Tennessee, Virginia, and Georgia.
	State Line, Ala	Mobile and Ohio.
	Waynesborough, Miss	
	Meridian, Miss	
	Macon, Miss	
	Columbus, Miss	
	Aberdeen, Miss	
	Okolona, Miss	

Districts and centres.	Stations.	
	Where.	On what railroad.
New Orleans	Scranton, Miss	Louisville and Nashville.
	Pass Christian, Miss.	
	Brookhaven, Miss	Chicago, Saint Louis, and New Orleans.
	Amite City, La	
	Terre Bonne, La	Morgan's, Louisiana and Texas.
	Morgan City, La	
	Franklin, La	
	New Iberia, La	
	Vermillionville, La	
	Whiteville, La	
	Cheneyville, La	
	Alexandria, La	Merchants' Union Telegraph Line, connecting with Western Union lines at Minden.
	Natchitoches, La	
	Coushatta, La	
	Minden, La	
Galveston	Orange, Tex	Texas and New Orleans.
	Beaumont, Tex	
	Sour Lake, Tex	
	Houston, Tex	Houston and Texas Central.
	Hempstead, Tex	
	Hearne, Tex	
	Corsicana, Tex	
	Waco, Tex	
	Dallas, Tex	
	Huntsville, Tex	
	Palestine, Tex	
	Longview, Tex	International and Great Northern.
	Tyler, Tex	
	Austin, Tex	
	Belton, Tex	Gulf, Colorado, and Santa Fé.
	Weimar, Tex	Galveston, Harrisburg, and San Antonio.
	Luling, Tex	
	San Antonio, Tex	
	Weatherford, Tex	Texas and Pacific.
Little Rock	Paris, Tex	Texas and Pacific.
	Texarkana, Ark	Saint Louis, Iron Mountain, and Southern.
	Prescott, Ark	
	Malvern Junction, Ark	
	Kensett, Ark	
	Walnut Ridge, Ark	
	Brinkley, Ark	Memphis and Little Rock.
	Madison, Ark	
	De Vall's Bluff, Ark	
	Russellville, Ark	Little Rock and Fort Smith.
	Fort Smith, Ark	
	Arkansas City, Ark	Little Rock, Mississippi River, and Texas.
	Monticello, Ark	
Vicksburg	Edwards, Miss	Vicksburg and Meridian.
	Jackson, Miss	
	Lake, Miss	
	Monroe, La	Vicksburg, Shreveport, and Pacific.
Memphis	Grand Junction, Tenn	Memphis and Charleston.
	Corinth, Miss	
	Tuscumbia, Ala	
	Decatur, Ala	
	Scottsborough, Ala	
	Withe, Tenn	Louisville and Nashville.
	Brownsville, Tenn	
	Milan, Tenn	
	Paris, Tenn	
	Erin, Tenn	
	Clarksville, Tenn	
	Nashville, Tenn	Nashville, Chattanooga, and Saint Louis.
	Hernando, Miss	Mississippi and Tennessee.
	Batesville, Miss	
	Grenada, Miss	

A new station will be added to the Galveston district shortly, namely, Cuero, Tex. Orders have already been given for its establishment.

Great advantages have been derived from the system of sending the cotton-belt district means over circuits, for thus not only the district centres, but also other cities, as Charlotte, N. C., Chattanooga, Tenn., Cincinnati, Ohio, Louisville Ky., Nashville, Tenn., Norfolk, Va., Pensacola, Fla., and Washington, D. C., received these reports. Other stations not on the circuits, but interested in cotton, as New York, Baltimore, and Saint Louis, received these reports by special message. Thus these data are published the next day in the principal cities of the United States engaged in the cotton trade.

Much credit is due to the railroad officials in the rapid development of this service.

They not only liberally assisted by granting passes to Signal Service observers for the establishment of stations and instruction of agents, but some also held their agents to strict account in the taking of observations.

The Mobile and Ohio Railroad has started a frost service of its own. When frost occurs at the stations on their road the agents telegraph the fact to the observer at Mobile, who bulletins the information at once.

Cotton exchanges have also evidenced a great interest in this service since its renewal in 1882. All the cotton exchanges have at their own expense erected a blackboard, 4 by 3 feet, in their rooms, on which the means are bulletined and can at a glance be seen by any one. This plan was recommended by Sergeant Wright, at Augusta.

The postal-card system has been kept up by all stations in so far as the reporting of the observations to this office concerns. These cards have proven valuable and have given some desirable data, which are published regularly in the monthly Weather Review. The appreciation of the data thus utilized is evident when even foreign countries perceive their value. Thus Mr. Amer Hoordz, of Lake of Harlem, Netherlands, in his letter of July 18, 1882, informed this office that he translated the cotton-belt data and had them published in the Handelsblad of Amsterdam, causing unusual interest among cotton merchants.

Inclosed is a map showing the location of the several stations with respect to district centres. This number will be increased, as emergency demands, in the course of time, and it is expected that this service will become one of the most important features of the Signal Service if its present development can be taken as a criterion. The press has been commenting on it favorably, cotton exchanges deem it a necessity, yes, even undergo expenses for its maintenance, and railroad officials begin to see that the data collected by their agents are of value to them, so much so that some have compelled their agents to take observations throughout the year. Under such favorable auspices it is hoped that the Signal Service will greatly increase its efficiency and usefulness.

I am, sir, very respectfully, your obedient servant,

JAMES ALLEN,
First Lieutenant, Third Cavalry, A. S. O. and Asst.

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APPENDIX 12.

List of military posts from which meteorological reports have been received monthly at the Office of the Chief Signal Officer during the year ending June 30, 1882.

Post.	State or Territory.	Post.	State or Territory.
Abraham Lincoln, Fort	Dakota.	McDowell, Fort	Arizona.
Adams, Fort	Rhode Island.	McHenry, Fort	Maryland.
Alcatraz Island	California.	Mojave, Fort	Arizona.
Angel Island	Do.	Monroe, Fort	Virginia
Apache, Fort	Arizona.	Meade, Fort	Dakota.
Assininiboine, Fort	Montana.	McPherson Barracks	Georgia.
Barrancas, Fort	Florida.	Maginnis, Fort	Montana.
Benicia Barracks	California.	Mount Vernon Barracks	Alabama.
Brady, Fort	Michigan.	Niagara, Fort	New York.
Bidwell, Fort	California.	Niobrara, Fort	Nebraska.
Bowie, Fort	Arizona.	Pembina, Fort	Dakota.
Brown, Fort	Texas.	Plattsburg Barracks	New York.
Buford, Fort	Dakota.	Point San José	California.
Bridger, Fort	Wyoming.	Porter, Fort	New York.
Brooke, Fort	Florida.	Preble, Fort	Maine.
Canby, Fort	Washington.	Presidio	California.
Columbus, Fort	New York.	Pagosa Springs	Colorado.
Concho, Fort	Texas.	Randall, Fort	Dakota.
Camp near Presidio	Do.	Ringgold, Fort	Texas.
Davis, Fort	Do.	Shaw, Fort	Montana.
Douglas, Fort	Utah.	Sisseton, Fort	Dakota.
Ellis, Fort	Montana.	Snelling, Fort	Minnesota.
Fetterman, Fort	Wyoming.	Stevenson, Fort	Dakota.
Fred Steele, Fort	Do.	Saint Augustine	Florida.
Garland, Fort	Colorado.	Sully, Fort	Dakota.
Gaston, Fort	California.	Stevens, Fort	Oregon.
Grant, Fort	Arizona.	Stanton, Fort	New Mexico.
Hale, Fort	Dakota.	Totten, Fort	Dakota.
Hamilton, Fort	New York.	Townsend, Fort	Washington.
Jefferson Barracks	Missouri.	Union, Fort	New Mexico.
Keogh, Fort	Montana.	Verde, Fort	Arizona.
Klamath, Fort	Oregon.	Wallace, Fort	Kansas.
Lapwai, Fort	Idaho.	Warren, Fort	Massachusetts.
Leavenworth, Fort	Kansas.	West Point	New York.
Lowell, Fort	Arizona.	Wingate, Fort	New Mexico.
Lyon, Fort	Colorado.	Washakie, Fort	Wyoming.
Lewis, Fort	Do.	Yates, Fort	Dakota.
Madison Barracks	New York.	Yuma, Fort	Arizona.
McDermit, Fort	Nevada.		

APPENDIX 13.

List of voluntary observers who have forwarded monthly reports to the Chief Signal Officer during the year ending June 30, 1882.

Name of observer.	Post-office address.	State.
Abbott, Dr. E. K	Salinas City, Monterey County	California.
Adriance, Charles E	Hector, Schuyler County	New York.
Alden, Lyman R	Coldwater, Branch County	Michigan.
Allan, W. T	Geneseo, Henry County	Illinois.
Agricultural College Farm	New Brunswick, Middlesex County	New Jersey.
Allin, Lucius C	Springfield, Hampden County	Massachusetts.
Alden, Thomas E	Rising Sun, Ohio County	Indiana.
Altaffer, J. M	Independence, Montgomery County	Kansas.
Anderson, Rev. John	Clarksville, Red River County	Texas.
Anderson, W. N	Stateburg, Sumter County	South Carolina.
Andrews, Luman	Southington, Hartford County	Connecticut.
Arden, Thomas B	Garrison's, Putnam County	New York.
Armstrong, Rev. G. C	Fayette, Jefferson County	Mississippi.
Augir, Ozro G	Flemington, Taylor County	West Virginia.
Barringer, William	Bellefontaine, Logan County	Ohio.
Blanchard, O. A	Elmira, Stark County	Illinois.
Bartlett, E. B	Vermillion, Oswego County	New York.
Baker, D. W. C	Austin, Travis County	Texas.
Brainerd, H. G	Independence, Buchanan County	Iowa.
Beebe, Levi	South Lee, Berkshire County	Massachusetts.
Beans, Thomas J	Moorestown, Burlington County	New Jersey.
Breed, J. E	Embarrass, Waupaca County	Wisconsin.
Beal, William	Murphy, Cherokee County	North Carolina.
Bell, Joseph	Franklin, Venango County	Pennsylvania.
Beall, Dr. and Mrs. R. S.	Lenoir, Caldwell County	North Carolina.
Brendell, Frederick	Peoria, Peoria County	Illinois.
Beloit College	Beloit, Rock County	Wisconsin.
Benedictine Fathers	Saint Meinrad, Spencer County	Indiana.
Bently, David	Princeton, Colusa County	California.
Briggs, John	Albany, Linn County	Oregon.
Bowman, Peter	Savannah, Ashland County	Ohio
Boerner, Prof. Charles G	Vevay, Switzerland County	Indiana.
Blodgett, Charles	Howard, Nemaha County	Nebraska.
Blood, Charles T	Windsor, Windsor County	Vermont.
Boies, A H	Federalsburgh, Caroline County	Maryland.
Bullard, R	Litchfield, Hillsdale County	Michigan.
Bullock, Thomas	Coalville, Summit County	Utah.
Bryant, A T	Clear Creek, Saunders County	Nebraska.
Breedon, Jacob	Adrian, Lenawee County	Michigan.
Blake, D. J	Calistoga, Napa County	California.
Bear, John P	Boston, Suffolk County	Massachusetts.
Bender, A. S	Sacramento, Sacramento County	California.
Ballin, B. B	Troy, Rensselaer County	New York.
Crane, G. W	Bethel, Clermont County	Ohio.
Clark, T. A	Weldon, Halifax County	North Carolina.
Chappellsmith, John	New Harmony, Posey County	Indiana.
Caulkins, John S	Thornville, Lapeer County	Michigan.
Calhoun, P. B	Austin, Wilson County	Tennessee.
Chandler, Dr. W. I	South Orange, Essex County	New Jersey.
Chapin, Adams	Poway, San Diego County	California.
Cheney, William	Minneapolis, Hennepin County	Minnesota.
Crump, H. H	Bowling Green, Warren County	Kentucky.
Couch, E. D	Contoocookville, Merrimac County	New Hampshire.
Cornell University	Ithaca, Tompkins County	New York.
Colt, Henry H	Nora Springs, Floyd County	Iowa.
Crosier, Adams	Laconia, Harrison County	Indiana.
Cutting, Dr. Hiram	Lunenburgh, Essex County	Vermont.
Cutler, J. L	Quitman, Brooks County	Georgia.
Curtiss, George G	Fallston, Harford County	Maryland.
Cutler, Rev. B. B	Heath, Franklin County	Massachusetts.
Cotton, Dr. D. B	Portsmouth, Scioto County	Ohio.
Collier, George	Topeka, Shawnee County	Kansas.
Couch, E. J	Dana, Green County	Iowa.
Clayton, H. H	Murfreesborough, Rutherford County	Tennessee.
Dawson, William	Spiceland, Henry County	Indiana.
Davis, Jacob	Rowe, Franklin County	Massachusetts.

List of voluntary observers who have forwarded monthly reports, &c.—Continued.

Name of observer.	Post-office address.	State.
Daball, Solon N	Olivet, Hutchinson County	Dakota.
Day, Theodore	Dyberry, Wayne County	Pennsylvania.
Denning, H. D	Wellsborough, Tioga County	Do.
Dickinson, J. P	Guttenburgh, Clayton County	Iowa.
Doton, Hosea	Woodstock, Windsor County	Vermont.
Davies, Mrs. D. D	Forest Hill, Jackson County	North Carolina.
Dazey, J. B	Charleston, Coles County	Illinois.
Dewhurst, Rev. E	Dexter, Penobscot County	Maine.
Downs, Edward C	Alexandria, Hanson County	Dakota.
Davis, Charles F	Fort Collins, Larimer County	Colorado.
Eisenberg, John C	Farmington, Saint Francois County	Missouri.
Ellis, Edwin	Ashland, Ashland County	Wisconsin.
Elliott, J. C	Swanwick, Perry County	Illinois.
Ewing, E. E	Highlands, Macon County	North Carolina.
Farquhar, Allan	Sandy Springs, Montgomery County	Maryland.
Failyer, G. H	Manhattan, Riley County	Kansas.
Ferris, E. J	Little Mountain, Lake County	Ohio.
Fernald, Prof. M. C	Orono, Penobscot County	Maine.
Friend, Charles W	Carson City, Ormsby County	Nevada.
Fortescue, Joseph	York Factory	British America.
Fuller, A. N	Hermosa, La Plata County	Colorado.
Fletcher, H. S	Watsonville, Santa Cruz County	California.
Fleming, John	Readington, Hunterdon County	New Jersey.
Frick, John H	Warrenton, Warren County	Missouri.
Floyd, E	Fayetteville, Cumberland County	North Carolina.
Gray, F. R	Yates Center, Woodson County	Kansas.
Gardiner, R. H	Gardiner, Kennebec County	Maine.
Grathwohl, John	Blooming Grove, Pike County	Pennsylvania.
Green, H. A	Atco, Camden County	New Jersey.
Gedding, Dr. W. H	Aiken, Aiken County	South Carolina.
Green, Dr. J. C	West Chester, Chester County	Pennsylvania.
Gillingham, C	Accotink, Fairfax County	Virginia.
Gillingham, M	Fallsington, Bucks County	Pennsylvania.
Gibbs, George J	Grand Turk, Turks and Caicos Islands	West Indies.
Gibson, E. P	Louisville, Clay County	Illinois.
Gowey, H. D	North Lewisburgh, Champaign County	Ohio.
Guffey, F. H	Milton, Northumberland County	Pennsylvania.
Georgeson, C. C	College Station, Brazos County	Texas.
Harper, George N	Cincinnati, Hamilton County	Ohio,
Hammit, John W	College Hill, Hamilton County	Do.
Haworth, John	Philadelphia, Philadelphia County	Pennsylvania.
Haywood, John	Westerville, Franklin County	Ohio.
Harvard College	Cambridge, Middlesex County	Massachusetts.
Hering, C. J	Paramaribo, Colony of Surinam, Dutch Guiana	South America.
Helm, Thomas B	Logansport, Cass County	Indiana.
Hilton, J. T	Paterson, Passaic County	New Jersey.
Hills, Frank T	Auburn, Rockingham County	New Hampshire.
Hoskinson, R. M	Port Blakeley, Kitsap County	Washington.
Howard, S. A	Greensborough, Guilford County	North Carolina.
Hurlin, Rev. William	Antrim, Hillsborough County	New Hampshire.
Hunter, T. C	Wabash, Wabash County	Indiana.
Hagensick, C. W	Lincoln, Lancaster County	Nebraska.
Hyde, G. A., and wife	Cleveland, Cuyahoga County	Ohio.
Hall, J. B	Worcester, Worcester County	Massachusetts.
Hunt, G. M	North Argyle, Washington County	New York.
Heaton, Isaac E	Fremont, Dodge County	Nebraska.
Ingram, Dr. J	Vineland, Cumberland County	New Jersey.
Iowa Agricultural College	Ames, Story County	Iowa.
Ingersoll, Prof. C. L	La Fayette, Tippecanoe County	Indiana.
James, John W	Marengo, McHenry County	Illinois.
Jones, Ira B	Nellsville, Clark County	Wisconsin.
Juni, Benedict	New Ulm, Brown County	Minnesota.
Jackson, C. E	Columbia, Richmond County	South Carolina.
Josephs, Wm. B	New Market, Rockingham County	New Hampshire.
Kaucher, William	Oregon, Holt County	Missouri.
Keeler, W. F	Mayport, Duval County	Florida
Keese, G. P	Cooperstown, Otsego County	New York.
Kellogg, J. H	Battle Creek, Calhoun County	Michigan
Kirkpatrick, J. A	Philadelphia, Philadelphia County	Pennsylvania.
Kimball, P. R	Grafton, Grafton County	New Hampshire.
Kuhne, F. W., and son	Fort Wayne, Allen County	Indiana.
Kent, Joseph C	Phillipsburgh, Warren County	New Jersey.
Kribben, H. D	Saint Louis, Saint Louis County	Missouri.
Luepe, Misses C. and E	Manitowoc, Manitowoc County	Wisconsin.
Leamer, J. F	Lincoln, Lancaster County	Nebraska.
Martin, Horace	Corning, Holt County	Missouri.
Marshall, Gregory	Cresco Howard County	Iowa.
McSwain, L. S	Thomasville, Thomas County	Georgia.
Maxwell, Samuel A	Morrison, Whiteside County	Illinois.
Metcalf, John G	Mendon, Worcester County	Massachusetts.
Meehan, Thomas	Germantown, Philadelphia County	Pennsylvania.
McCready, Miss L	Fort Madison, Lee County	Iowa.

List of voluntary observers who have forwarded monthly reports, &c.—Continued.

Name of observer.	Post-office address.	State.
Mell, P. H., jr	Auburn, Lee County	Alabama.
Michigan State Board of Health.	Lansing, Ingham County	Michigan.
McGill College	Montreal	Canada.
Moore, C. R	Johnsontown, Northampton County	Virginia.
Morris, Rev. John	Morriston, Davison County	Dakota.
Mount Saint Mary's College	Emmittsburgh, Frederick County	Maryland.
Moulton, M. M	Monticello, Jones County	Iowa.
Morgan, William J	Somerville, Somerset County	New Jersey.
McConnell, E. M	New Castle, Lawrence County	Pennsylvania.
McDonogh School	Owing's Mills, Baltimore County	Maryland.
Mueller, Dr. R	New Corydon, Jay County	Indiana.
Munn, A. M	Kalamazoo, Kalamazoo County	Michigan.
McLouth, Bessie C	Ypsilanti, Washtenaw County	Do.
Micklem, J. Howard	Variety Mills, Nelson County	Virginia.
Newcombe, G. S	Westborough, Worcester County	Massachusetts.
Neill, Thomas	Sandusky, Erie County	Ohio.
Newbegin, Dr. John D	Anna, Union County	Illinois.
Nixon, J. Sharpe	Chambersburg, Franklin County	Pennsylvania.
Nipher, Prof. F. E	Saint Louis, Saint Louis County	Missouri.
Noll, A. B	Linden, Union County	New Jersey.
Nutz, Leonard	Fort Riley, Davis County	Kansas.
Nelson, W. H	Northport, Leelenaw County	Michigan.
Nagelvoork, J. B	Austin, Sherman County	Nebraska.
Owsley, Dr. J. B	Jacksonburg, Butler County	Ohio.
Partrick, J. M	North Volney, Oswego County	New York.
Pearce, F	Eola, Polk County	Oregon.
Phillips, W. R	Edgerton, Rock County	Wisconsin.
Payne, William W	Northfield, Rice County	Minnesota.
Powell, F. L	Flemington, Taylor County	West Virginia.
Pruett, William	Catawissa, Columbia County	Pennsylvania.
Quarterman, E. A	Flushing, Queens County	New York.
Quijano, F., and others	Mazatlan	Mexico.
Remington, C. V. S	Fall River, Bristol County	Massachusetts.
Reeves, James S	Niles, Berrien County	Michigan.
Rice, William F	Otley, Marion County	Iowa.
Richardson, C. F	Freehold, Monmouth County	New Jersey.
Ring, John J	San Bernardino, San Bernardino County	California.
Robertson, Thomas D	Rockford, Winnebago County	Illinois.
Rodman, Miss Susan	New Bedford, Bristol County	Massachusetts
Rogers, Jesse D	Friendship, Alleghany County	New York.
Rockwood, Prof. C. G	Princeton, Mercer County	New Jersey.
Roberts, L. H	Clinton, Clinton County	Iowa.
Runge, C	New Ulm, Austin County	Texas.
Russell, George W	Wellsburg, Brooke County	West Virginia.
Reede, J. W	Marysville, Seward County	Nebraska.
Rodgers, J. B	Dundee, Yates County	New York.
Slade, Elisha	Somerset, Bristol County	Massachusetts.
Saxby, J. J	San Buenaventura, Ventura County	California.
Swan, James G	Neah Bay, Clallam County	Washington Territory.
Seltz, Charles	De Soto, Washington County	Nebraska.
Snell, S. C	Amherst, Hampshire County	Massachusetts.
Slenker, Elmira D	Snowville, Pulaski County	Virginia.
Stern, Jacob F	Logan, Harrison County	Iowa.
Scribner, H. F. J	Strafford, Orange County	Vermont.
Stringfield, W. W	Waynesville, Haywood County	North Carolina.
Siler, Mrs. A	Franklin, Macon County	Do.
Shriver, E. T	Cumberland, Alleghany County	Maryland.
Shriver, Howard	Wytheville, Wythe County	Virginia.
Smith, William Allan	Dover, Morris County	New Jersey.
Smith, E. A	Moriches, Suffolk County	New York.
Smith, C. J	Hudson, Summit County	Ohio.
Spilman, J. J	Pierce City, Lawrence County	Missouri.
Snow, Prof. F. H	Lawrence, Douglas County	Kansas.
Scott, T. G	Forsyth, Monroe County	Georgia.
Stoddard, Prof. O. N	Wooster, Wayne County	Ohio.
Stucky, Dr. C. T	Helvetia, Randolph County	West Virginia.
Schoolfield, L. H	Deer Park, Garrett County	Maryland.
Sadler, H. E	Emporia, Lyon County	Kansas.
Stanton, J. C	Rio Vista, Solano County	California.
Stratton, Thomas	Port Angeles, Clallam County	Washington Territory.
Scott, Robert J	New Tacoma, Pierce County	Do.
Smith, Palmer	Rio Magna, Santo Domingo	West Indies.
Smyth, B. B	Council Grove, Morris County	Kansas.
Stienecker, W. H. E	Franklin, Sheboygan County	Wisconsin.
Sewell, Thomas M	New Athens, Harrison County	Ohio.
Smith, F. S	New Brunswick, Middlesex County	New Jersey.
Sweet, Frederick	Hastings, Barry County	Michigan.
Thralls, George R	Houston, Suwanee County	Florida.
Tatlock, John	Williamstown, Berkshire County	Massachusetts.
Teele, A. R	Milton, Norfolk County	Do.

List of voluntary observers who have forwarded monthly reports, &c.—Continued.

Name of observer.	Post-office address.	State.
Trembly, Dr. J. B.	Oakland, Alameda County	California.
Tebbets, George P.	Santa Barbara, Santa Barbara County	Do.
Trowbridge, David	Waterburgh, Tompkins County	New York.
Tutwiler, H., LL. D.	Green Springs, Hale County	Alabama.
Turner, Ernest	Point Pleasant, Tensas Parish	Louisiana.
Trueman, George S.	Genoa, Black County	Nebraska.
Thompson, S. R.	Lincoln, Lancaster County	Do.
Turnbo, Silas	Protem, Taney County	Missouri.
Valente, Rev. A. X., S. J.	Woodstock, Howard County	Maryland.
Van Inwegen, Charles F.	Port Jervis, Orange County	New York.
Vermilllion, W. W.	Curryville, Pike County	Missouri.
Vitz, Martin	Franklin, Sheboygan County	Wisconsin.
Vögeli, Adolphus	Des Moines, Polk County	Iowa.
Vanhekle, J. M.	Philadelphia, Philadelphia County	Pennsylvania.
Walton, J. P.	Muscatine, Muscatine County	Iowa.
Watters, Dr. James	Holton, Jackson County	Kansas.
Washington Aqueduct	Receiving Reservoir	District of Columbia.
	Distributing Reservoir	
	Great Falls	Maryland.
	Rock Creek	
West, Silas	Cornish, York County	Maine.
Weymouth, James E.	Corpus Christi, Nueces County	Texas.
Wild, Rev. E. P.	Newport, Orleans County	Vermont.
Wing, Miss Minerva E.	Charlotte, Chittenden County	Do.
Willis, O. R.	White Plains, Westchester County	New York.
Williams, C. Foster	Hoffman, Maury County	Tennessee.
Winnipiseogee Lake Cotton and Woolen Manufacturing Company.	Wier's Bridge, Belknap County	New Hampshire.
	Wolfeborough, Carroll County	
	Woodstock, Grafton County	
	Lake Village, Belknap County	
	Belmont, Belknap County	
	Bristol, Grafton County	
	Ashland, Grafton County	
Whittington, Granville	Mount Ida, Montgomery County	Arkansas.
Whitney, C. E.	Creswell, Marion County	Kansas.
Williamson, J. A.	Johnstown, Fulton County	New York.
Wigg, Dr. George	Clay Centre, Clay County	Kansas.
Wolfe, John W.	Wellington, Sumner County	Do.
Wylie, William	Mount Forest	Canada.
Wise, W. S.	Meadville, Crawford County	Pennsylvania.
Weet, Dr. Joseph O.	Princeton, Worcester County	Massachusetts.
Woodruff, Lum.	Santarem, Provinco Para, Brazil	South America.
Wilson, W. E.	Cedar Rapids, Lincoln County	Iowa.
Worth, J. M.	Fayetteville, Cumberland County	North Carolina.
Yetter, W. G.	Catawissa, Columbia County	Pennsylvania.
Young, George R.	Penn Yan, Yates County	New York.
Young, John	Plegan, Choteau County	Montana.
Yates, T. P.	Factoryville, Tioga County	New York.
Zimmerman, Irving R.	Wicklow, Lake County	Dakota.

APPENDIX 14.

List of places for which stations have been requested, but not established on June 30, 1882.

Place.	Applicant.	Date.
Huron City, Mich	Board of Trade, Toledo	January 27, 1871.
	Board of Trade, Cleveland	February 19, 1871.
	Board of Trade, Detroit	February 19, 1871.
Richmond, Va	W. G. Turpin	April 3, 1871.
Body Island, N. C	Board of Trade, Norfolk; and resolution of general assembly of Virginia.	April 17, 1871.
The Parks of Colorado	E. J. Mallett, late consul-general	May 24, 1871.
Staten Island, N. Y	C. Kentgen, jr	June 9, 1871.
	C. Kentgen, jr	June 20, 1871.
Chambersburg, Pa	Hon. J. Scott, United States Senate	June 12, 1871.
	Hon. Simon Cameron, United States Senate	June 12, 1871.
Watertown, N. Y	L. L. Pratt	June 21, 1871.
	Common council, forwarded by mayor	June 21, 1873.
	Fred. D. Hills	March 9, 1876.
Xenia, Ohio	C. E. Case	June 30, 1871.
Port Hope, Mich	Board of Trade, Detroit	July 22, 1871.
Niles, Mich	J. B. Fitzgerald, secretary Berrien County Agricultural Society.	July 27, 1871.
Louisiana, Mo	W. Stark and R. E. Pleasants	August 3, 1871.
	Hon. A. H. Buckner, M. C	January 4, 1882.
Hot Springs, Ark	J. H. Morton, M. D	August 2, 1871.
	B. F. Kelley, superintendent	December 10, 1877.
Janesville, Wis	J. B. Whiting, M. D., and Rock County Agricultural Society.	August 7, 1871.
Hillsdale, Mich	Prof. G. McMillan, secretary of Hillsdale College, Hillsdale County Agricultural Society.	August 6, 1871.
Metamora, Ill	Edward Kipp, secretary Woodford County Agricultural Society.	August 8, 1871.
Mount Pleasant, Pa. (Mt. Pleasant Academy.)	W. H. McCreery, acting principal	August 11, 1871.
Nebraska City, Nebr	H. K. Raymond, secretary Otoe County Farmers' Club.	August 14, 1871.
Princeton, Ill	L. J. Colton	August 11, 1871.
Mount Moosilauk, N. H	Prof. C. H. Hitchcock, A. F. Clough	August 16, 1871.
Catasauqua, Pa	Hon. E. McPherson, Clerk United States House of Representatives.	September 11, 1871.
Galena, Ill	D. Wilmot Scott, publisher Galena Commercial Advertiser.	September 14, 1871.
Columbus, Nebr	J. O. Shannon, secretary Platt County Agricultural Society.	September 5, 1871.
Mason City, Iowa	T. G. Emsley, secretary Cerro Gordo County Agricultural Society.	October 6, 1871.
Orono, Me. (State Agricultural College.)	M. C. Fernald, Maine State College of Agriculture	October 19, 1871.
	L. Libbey, P. M	February 17, 1873.
Balize, La., and Waco, Tex	Agents and captains of Morgan Steamship Company.	October 31, 1871.
Fort Randall, Dak	R. J. Percy for Missouri Valley Telegraph company.	November 9, 1871.
Ann Arbor, Mich. (University of Michigan.)	Prof. G. B. Merriman	November 28, 1871.
Fountain, Colo	R. F. Long, editor of El Paso Ranchman	December 4, 1871.
Vineyard Haven, Mass	Prof. J. E. Hilgard, United States Coast Survey; Daniel W. Stevens, and Rev. Thomas Hill.	December 18, 1871.
Cape Ann, Mass	Hon. B. F. Butler, M. C	December 19, 1871.
Iowa City, Iowa. (State University.)	John P. Irish	December 14, 1871.
	S. J. Kirkwood	January 6, 1873.
	A. D. Schenck, first lieutenant Second United States Artillery.	January 8, 1875.
Manassas, Va	G. C. Round	December 27, 1871.
Quincy, Ill	A. H. Hill, secretary National Board of Trade	January 4, 1872.
	Hon. J. A. Logan, United States Senate, and 51 others.	July 25, 1879.
	Hon. J. A. Logan, J. H. Ralston	December 3, 1879.
Dover Point, N. H	John B. Stevens, mayor	January 13, 1872.
Wilmington, Del	Board of Trade, Wilmington	January 24, 1872.
Additional stations on eastern slope.	Hon. H. H. Holt, Michigan Legislature	February 11, 1871.

List of places for which stations have be requested, &c.—Continued.

Place.	Applicant.	Date.
Additional stations on mountains of Virginia.	G. C. Wedderburn, secretary Virginia Telegraph Company; L. A. Gobright, associated press.	May 17, 1871.
Additional stations on western slope of the Mississippi Valley.	Merchants' Exchange, Saint Louis, Mo	July 16, 1871.
Monomdy Point, Cape Cod Light, Mass.	R. B. Forbes	November 29, 1871.
Southwest Pass, La. (Pass à l'Outre.)	Thornton A. Jenkins, Rear-Admiral United States Navy.	March 20, 1871.
Stannton, Va., Christianburg, Va., Bristol, Tenn., Easton, Pa., Winchester, Va.	Jed Hotchkiss, secretary of the Augusta County Fair, Virginia.	August 15, 1871.
Harrisburg, Pa	Jed Hotchkiss, secretary of the Augusta County Fair, Virginia.	August 15, 1871.
Harrisburg, Pa	Alf. S. Sheller, P. M., at Lewisburg, Pa.	February 26, 1881.
Towanda, Kans	Alf. S. Sheller, P. M	October 29, 1881.
Black Dome, N. C	M. B. Ellis	February 12, 1872.
(Black Mountain)	William Cain	February 12, 1872.
	Hon. R. B. Vance, M. C	December 10, 1880.
	Hon. R. B. Vance, M. C.; Dr. R. L. Beall	January 28, 1881.
Gallitzin and Altoona, on Pennsylvania Central Railroad.	David Peelor	February 17, 1872.
Minneapolis, Minn. (University of Minnesota.)	William W. Folwell, president	February 21, 1872.
Each of the State Agricultural Colleges.	J. B. Bowman, regent of Kentucky University, and others.	February 29. 1372.
Northfield, Vt. (Norwich University.)	Capt. C. A. Curtis	March 15. 1872.
Grand Tower, Ill	A. R. Harris, Secretary Mutual Aid and Improvement Society, Saint Louis, Mo.	March 21, 1872.
Iuka, Miss	Rev. J. T. Freeman (through Hon. George E. Harris, M. C.)	March 25, 1872.
Great Natihalee, N. C. (Bald Mountain).	Charles W. Jenks	April 1, 1872.
Deposit, N. Y	G. W Hanford	April 1, 1872.
Heilman Dale, Pa	S. P. Heilman	April 1, 1872.
Fort Wayne and New Albany, Ind.	F. C. Johnson, chairman meteorological committee Indiana State board of agriculture.	April 12, 1872.
Maryland Agricultural College.	A. R. Davis, president of board of trustees	April 19, 1872.
	do	June 21, 1872.
Auburn, Ala. (Agricultural and Mechanical College of Alabama.)	William C. Stubbs, John B. Read, W. H. Jennison	May 14, 1872.
	William C. Stubbs, secretary of faculty	December 23, 1880.
Ogdensburgh, N. Y	do	January 4, 1881.
Plattsburgh, N. Y	Hon. W. A. Wheeler, M. C	May 25, 1872.
Sewanee, Tenn. (University of the South.)	Hon. John Rogers, M. C	May 28, 1872.
	John L. Cooper, (through Prof. Joseph Henry, Smithsonian Institution).	June 10, 1872.
	Hon. W. C. Whittehorne, Right Rev. Alex. Gregg, bishop of Texas, faculty of college, and others.	June 26, 1877.
	Hon. A. H. Stephens, M. C., Prof. John McCrady.	April 22, 1881.
Newark, Del. (Delaware College.)	Telfair Hodgson, vice chancellor, Lieut. R. M. Rogers, Second Artillery, Prof. E. K. Smith, and eleven members of Congress.	December 17, 1881.
Beaver City, Utah	William D. Mackey, secretary of faculty	June 11, 1872.
New Ulm, Minn	Daniel Tyler	July 8, 1872.
Aiken, S. C	Dr. Alfred Muller	July 10, 1872.
	J. A. Eckstein, attorney at law	December 15, 1881.
	Hon. F. A. Sawyer, U. S. Senate, and 16 others	July 16, 1872.
Winona, Miss	John C. Derby	September 2, 1872.
Eutaw, Ala	James Whitall	March 31, 1875.
Ithaca, N. Y. (Cornell University.)	A. M. Rafter	July 20, 1872.
	W. S. Bird	July 20, 1872.
	A. D. White, president, and petition of 75 citizens.	August 8, 1872.
	Farmers' Club of Ithaca	November 18, 1872.
	A. D. White, president of faculty of university	November 22, 1872.
	Hon. Roscoe Conklin, U. S. Senate	January 25, 1873.
	P. B. Crandell, corresponding secretary Farmers' Club.	January 3, 1875.
	E. A. Fuertes, Department of Engineering	March 17, 1875.
	E. A. Fuertes, dean	April 17, 1875.
Belfast, Me	Z. Hazzard Potter	May 7, 1878.
Carthage, Ill	William C. Russell, acting president	August 8, 1878.
Kutztown, Pa. (Keystone State Normal School.)	George E. Brackett	August 6, 1872.
	L. F. M. Easterday, and 105 citizens	September 2, 1872.
Gainesville, Ga	A. R. Horne, principal	September 13, 1872.
Some point between Leavenworth and Shreveport.	M. F. Stephenson	November 5, 1872.
	Steamboatmen's convention assembled at Cairo, Ill.	November 17, 1872.

List of places for which stations have been requested, &c.—Continued.

Place.	Applicant.	Date.
On plains of Western Kansas and regions to southward and southwestward.	Kansas State Horticultural Society	December 21, 1872.
Dallas, Tex	W. A. Jones & Co., W. C. Connor, and 133 others	December 26, 1872.
	G. T. Atkins, and 242 others	November 25, 1878.
	G. T. Atkins	February 28, 1880.
	Hon. Olin Wellborn, M. C	March 10, 1880.
	George T. Atkins	August 27, 1881.
Parker's Landing on the Allegheny River, Greensborough on the Monongahela River.	Resolution of select council of Pittsburg, transmitting and approving petition of 46 citizens of Pittsburg.	December 28, 1872.
	do	January 10, 1873.
Lawrence, Kans. (University of Kansas.)	John Frazer, chancellor	January 16, 1873.
	Hon. Stephen A. Cobb, M. C., inclosing petition of Alfred Gray, secretary of the State Board of Agriculture.	May 6, 1873.
	J. Savage	January 7, 1881.
Manchester, N. H	Hon. S. N. Bell, M. C., inclosing resolution of New Hampshire State Agriculture Society.	January 21, 1873.
Sandwich, Ill	N. E. Ballou (through Commissioner of Agriculture.)	January 22, 1873.
Detroit, Minn	Daniel Cony	February 2, 1878.
Dayton, Ohio. (National Soldiers' Home.)	Hon. Isaac Strohen	February 11, 1873.
	Thomas L. Neal, president, and Thomas D. Davis, secretary, Montgomery County Medical Society.	February 1, 1875.
Palatka, Fla	J. F. Stone (through Secretary of Navy)	February 17, 1873.
Emporia, Kans. (State Normal School.)	Robt. Milliken	March 6, 1873.
	Hon. P. B. Plumb, United States Senate; H. E. Sadler.	February 2, 1881.
North and west of Galveston, Tex.	Chamber of Commerce (through Hon. John Hancock).	March 6, 1873.
Charlottesville, Va. (University of Virginia.)	Hon. R. T. W. Duke, M. C	March 2, 1873.
Raleigh, N. C	Cotton Exchange, New Orleans	March 30, 1873.
Columbia, S. C	do	March 30, 1873.
	Hon. John Alexander, mayor, transmitting resolutions of city council.	June 11, 1873.
	Hon. F. A. Sawyer, and petition of 58 citizens, and resolution of city council.	August 5, 1873.
Pierce City, Mo	E. P. Lingee, president board of education	April 9, 1873.
	C. W. Rogers, general manager of the Saint Louis and San Francisco Railroad.	November 10, 1882.
Columbus, Miss	Cotton Exchange, New Orleans	March 30, 1873.
	Hon. H. L. Muldrow, M. C., and 3 others	June 4, 1880.
	Cotton Exchange, Mobile	July 8, 1880.
Neshanic Mountain, Somerset County, N. J.	J. V. D. Pumyea	April 12, 1873.
Vincennes, Ind	W. Hays	June 15, 1873.
Salina, Kans	Freeman Kingman, secretary of Patrons of Husbandry and Farmers' Club.	July 17, 1878.
	Hon. W. A. Phillips, M. C	April 2, 1877.
Alleghanies, in North Carolina	George Warren, jr	July 26, 1873.
Carthage, Mo	E. P. Searle and 174 others	August 15, 1873.
New Berne, N. C	G. W. Nason, jr	September 13, 1873.
Port Townsend, Wash	J. W. Sweeney, general superintendent Puget Sound Telegraph Company.	September 30, 1873.
	Maj. William G. Morris, special agent Treasury Department.	March 8, 1878.
	Thomas P. Minor, president of Puget Sound Telegraph Company.	December 16, 1878.
	G. A. Weed, mayor of Seattle	December 17, 1878.
	Maj. G. L. Gillespie, Corps of Engineers	March 5, 1880.
Mineral Point, Wis	Hon. T. O. Howe, United States Senate; M. M. Strong.	December 16, 1873.
Latitude 40° 30′, longitude 74° 42′, Somerset County, N. J.	Hon. F. T. Frelinghuysen, United States Senate; citizens of Somerset, Hunterdon, and Middlesex Counties.	December 22, 1873.
Carlton, Wis	Edward Bach, farmers, and ship-owners of the district.	January 10, 1874.
	Hon. Philetus Sawyer, M. C.; Edward Bach	January 26, 1874.
Oakland, Cal. (University of California.)	J. West Martin, secretary of the Board of Regents	February 12, 1874.
Fayetteville, Ark. (Arkansas Industrial University.)	Hon. A. S. Prather, trustee	February 17, 1874.
Beatrice, Nebr	C. P. Conrad, professor of chemistry	September 28, 1881.
	Hon. P. W. Hitchcock, United States Senate; Hon. A. S. Paddock.	March 3, 1874.
One or more stations in Arizona.	Charles Denison, M. D	March 16, 1874.
Gorham, N. H	Elias S. Mason	March 30, 1874.
Mason City, Mo	J. F. Benjamin, Brown and Sheppard, E. B. Van Vent, and 33 others.	March 30, 1874.

List of places for which stations have been requested, &c.—Continued.

Place	Applicant.	Date.
Rome, Ga	Thomas J. Perry, chairman meteorological committee Rome Agricultural, Horticultural, and Mechanical Fair Association.	April 24, 1874.
	....do	January 21, 1875.
	....do	December 4, 1875.
	Hon. W. H. Felton, M. C	March 31, 1876.
	Henry A. Hill, secretary Chamber of Commerce, Rome, Ga.	March 16, 1877.
Syracuse, N. Y	Thomas J. Perry, secretary, and H. Harpold, president Chamber of Commerce.	July 19, 1878.
	N. Graves, mayor, William Kirkpatrick, J. R. Whitlock, and J. B. Hill.	May 9, 1874.
Bakersfield, Cal	Hon. R. H. Duell, M. C	May 11, 1874.
Palmyra, Wis	A. C. Bratton, M. D.; P. D. McClanahon	May 14, 1874.
Crawfordsville, Ind. (Wabash College.)	John C. Minton	May 19, 1874.
Calais, Me	Col. H. B. Carrington, U. S. A., chairman, military science, Wabash College.	June 6, 1774.
Fort Thompson, Dak	Hon. Eugene Hale, M. C.; Boardman Bros	June 16, 1874.
Chatawa, Miss. (College of the Redemptionist Fathers.)	Col. D. S. Stanley	June, 18, 1874.
Ellsworth, Kans	Alexander W. Gordon	July 13, 1874.
	Hon. W. A. Phillips, M. C	July 14, 1874.
Mount Lake or Bald Knob, Giles Co., Va.	M. W. Henry	July 21, 1874.
Camden, N. J. (the River Iron Works.)	Mrs. H. Haupt	July 21, 1874.
Bloomington and Decatur, Ill.	Wood, Dialogue & Co	July 29, 1874.
Mount Kearsage, Warner, N. H.	E. A. Gastman, chairman meteorological committee Macon County Fruit Growers' Association	August 30, 1874.
Ceredo, W. Va	John Eaton, Commissioner of Education; Hon. N. G. Ordway, Hon. W. E. Chandler.	October 28, 1874.
	S. A. Forbes	November 21, 1874.
Astoria, Oreg	Frank Hereford	June 10, 1876.
	Hon. J. H. Mitchell, United States Senate	November 29, 1874.
	....do	January 18, 1878.
	....do	March 30, 1878.
	Aug. C. Kinney, secretary of Chamber of Commerce.	July 20, 1878.
	....do	April 2, 1879.
	Hon. James H. Slater, United States Senate; E. C. Holden, secretary Chamber of Commerce.	February 6, 1880.
	Aug. C. Kinney, chairman meterological committee, Astoria Chamber of Commerce.	March 4, 1880.
	Board of Trade, Portland, Oreg; Board of Trade, San Francisco; Chamber of Commerce, San Francisco; Chamber of Commerce, Astoria.	August 26, 1880.
	Hon. J. Whitcaker, M. C.; E. C. Holden, secretary Astoria Chamber of Commerce.	December 27, 1880.
Fond du Lac, Wis	Hon. J. H. Slater, U. S. Senate; E. C. Holden, secretary Astoria Chamber of Commerce.	January 3, 1881.
Corpus Christi, Tex	Hon. C. A. Eldridge, M C.; J. W. Carney	December 15, 1874.
	H. Taylor, P. M	January 4, 1875.
	....do	January 15, 1875.
Lansing, Mich. (State Agricultural College.)	Hon. G. Schleider, M. C.; Wm. Headon, Maj. R. I. Denney, secretary of city; J. P. Rodney, and 3 others.	
Pana, Ill	R. C. Kedzie, professor of chemistry	January 12, 1875.
Columbus, Ga	E. C. Reese, P. M	January 17, 1875.
	Hon. H. R. Harris, M. C	January 19, 1875.
Salisbury, N. C	....do	January 20, 1876.
Hartford, Conn	Hon. W. M. Robbins, M. C	January 20, 1875.
Oshkosh, Wis	G. H. Kingsbury, chairman meteorological committee, Tolland Co. Agricultural Society.	January 21, 1875.
Ames, Iowa (State Agricultural College.)	T. Floyd Woodworth, M. D	January 22, 1875.
Mount Anthony, Bennington, Vt.	J. K. Macomber, professor of physics	January 23, 1875.
Afton, Iowa	G. W. Robinson	January 27, 1875.
Mount Pisgah, Bradford County, Pa.	Hon. James W. McDill, M. C.; N. W. Rowell, W. R. Roberts, and 12 others.	February 17, 1875.
Jacksonsville, Ill	R. Redmgton	March 2, 1875.
Ironton, Ohio	Hon. John A. Logan, U. S. Senate; G. V. Black, Sam'l H. Martin, and H. G. Whitlock.	March 15, 1875.
Isles of Shoals, N. H	Albert Lawson, W. S. McQuigg, and 24 others	March 25, 1875.
	John R. Poor, J. Albert Walker, John Walker, and 7 others.	
Abingdon, Ill. (Abingdon College.)	Dr. H. I. Bowditch, member National Board of Trade.	September 10, 1870.
	D. S. Harris, professor of natural sciences	April 1, 1875.

List of places for which stations have been requested, &c.—Continued.

Place.	Applicant.	Date.
Hingham, Wis	Charles Rogers and F. A. Balch, meteorological committee Farmers' Club of Hingham.	April 19, 1875.
Three or four additional stations in the interior of Florida.	John P. Wall, M. D	May 6, 1875.
Lake Charles, La	William Myer, assistant postmaster	June 12, 1875.
	D. H. Reese, postmaster	October 15, 1877.
Tallahassee, Fla	Hon. S. B. Conover, United States Senate, and 41 others.	June 12, 1875.
Franklin, Idaho	J. Richardson	July 23, 1875.
Lenoir, N. C	Clinton A. Cilley (late brevet lieutenant-colonel and acting assistant quartermaster, U. S. Army.)	July 28, 1875.
Fort Dodge, Iowa	Frederick Hess	November 4, 1875.
Friendsville, Ala	James Pool	November 6, 1875.
Greencastle, Ind. (Asbury University.)	Alex. Martin, president	November 18, 1875.
	Hon. O. P. Morton, United States Senate; Alex. Martin, D.D., president of university.	March 7, 1876.
	Wm. R. Hamilton, lieutenant Fifth United States Artillery.	September 14, 1880.
Danville, Va	J. R. Winston	December 13, 1875.
	A. M. Wheeler, postmaster	July 15, 1879.
	Hon. Geo. C. Cabell, M. C	May 23, 1882.
Cape Henlopen, Del	J. E. Jouett, captain United States Navy	December 22, 1875.
Fulton, Ark	Jay Guy Lewis	December 28, 1875.
	Hon. J. B. Elam, M. C.; B. Martin and 24 others	December 21, 1879.
Silver City, Idaho; Walla Walla, Wash., and Baker City, Oreg.	Hon. T. W. Bennett, Delegate from Idaho	February 9, 1876.
Carson City, Nev	Hon. John P. Jones, United States Senate; Hon. Wm. Sharon, United States Senate; Hon. Wm. Woodburn, M. C.; the governor and numerous state officials of Nevada.	March 6, 1876.
Paw Paw, Mich	E. E. Rowland	April 3, 1876.
Carlisle, Pa	William H. Cooke	May 4, 1876.
Fairbury, Nebr	Will. W. Watson, civil engineer	May 12, 1876.
Kelly's Island, Ohio	D. K. Huntington, deputy collector of customs	May 25, 1876.
	James Monroe, M. C.; R. K. Winslow and 102 others.	December 17, 1879.
	Board of Trade, Detroit	August 19, 1880.
Three Rivers, Mich	John Anable	May 30, 1876.
Moffat, Tenn	John Francis	June 29, 1876.
University of Missouri	Col. Rollins (through Commissioner of Education).	July 17, 1876.
Bald Knob, Giles County, Va.	Wm. Terry; Mrs. H. Haupt	December 22, 1876.
Stowe, Vt.	A. C. Stickney, civil engineer	December 22, 1876.
Alfred Centre, N. Y. (Alfred University.)	H. E. Coon	January 12, 1877.
Anchorage, Ky. (Forest Academy.)	Col. J. H. Current	March 31, 1877.
Monticello, Iowa	M. M. Moulton, city marshal; F. I. Tryon, mayor; M W. Herrick, city attorney.	April 15, 1877.
Reed's Landing, Minn	T. B. Wilson and Co	June 25, 1877.
Ocracoke, N. C	Thomas L. Tolton, M. F. Nelson, and 17 others, shipmasters, pilots, &c.	June 29, 1877.
Ripon, Wis. (Ripon College.)	Hon. P. Sawyer, C. A. Kenaston, secretary	July 21, 1877.
	Prof. C. A. Kenaston	February 5, 1878.
	Prof. C. A. Kenaston	February 29, 1878.
Cheyenne Wells, Cal	L. M. McLane	July 27, 1877.
Judsonia, Ark. (Judson University.)	Hon. A. H. Garland, Prof. Hubert M. Skinner	August 18, 1877.
	J. H. Wymer, voluntary observer	July 6, 1878.
Statesville, N. C	Hon. William M. Robbins, M. C	November 17, 1877.
	Hon. William M. Robbins, M. C	January 29, 1879.
"The Vista" Catskill Mountains, N. Y.	Prof. Samuel E. Rusk	February 6, 1878.
Algona Iowa	P. Dorweiler	February 14, 1878.
Thomasville, Ga	D. S. Brandon	March 18, 1878.
	Dr. John T. Metcalf	July 16, 1878.
Amherst, Mass. (State Agricultural College.)	Lieut. C. A. L. Totten, Fourth Artillery, acting signal officer.	March 30, 1878.
	W. S. Clarke, president	March 30, 1878.
Eagle River, Mich. (north-side of Point Keeweenaw, Lake Superior.)	J. T. Whiting, general agent Lake Superior Transit Company.	May 1, 1878.
	Leopold and Austrian, proprietors Lake Superior People's Line of Steamers.	May 2, 1878.
Grayville, Ill	R. W. Townshend, M. C.; J. G. Stokes, M. D	June 7, 1878.
Starkey, N. Y	H. L. Jennison	August 8, 1878.
Roan Mountain, N. C	Hon. J. N. Thornburgh, M. C	July 19, 1878.
Mount Mitchell, N. C	Hon. R. B. Vance, M. C	August 29, 1878.
Carbondale, Ill. (Southern Illinois Normal University.)	Robert Allyn, principal; Capt. T. J. Spencer, U. S. A	October 1, 1878.
	Hon. J. A. Logan; James Roberts, secretary, and G. F. Foster, professor of physics.	October 2, 1878.

List of places for which stations have been requested, &c.—Continued.

Place.	Applicant.	Date.
Seattle, Wash	G. A. Weed, mayor, and 22 others	October 26, 1878.
Doboy Island, Ga	E. F. Brian, superintendent Savannah Cotton Exchange.	January 25, 1879.
South Saint George, Me	Hon. S. D. Lindsey, M. C.; Franklin Trussell	February 6, 1879.
Beaufort, N. C	Hon. A. M. Waddell, M. C.; John D. Davis, D. S. Boone, and 87 others, citizens of Beaufort.	February 10, 1879.
	Citizens of Beaufort (through Lieut. J. A. Swift, Signal Corps U. S. Army).	February 15, 1881.
Overlook Mountain, N. Y	James Smith	March 7, 1879.
Whitehall, Mich	Francis Smith, C. C. Thompson, P. M., and 41 others.	March 29, 1879.
Lafayette, Ind. (Purdue University.)	C. C. Thompson, P. M	October 6, 1879.
Ogden, Utah	Hon. G. S. Orth, M. C	April 14, 1879.
	George B. Prescott, electrician W. U. Telegraph Company; W. B. Hibbard.	April 26, 1879.
Flagstaff Hill, Mass	N. Bearse, W. W. Hallett, and 109 others	May 2, 1879.
Elliott's Knob, Va	Jed. Hotchkiss	May 23, 1879.
Northfield, Minn. (Carleton College).	Hon. William Windom, United States Senate	May 28, 1879.
	James W. Strong, president; W. W. Payne, professor.	November 19, 1880.
Belton, Texas	Hon. S. B. Maxey, United States Senate; Hon. Richard Coke, United States Senate; S. C. Alexander, and 67 others.	May 28, 1879.
Hummelstown, Pa	Hon. J. W. Killinger, M. C	June 10, 1879.
Swansborough, N. C	D. J. Sanders, W. W. Demuls, and 31 others	September 4, 1879.
Butte, Mont	Henry Jacobs, mayor, and 70 others	October 11, 1879.
Berkshire Hills, Pittsfield, Mass.	W. T. Bacon	December 20, 1879.
Gaylord, Kans	Hon. J. A. Anderson, M. C.; T. W. McBride, and 15 others.	December 27, 1879.
Summit, Colo	John M. Walker, director Iowa and Colorado Consolidated Mining Company.	January 7, 1880.
Leadville, Colo	Hon. J. A. Logan, United States Senate; W. S. Green, W. A. Camplin, James L. Clark, and 191 others.	January 17, 1880.
	Lieut. George Stanley, topographical engineer of the Colorado and New Mexican geological survey.	February 9, 1881.
Glasgow, Mo	Web. M. Samuel, chairman metl. committee Merchants' Exchange, Saint Louis, Mo.	March 8, 1880.
Winston, N. C	W. O. Shelburn.	March 17, 1880.
Florence, Ala	Hon. William M. Lowe, M. C	April 20, 1880.
Rolla, Mo. (Missouri School of Mines.)	Hon. G. G. Vest, United States Senate; Charles E. Waite, director.	May 5, 1880.
Suspension Bridge, N. Y. (Seminary of our Lady of Angels.)	Rev. C. Wotruba, C. M. professor of physics and astronomy.	May 14, 1880.
Point Adams, Oregon	Board of Trade, Portland, Oregon; Board of Trade, San Francisco; Chamber of Commerce, San Francisco; Chamber of Commerce, Astoria, Oregon.	August 26, 1880.
Tillamook Rock, Oregon	Board of Trade, Portland, Oregon; Board of Trade, San Francisco; Chamber of Commerce, San Francisco; Chamber of Commerce, Astoria, Oregon.	August 26, 1880.
	Hon. J. Whiteaker, M. C.; E.C. Holden, secretary Astoria Chamber of Commerce.	December 27, 1880.
	Hon. J. H. Slater, United States Senate; E. C. Holden, secretary Astoria Chamber of Commerce.	January 3, 1881.
	Chamber of Commerce, San Francisco	June 20, 1881.
	Chamber of Commerce, Astoria, Oregon	January 31, 1882.
	Board of Trade, San Francisco	March 8, 1882.
Comfort, Texas	Hon. C. Upson, M. C.; Brig. Gen'l. E. O. C. Ord, U. S. Army, and 83 others.	September 2, 1880.
	Hon. C. Upson, M. C., and 52 others	September 6, 1880.
	Dr. Fred. Potterson, secretary Comfort Agricultural Society.	November 15, 1880.
Long Beach, L. I	Thomas R. Sharp, president Long Beach Improvement Company.	October 16, 1880.
The National Park	Dr. E. T. Yager	November 7, 1880.
Race-Rock Light-House, Ct	James Fitch, chairman meteorological committee, New London.	November 20, 1880.
Cimarron, N. Mex	Colonel Edward Hatch, Ninth Cavalry; "The Maxwell Land Grant Company."	December 3, 1880.
Orange, Texas	Hon. J. H. Reagan, M. C	December 14, 1880.
Tyler, Texas	Hon. J. H. Reagan, M. C	December 14, 1880.
Wilmington, Cal	Hon. J. H. Reagan, M. C.; Hon. J. P. Douglas	January 15, 1881.
	Phineas Banning	January 4, 1881.
Boerne, Texas	Phineas Banning	January 31, 1881.
Macon, Miss	Hon. C. Upson, M. C.; F. E. Grothaus	January 6, 1881.
	Hon. H. D. Money, M. C	January 9, 1881.

List of places for which stations have been requested, &c.—Continued.

Place.	Applicant.	Date.
Hibritten Mountain, N. C	Hon. R. B. Vance, M. C.; Dr. R. L. Beall	January 28, 1881.
Springfield, Ohio	W. B. Dix, William Moore	February 7, 1881.
Cedar Rapids, Iowa	Hon. W. B. Allison, United States Senate; T. J. Upton, president; W. Harman, secretary Board of Trade, Cedar Rapids.	February 11, 1881.
Breckenridge, Minn	R. Phelps, registrar of deeds	February 14, 1881.
Fort Fred. Steele, Wyo	Hon. S. W. Dorsey, M. C.; A. V. Laromer, John T. Stewart, and 12 others.	February 24, 1881.
White Head, Me	Hon. T. H. March, M. C.; J. S. Case, and 228 others	Febrnary 24, 1881.
At numerous points in Alaska and the Aleutian Islands.	Lieut. A. W. Greely, Fifth United States Cavalry, acting signal officer.	February 25, 1881.
Baton Rouge, La. (State University and Agricultural and Mechanical College.)	Hon. R. L. Gibson, M. C.; William Preston Johnston, president.	February 25, 1881.
Some points on the Atchison, Topeka, and Santa Fé R. R.	Lieut. J. P. Story, Fourth United States Artillery, acting signal officer.	March 2, 1881.
Carrolton, Ky	J. T. Lewis, P. M	March 6, 1881.
Nantucket, Mass	W. H. Starbuck	March 8, 1881.
Oakland, Cal	H. Vrooman, W. E. Dargie, and J. J. Hunifan	March 12, 1881.
Randolph, Vt. (State Normal School.)	A. W. Edson, principal	March 14, 1881.
Fair Haven, Conn	H. A. French, G. M. Clark, and 63 others	March 25, 1881.
Wilkesbarre, Pa	D. L. Rhone	April 8, 1881.
Bedford, Mont	A. B. Miller, P. M., and 72 others	April 10, 1881.
South Framingham, Mass. (State Arsenal.)	A. Hun Berry, adjutant-general Massachusetts Volunteer Militia.	April 18, 1881.
	I. F. Kingsbury, colonel and assistant adjutant-general Massachusetts Volunteer Militia	July 23, 1881.
	A. Hun Berry, adjutant-general Massachusetts Volunteer Militia.	August 22, 1881.
Bozeman, Mont	Lieut. Geo. S. Grimes, Second Artillery, acting signal officer.	April 24, 1881.
Ascutney Mountain, Vt	S. J. Bronson	May 24, 1881.
Fort Worth, Tex	C. Arnold	May 25, 1881.
Glen Haven, Mich	D. H. Day, agent Northern Transit Company	June 11, 1881.
	D. H. Day & Co	December 4, 1881.
	P. Chamberlain, president Northern Transit Company.	March 14, 1882.
Sheldon, and Sioux City, Iowa	Hon. G. C. Carpenter, M. C., and 67 others	July 18, 1881.
Bass River (South Dennis, Mass.)	Hon. W. W. Crapo, M. C	July 25, 1881.
	Hon. W. W. Crapo, M. C.; P. P. & W. H. Baxter	August 21, 1881.
	Hon. W. W. Crapo, M. C., and 53 others	September 29, 1881.
On Danville, Mocksville, and Southwestern Railroad, in North Carolina.	Thomas R. Sharp, president	July 29, 1881.
Summit of Blue Ridge Mountains near Berks, Pa.	Oliver D. Shock	September 9, 1881.
Hillsboro, Ohio	J. W. Bridwell, editor "The Saturday Herald"	September 13, 1881.
Ottawa Point Light (East Tawas), Mich.	George Haskins, light-keeper	September 28, 1881.
	George Haskins and 118 others	November 2, 1881.
	George Haskins	December 27, 1881.
Marion, Ala	Hon. C. M. Shelley, M. C	October 16, 1881.
Etchetah, Mont	Charles A. Dyer	October 21, 1881.
Cuero, Tex	Hon. S. B. Maxey, United States Senate; Hon. R. Coke, United States Senate.	October 22, 1881.
Manitou Islands, Lake Michigan.	Michigan Legislature; Board of Trade, Chicago	October 24, 1881.
Port Jervis, N. Y	W. T. Doty	November 8, 1881.
Paris, Tex	Hon. S. B. Maxey, United States Senate	November 15, 1881.
Crumples Island, Me	J. M. Richardson, superintendent first life-saving district, and 100 others.	December 4, 1881.
	J. M. Richardson, superintendent first life-saving district, and 84 others.	December 10, 1881.
Cape Disappointment, Wash	Lieut. C. E. Kilbourne, acting signal officer and assistant.	December 9, 1881.
Highland, N. C	Hon. R. B. Vance, M. C.; Capt. S. T. Kelsey	December 13, 1881.
	E. E. Ewing	December 29, 1881.
	H. M. Bascom	December 30, 1881.
Aberdeen, Miss	Hon. H. L. Muldrow, M. C	December 21, 1881.
Patuha City, Wash	Sergt. F. Greene, Signal Corps, United States Army, and 30 others.	December 21, 1881.
Clarksville, Tenn	J. P. Howard	December 21, 1881.
Fort Jupiter Light, Fla	New York Maritime Association	December 27, 1881.
	Charles Dennis, secretary Board of Underwriters and vice-president Atlantic Mutual Insurance Company.	December 31, 1881.
	Insurance Company of North America, Insurance Company of Pennsylvania, Insurance Company of Philadelphia, and Delaware Mutual Safety Insurance Company.	December 31, 1881.

List of places for which stations have been requested, &c.—Continued.

Place.	Applicant.	Date.
Fort Jupiter Light, Fla.—Continued.	C. H. Mallory & Co., F. Alexander & Sons, and 14 others.	December 31, 1881.
	Washington Fire and Marine Insurance Company and 8 other insurance companies.	January 4, 1882.
East Tawas, Mich	Chamber of Commerce, New York City.	February 4, 1882.
Whitestone, L. I	J. H. Schenck	December 27, 1881.
Oxford, Miss	Capt. B. S. Osbon	December 29, 1881.
(University of Mississippi)	Prof. R. B. Fulton	January 7, 1882.
	Gen. S. D. Lee, president of the Agricultural and Mechanical College of Mississippi.	January 26, 1882.
Alexandria, and Natchitoches, La.	Hon. Van H. Manning	April 3, 1882.
	Hon N. C. Blanchard, M. C	January 12, 1882.
At the entrance to Penobscot Bay, Me.	R. T. Carver	January 19, 1882.
Tawas Light (Tawas Bay), Lake Huron.	R. A. Alger	January 21, 1882.
Saint Joseph, Mo	Hon. A. Ford, M. C	January 22, 1882.
New Switzerland, Ga	A. Pope, general passenger agent Richmond and Danville Railroad; Mrs. C. R. Biedermann.	February 3, 1882.
Mount Carmel, Ill	Hon. G. B. Raum, Frank W. Havill, and 83 others	February 7, 1882.
Cape Hancock, Wash	Board of Trade, Portland Oreg	February 12, 1882.
Bailey's Harbor, Wis	T. A. Pieplow	February 16, 1882.
	W. H. Horn	April 16, 1882.
Aberdeen, Dak	John H. Drake	February 18, 1872.
Ticonderoga, N. Y	Hon. John Hammond, M. C	February 21, 1882.
Oxford, Ohio	L. H. Wells	February 22, 1882.
Mount Massive, Colo	R. E. Goodell, secretary Yankee Hill Consolidated Mining Company.	February 23, 1882.
Leland, Mich	V. K. Moore, president Leland Iron Company	February 25, 1882.
Grainfield, Kans	Thomas Hindman	March 3, 1882.
Trinity, Ala	Hon. Jos. Wheeler, M. C.; Rev. Jos. Shackleford	March 4, 1882.
Greenville, Miss	W. A. Everman, secretary and treasurer Board of Mississippi Levee Commission.	March 8, 1882.
Cutler, Me	John C. Smith, superintendent New York Maritime Association.	April 3, 1882.
Lexington, Ky	Hon. J. B. Beck, Prof. J. R. Patterson, A. S. Winston.	April 22, 1882.
Holly Springs, Miss	Hon. Van H. Manning, M. C	May 17, 1882.
Columbia, Tex	Hon. G. W. Jones, M. C.; John Wells	May 29, 1882.
Wolf Point, Mont	Charles Aubrey and others	June 16, 1882.
Chamberlain, Dak	Hon. R. F. Pettigrew, Delegate; F. M. Goodyhoontz.	June 22, 1882.
	S. S. Merrill, general manager Chicago, Milwaukee, and Saint Paul Railroad.	June 22, 1882.

APPENDIX 15

Annual and mean annual barometer, reduced to sea-level, at stations of the Signal Service, United States Army, from the commencement of observations to December 31, 1881.

Stations.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	Years data compiled from.	Mean annual barometer.
Albany, N. Y.	.....	.....	.....	29.996	30.005	30.079	30.004	29.945	30.034	30.060	30.037	8	30.020
Alpena, Mich	.....	.....	29.969	30.017	29.952	29.940	30.000	29.906	30.013	29.986	30.026	9	29.979
Atlanta, Ga	.....	.....	.....	.....	.....	.....	.....	.....	30.061	30.065	30.069	3	30.065
Atlantic City, N. J	.....	.....	.....	30.076	30.049	30.030	30.042	29.979	30.081	30.092	30.049	8	30.050
Augusta, Ga	.....	30.096	30.092	30.112	30.078	30.079	30.068	30.027	30.119	30.140	30.093	10	30.090
Baltimore, Md	30.102	30.058	30.044	30.077	30.057	30.056	30.061	29.990	30.096	30.103	30.069	11	30.065
Barnegat, N. J	.....	.....	.....	30.023	30.024	30.020	30.033	29.979	30.063	30.073	30.029	8	30.030
Bismarck, Dak	.....	.....	.....	.....	29.883	29.844	29.843	29.953	30.001	29.996	30.018	7	29.934
Block Island, R. I	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	30.018	1	30.018
Boisé City, Idaho	.....	.....	.....	.....	.....	.....	.....	30.053	30.103	30.145	30.095	4	30.099
Boston, Mass	29.982	29.975	29.987	30.029	29.996	29.973	29.997	29.944	30.022	30.041	30.009	11	29.996
Brackettville, Tex	.....	.....	.....	.....	.....	.....	.....	29.806	29.858	29.893	29.844	4	29.850
Brownsville, Tex	.....	.....	.....	.....	.....	.....	.....	.....	29.989	29.996	29.986	3	29.990
Buffalo, N. Y	29.963	29.947	29.946	30.018	29.983	29.962	29.996	29.929	30.011	30.006	30.019	11	29.980
Burlington, Vt	.....	29.940	29.971	30.009	29.997	29.968	30.006	29.938	30.001	30.034	30.004	10	29.987
Cairo, Ill	.....	30.120	30.023	30.079	30.058	30.057	30.054	29.997	30.109	30.109	30.085	10	30.069
Campo, Cal	.....	.....	.....	.....	.....	.....	.....	29.949	29.974	29.973	29.978	4	29.968
Cape Henry, Va	.....	.....	.....	30.021	30.071	30.046	30.046	29.989	30.094	30.094	30.059	8	30.052
Cape May, N. J	.....	30.051	30.033	30.078	30.054	30.041	30.042	29.993	30.069	30.079	30.044	10	30.048
Castroville, Tex	.....	.....	.....	.....	.....	.....	.....	.....	29.908	29.920	29.906	3	29.911
Cedar Keys, Fla	.....	.....	.....	.....	.....	.....	.....	.....	.....	30.104	30.067	2	30.085
Champaign, Ill	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	29.999	1	29.999
Charleston, S. C	.....	30.078	30.083	30.104	30.095	30.090	30.076	30.057	30.100	30.109	30.078	10	30.087
Charlotte, N. C	.....	.....	.....	.....	.....	.....	.....	.....	30.050	30.052	30.062	3	30.055
Chattanooga, Tenn	.....	.....	.....	.....	.....	.....	.....	.....	30.088	30.092	30.083	3	30.088
Cheyenne, Wyo	.....	29.981	29.954	29.956	29.943	29.933	29.946	29.943	29.962	29.950	30.002	10	29.957
Chicago, Ill	.....	30.041	29.998	30.020	29.983	29.965	29.988	29.928	30.022	30.005	30.022	10	29.997
Chincoteague, Va	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	30.059	1	30.059
Cincinnati, Ohio	.....	30.119	30.040	30.083	30.010	29.976	29.980	29.959	30.083	30.088	30.070	10	30.041
Cleveland, Ohio	.....	30.033	29.970	30.007	29.991	30.002	30.034	29.965	30.051	30.047	30.057	10	30.016
Columbus, Ohio	.....	.....	.....	.....	.....	.....	.....	.....	30.043	30.051	30.047	3	30.047
Concho, Tex	.....	.....	.....	.....	.....	.....	.....	29.666	29.746	29.748	29.919	4	29.770
Corsicana, Tex	.....	.....	.....	.....	30.003	30.021	30.019	29.971	30.022	30.052	(a)	6	30.015
Davenport, Iowa	.....	30.067	29.996	30.040	30.018	29.995	30.024	29.959	30.034	30.003	30.031	10	30.017
Dayton, Wash	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	30.055	1	30.055
Decatur, Tex	.....	.....	.....	.....	.....	.....	.....	.....	29.884	(a)	(a)	1	29.884
Delaware Breakwater, Del	.....	.....	.....	.....	.....	.....	.....	.....	.....	30.096	30.045	2	30.070
Denison, Tex	.....	.....	.....	.....	.....	.....	.....	29.962	30.007	30.025	30.028	4	30.005

Denver, Colo		30.019	30.004	30.001	29.993	29.993	29.987	29.972	29.915	29.984	30.008	10	29.995
Des Moines, Iowa									30.011	30.001	30.035	3	30.016
Detroit, Mich		29.999	29.971	30.013	29.983	29.968	29.991	29.932	30.020	30.015	30.038	10	29.993
Dodge City, Kans					29.656	29.636	29.641	29.608	29.663	29.685	29.889	7	29.663
Dubuque, Iowa				30.040	30.009	29.995	29.996	29.937	30.023	30.000	30.027	8	30.003
Duluth, Minn		29.960	29.949	29.988	29.981	29.971	29.974	29.920	29.995	29.966	30.019	10	29.974
Eagle Pass, Tex								29.892	29.932	29.950	30.013	4	29.947
Eagle Rock, Idaho											30.047	1	30.047
Eastport, Me				29.951	29.938	29.914	29.955	29.900	29.956	29.977	29.950	8	29.943
Erie, Pa				30 010	29.979	29.965	29.995	29.934	30.028	30.015	30.028	8	29.994
Escanaba, Mich		29.956	29.929	29.992	29.974	29.954	29.990	29.941	30.009	29.974	30.013	10	29.973
Florence, Ariz									30.023	30.022	30.016	3	30.020
Fort Apache, Ariz											30.178	1	30.178
Fort Benton, Mont												2	29.995
Fort Buford, Dak				29.988	30.002							2	29.889
Fort Davis, Tex										29.797	29.981	1	30.178
Fort Elliott, Tex									30.178	(a)	(a)	1	30.020
Fort Gibson, Ind. T											30.020	8	29.994
Fort Grant, Ariz				29.991	29.985	29.984	29.989	29.945	30.013	30.027	30.007	2	30.016
Fort Griffin, Tex									30.026	30.007	(a)	4	29.961
Fort Macon, N. C								29.931	29.978	30.007	29.930	1	30.060
Fort McKavett, Tex											30.060	3	29.651
Fort Sill, Ind. T									29.649	29.649	29.655	4	29.884
Fredericksburg, Tex								29.828	29.676	29.895	29.939	2	29.772
Galveston, Tex		30.077	30.060	30.051	30.051	30.067	30.048	29.997	29.730	(a)	29.815	10	30.050
Grand Haven, Mich		29.971	29.950	30.046	29.985	29.959	29.991	29.936	30.055	30.051	30.039	10	29.988
Hatteras, N. C. (b)					30.049	30.005	29.997	30.020	30.020	29.995	30.024	7	30.046
Henrietta, Tex									30.109	30.079	30.063	1	29.905
Indianapolis, Ind		30.043	30.004	30.038	30.005	29.997	30.008	29.946	30.038	30.030	29.905	10	30.013
Indianola, Tex			30.051	30.072	30.055	30.061	30.045	29.996	30.054	30.054	30.024	9	30.047
Jacksborough, Tex								29.918	(a)	(a)	30.033	2	29.937
Jacksonville, Fla		30.101	30.085	30.097	30.097	30.079	30.066	30.028	30.103	30.111	29.956	10	30.083
Keokuk, Iowa		29.987	29.973	30.006	29.975	29.961	29.972	29.917	30.080	29.975	30.066	10	29.987
Key West, Fla	30.046	30.050	30.060	30.065	30.085	30.064	30.031	30.006	30.060	30.080	30.022	11	30.054
Kitty Hawk, N. C						30.072	30.058	30.010	30.096	30.122	30.047	6	30.073
Knoxville, Tenn		30.086	30.061	30.080	30.055	30.068	30.056	30.017	30.101	30.099	30.081	10	30.072
La Crosse, Wis			30.011	30.038	29.994	29.967	29.982	29.918	29.997	29.973	30.098	9	29.987
La Mesilla, N. M											30.000	1	30.241
Laredo, Tex											30.241	3	29.913
Leavenworth, Kans		30.042	29.975	29.995	29.982	29.970	29.977	29.953	29.889	29.896	(a)	10	29.988
Lewiston, Idaho								29.922	29.998	29.992	30.026	1	29.980
Little Rock, Ark											29.980	2	30.052
Los Angeles, Cal											30.068	4	29.991
Louisville, Ky		30.058	30.018	30.050	30.027	30.025	30.022	29.955	30.000	30.008	30.000	10	30.032
Lynchburg, Va		30.078	30.042	30.094	30.057	30.038	30.043	29.965	30.068	30.054	30.032	10	30.056
Madison, Wis								29.982	30.071	30.092	30.063	3	29.995
Marquette, Mich									29.997	29.965	30.023	9	29.964
Mason, Tex			29.952	29.988	29.966	29.952	29.960	29.916	29.973	29.954	30.018	4	30.087
Memphis, Tenn								30.051	30.094	30.094	30.110	10	30.071
Milwaukee, Wis		30.117	30.061	30.088	30.063	30.071	30.060	30.008	30.092	30.084	30.066	10	30.000
		29.986	29.961	30.054	30.019	29.991	30.025	29.937	30.013	29.984	30.026		

a Record incomplete. *b* Record for Cape Hatteras, N. C., used prior to December 1, 1880.

Annual and mean annual barometer, reduced to sea-level, at stations of the Signal Service, United States Army—Continued.

Stations.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	Years data compiled from.	Mean annual barometer.
Mobile, Ala	.....	30.109	30.102	30.096	30.088	30.089	30.066	30.032	30.093	(a)	30.058	9	30.081
Montgomery, Ala	.....	.....	30.091	30.103	30.095	30.099	30.072	30.028	30.094	30.110	30.075	9	30.085
Moorhead, Minn (b)	.....	.....	29.977	29.983	29.989	29.972	29.962	29.899	29.977	(a)	30.013	8	29.971
Morgantown, W. Va	.....	.....	.....	30.042	30.017	30.010	30.027	29.963	30.049	30.057	30.026	8	30.024
Mount Washington, N. H	.....	29.909	29.926	29.964	29.945	29.958	30.018	29.972	29.988	30.021	29.940	10	29.96.
Nashville, Tenn	.....	30.134	30.056	30.076	30.041	30.041	30.049	30.004	30.093	30.093	30.065	10	30.065
New Haven, Conn	.....	.....	30.009	30.008	30.037	30.005	30.019	29.966	30.045	30.063	30.021	9	30.026
New London, Conn	.....	29.994	30.020	30.061	30.037	30.009	30.025	29.971	30.051	30.064	30.033	10	30.026
New Orleans, La	.....	30.075	30.068	30.077	30.071	30.075	30.049	30.006	30.072	30.081	30.047	10	30.062
Newport, R. I	.....	.....	.....	.....	.....	29.993	30.013	29.955	30.040	30.054	30.015	6	30.012
New York, N. Y	.....	29.999	30.033	30.070	30.047	30.024	30.041	29.986	30.068	30.080	30.042	10	30.039
Norfolk, Va	.....	30.058	30.054	30.100	30.070	30.059	30.061	30.012	30.097	30.105	30.065	10	30.068
North Platte, Nebr	.....	.....	.....	.....	29.616	29.604	29.611	29.597	29.636	29.630	29.898	7	29.656
Olympia, Wash	.....	.....	.....	.....	.....	.....	.....	29.977	29.995	30.048	30.024	4	30.011
Omaha, Nebr	.....	29.943	29.970	29.983	29.981	29.956	29.945	29.883	29.943	29.945	30.052	10	29.958
Oswego, N. Y	.....	29.950	29.992	30.032	30.008	29.989	30.021	29.952	30.035	30.036	30.007	10	30.002
Pensacola, Fla	.....	.....	.....	.....	.....	.....	.....	.....	.....	30.109	30.065	2	30.087
Philadelphia, Pa	.....	30.046	30.041	30.089	30.059	30.037	30.048	29.987	30.075	30.092	30.051	10	30.052
Pike's Peak, Colo	.....	.....	.....	29.958	29.939	29.953	29.956	29.951	29.988	29.928	29.962	8	29.954
Pioche, Nev	.....	.....	.....	.....	.....	.....	.....	29.803	(a)	29.861	30.005	3	29.870
Pittsburg, Pa	.....	30.003	29.994	30.039	30.005	29.993	30.005	29.949	30.052	30.054	30.056	10	30.015
Port Huron, Mich	.....	.....	.....	.....	29.990	29.968	29.992	29.922	30.004	29.997	30.028	7	29.986
Portland, Me	.....	29.970	29.920	29.959	30.077	29.964	29.976	29.922	29.986	30.006	29.978	10	29.976
Portland, Oreg	.....	30.102	30.107	30.076	30.117	30.032	30.079	30.065	30.064	30.086	30.074	10	30.080
Prescott, Ariz	.....	.....	.....	.....	.....	.....	.....	30.107	30.118	30.124	30.050	4	30.100
Punta Rassa, Fla	.....	30.076	30.079	30.092	30.110	30.083	30.052	30.027	30.077	30.074	30.032	10	30.070
Red Bluff, Cal	.....	.....	.....	.....	.....	.....	.....	29.943	29.991	29.996	29.991	4	29.980
Rio Grande City, Tex	.....	.....	.....	.....	.....	.....	.....	.....	30.009	30.023	30.003	3	30.012
Rochester, N. Y	.....	29.948	29.960	30.011	29.990	29.960	29.992	29.923	30.020	30.000	30.014	10	29.982
Roseburg, Oreg	.....	.....	.....	.....	.....	.....	.....	30.041	30.081	30.101	30.095	4	30.106
Sacramento, Cal	.....	.....	.....	.....	.....	.....	.....	29.956	30.006	30.023	30.023	4	30.002
Saint Louis, Mo	.....	30.034	30.016	30.063	30.040	30.027	30.029	29.976	30.063	30.050	30.052	10	30.035
Saint Paul, Minn	.....	.....	29.955	29.958	29.942	29.936	29.937	29.876	29.956	29.926	29.996	9	29.942
Saint Vincent, Minn (c)	.....	.....	.....	29.980	(a)	29.976	29.980	29.922	29.966	29.926	29.993	7	29.963
Salt Lake City, Utah	.....	.....	.....	29.977	29.971	29.959	29.959	29.962	29.963	29.971	29.988	8	29.969
San Antonio, Tex	.....	.....	.....	.....	.....	.....	.....	.....	29.865	30.009	30.026	3	29.967
San Diego, Cal	.....	30.020	29.990	30.010	30.030	30.017	29.999	30.001	30.027	30.048	29.978	10	30.012
Sandusky, Ohio	.....	.....	.....	.....	.....	.....	.....	29.965	30.052	30.039	30.040	4	30.024
Sandy Hook, N. J	.....	.....	.....	30.060	30.028	29.999	30.033	29.978	30.059	30.068	30.036	8	30.033
San Francisco, Cal	.....	30.047	30.040	30.028	30.037	30.017	30.005	29.987	30.043	30.052	30.051	10	30.031
Santa Fé, N. M	.....	29.833	29.814	29.756	29.753	29.796	29.809	29.799	29.843	29.810	(a)	9	29.801
Savannah, Ga	30.101	30.090	30.097	30.110	30.094	30.092	30.075	30.035	30.114	30.124	30.077	11	30.092
Shreveport, La	.....	30.057	30.055	30.033	30.067	30.098	30.065	29.998	30.053	30.060	30.041	10	30.053

Smithville, N. C						*30. 066*	*30. 077*	*30. 050*	*30. 130*	*30. 134*	*30. 080*	*6*	*30. 093*
Springfield, Ill										*30. 051*	*30. 050*	*2*	*30. 050*
Springfield, Mass					*30. 016*	*29. 989*	*29 987*	*29. 913*	*30. 037*	*30. 060*	*30. 019*	*7*	*30. 003*
Stockton, Tex								*29. 953*	*29. 971*	*29. 981*	*30. 024*	*4*	*29. 982*
Thatcher's Island, Mass						*29. 974*	*29. 999*	*29. 944*	*30. 053*	*30. 044*	*30. 008*	*6*	*30. 004*
Toledo, Ohio		*30. 004*	*29. 980*	*30. 038*	*29. 986*	*29. 960*	*30. 005*	*29. 931*	*30. 023*	*30. 020*	*30. 033*	*10*	*29 998*
Tucson, Ariz							*30. 049*	*(a)*	*(a)*	*30. 068*	*29. 948*	*3*	*30. 022*
Umatilla, Oreg								*30. 135*	*30. 151*	*30. 193*	*30. 160*	*4*	*30. 160*
Uvalde, Tex									*29. 880*	*29. 865*	*29. 841*	*3*	*29. 862*
Vicksburg, Miss			*30. 110*	*30. 125*	*30. 128*	*30. 102*	*30. 081*	*30. 035*	*30. 102*	*30. 100*	*30. 069*	*9*	*30. 095*
Visalia, Cal								*29. 982*	*29. 961*	*29. 970*	*29. 980*	*4*	*29. 978*
Washington, D. C	*30. 059*	*30. 052*	*30. 044*	*30. 091*	*30. 066*	*30. 052*	*30. 060*	*30. 006*	*30. 090*	*30. 102*	*30. 067*	*11*	*30. 063*
Wilmington, N. C		*30. 090*	*30. 073*	*30. 108*	*30. 084*	*30. 078*	*30. 064*	*30. 022*	*30. 102*	*30. 110*	*30. 067*	*10*	*30. 080*
Winnemucca, Nev								*29. 985*	*29. 999*	*(a)*	*29. 991*	*3*	*29. 992*
Wood's Holl, Mass			*30. 020*	*30. 056*	*30. 027*	*30. 003*	*30. 024*	*29. 956*	*29. 955*	*30. 036*	*30. 004*	*9*	*30. 009*
Yankton, Dak				*30. 022*	*30. 027*	*30. 009*	*30. 002*	*29. 953*	*(a)*	*30. 002*	*30. 047*	*7*	*30. 009*
Yuma, Ariz								*29. 890*	*29. 912*	*29. 918*	*29. 906*	*4*	*29. 906*

a Record incomplete. *b* Record for Breckenridge, Minn., used prior to January 1, 1881. *c* Record for Pembina, Dak., used prior to September 4, 1880.

APPENDIX 16.

Mean normal barometer, corrected for temperature and instrumental error only, from observations taken at 7 a. m., 3 and 11 p. m. (Washington time), from November 1, 1879, to October 31, 1881, except for stations opened subsequent to the former date.

Station.	Height of cistern of barometer above mean sea-level.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Mean annual barometer.
	Feet.													
Albany, N. Y	75	30.083	30.049	29.830	29.840	29.949	29.861	29.864	29.956	29.981	30.035	30.083	30.022	29.963
Alpena, Mich	609	29.377	29.370	29.299	29.295	29.347	29.292	29.318	29.388	29.330	29.388	29.375	29.352	29.344
Atlanta, Ga	1,131	28.955	28.955	28.810	28.877	28.902	28.871	28.880	28.885	28.925	28.966	29.019	28.947	28.916
Atlantic City, N. J	13	30.155	30.142	29.890	29.961	30.061	29.950	29.962	30.048	30.070	30.131	30.199	30.035	30.055
Augusta, Ga	183	29.995	29.991	29.820	29.821	29.894	29.836	29.837	29.860	29.916	29.970	30.046	29.979	29.919
Baltimore, Md	45	30.141	30.128	29.893	29.941	30.023	29.925	29.940	30.010	30.033	30.100	30.179	30.089	30.033
Barnegat, N. J	20	30.131	30.120	29.863	29.930	30.016	29.923	29.935	30.019	30.042	30.100	30.173	30.072	30.027
Bismarck, Dak	1,694	28.158	28.146	28.180	28.148	28.064	28.069	28.150	28.134	28.118	28.202	28.218	28.254	28.153
Block Island, R. I	27	30.063	30.120	29.677	29.807	30.029	29.883	29.904	29.976	30.037	30.093	30.184	29.921	29.974
Boisé City, Idaho	2,750	27.224	27.236	27.203	27.126	27.145	27.100	27.141	27.102	27.185	27.243	27.325	27.163	27.183
Boston, Mass	142	29.966	29.936	29.698	29.736	29.886	29.776	29.790	29.871	29.907	29.943	29.989	29.907	29.867
Brackettville, Tex	1,170	28.900	28.889	28.799	28.783	28.728	28.744	28.796	28.790	28.803	28.886	28.942	28.905	28.830
Brownsville, Tex	43	30.031	30.019	29.922	29.900	29.845	29.859	29.910	29.864	29.897	29.969	30.050	30.028	29.941
Buffalo, N. Y	696	29.320	29.304	29.155	29.179	29.270	29.199	29.217	29.286	29.281	29.325	29.334	29.279	29.262
Burlington, Vt	268	29.853	29.794	29.593	29.576	29.706	29.620	29.654	29.723	29.733	29.776	29.808	29.770	29.717
Cairo, Ill	377	29.763	29.744	29.629	29.642	29.648	29.621	29.668	29.643	29.690	29.743	29.832	29.777	29.700
Camp, Cal	2,500	27.453	27.472	27.418	27.425	27.346	27.347	27.391	27.344	27.322	27.402	27.448	27.432	27.400
Camp Thomas, Ariz	2,710	27.293	27.236	27.217	27.174	27.099	27.116	27.109	27.170	27.183	27.233	27.272	27.283	27.206
Cape Henry, Va	16	30.147	30.145	29.903	29.977	30.058	29.949	29.962	30.028	30.066	30.130	30.208	30.103	30.056
Cape May, N. J	27	30.135	30.125	29.871	29.933	30.029	29.921	29.934	30.025	30.043	30.098	30.177	30.078	30.031
Castroville, Tex	780	29.291	29.277	29.198	29.181	29.127	29.147	29.190	29.168	29.185	29.266	39.344	29.273	29.221
Cedar Keys, Fla	22	30.108	30.125	30.039	30.085	30.005	30.020	30.035	29.981	30.025	30.060	30.146	30.125	30.063
Champaign, Ill	767	29.292	29.247	29.032	29.168	29.194	29.115	29.215	29.195	29.157	29.260	29.385	29.277	29.211
Charleston, S. C	52	30.109	30.119	29.938	30.007	30.031	29.963	29.963	29.982	30.031	30.080	30.166	30.097	30.040
Charlotte, N. C	808	29.290	29.281	29.098	29.181	29.228	29.155	29.167	29.109	29.237	29.288	29.349	29.254	29.227
Chattanooga, Tenn	783	29.332	29.319	29.171	29.233	29.258	29.223	29.239	29.240	29.283	29.335	29.392	29.325	29.279
Cheyenne, Wyo	6,089	23.900	23.904	23.926	23.974	24.007	24.036	24.145	24.119	24.082	24.069	24.004	23.883	24.004
Chicago, Ill	661	29.341	29.340	29.252	29.253	29.294	29.240	29.247	29.315	29.290	29.349	29.390	29.355	29.310
Chincoteague, Va	18	30.130	30.168	29.875	29.982	30.062	29.951	29.963	30.038	30.064	30.126	30.233	30.029	30.053
Cincinnati, Ohio	620	29.471	29.462	29.322	29.358	29.404	29.348	29.385	29.398	29.425	29.470	29.531	29.469	29.420
Cleveland, Ohio	690	29.355	29.343	29.209	29.237	29.310	29.245	29.279	29.327	29.324	29.366	29.394	29.336	29.310
Columbus, Ohio	805	29.247	29.237	29.092	29.118	29.197	29.132	29.167	29.199	29.215	29.258	29.301	29.234	29.200
Concho, Tex	1,900	28.144	28.135	28.063	28.040	28.001	28.017	28.075	28.074	28.082	28.135	28.196	28.160	28.093
Corsicana, Tex		29.641	29.631	29.553	29.528	29.492	29.508	29.555	29.532	29.560	29.628	29.688	29.661	29.581
Davenport, Iowa	615	29.407	29.394	29.328	29.316	29.329	29.283	29.353	29.353	29.334	29.402	29.467	29.441	29.367

Dayton, Wash	*1, 660*	*28. 410*	*28. 287*	*28. 306*	*28. 274*	*28. 280*	*28. 191*	*28. 237*	*28. 226*	*28. 245*	*28. 281*	*28. 421*	*28. 338*	*28. 291*
Deadwood, Dak	*4, 600*	*25. 213*	*25. 230*	*25. 266*	*25. 297*	*25. 321*	*25. 836*	*25. 421*	*25. 398*	*25. 373*	*25. 389*	*25. 842*	*25. 233*	*25. 318*
Decatur, Tex	*1, 129*	*28. 881*	*28. 878*	*28. 808*	*28. 767*	*28. 761*	*28. 763*	*28. 829*	*28. 804*	*28. 837*	*28. 950*	*28. 947*	*28. 915*	*28. 843*
Delaware Breakwater, Del	*20*	*30. 196*	*30. 137*	*29. 885*	*29. 952*	*30. 047*	*29. 949*	*29. 955*	*30. 028*	*30. 050*	*30. 109*	*30. 222*	*30. 016*	*30. 045*
Denison, Tex	767	29. 283	29. 281	29. 202	29. 170	29. 147	29. 159	29. 218	29. 184	29. 215	29. 276	29. 338	29. 304	29. 231
Denver, Colo	5, 291	24. 689	24. 693	24. 696	24. 722	24. 735	21. 687	24. 842	24. 823	24. 812	24. 810	24. 787	24. 668	24. 747
Des Moines, Iowa	849	29. 165	29. 153	29. 104	29. 079	29. 067	29. 025	29. 119	29. 101	29. 078	29. 151	29. 215	29. 214	29. 123
Detroit, Mich	661	29. 352	29. 345	29. 231	29. 245	29. 313	29. 253	29. 287	29. 339	29. 324	29. 372	29. 366	29. 319	29. 314
Dodge City, Kans	2, 512	27. 404	27. 391	27. 346	27. 334	27. 326	27. 298	27. 420	27. 413	27. 382	27. 434	27. 478	27. 415	27. 367
Dubuque, Iowa	665	29. 333	29. 327	29. 265	29. 247	29. 265	29. 219	29. 294	29. 299	29. 263	29. 329	29. 375	29. 370	29. 299
Duluth, Minn	644	29. 327	29. 335	29. 331	29. 260	29. 260	29. 220	29. 279	29. 294	29. 214	29. 307	29. 345	29. 370	29. 295
Eagle Pass, Tex	780	39. 322	29. 312	29. 213	29. 183	29. 122	29. 115	29. 155	29. 156	29. 182	29. 271	29. 360	29. 323	29. 225
Eagle Rock, Idaho	4, 650	25. 268	25. 253	25. 263	25. 225	25. 216	25. 118	25. 270	25. 241	25. 221	25. 246	25. 357	25. 220	25. 241
Eastport, Me	61	29. 970	29. 945	29. 745	29. 729	29. 052	29. 817	29. 824	29. 902	29. 964	29. 964	29. 997	29. 934	29. 895
El Paso, Tex	3, 760	26. 251	26. 229	26. 184	26. 200	26. 130	26. 149	26. 226	26. 224	26. 225	26. 258	26. 281	26. 248	26. 217
Erie, Pa	681	29. 353	29. 338	29. 187	29. 224	29. 309	29. 237	29. 262	29. 311	29. 305	29. 347	29. 369	29. 320	29. 297
Escanaba, Mich	608	29. 356	29. 359	29. 324	29. 288	29. 318	29. 274	29. 312	29. 358	29. 284	29. 354	29. 360	29. 355	29. 328
Florence, Ariz	1, 480	28. 516	28. 500	28. 473	28. 421	28. 313	28. 304	28. 362	28. 339	28. 354	28. 427	28. 499	28. 503	28. 414
Fort Apache, Ariz	5, 050	25. 010	24. 998	25. 003	25. 028	24. 962	25. 005	25. 058	25. 047	25. 038	25. 051	25. 024	25. 026	25. 021
Fort Assininiboine, Mont. (*a*)	2, 710	27. 221	27. 125	27. 107	27. 119	27. 110	27. 087	27. 134	27. 117	27. 106	27. 231	27. 172	27. 073	27. 133
Fort Bennett, Dak	1, 510	28. 515	28. 448	28. 420	28. 417	28. 346	28. 258	28. 316	28. 295	28. 377	28. 455	28. 535	28. 525	28. 409
Fort Benton, Mont	2, 700	27. 268	27. 158	27. 144	27. 151	27. 161	27. 078	27. 084	27. 063	27. 169	27. 251	27. 344	27. 254	27. 177
Fort Buford Dak	1, 900	27. 944	27. 940	27. 960	27. 989	27. 867	27. 853	27. 941	27. 941	27. 965	28. 050	28. 010	28. 061	27. 956
Fort Custer, Mont	3, 040	26. 756	26. 769	26. 778	26. 778	26. 761	26. 732	26. 814	26. 778	26. 816	26. 871	26. 881	26. 817	26. 796
Fort Davis, Tex	4, 940	25. 170	25. 183	25. 135	25. 177	25. 145	25. 186	25. 248	25. 238	25. 270	25. 180	25. 243	25. 195	25. 197
Fort Elliott, Tex	2, 650	27. 255	27. 249	27. 226	27. 190	27. 170	27. 157	27. 276	27. 266	27. 269	27. 302	27. 352	27. 252	27. 247
Fort Gibson, Ind. T	540	29. 535	29. 521	29. 444	29. 409	29. 384	29. 382	29. 453	29. 415	29. 442	29. 510	29. 596	29. 561	29. 471
Fort Grant, Ariz	4, 860	25. 210	25. 210	25. 153	25. 189	25. 157	25. 202	25. 214	25. 192	25. 245	25. 255	25. 233	25. 220	25. 207
Fort Griffin, Tex	1, 260	28. 778	28. 743	28. 671	28. 641	28. 605	28. 648	28. 711	28. 707	28. 725	28. 796	28. 851	28. 813	28. 724
Fort Keogh, Mont	2, 372	27. 438	27. 452	27. 446	27. 436	27. 389	27. 365	27. 445	27. 422	27. 457	27. 523	27. 608	27. 565	27. 462
Fort McKavett, Tex	2, 240	27. 782	27. 762	27. 703	27. 710	27. 672	27. 696	27. 734	27. 756	27. 770	27. 832	27. 825	27. 788	27. 752
Fort Macon, N. C	11	30. 140	30. 161	29. 937	30. 037	30. 083	29. 986	29. 992	30. 030	30. 072	30. 119	30. 191	30. 106	30. 071
Fort Missoula, Mont	3, 140	26. 769	26. 709	26. 734	26. 699	26. 699	26. 662	26. 721	26. 684	26. 729	26. 774	26. 865	26. 693	26. 728
Fort Shaw, Mont	3, 550	26. 383	26. 293	26. 316	26. 254	26. 255	26. 234	26. 315	26. 297	26. 359	26. 419	26. 483	26. 361	26. 331
Fort Sill, Ind. T	1, 200	28. 828	28. 849	28. 759	28. 719	28. 693	28. 689	28. 774	28. 761	28. 770	28. 832	28. 886	28. 847	28. 784
Fort Stevenson, Dak	1, 750	28. 125	28. 105	28. 137	28. 121	28. 019	28. 028	28. 109	28. 117	28. 085	28. 176	28. 171	28. 243	28. 120
Fredericksburg, Tex	1, 700	28. 256	28. 202	28. 203	28. 190	28. 145	28. 224	28. 285	28. 273	28. 262	28. 326	28. 307	28. 283	28. 251
Galveston, Tex	48	30. 067	30. 057	29. 976	29. 972	29. 912	29. 936	29. 973	29. 932	29. 957	30. 021	30. 095	30. 080	29. 998
Grand Haven, Mich	620	29. 377	29. 362	29. 289	29. 295	29. 342	29. 284	29. 333	29. 367	29. 329	29. 387	29. 410	29. 372	29. 346
Hatteras, N. C	19	30. 129	30. 146	29. 914	30. 008	30. 074	29. 974	29. 983	30. 033	30. 069	30. 114	30. 185	30. 099	30. 061
Helena, Mont	4, 100	25. 809	25. 743	25. 749	25. 757	25. 768	25. 753	25. 829	25. 799	25. 815	25. 848	25. 945	25. 782	25. 801
Henrietta, Tex	915	29. 083	29. 081	28. 976	28. 940	28. 942	28. 931	28. 969	28. 931	28. 936	29. 048	29. 155	29. 097	29. 007
Huron, Dak. (*b*)	1, 305	28. 622	28. 567	28. 621	28. 581	28. 568	28. 509	28. 606	28. 535	28. 506	28. 638	28. 628	28. 634	28. 584
Indianapolis, Ind	753	29. 272	29. 262	29. 146	29. 176	29. 220	29. 167	29. 218	29. 227	29. 241	29. 286	29. 338	29. 285	29. 236
Indianola, Tex	26	30. 091	30. 070	29. 979	29. 974	29. 921	29. 941	29. 984	29. 941	29. 958	30. 038	30. 119	30. 101	30. 010
Jacksborough, Tex	1, 120	28. 897	28. 878	28. 830	28. 800	28. 783	28. 789	28. 829	28. 820	28. 870	28. 928	28. 984	28. 942	28. 862
Jacksonville, Fla	43	30. 110	30. 123	29. 992	30. 028	30. 006	29. 993	29. 999	29. 968	30. 017	30. 060	30. 148	30. 115	30. 047
Keokuk, Iowa	618	29. 400	29. 384	29. 316	29. 299	29. 306	29. 267	29. 348	29. 335	29. 331	29. 397	29. 463	29. 432	29. 356
Key West, Fla	20	30. 067	30. 100	30. 050	30. 089	29. 968	30. 027	30. 042	29. 970	29. 980	30. 005	30. 083	30. 097	30. 040
Kittyhawk, N. C	22	30. 152	30. 157	29. 929	30. 015	30. 090	29. 983	29. 992	30. 050	30. 081	30. 138	30. 208	30. 108	30. 075

a June, 1882, has been used to obtain a full year. *b* January to June, 1882, inclusive, have been used to obtain a full year.

APPENDIX 16.—*Mean normal barometer, corrected for temperature and instrumental error only*—Continued.

Station.	Height of cistern of barometer above mean sea-level.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Mean annual barometer.
	Feet.													
Knoxville, Tenn	980	29.125	29.115	28.970	29.032	29.068	29.032	29.055	29.057	29.101	29.142	29.192	29.119	29.084
La Cross, Wis	725	29.255	29.257	29.214	29.179	29.184	29.134	29.205	29.220	29.169	29.271	29.293	29.298	29.223
La Mesilla, N. Mex	3,900	26.104	26.095	26.043	26.056	26.001	26.022	26.096	26.097	26.106	26.139	26.139	26.107	26.084
Laredo, Tex	325	29.664	29.636	29.533	29.491	29.434	29.444	29.486	29.475	29.543	29.587	29.682	29.646	29.552
Leavenworth, Kans	842	29.196	29.180	29.118	29.093	29.069	29.036	29.137	29.106	29.108	29.178	29.251	29.235	29.142
Lewiston, Idaho	780	29.361	29.227	29.240	29.173	29.183	29.105	29.136	29.110	29.188	29.265	29.517	29.179	29.224
Little Rock, Ark	298	29.790	29.774	29.681	29.673	29.655	29.652	29.695	29.666	29.711	29.769	29.851	29.802	29.727
Los Angeles, Cal	371	29.737	29.756	29.694	29.687	29.594	29.573	29.604	29.543	29.557	29.635	29.719	29.714	29.651
Louisville, Ky	530	29.530	29.522	29.488	29.422	29.453	29.408	29.447	29.443	29.480	29.528	29.607	29.543	29.481
Lynchburg, Va	652	29.471	29.456	29.251	29.315	29.395	29.308	29.325	29.377	29.405	29.457	29.525	29.422	29.392
Madison, Wis	949	28.999	28.991	28.939	28.932	28.967	28.918	28.999	29.010	28.960	29.026	29.039	29.021	28.983
Marquette, Mich	673	29.278	29.300	29.277	29.232	29.256	29.212	29.255	29.300	29.207	29.282	29.285	29.278	29.263
Mason, Tex	1,620	28.414	28.409	28.334	28.326	28.287	28.310	28.362	28.354	28.359	28.425	28.464	28.431	28.373
Memphis, Tenn	321	29.792	29.774	29.671	29.679	29.655	29.651	29.713	29.679	29.727	29.781	29.866	29.803	29.733
Milwaukee, Wis	697	29.285	29.277	29.216	29.209	29.248	29.195	29.252	29.279	29.232	29.289	29.319	29.292	29.258
Mobile, Ala	41	30.072	30.062	29.961	30.000	29.943	29.948	29.970	29.919	29.959	30.011	30.138	30.088	30.006
Montgomery, Ala	219	29.929	29.925	29.796	29.841	29.811	29.801	29.806	29.785	29.838	29.892	29.975	29.937	29.861
Moorhead, Minn	923	29.140	29.090	29.040	29.016	28.969	28.881	28.974	28.927	28.883	29.043	28.986	28.991	29.995
Morgantown, W. Va	963	29.104	29.097	28.923	28.971	29.057	28.985	29.021	29.069	29.092	29.119	29.159	29.079	29.056
Mount Washington, N. H	6,279	23.496	23.454	23.341	23.444	23.818	23.777	23.857	23.825	23.902	23.733	23.567	23.441	23.646
Nashville, Tenn	507	29.601	29.583	29.460	29.492	29.509	29.475	29.506	29.488	29.542	29.588	29.669	29.608	29.543
New London, Conn	47	30.092	30.077	29.820	29.878	30.017	29.897	29.913	29.996	30.026	30.058	30.124	30.023	29.993
New Haven, Conn	107	30.029	30.007	29.759	29.807	29.930	29.822	29.837	29.922	29.949	29.996	30.052	29.964	29.923
New Orleans, La	52	30.074	30.066	29.974	29.999	29.932	29.949	29.976	29.929	29.964	30.018	30.110	30.090	30.007
Newport, R. I	44	30.073	30.053	29.799	29.857	30.001	29.885	29.903	29.987	30.018	30.062	30.114	30.013	29.980
New York, N. Y	164	29.981	29.963	29.720	29.767	29.881	29.778	29.795	29.876	29.903	29.953	30.014	29.918	29.879
Norfolk, Va	30	30.136	30.143	29.895	29.970	30.040	29.943	29.957	30.022	30.055	30.115	30.190	30.088	30.046
North Platte, Nebr	2,841	27.056	27.046	27.034	27.030	27.017	26.988	27.107	27.068	27.067	27.113	27.119	27.077	27.060
Olympia, Wash	30	29.956	30.011	30.000	29.923	30.014	29.949	30.026	29.975	30.009	30.034	30.108	29.869	29.989
Omaha, Nebr	1,113	28.886	28.870	28.835	28.807	28.768	28.737	28.857	28.834	28.814	28.894	28.945	28.941	28.849
Oswego, N. Y	304	29.782	29.762	29.589	29.595	29.694	29.623	29.623	29.702	26.697	29.755	29.786	29.732	29.695
Pensacola, Fla	30	30.132	30.127	30.022	30.056	29.991	29.995	30.011	29.967	30.016	30.066	30.169	30.144	30.058
Philadelphia, Pa	92	30.076	30.057	29.812	29.864	29.960	29.861	29.875	29.957	29.983	30.042	30.110	30.017	29.968
Phœnix, Ariz	1,120	28.896	28.895	28.820	28.876	28.673	28.663	28.709	28.681	28.702	28.788	28.878	28.881	28.788
Pike's Peak, Colo	14,134	17.491	17.476	17.510	17.676	17.794	17.947	18.060	18.028	17.909	17.790	17.584	17.488	17.729
Pioche, Nev	6,110	23.995	24.025	23.978	23.984	23.983	24.003	24.094	24.090	24.093	24.096	24.072	23.997	24.034
Pittsburgh, Pa	762	29.301	29.296	29.121	29.161	29.248	29.173	29.206	29.252	29.270	29.311	29.349	29.277	29.247
Port Eads, La. (c)	7	30.139	30.162	30.149	30.054	29.993	29.990	30.014	29.975	30.004	30.072	30.118	30.143	30.068
Port Huron, Mich	633	29.372	29.397	29.247	29.283	29.259	29.277	29.303	29.358	29.335	29.389	29.397	29.347	29.332

Portland, Me	45	30.037	30.002	29.788	29.793	29.969	29.857	29.862	29.942	29.992	30.016	30.057	29.990	29.942
Portland, Oreg	67	29.993	30.051	30.029	29.928	30.019	29.964	30.004	29.953	29.992	30.041	30.123	29.913	30.001
Prescott, Aris	5,340	24.756	24.763	24.708	24.742	24.705	24.750	24.815	24.796	24.786	24.792	24.785	24.749	24.762
Punta Rassa, Fla	18	30.077	30.102	30.033	30.076	29.968	30.011	30.027	29.960	29.980	30.013	30.106	30.103	30.038
Red Bluff, Cal	350	29.770	29.793	29.711	29.620	29.607	29.539	29.526	29.481	29.546	29.664	29.775	29.705	29.645
Rio Grande City, Tex	230	29.886	29.872	29.782	29.747	29.698	29.717	29.755	29.724	29.750	27.837	29.924	29.890	29.798
Rochester, N. Y	621	29.446	29.431	29.264	29.283	29.382	29.314	29.324	29.398	29.394	29.421	29.469	29.400	29.377
Roseburg, Oreg	511	29.537	29.588	29.535	29.442	29.528	29.487	29.518	29.469	29.499	29.546	29.633	29.644	29.535
Sacramento, Cal	65	30.078	30.091	30.011	29.945	29.904	29.844	29.826	29.796	29.830	29.950	30.049	30.009	29.944
Saint Louis, Mo	568	29.517	29.496	29.401	29.407	29.417	29.352	29.442	29.424	29.439	29.510	29.580	29.536	29.463
Saint Paul, Minn	811	29.134	29.139	29.118	29.063	29.077	29.022	29.112	29.101	29.041	29.132	29.174	29.192	29.109
Saint Vincent, Minn	804	29.271	29.240	29.197	29.133	29.088	29.009	29.074	29.048	29.004	29.127	29.205	29.247	29.137
Salt Lake City, Utah	4,348	25.669	25.669	25.625	25.589	25.580	25.561	25.636	25.595	25.638	25.676	25.742	25.616	25.633
San Antonio, Tex	673	29.408	29.398	29.307	29.280	29.236	29.256	29.301	29.278	29.296	29.377	29.434	29.414	29.333
San Diego, Cal	67	30.044	30.073	30.001	29.974	29.881	29.859	29.886	29.822	29.829	29.912	30.015	30.018	29.943
Sandusky, Ohio	639	29.405	29.389	29.266	29.288	29.353	29.289	29.326	29.365	29.358	29.406	29.445	29.391	29.357
Sandy Hook, N. J	28	30.122	30.106	29.855	29.914	30.021	29.916	29.926	30.007	30.035	30.099	30.159	30.065	30.019
San Francisco, Cal	60	30.076	30.103	30.036	29.977	29.955	29.916	29.906	29.864	29.885	29.982	30.064	30.015	29.982
Santa Fé, N. Mex	7,106	23.172	23.165	23.131	23.206	23.209	23.250	23.337	23.325	23.295	23.283	23.221	23.169	23.230
Savannah, Ga	87	30.069	30.089	29.918	29.985	29.987	29.939	29.937	29.939	29.993	30.041	30.118	30.063	30.006
Shreveport, La	227	29.867	29.853	29.775	29.757	29.729	29.744	29.785	29.758	29.770	29.851	29.922	29.882	29.808
Silver City, N. Mex	5,890	24.269	24.267	24.223	24.267	24.219	24.271	24.333	24.324	24.277	24.202	24.174	24.195	24.252
Sitka, Alaska, (*a*)	63	29.777	29.407	29.849	29.805	29.857	29.812	29.900	29.903	29.824	29.883	29.753	29.369	29.761
Smithville, N. C	34	30.136	30.158	29.950	30.037	30.077	29.993	29.996	30.023	30.067	30.113	30.198	30.117	30.072
Spokane Falls, Wash. (*b*)	1,910	28.011	27.976	28.003	27.959	27.979	27.896	27.952	27.937	27.942	27.995	28.110	28.026	27.982
Springfield, Ill	644	29.410	29.404	29.295	29.310	29.337	29.288	29.358	29.346	29.343	29.408	29.467	29.427	29.366
Springfield, Mass	120	30.018	29.988	29.750	29.781	29.999	29.808	29.818	29.903	29.934	29.981	30.036	29.958	29.907
Stockton, Tex	3,010	27.011	26.992	26.943	26.940	26.867	26.889	26.975	26.972	26.984	27.028	27.051	27.009	26.972
Thatcher's Island, Mass	48	30.068	30.038	29.801	29.835	29.994	29.880	29.896	29.978	30.020	30.051	30.098	30.007	29.972
Toledo, Ohio	651	29.373	29.359	29.244	29.264	29.320	29.266	29.304	29.345	29.336	29.383	29.414	29.365	29.331
Tucson, Ariz	2,369	27.572	27.571	27.521	27.525	27.417	27.419	27.459	27.442	27.447	27.520	27.582	27.582	27.505
Umatilla, Oreg	340	29.743	29.783	29.721	29.634	29.682	29.599	29.624	29.595	29.667	29.750	29.904	29.720	29.702
Uvalde, Tex	930	29.153	29.130	29.040	29.012	28.954	28.969	29.027	29.016	29.028	29.104	29.186	29.149	29.064
Vicksburg, Miss	244	29.857	29.875	29.779	29.793	29.751	29.768	29.801	29.757	29.796	29.857	29.936	29.902	29.825
Visalia, Cal	348	29.753	29.758	29.671	29.617	29.545	29.488	29.479	29.445	29.486	29.617	29.721	29.708	29.607
Washington, D. C	105	30.069	30.054	29.830	29.879	29.959	29.864	29.877	29.948	29.973	30.034	30.106	30.016	29.967
Wilmington, N. C	52	30.099	30.113	29.903	29.987	30.030	29.928	29.952	29.988	30.032	30.085	30.157	30.074	30.029
Winnemucca, Nev	4,327	25.659	25.666	25.621	25.576	25.595	25.548	25.626	25.584	25.626	25.680	25.743	25.698	25.635
Wood's Holl, Mass	35	30.070	30.052	29.793	29.861	30.008	29.888	29.896	29.967	30.018	30.062	30.110	30.009	29.978
Yankton, Dak	1,228	28.738	28.742	28.721	28.671	28.624	28.591	28.698	28.656	28.659	28.740	28.800	28.794	28.704
Yuma, Ariz	141	29.925	29.914	29.826	29.779	29.653	29.611	29.650	29.621	29.649	29.761	29.904	29.902	29.766

a January, February, and March, 1882, have been used to obtain a full year. *b* January, 1882, has been used to obtain a full year.

APPENDIX 17.

Monthly and annual mean barometer, reduced to sea-level, at stations of observation of the Signal Service, U. S. Army, for the year ending June 30, 1882.

Station.	Height of cistern of barometer above mean sea-level.	1881.						1882.						Annual mean.
		July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	Feet.													
Albany, N. Y.	75	29.932	30.014	30.089	30.137	30.170	30.142	30.138	30.145	30.086	30.009	30.016	29.873	30.063
Alpena, Mich.	609	29.975	30.034	29.989	30.115	30.026	30.072	30.088	30.031	30.078	30.076	(g)30.036	29.867	30.032
Atlanta, Ga.	1,131	30.009	30.026	30.098	30.202	30.249	30.231	30.218	30.208	30.165	30.051	30.024	30.013	30.124
Atlantic City, N. J.	13	29.949	30.037	30.100	30.158	30.195	30.168	39.163	30.149	30.087	30.021	30.001	29.904	30.078
Augusta, Ga.	183	29.997	30.021	30.091	30.188	30.237	30.235	30.235	30.239	30.178	30.063	30.048	30.035	30.131
Baltimore, Md.	45	29.972	30.048	30.095	30.165	30.215	30.187	30.197	30.175	30.134	30.060	30.034	29.969	30.102
Barnegat, N. J.	20	29.929	30.014	30.083	30.134	30.170	30.147	30.140	30.138	30.091	30.027	30.011	29.904	30.066
Bismarck, Dak.	1,694	29.886	29.880	29.922	30.139	30.137	30.144	30.132	30.065	30.086	30.052	29.924	29.837	30.017
Block Island, R. I.	27	29.933	30.006	30.104	30.132	30.149	30.131	30.096	(h)30.113	30.059	29.997	30.014	29.890	30.052
Boisé City, Idaho	2,750	29.889	29.902	29.994	30.106	30.317	30.335	30.184	(i)30.153	30.166	29.965	29.957	29.857	30.069
Boston, Mass.	142	29.919	29.990	30.113	30.123	30.136	30.124	30.082	30.097	30.043	29.981	30.013	29.854	30.040
Brackettville, Tex.	1,170	29.775	29.757	29.770	29.872	29.988	(a)30.024	(g)						
Brownsville, Tex.	43	29.932	29.901	29.916	(b)29.980	30.085	30.140	(b)30.054	30.050	30.048	29.923	29.882	29.930	29.987
Buffalo, N. Y.	696	29.938	30.019	30.037	30.124	30.104	30.114	30.124	30.105	30.083	30.026	29.991	(b)29.888	30.046
Burlington, Vt.	268	29.887	29.977	30.055	30.103	30.100	30.088	30.068	30.101	30.050	29.977	29.987	29.828	30.018
Cairo, Ill.	377	30.049	30.009	30.050	30.148	30.214	30.224	30.219	30.144	30.145	30.049	30.009	29.982	30.104
Campo, Cal.	2,500	29.956	29.930	(c)29.885	29.960	30.022	30.074	(d)30.038	(n)30.118	30.079	(h)29.988	(f)29.885	29.838	29.981
Camp Thomas, Ariz.	2,710							(o)30.064	30.117	30.018	29.875	29.775	29.767	
Cape Henry, Va.	16	29.960	30.035	30.102	30.170	30.213	30.194	30.198	30.138	30.140	30.057	30.029	29.961	30.104
Cape May, N. J.	27	(e)29.929	(f)30.048	30.094	(b)30.141	(e)30.184	(d)30.189	30.140	(i)30.135	(o)30.072	(e)30.040	(n)29.983	(n)29.901	30.071
Castroville, Tex.	780	(g)29.864	(g)29.811	(f)29.831	(b)29.907	30.013	(h)30.062	30.119	30.097	(b)30.100	(l)			
Cedar Keys, Fla.	22	30.025	29.995	30.029	30.095	30.136	30.161	30.200	30.209	30.176	30.041	30.034	30.062	30.097
Champaign, Ill.	767	29.970	29.949	29.919	30.048	30.091	30.106	30.172	30.084	30.081	30.023	29.942	29.893	30.023
Charleston, S. C.	52	30.005	30.009	30.083	30.157	30.199	30.190	(b)30.218	30.219	30.155	30.057	30.038	30.011	30.112
Charlotte, N. C.	808	30.010	30.047	30.103	30.211	30.251	30.235	30.196	30.188	30.131	30.027	29.992	29.959	30.112
Chattanooga, Tenn.	783	30.023	30.027	30.097	30.195	30.243	30.228	30.222	30.209	30.169	30.054	30.016	30.025	30.126
Cheyenne, Wyo.	6,089	29.959	29.953	30.008	30.164	30.229	30.308	30.120	30.166	30.135	29.922	29.857	29.783	30.053
Chicago, Ill.	661	29.993	30.007	29.954	30.098	30.090	30.130	30.140	30.046	30.056	30.043	29.972	29.875	30.034
Chincoteague, Va.	18	29.958	30.042	30.100	30.163	30.201	(d)30.198	30.180	30.166	30.109	30.037	30.013	29.935	30.092
Cincinnati, Ohio	620	30.018	30.037	30.060	30.156	30.199	30.202	30.197	30.139	30.129	30.052	29.981	29.946	30.093
Cleveland, Ohio	690	29.997	30.055	30.051	30.153	30.190	30.167	30.159	30.120	30.101	30.062	29.968	29.919	30.078
Columbus, Ohio	895	29.977	30.032	30.058	30.158	30.187	30.194	30.173	30.128	30.097	30.042	29.964	29.924	30.077
Concho, Tex.	1,900	29.958	29.953	29.981	30.110	30.195	30.253	30.149	30.128	30.084	29.948	29.887	29.891	30.045

Corsicana, Tex		30.007	29.973	30.007	(r)										
Davenport, Iowa	615	30.014	29.994	29.934	30.087	30.109	30.151	30.173	30.052	30.064	30.013	29.957	29.886	30.036	
Dayton, Wash	1,660	29.987	29.996	30.054	30.141	30.311	30.248	30.131	30.100	30.139	30.015	30.025	29.949	30.091	
Deadwood, Dak	4,600	(k)	29.992	30.026	30.229	30.294	30.335	30.158	30.141	30.118	29.979	29.835	29.770		
Decatur, Tex	1,129	(b)29.910	(f)29.860	(d)29.880	(a)30.046										
Delaware Breakwater, Del	20	29.952	30.033	30.084	30.146	30.186	30.161	30.159	30.146	30.105	30.043	30.012	29.924	30.079	
Denison, Tex	767	29.981	(g)29.953	29.987	30.080	30.169	30.203	30.143	30.090	30.082	(f)29.945	(g)29.924	29.939	30.041	
Denver, Colo	5,294	29.901	29.934	29.966	(g)30.125	30.280	30.338	30.144	30.177	(g)30.112	29.888	29.839	29.759	30.039	
Des Moines, Iowa	849	30.006	29.975	29.905	30.088	30.130	30.167	30.170	30.065	30.093	30.005	29.954	29.883	30.037	
Detroit, Mich	661	29.985	30.044	30.030	30.136	30.125	30.149	30.154	30.082	(g)30.091	30.059	29.992	(b)29.876	30.060	
Dodge City, Kans	2,512	29.922	29.933	29.925	30.101	30.227	30.274	30.149	30.113	30.123	29.950	(d)29.974	29.821	30.043	
Dubuque, Iowa	665	29.997	30.000	29.923	30.081	30.094	30.154	30.160	30.038	30.060	30.027	29.968	29.874	30.031	
Duluth, Minn	644	29.971	29.966	29.889	30.077	30.014	30.059	30.084	29.997	30.070	30.107	30.025	29.900	30.013	
Eagle Pass, Tex	780	29.978	29.970	29.989	30.092	30.195	30.246	30.143	30.123	30.097	29.956	29.917	29.933	30.053	
Eagle Rock, Idaho	4,650	29.980	30.001	30.071	30.236	30.437	30.502	30.210	30.169	30.163	29.914	29.896	29.801	30.115	
Eastport, Me	61	29.874	29.950	30.090	30.045	30.056	30.059	29.983	30.030	29.991	29.935	(g)29.987	29.805	29.984	
El Paso, Tex	3,760	29.880	29.908	29.943	30.072	30.216	30.293	30.133	30.173	30.074	29.932	29.808	29.789	30.018	
Erie, Pa	681	29.940	30.036	30.037	30.136	30.136	30.147	30.138	30.102	30.090	30.044	29.990	29.903	30.058	
Escanaba, Mich	608	29.961	29.999	29.917	30.075	29.992	30.052	30.082	30.007	30.069	30.086	30.017	29.865	30.010	
Florence, Ariz	1,480	29.972	29.968	29.941	30.003	30.095	30.163	30.063	30.127	30.063	29.894	(u)			
Fort Apache, Ariz	5,050	29.841	(i)29.889	29.917	30.064	30.175	30.274	30.091	30.137	30.049	29.880	29.775	29.752	29.987	
Fort Assininiboine, Mont	2,710	(e)29.824	29.847	29.916	30.171	30.192	30.133	30.116	30.067	30.154	30.024	29.960	29.877	30.023	
Fort Bennett, Dak	1,510	(j)29.788	29.785	(d)29.840	(e)30.109	(b)30.079	30.092	30.137	30.077	30.106	29.993	29.869	29.798	29.973	
Fort Buford, Dak	2,700	29.897	29.895	29.993	30.229	30.281	30.220	30.095	30.066	30.156	30.006	29.924	29.879	30.053	
Fort Benton, Mont	1,900	29.904	29.872	29.954	30.181	30.181	30.163	30.157	30.095	30.154	30.092	29.955	29.883	30.049	
Fort Custer, Mont	3,040	29.879	29.900	30.015	30.242	30.342	30.347	30.154	30.099	30.142	29.953	29.878	29.819	30.064	
Fort Davis, Tex	4,940	30.196	30.188	(k)	29.958	(k)	(f)30.172	30.157	30.165	30.100	29.937	29.870	29.811		
Fort Elliott, Tex	2,650	30.338	30.360	30.414	30.577	30.525	30 257	30.173	30.120	30.063	29.932	29.847	29.834	30.203	
Fort Gibson, Ind. Ter	510	29.970	29.915	29.939	30.048	30.143	30.168	30.151	30.076	30.066	29.969	(v)29.818			
Fort Grant, Ariz	4,860	(m)	(n)	(m)	(l)30.055	30.076	30.103	30.094	30.101	30.061	29.893	29.742	29.744		
Fort Griffin, Tex	1,260	29.879	(b)29.852	(f)29.868	29.981	30.090	30 154	(d)30.183	30.135	(p)30.124	(s)29.970		29.896	30.026	
Fort Keogh, Mont	2,372	29.835	29.850	29.963	30.193	30.256	30.258	30.112	30.075	30.116	29.983	(g)29.876	29.818	30.028	
Fort McKavett, Tex	2,240	(j)29.589	(n)29.562	(h)29.575	(e)29.708	(a)29.888	29.856	30.217	30.194	30.149	29.983	29.945	29.946	29.884	
Fort Macon, N. C	11	29.981	30.020	30.097	30.162	30.195	30.186	30.190	30.195	30.139	30.048	30.032	29.983	30.102	
Fort Missoula, Mont	3,140	30.079	30.106	30.207	30.384	30.542	30.545	30.145	30.080	30.090	29.958	29.981	29.912	30.169	
Fort Shaw, Mont	3,550	29.813	29.846	29.937	30.148	30.215	30.182	30.116	30.069	30.128	29.982	29.928	29.879	30.020	
Fort Sill, Ind. Ter	1,200	29.971	29.757	29.970	30.090	30.183	30.225	30.185	30.105	(b)30.068	29.945	29.914	29.896	30.026	
Fort Stevenson, Dak	1,750	29.884	(d)29.902	29.931	30.164	30.137	30.147	30.145	30.068	(n)30.094	(p)29.998	29.935	29.850	30.021	
Fredericksburg, Tex	1,700	(h)29.751	(g)29.713	(b)29.730	29.819	29.918	(d)29.972	(t)30.133	30.105	30.073	29.933	(f)29.943	29.918	29.917	
Galveston, Tex	48	30.003	29.963	29.986	30.043	30.133	30.170	30.101	30.106	30.102	29.979	29.959	29.994	30.045	
Grand Haven, Mich	620	29.996	30.026	29.962	30.109	30.069	30.118	30.123	30.038	30.059	30.058	29.989	29.868	30.035	
Hatteras, N. C	19	29.980	30.032	30.108	30.168	30.217	30.187	30.185	30.190	30.137	30.048	30.037	29.985	30.106	

a Mean for 16 days only.
b Mean for 29 days only.
c Mean for 22 days only.
d Mean for 28 days only.
e Mean for 25 days only.
f Mean for 26 days only.
g Mean for 30 days only.
h Mean for 27 days only.
i Mean for 23 days only.
Mean for 13 days only.
k Record incomplete.
l Mean for 5 days only.
m No barometer on station.
n Mean for 24 days only.
o Mean for 21 days only.
p Mean for 20 days only.
q Observations of barometer discontinued after December 16, 1881.
r Observations discontinued October 31, 1881.
s Observations discontinued April 15, 1882.
t Observations discontinued March 29, 1882.
u Observations discontinued April 30, 1882.
v Mean for 12 days only.

APPENDIX 17.—*Monthly and annual mean barometer, reduced to sea-level, at stations of observation of the Signal Service, &c.*—Continued.

Station.	Height of cistern of barometer above mean sea-level.	1881.						1882.						Annual mean.
		July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	Feet.													
Helena, Mont	4,100	29.997	30.030	30.153	30.393	30.542	30.554	30.127	30.082	30.122	29.982	29.924	29.869	30.148
Henrietta, Tex	915	(c)29.808	(e)29.777	29.782	29.937	(e)30.068	30.099	30.204	(h)30.119	(g)30.116	30.008	(c)29.935	(c)29.938	29.983
Huron, Dak	1,305	29.936	29.885	29.896	30.098	30.128	30.154	30.162	30.087	30.101	30.031	29.918	29.849	30.020
Indianapolis, Ind	753	29.985	29.995	30.007	30.120	30.153	30.160	30.149	30.091	30.078	30.017	29.945	29.897	30.050
Indianola, Tex	26	30.003	29.964	29.974	30.037	30.125	30.176	30.097	30.094	30.092	29.966	29.946	29.985	30.038
Jacksborough, Tex	1,120	29.886	29.846	29.875	29.977	30.098	30.126	30.166	30.121	30.091	(q)29.957	29.921	29.903	29.997
Jacksonville, Fla	43	30.010	29.989	30.044	30.116	30.160	30.169	30.210	30.223	30.175	30.043	30.033	30.040	30.101
Keokuk, Iowa	618	30.006	29.974	29.929	30.072	30.117	30.152	30.160	30.058	30.059	29.983	29.939	29.876	30.027
Key West, Fla	20	30.037	29.979	29.976	30.029	30.049	30.118	30.173	30.168	30.162	30.041	30.006	30.050	30.068
Kittyhawk, N. C	22	29.993	30.056	30.121	30.184	30.215	30.200	30.203	30.202	30.159	30.072	30.053	29.989	30.121
Knoxville, Tenn	980	30.043	30.052	30.129	30.231	30.275	30.242	30.221	30.208	30.159	30.055	30.015	30.011	30.137
La Crosse, Wis	725	29.957	29.959	29.874	30.070	30.043	30.101	30.128	30.016	30.045	30.029	29.955	(b)29.862	30.003
La Mesilla, N. Mex	3,900	30.255	30.252	30.228	30.260	30.309	30.358	30.127	30.152	30.070	29.912	29.765	29.769	30.121
Laredo, Tex	325	29.798	29.780	(j)	(d)29.873	29.971	(a)30.024	(n)						
Leavenworth, Kans	842	30.010	29.969	29.935	30.082	30.169	30.201	30.185	30.091	30.103	29.982	29.944	29.891	30.047
Lewiston, Idaho	780	29.934	29.938	29.995	30.086	30.265	30.191	30.148	30.108	30.108	30.012	29.995	29.882	30.055
Little Rock, Ark	298	29.997	29.965	29.998	30.077	30.164	30.164	30.148	30.083	30.086	29.987	29.951	29.955	30.048
Los Angeles, Cal	371	29.948	29.909	29.900	29.989	30.064	30.131	30.099	30.163	30.134	30.065	29.996	29.969	30.031
Louisville, Ky	530	29.987	29.973	30.021	30.113	30.173	30.160	30.162	30.097	30.088	30.004	(f)29.943	29.919	30.053
Lynchburg, Va	652	29.976	30.036	30.088	30.176	30.231	30.198	30.187	30.165	30.129	(b)30.055	30.012	29.947	30.100
Madison, Wis	949	29.996	30.041	29.938	30.111	30.090	30.146	30.142	30.048	30.063	30.049	29.976	29.879	30.040
Marquette, Mich	673	29.966	30.008	29.915	30.087	29.985	30.040	30.053	29.990	30.072	30.114	30.038	29.898	30.014
Mason, Tex	1,620	30.019	29.995	30.012	30.114	30.236	30.274	(b)30.164	(g)30.132	(b)30.104	(p)29.955			
Memphis, Tenn	321	30.026	29.984	30.040	30.126	30.202	30.194	30.187	30.123	30.119	30.021	29.978	29.983	30.082
Milwaukee, Wis	697	30.002	30.020	29.945	30.095	30.069	30.119	30.125	30.029	30.055	30.055	29.980	29.878	30.031
Mobile, Ala	41	30.009	29.984	30.024	30.097	30.152	30.156	30.162	30.172	30.153	30.025	30.011	30.025	30.081
Montgomery, Ala	219	30.001	30.008	30.054	30.142	30.200	30.187	30.193	30.194	30.161	30.037	30.023	30.027	30.102
Moorhead, Minn	923	29.933	29.907	29.898	30.103	30.076	30.091	30.128	30.049	30.094	30.056	29.952	29.870	30.013
Morgantown, W. Va	963	29.961	30.004	30.025	30.112	30.156	30.134	30.180	30.174	30.124	30.039	29.989	29.954	30.071
Mount Washington, N. H	6,279	29.863	30.010	30.164	30.119	30.095	30.106	30.006	30.106	29.992	29.922	29.854	29.820	30.005
Nashville, Tenn	507	30.009	29.991	30.054	30.152	30.208	30.193	30.187	30.141	30.131	30.022	29.981	29.972	30.087
New London, Conn	47	29.947	30.020	30.116	30.146	30.170	30.143	30.118	30.140	30.079	30.013	30.026	29.894	30.068
New Haven, Conn	107	29.923	30.006	30.096	30.131	30.160	30.128	30.106	30.129	30.072	30.008	30.016	29.882	30.055
New Orleans, La	52	29.997	29.962	30.005	30.075	30.135	30.154	30.133	30.147	30.137	30.005	29.985	30.009	30.062
Newport, R. I	44	29.931	30.006	30.108	30.132	30.158	30.131	30.089	30.112	30.056	29.988	30.013	29.885	30.050
New York, N. Y	164	29.940	30.018	30.106	30.149	30.187	30.182	30.155	30.152	30.087	30.029	30.024	(b)29.899	30.076
Norfolk, Va	30	29.970	30.042	30.097	30.169	30.213	30.190	30.194	30.178	30.135	30.051	30.023	29.956	30.103

North Platte, Nebr.	2,841	29.923	29.910	29.949	30.148	30.215	30.305	30.165	30.142	30.117	29.957	29.899	29.808	30.046
Olympia, Wash.	30	30.038	29.990	29.996	30.000	30.147	30.010	30.064	30.014	30.079	30.004	30.057	30.001	30.033
Omaha, Nebr.	1,113	30.006	29.969	29.924	30.115	30.177	30.220	30.186	30.107	30.116	(b)30.004	29.962	29.880	30.056
Ooglaamie (Point Barrow), Alaska					(m)29.785	29.896	29.861	29.840	29.722	30.079	29.978	30.075	29.881	
Oswego, N. Y.	304	29.913	29.992	30.028	30.107	30.095	30.087	30.094	30.086	30.050	30.001	29.995	29.856	30.025
Palestine, Tex.	533							(l)30.149	(a)30.105	(h)30.109	30.000	29.985	29.999	
Pensacola, Fla.	30	30.008	29.987	30.026	30.100	30.152	30.159	30.175	30.187	30.162	30.027	30.016	30.030	30.086
Philadelphia, Pa.	92	29.954	30.037	30.103	30.162	30.200	30.175	30.176	30.168	30.110	30.045	30.027	29.921	30.090
Phœnix, Ariz.	1,120	30.386	30.373	30.383	30.517	30.716	30.771	(o)						
Pike's Peak, Colo.	14,134	30.299	30.257	30.074	29.979	29.788	29.839	30.117	30.224	30.182	29.875	29.764	29.719	30.010
Pioche, Nev.	6,110	29.946	30.021	30.092	30.250	30.443	30.533	30.211	30.211	30.198	29.946	29.877	29.794	30.127
Pittsburg, Pa.	762	29.988	30.045	30.081	30.177	30.205	30.194	30.162	30.146	30.104	30.031	29.967	29.907	30.084
Port Eads, La.	7	30.024	29.985	30.014	30.082	30.128	30.153	30.149	30.172	30.159	30.020	30.013	30.041	30.078
Port Huron, Mich.	633	29.970	30.030	30.008	30.119	30.097	30.126	30.129	30.069	30.070	30.041	29.991	29.873	30.044
Portland, Me.	45	29.890	29.963	30.096	30.089	30.093	30.072	30.029	30.067	30.012	29.954	29.988	29.821	30.006
Portland, Oreg.	67	30.064	30.015	30.028	30.052	30.217	30.109	30.151	30.112	30.145	30.063	30.088	30.035	30.090
Prescott, Ariz.	5,340	29.890	29.916	29.949	30.066	30.169	30.276	30.078	30.123	30.106	29.922	29.802	29.778	30.006
Provincetown, Mass.	29								(m)30.157	30.033	29.974	30.001	29.860	
Punta Rassa, Fla.	13	30.007	(b)29.956	29.971	30.032	30.061	30.114	30.172	30.184	30.151	(b)30.020	30.004	30.050	30.060
Red Bluff, Cal.	350	29.875	29.849	29.908	30.006	30.152	30.172	30.158	30.162	30.099	30.029	29.947	29.855	30.015
Rio Grande City, Tex.	230	29.953	29.908	29.932	30.001	30.118	30.129	30.073	30.054	30.048	29.905	29.895	29.942	29.997
Rochester, N. Y.	621	29.932	30.010	30.041	30.127	30.105	30.112	30.104	30.092	30.067	30.017	29.993	29.864	30.039
Roseburg, Oreg.	511	30.078	30.036	30.063	30.079	30.268	30.153	30.177	30.135	30.136	30.072	(f)30.056	30.008	30.105
Sacramento, Cal.	65	29.913	29.886	29.895	30.031	30.163	30.197	30.139	30.170	30.102	30.052	29.957	(b)29.883	30.032
Saint Louis, Mo.	568	30.024	30.000	29.997	30.134	30.184	30.199	30.205	30.111	30.097	30.010	29.971	29.936	30.072
Saint Paul, Minn.	811	29.973	29.953	29.875	30.081	30.047	30.094	30.111	30.004	30.044	30.019	29.946	29.856	30.000
Saint Paul's Island, Alaska		29.965	29.950	29.704	29.660	29.648	29.648	29.346	29.832	30.077	30.047	29.885	29.806	29.797
Saint Vincent, Minn.	804	29.914	29.907	29.890	(f)30.109	30.066	30.033	30.103	30.033	30.105	30.111	29.969	29.874	30.010
Salt Lake City, Utah	4,348	29.834	29.836	29.921	30.062	30.295	30.359	30.209	30.231	30.190	29.924	29.875	29.778	30.043
San Antonio, Tex.	673	29.980	29.948	29.968	30.068	30.150	30.181	30.103	30.086	30.080	29.948	29.929	29.941	30.032
San Diego, Cal.	67	29.906	29.867	29.838	29.941	30.007	30.073	30.034	(g)30.149	30.112	30.046	29.973	29.961	29.992
Sandusky, Ohio	639	29.986	30.032	30.027	30.131	30.133	30.149	30.156	30.097	30.089	30.050	29.976	29.898	30.060
Sandy Hook, N. J.	28	29.938	30.018	30.096	30.142	30.176	30.151	30.156	30.150	30.099	30.038	30.027	29.912	30.075
San Francisco, Cal.	60	29.978	29.943	29.922	30.053	30.155	30.186	30.148	30.173	30.116	(b)30.097	30.016	29.966	30.063
Santa Fé, N. Mex.	7,106	29.909	29.957	30.093	30.290	(k)30.361	(r)	30.179	30.239	30.167	29.892	29.767	29.770	
Savannah, Ga.	87	30.006	30.001	30.072	30.148	30.194	30.198	30.220	30.220	30.159	30.055	(b)30.053	30.027	30.113
Shreveport, La.	227	30.005	29.960	29.997	30.068	30.146	30.166	30.139	30.107	30.100	29.987	29.963	29.984	30.052
Silver City, N. Mex.	5,890	29.805	29.837	29.857	29.978	30.040	30.119	30.062	30.103	30.042	29.876	29.757	29.777	29.938
Sitka, Alaska	63	(i)29.968	(c)29.971	29.892	(f)29.953	(g)29.822	(g)29.440	29.849	29.477	29.919	29.769	29.960	(c)29.948	29.831
Smithville, N. C.	34	29.999	30.023	30.102	30.169	30.205	30.194	30.204	30.212	30.148	30.054	30.042	30.002	30.113
Spokane Falls, Wash.	1,910	29.911	29.917	29.962	30.065	30.220	30.156	30.151	30.089	30.133	30.003	30.007	29.935	30.046
Springfield, Ill.	644	30.022	30.010	29.984	30.116	30.158	30.186	30.190	30.097	30.095	30.024	29.961	29.915	30.063
Springfield, Mass.	120	29.918	29.996	30.094	30.127	30.154	30.131	30.118	30.132	30.078	29.996	30.014	29.876	30.053
Springfield, Mo.	1,351							(b)30.240	30.176	30.181	30.068	30.012	29.999	

a Mean for 16 days only.
b Mean for 29 days only.
c Mean for 28 days only.
d Mean for 25 days only.
e Mean for 26 days only.
f Mean for 30 days only.
g Mean for 27 days only.
h Mean for 23 days only.
i Mean for 24 days only.
j Record incomplete; observer sick.
k Mean for 20 days only.
l Mean for 7 days only.
m Mean for 14 days only.
n Observations of barometer discontinued after December 16, 1881.
o Station closed December 31, 1881.
p Observations discontinued April 15, 1882.
q Mean for 19 days only.
r No record on station.

APPENDIX 17.—*Monthly and annual mean barometer, reduced to sea-level, at stations of observation of the Signal Service, &c.*—Continued.

Station.	Height of cistern of barometer above mean sea-level.	1881.						1882.						Annual mean.
		July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	Feet.													
Stockton, Tex	3,010	29.977	29.989	30.026	30.164	30.256	30.328	30.144	30.140	30.104	29.950	29.903	29.849	30.069
Thatcher's Island, Mass	48	29.922	29.998	30.121	30.123	30.133	30.113	30.075	30.095	30.044	29.974	30.006	29.859	30.039
Toledo, Ohio	651	29.983	30.020	30.011	30.113	30.123	30.142	30.148	30.086	30.075	30.046	29.970	29.886	30.050
Tucson, Ariz	2,369	29.736	29.752	29.754	29.923	30.060	30.145	30.052	30.101	30.040	29.883	29.787	29.765	29.916
Umatilla, Oreg	340	30.013	30.000	30.040	30.136	30.316	30.231	30.186	30.131	30.137	30.045	30.032	29.924	30.099
Uvalde, Tex	930	(*d*)29.768	(*d*)29.757	(*a*)29.754	(*a*)29.847	(*a*)29.957	(*e*)30.001	(*h*)30.076	(*i*)30.082	(*a*)30.063	29.935	29.891	29.916	29.921
Vicksburg, Miss	244	30.035	29.992	30.029	30.109	30.189	30.194	30.163	30.148	30.130	30.016	29.992	30.015	30.084
Visalia, Cal	348	29.853	29.829	29.837	29.991	30.117	30.163	30.110	30.142	30.086	(*b*)30.014	(*g*)29.914	29.877	29.994
Washington, D. C	105	29.971	30.046	30.089	30.168	30.221	30.197	30.206	30.175	30.136	30.067	30.026	29.940	30.104
West Las Animas, Colo	3,905	.....	.....	.....	(*f*)30.109	(*i*)30.277	(*k*)30.332	(*k*)30.110	(*c*)30.112	30.083	29.887	29.831	29.756	.....
Williamsport, Pa	561	.....	.....	.....	.....	.....	.....	(*b*)30.124	30.142	30.101	30.027	30.001	29.905	.....
Wilmington, N. C	52	29.992	30.024	30.095	30.172	30.206	30.189	30.198	30.205	30.142	30.046	30.021	29.979	30.106
Winnemucca, Nev	4,327	29.804	29.819	29.931	30.068	30.311	30.338	30.181	30.159	(*d*)30.152	29.958	29.926	29.811	30.038
Wood's Holl, Mass	35	29.927	29.997	30.101	30.124	30.143	30.123	(*j*)30.121	.....	.....	.....	.....	.....	.....
Yankton, Dak	1,228	29.972	29.927	29.905	30.102	30.155	30.185	30.152	30.103	30.106	29.993	29.936	29.874	30.034
Yuma, Ariz	141	29.792	29.782	29.763	29.877	30.038	30.094	30.040	30.100	30.032	29.912	29.812	29.780	29.918

a Mean for 28 days only.
b Mean for 25 days only.
c Mean for 26 days only.
d Mean for 30 days only.
e Mean for 27 days only.
f Mean for 23 days only.
g Mean for 21 days only.
h Mean for 7 days only.
i Mean for 17 days only.
j Observations discontinued January 31, 1882.
k Mean for 12 days only.

APPENDIX No. 18.

Monthly and annual mean barometer, corrected for temperature and instrumental error only, at stations of observation of the Signal Service, U. S. Army, for the year ending June 30, 1882.

Station.	Height of cistern of barometer above mean sea-level.	1881.						1882.						Annual mean.
		July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	Feet.													
Albany, N. Y.	75	29.852	29.934	30.009	30.057	30.080	30.052	30.048	30.055	29.996	29.929	29.936	29.793	29.978
Alpena, Mich.	609	29.325	29.384	29.319	29.425	29.326	29.362	29.378	29.321	29.378	29.386	(a)29.376	29.217	29.350
Atlanta, Ga.	1,131	28.859	28.866	28.918	28.982	29.009	28.981	28.988	28.988	28.955	28.861	28.854	28.863	28.927
Atlantic City, N. J.	13	29.939	30.027	30.090	30.148	30.185	30.158	30.153	30.139	30.077	30.011	29.991	29.894	30.068
Augusta, Ga.	183	29.817	29.831	29.901	29.988	30.037	30.025	30.035	30.039	29.978	29.873	29.858	29.845	29.936
Baltimore, Md.	45	29.922	29.998	30.045	30.115	30.165	30.137	30.147	30.125	30.084	30.010	29.984	29.889	30.052
Barnegat, N. J	20	29.909	29.994	30.063	30.114	30.150	30.127	30.120	30.118	30.071	30.007	29.991	29.884	30.046
Bismarck, Dak	1,694	28.146	28.111	28.092	28.219	28.157	28.134	28.132	28.085	28.166	28.182	28.144	28.087	28.138
Block Island, R. I	27	29.904	29.976	30.074	30.102	30.119	30.101	30.066	30.083	30.025	29.967	29.984	29.860	30.022
Boisé City, Idaho	2,750	27.129	27.112	27.154	27.186	27.357	27.345	27.254	(b) 27.193	27.246	27.125	27.117	27.077	27.191
Boston, Mass	142	29.769	29.840	29.953	29.963	29.976	29.954	29.912	29.937	29.883	29.821	29.853	29.704	29.880
Brackettville, Tex.	1,170	28.784	28.769	28.771	28.850	28.930	(c) 28.967							
Brownsville, Tex.	43	29.892	29.861	29.876	(d)29.930	30.035	30.090	(d)30.004	30.000	29.998	29.873	29.842	29.890	29.941
Buffalo, N. Y.	696	29.248	29.319	29.317	29.384	29.314	29.314	29.324	29.305	29.293	29.256	29.251	(d)29.148	29.289
Burlington, Vt	268	29.607	29.679	29.765	29.803	29.790	29.778	29.758	29.791	29.740	29.677	29.697	29.538	29.719
Cairo, Ill.	377	29.659	29.619	29.650	29.738	29.794	29.794	29.799	29.724	29.725	29.639	29.609	29.592	29.695
Campo, Cal	2,500	27.386	27.360	(b)27.315	27.390	27.452	27.504	(e)27.408	(f)27.478	27.469	(g) 27.408	(h)27.355	27.358	27.407
Camp Thomas, Ariz	2,710	27.185	(i) 27.169	27.154	(j)27.207	27.296	27.354	(k)27.234	27.287	27.238	27.145	27.105	27.137	27.209
Cape Henry, Va	16	29.940	30.015	30.082	30.150	30.193	30.174	30.178	30.168	30.120	30.037	30.009	29.941	30.084
Cape May, N. J.	27	(l) 29.901	(h)30.018	30.066	(d)30.112	(l) 30.154	(e)30.160	30.110	(i)30.105	(k)30.042	(l)30.010	(f)29.953	(f)29.871	30.042
Castroville, Tex.	780	(a)29.182	(a)29.150	(h)29.160	(d)29.226	29.305	(g)29.350	29.269	29.257	(d) 29.270				
Cedar Keys, Fla.	22	30.005	29.975	30.009	30.075	30.116	30.141	30.180	30.189	30.156	30.021	30.014	30.042	30.077
Champaign, Ill.	767	29.215	29.195	29.157	29.259	29.270	29.282	29.302	29.214	29.221	29.183	29.142	29.103	29.212
Charleston, S. C.	52	29.945	29.951	30.023	30.097	30.139	30.130	(d)30.158	30.159	30.095	29.997	29.988	29.961	30.054
Charlotte, N. C.	808	29.150	29.177	29.223	29.301	29.331	29.305	29.306	29.298	29.251	29.167	29.152	29.129	29.232
Chattanooga, Tenn.	783	29.223	29.218	29.267	29.345	29.383	29.358	29.362	29.349	29.319	29.224	29.206	29.215	29.289
Cheyenne, Wyo. Ter.	6,089	24.149	24.123	24.038	24.034	23.999	24.028	23.870	23.916	23.955	23.922	23.987	24.043	24.005
Chicago, Ill.	661	29.313	29.317	29.244	29.358	29.340	29.370	29.390	29.296	29.316	29.313	29.272	29.185	29.310

a Mean for 30 days only.
b Mean for 23 days only.
c Mean for 16 days only.
d Mean for 29 days only.
e Mean for 28 days only.
f Mean for 24 days only.
g Mean for 27 days only.
h Mean for 26 days only.
i Mean for 23 days only.
j Mean for 30 days only.
k Mean for 21 days only.
l Mean for 25 days only.

APPENDIX 18.—*Monthly and annual mean barometer corrected for temperature and instrumental error only, for the year ending June 30, 1882—Cont'd.*

Station.	Height of cistern of barometer above mean sea-level.	1881.						1882.						Annual mean.
		July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	Feet.													
Chincoteague, Va	18	29.938	30.022	30.080	30.143	30.181	(a)30.178	30.160	30.146	30.089	30.017	29.993	29.915	30.072
Cincinnati, Ohio	620	29.378	29.387	29.399	29.476	29.499	29.492	29.507	29.449	29.429	29.382	29.331	29.296	29.419
Cleveland, Ohio	690	29.277	29.325	29.311	29.383	29.370	29.367	29.379	29.330	29.321	29.302	29.258	29.189	29.318
Columbus, Ohio	805	29.157	29.192	29.198	29.268	29.277	29.264	29.273	29.226	29.207	29.172	29.124	29.084	29.204
Concho, Tex	1,900	28.080	28.053	28.041	28.110	28.165	28.203	28.129	28.108	28.114	28.006	27.987	28.021	28.085
Corsicana, Tex		29.547	29.513	29.537	(b)29.604									
Davenport, Iowa	615	29.374	29.354	29.274	29.407	29.409	29.441	29.463	29.352	29.374	29.343	29.317	29.246	29.363
Dayton, Wash	1,660	28.237	28.226	28.244	28.281	28.421	28.338	28.331	28.291	28.329	28.265	28.275	28.209	28.287
Deadwood, Dak	4,600	25.341	25.386	25.333	25.369	25.324	25.315	25.208	25.221	25.278	25.289	25.325	25.340	25.311
Decatur, Tex	1,129	(c)28.814	(d)28.771	(a)28.782	(e)28.917									
Delaware Breakwater, Del	20	29.933	30.013	30.064	30.126	30.166	30.141	30.139	30.126	30.085	30.023	29.992	29.904	30.059
Denison, Tex	767	29.203	(f)29.163	29.177	29.249	29.329	29.353	29.303	29.250	29.252	(d)29.145	(f)29.134	29.159	29.226
Denver, Colo	5,294	24.831	24.814	24.746	(f)24.755	24.810	24.818	24.624	24.657	(f)24.672	24.618	24.679	24.719	24.729
Des Moines, Iowa	849	29.126	29.085	28.995	29.138	29.160	29.187	29.200	29.095	29.133	29.075	29.064	29.003	29.105
Detroit, Mich	661	29.295	29.344	29.310	29.396	29.365	29.379	29.394	29.332	(f)29.341	29.329	29.292	(c)29.186	29.330
Dodge City, Kans	2,512	27.432	27.403	27.335	27.411	27.467	27.484	27.399	27.373	27.393	27.310	(a)27.324	27.311	27.387
Dubuque, Iowa	665	29.317	29.300	29.203	29.341	29.334	29.374	29.390	29.278	29.310	29.297	29.268	29.184	29.300
Duluth, Minn	644	29.291	29.276	29.179	29.347	29.264	29.299	29.324	29.237	29.330	29.387	29.325	29.210	29.289
Eagle Pass, Tex	780	29.168	29.150	29.159	29.242	29.335	29.386	29.303	29.283	29.277	29.146	29.117	29.143	29.226
Eagle Rock, Idaho	4,650	25.270	25.241	25.221	25.246	25.357	25.382	25.250	25.269	25.293	25.194	25.216	25.211	25.262
Eastport, Me	61	29.804	29.880	30.020	29.975	29.986	29.989	29.913	29.960	29.921	29.865	(f)29.917	29.735	29.914
El Paso, Tex	3,760	26.230	26.228	26.193	26.232	26.316	26.363	26.253	26.293	26.274	26.192	26.168	26.199	26.245
Erie, Pa	681	29.256	29.316	29.307	29.376	29.356	29.357	29.368	29.332	29.320	29.294	29.270	29.183	29.311
Escanaba, Mich	608	29.321	29.349	29.257	29.395	29.292	29.342	29.362	29.287	29.359	29.396	29.357	29.215	29.328
Florence, Ariz	1,480	28.372	28.368	28.341	28.403	28.495	28.563	28.483	28.547	28.493	(g)28.394			
Fort Apache, Ariz	5,050	25.061	25.059	(h)25.007	25.024	25.045	25.104	24.971	25.037	25.029	24.960	24.955	25.002	25.021
Fort Assiniboine, Mont	2,710	(i) 27.134	27.117	27.106	27.231	27.172	27.073	27.076	27.027	27.144	27.124	27.120	27.087	27.116
Fort Bennett, Dak	1,510	(j) 28.318	28.295	(a)28.300	(i)28.499	(c) 28.419	28.412	28.397	28.347	28.406	28.353	28.309	28.258	28.359
Fort Benton, Mont	2,700	27.156	27.130	27.133	27.249	27.211	27.110	27.115	27.066	27.176	27.146	27.134	(k)27.109	27.145
Fort Buford, Dak	1,900	27.958	27.922	27.944	28.071	28.016	27.963	27.957	27.915	28.014	28.022	27.975	27.923	27.973
Fort Custer, Mont	3,040	26.789	26.760	26.775	26.852	26.852	26.807	26.774	26.739	26.812	26.773	26.778	26.759	26.789
Fort Davis, Tex	4,940	25.236	25.228	(m)	24.998	(l)	(d)25.212	25.117	25.145	25.157	25.086	25.074	25.135	
Fort Elliott, Tex	2,650	27.269	27.251	27.224	27.277	27.285	27.319	27.243	27.219	27.233	27.152	27.147	27.164	27.232
Fort Gibson, Ind. Ter	540	29.440	29.385	29.389	29.478	29.563	29.578	29.551	29.476	29.476	29.389	m29.298		
Fort Grant, Ariz	4,800	(m)	(m)	(m)	(o)25.253	25.270	25.303	25.104	25.241	25.231	25.163	25.132	25.204	
Fort Griffin, Tex	1,260	28.605	(e)28.672	(d)28.667	28.761	28.809	28.862	(a)28.803	28.705	(k) 28.774	(p)28.670			
Fort Keogh, Mont	2,372	27.425	27.400	27.423	27.523	27.606	27.458	27.422	27.395	27.466	27.443	(f)27.428	27.388	27.440

Fort McKavett, Tex	*2, 240*	*(l) 27. 779*	*(p)27. 756*	*(r)27. 756*	*(t)27. 838*	*27. 940*	*27. 906*	*27. 827*	*27. 814*	*27. 820*	*27. 723*	*27. 705*	*27. 746*	*27. 802*	
Fort Macon, N. C	*11*	*29. 971*	*30. 011*	*30. 087*	*30. 152*	*30. 185*	*30. 176*	*30. 180*	*30. 185*	*30. 129*	*30. 038*	*30. 022*	*29. 973*	*30. 092*	
Fort Missoula, Mont	*3, 140*	*26. 698*	*26. 676*	*26. 687*	*26. 734*	*26. 802*	*26. 755*	*26. 685*	*26. 650*	*26. 710*	*26. 648*	*26. 681*	*26. 652*	*26. 698*	
Fort Shaw, Mont	*3, 550*	*26. 363*	*26. 346*	*26. 337*	*26. 408*	*26. 375*	*26. 292*	*26. 256*	*26. 219*	*26. 328*	*26. 312*	*26. 328*	*26. 309*	*26. 323*	
Fort Sill, Ind. Ter	*1, 200*	*28. 761*	*28. 726*	*28. 720*	*28. 800*	*28. 873*	*28. 905*	*28. 855*	*28. 795*	*28. 778*	*28. 705*	*28. 694*	*28. 696*	*28. 776*	
Fort Stevenson, Dak	*1, 750*	*28. 104*	*(a)28. 092*	*28. 061*	*28. 204*	*28. 117*	*28. 087*	*28. 085*	*28. 048*	*(b)28. 114*	*(k)28. 098*	*28. 105*	*28. 050*	*28. 097*	
Fort Saint Michael's, Alaska		*29. 888*	*29. 900*	*29. 750*	*29. 847*	*29. 672*	*29. 736*	*29. 584*	*29. 822*	*30. 145*	*30. 026*	*29. 931*	*29. 831*	*29. 844*	
Fort Washakie, Wyo	*5, 580*								*(s) 24. 323*	*24. 389*	*24. 354*	*24. 412*	*24. 441*		
Fredericksburg, Tex	*1, 700*	*(i)28. 276*	*(l)28.242*	*(c)28. 242*	*28. 305*	*28. 354*	*(t)28. 398*	*(a)28. 313*	*28. 305*	*28. 313*	*28. 213*	*(u)28. 223*	*28. 238*	*28. 285*	
Galveston, Tex	*48*	*29. 962*	*29. 923*	*29. 946*	*30. 003*	*30. 093*	*30. 130*	*30. 061*	*30. 066*	*30. 062*	*29. 939*	*29. 909*	*29. 944*	*30. 003*	
Grand Haven, Mich	*620*	*29. 346*	*29. 366*	*29. 292*	*29. 409*	*29. 359*	*29. 398*	*29. 413*	*29. 328*	*29. 359*	*29. 368*	*29. 329*	*29. 218*	*29. 349*	
Hatteras, N. C	*19*	*29. 960*	*30. 012*	*30. 088*	*30. 148*	*39. 197*	*30. 167*	*30. 165*	*30. 170*	*30. 117*	*30. 038*	*30. 017*	*29. 965*	*30. 086*	
Helena, Mont	*4, 100*	*25. 798*	*25. 772*	*25. 763*	*25. 803*	*25. 822*	*25. 774*	*25. 697*	*25. 682*	*25. 752*	*25. 722*	*25. 754*	*25. 749*	*25. 757*	
Henrietta, Tex	*915*	*(t)28. 962*	*28. 927*	*(w)28. 934*	*29. 048*	*(u) 29. 149*	*29. 173*	*29. 134*	*(a)29. 069*	*(i)29. 076*	*28. 977*	*(t)28. 955*			
Huron, Dak	*1, 305*	*28. 606*	*28. 535*	*28. 506*	*28. 638*	*28. 628*	*28. 634*	*28. 622*	*28. 567*	*28. 621*	*28. 581*	*28. 568*	*28. 509*	*28. 585*	
Indianapolis, Ind	*753*	*29. 215*	*29. 215*	*29. 207*	*29. 290*	*29. 303*	*29. 300*	*29. 309*	*29. 241*	*29. 238*	*29. 197*	*29. 155*	*29. 117*	*29. 232*	
Indianola, Tex	*26*	*29. 973*	*29. 934*	*29. 944*	*30. 007*	*30. 095*	*30. 146*	*30. 067*	*30. 064*	*30. 062*	*29. 936*	*29. 916*	*29. 955*	*30. 008*	
Jacksborough, Tex	*1, 120*	*28. 830*	*28. 797*	*28. 804*	*28. 881*	*28. 954*	*28. 980*	*28. 926*	*28. 881*	*28. 881*	*(b)28. 777*	*28. 771*	*28. 783*	*28. 855*	
Jacksonville, Fla	*43*	*29. 970*	*29. 949*	*30. 004*	*30. 076*	*30. 120*	*30. 129*	*30. 160*	*30. 173*	*30. 125*	*30. 003*	*29. 993*	*30. 000*	*30. 058*	
Keokuk, Iowa	*618*	*29. 366*	*29. 334*	*29. 269*	*29. 392*	*29. 417*	*29. 442*	*29. 460*	*29. 358*	*29. 369*	*29. 313*	*29. 289*	*29. 236*	*29. 354*	
Key West, Fla	*20*	*30. 007*	*29. 949*	*29. 946*	*29. 999*	*30. 019*	*30. 088*	*30. 143*	*30. 158*	*30. 142*	*30. 021*	*29. 988*	*30. 030*	*30. 041*	
Kittyhawk, N. C	*22*	*29. 973*	*30. 036*	*30. 101*	*30. 164*	*30. 195*	*30. 180*	*30. 183*	*30. 182*	*30. 139*	*30. 052*	*30. 033*	*29. 969*	*30. 101*	
Knoxville, Tenn	*980*	*29. 043*	*29. 042*	*29. 089*	*29. 161*	*29. 185*	*29. 142*	*29. 141*	*29. 128*	*29. 099*	*29. 015*	*28. 995*	*29. 001*	*29. 087*	
La Crosse, Wis	*725*	*29 237*	*29. 209*	*29. 104*	*29. 270*	*29. 223*	*29. 271*	*29. 288*	*29. 176*	*29. 225*	*29. 229*	*29. 195*	*(c)29. 102*	*29. 211*	
La Mesilla, New Mex	*3, 900*	*26. 105*	*26. 102*	*26. 078*	*26. 110*	*26. 159*	*26. 208*	*26. 097*	*26. 142*	*26. 120*	*26. 032*	*26. 005*	*26. 049*	*26. 101*	
Laredo, Tex	*325*	*29. 480*	*29. 461*	*(f)*	*(h)29. 544*	*29. 632*	*(l)29. 683*								
Leavenworth, Kans	*842*	*29. 140*	*29. 089*	*29. 035*	*29. 152*	*29. 209*	*29. 231*	*29. 225*	*29. 141*	*29. 163*	*29. 072*	*29. 064*	*29. 021*	*29. 128*	
Lewiston, Idaho	*780*	*29. 104*	*29. 098*	*29. 145*	*29. 206*	*29. 375*	*29. 291*	*29. 278*	*29. 236*	*29. 248*	*29. 162*	*29. 155*	*29. 062*	*29. 197*	
Little Rock, Ark	*298*	*29. 687*	*29. 645*	*29. 678*	*29. 757*	*29. 834*	*29. 834*	*29. 818*	*29. 753*	*29. 756*	*29. 667*	*29. 641*	*29. 645*	*29. 726*	
Los Angeles, Cal	*371*	*29. 578*	*29. 539*	*29. 520*	*29. 609*	*29. 684*	*29. 751*	*29. 699*	*29. 763*	*29. 734*	*29. 665*	*29. 596*	*29. 579*	*29. 643*	
Louisville, Ky	*530*	*29. 439*	*29. 423*	*29. 451*	*29. 533*	*29. 573*	*29. 560*	*29. 572*	*29. 507*	*29. 498*	*29. 434*	*(l)29. 393*	*29. 369*	*29. 479*	
Lynchburg, Va	*652*	*29. 306*	*29. 356*	*29. 398*	*29. 466*	*29. 501*	*29. 468*	*29. 467*	*29. 445*	*29. 409*	*(c)29. 345*	*29. 332*	*29. 277*	*29. 398*	
Madison, Wis	*949*	*29. 016*	*29. 041*	*28. 908*	*29. 041*	*28. 990*	*29. 036*	*29. 052*	*28. 958*	*28. 993*	*29. 009*	*28. 976*	*28. 889*	*28. 992*	
Marquette, Mich	*673*	*29. 256*	*29. 287*	*29. 185*	*29. 327*	*29. 215*	*29. 260*	*29. 273*	*29. 210*	*29. 302*	*29. 364*	*29. 318*	*29. 178*	*29. 265*	
Mason, Tex	*1, 620*	*28. 342*	*28. 337*	*28. 336*	*28. 403*	*28. 460*	*28. 492*	*(c)28. 424*	*(i)28. 402*	*(c)28. 414*	*(v)28. 305*				
Memphis, Tenn	*321*	*29. 696*	*29. 654*	*29. 700*	*29. 776*	*29. 842*	*29. 834*	*29. 827*	*29. 773*	*29. 769*	*29. 681*	*29. 648*	*29. 653*	*29. 738*	
Milwaukee, Wis	*697*	*29. 272*	*29. 280*	*29. 185*	*29. 315*	*29. 269*	*29. 309*	*29. 325*	*29. 229*	*29. 265*	*29. 285*	*29. 240*	*29. 138*	*29. 259*	
Mobile, Ala	*41*	*29. 940*	*29. 914*	*29. 954*	*30. 027*	*30. 112*	*30. 116*	*30. 122*	*30. 132*	*30. 113*	*29. 985*	*29. 971*	*29. 985*	*30. 031*	
Montgomery, Ala	*219*	*29. 781*	*29. 778*	*29. 824*	*29. 902*	*29. 960*	*29. 917*	*29. 953*	*29. 954*	*29. 921*	*29. 807*	*29. 763*	*29. 797*	*29. 868*	
Moorhead, Minn	*923*	*28. 974*	*28. 927*	*28. 888*	*29. 043*	*28. 986*	*28. 991*	*29. 018*	*28. 949*	*29. 014*	*29. 026*	*28. 972*	*28. 900*	*28. 974*	
Morgantown, W. Va	*963*	*29. 014*	*29. 055*	*29. 076*	*29. 133*	*29. 151*	*29. 126*	*29. 120*	*29. 104*	*29. 064*	*28. 999*	*28. 979*	*28. 954*	*29. 065*	

a Mean for 28 days only.
b Observations discontinued October 31, 1881.
c Mean for 29 days only.
d Mean for 26 days only.
e Mean for 16 days only.
f Mean for 30 days only.
g Observations discontinued and station closed April 30, 1882.
h Mean for 23 days only.
i Mean for 25 days only.
j Mean for 13 days only.
k Mean for 20 days only.
l Record incomplete.
m Mean for 12 days only.
n No barometer on station.
o Mean for 5 days only.
p Observations discontinued and station closed April 15, 1882.
q Mean for 24 days only.
r Mean for 27 days only.
s Mean for 14 days only.
t Mean for 22 days only.
u Mean for 17 days only.
v Mean for 21 days only.

APPENDIX 18.—*Monthly and annual mean barometer corrected for temperature and instrumental error only, for the year ending June 30, 1882*—Cont'd.

Station.	Height of cistern of barometer above mean sea-level.	1881.						1882.						Annual mean.
		July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	Feet.													
Mount Washington, N. H	6,279	23.839	23.920	23.964	23.749	23.605	23.566	23.376	23.486	23.472	23.512	23.674	23.700	23.655
Nashville, Tenn	507	29.489	29.461	29.514	29.592	29.638	29.623	29.627	29.581	29.571	29.482	29.451	29.452	29.540
New London, Conn	47	29.897	29.970	30.066	30.096	30.120	30.093	30.068	30.090	30.029	29.963	29.976	29.844	30.018
New Haven, Conn	107	29.812	29.894	29.983	30.014	30.041	30.007	29.936	30.009	29.952	29.888	29.896	29.772	29.938
New Orleans, La	52	29.947	29.912	29.945	30.015	30.075	30.094	30.073	30.087	30.077	29.945	29.935	29.959	30.005
Newport, R. I	44	29.883	29.958	30.060	30.082	30.102	30.079	30.039	30.062	30.006	29.938	29.963	29.835	30.001
New York, N. Y	164	29.770	29.848	29.926	29.969	29.997	29.972	29.965	29.962	29.907	29.849	29.844	(a)29.729	29.895
Norfolk, Va	30	29.940	30.012	30.067	30.138	30.183	30.160	30.164	30.148	30.105	30.021	29.993	29.928	30.072
North Platte, Nebr	2,841	27.113	27.050	27.009	27.088	27.110	27.125	27.045	27.042	27.057	26.997	27.029	27.008	27.056
Olympia, Wash	30	29.998	29.950	29.956	29.960	30.107	29.970	30.024	29.974	30.039	29.964	30.017	29.961	29.993
Omaha, Neb	1,113	28.866	28.819	28.734	28.875	28.907	28.930	28.916	28.837	28.866	(a)28.794	28.802	28.740	28.840
Ooglaamie (Pt. Barrow) Alaska					(b)29.767	29.877	29.841	29.820	29.701	30.059	29.959	30.056	29.863	
Oswego, N. Y	304	29.593	29.672	29.698	29.767	29.745	29.737	29.744	29.736	29.710	29.661	29.665	29.536	29.689
Palestine, Tex	533						(b)29.638	(c)29.589	(d)29.525	(e)29.539	29.440	29.435	29.459	
Pensacola, Fla	30	29.977	29.957	29.996	30.040	30.122	30.129	30.145	30.157	30.132	29.997	29.986	30.000	30.056
Philadelphia, Pa	92	29.894	29.977	30.043	30.103	30.140	30.115	30.116	30.058	30.010	29.945	29.927	29.821	30.012
Phœnix, Ariz	1,120	28.710	28.692	28.674	28.760	28.887	28.943	(f)						
Pike's Peak, Col	14,134	18.089	18.047	17.864	17.769	17.578	17.629	17.417	17.504	17.592	17.595	17.704	17.899	17.724
Pioche, Nev	6,110	24.096	24.111	24.072	24.060	24.143	24.173	24.011	24.051	24.058	23.960	23.957	23.994	24.057
Pittsburg, Pa	762	29.198	29.245	29.261	29.327	29.335	29.314	29.312	29.286	29.254	29.201	29.167	29.117	29.251
Port Eads, La	7	30.014	29.975	30.004	30.072	30.118	30.143	30.139	30.162	30.149	30.010	30.003	30.031	30.068
Port Huron, Mich	633	29.310	29.359	29.318	29.409	29.367	29.386	29.399	29.339	29.350	29.341	29.311	29.203	29.341
Portland, Me	45	29.840	29.914	30.046	30.039	30.043	30.022	29.979	30.017	29.962	29.904	29.938	29.771	29.873
Portland, Oreg	67	29.994	29.945	29.958	29.982	30.147	30.029	30.081	30.042	30.075	29.993	30.018	29.965	30.019
Prescott, Ariz	5,340	24.820	24.806	24.759	24.756	24.779	24.836	24.698	24.763	24.766	24.702	24.702	24.758	24.762
Provincetown, Mass	29								(g)30.127	30.003	29.944	29.971	29.830	
Punta Rassa, Fla	13	29.997	(a)29.946	29.961	30.022	30.051	30.104	30.162	30.174	30.141	(a)30.010	29.994	30.040	30.050
Red Bluff, Cal	350	29.545	29.510	29.532	29.656	29.802	29.812	29.778	29.782	29.719	29 659	29.577	29.495	29.656
Rio Grande City, Tex	230	29.734	29.697	29.727	29.793	29.902	29.911	29.824	29.804	29.808	29.665	29.655	29.712	29.769
Rochester, N. Y	621	29.313	29.390	29.401	29.429	29.395	29.392	29.394	29.382	29.367	29.327	29.333	29.214	29.361
Roseburg, Oreg	511	29.516	29.466	29.483	29.489	29.678	29.553	29.607	29.565	29.576	29.512	(h)29.506	26.458	29.534
Sacramento, Cal	65	29.843	29.816	29.815	29.951	30.083	30.117	30.059	30.090	30.022	29.972	29.877	(a)29.813	29.955
Saint Louis, Mo	568	29.444	29.410	29.387	29.504	29.544	29.549	29.565	29.471	29.467	29.400	29.381	29.346	29.456
Saint Paul, Minn	811	29.133	29.093	28.995	29.161	29.107	29.144	29.161	29.064	29.124	29.129	29.096	29.006	29.101
Saint Vincent, Minn	804	29.074	29.048	29.000	(i)29.179	29.106	29.063	29.123	29.063	29.165	29.201	29.109	29.024	29.096
Salt Lake City, Utah	4,348	25.634	25.596	25.591	25.612	25.755	25.779	25.630	25.671	25.670	25.554	25.555	25.558	25.634
San Antonio, Tex	673	29.290	29.258	29.348	29.348	29.430	29.461	29.373	29.386	29.370	29.248	29.229	29.281	29.332

San Diego, Cal	*67*	*29.836*	*29.797*	*29.768*	*29.871*	*29.937*	*30.003*	*29.964*	(*t*)30.079	*30.042*	*29.976*	*29.903*	*29.891*	*29.922*
Sandusky, Ohio	*639*	*29.327*	*29.362*	*29.337*	*29.421*	*29.413*	*29.419*	*29.436*	*29.377*	*29.369*	*29.350*	*29.306*	*29.228*	*29.362*
Sandy Hook, N. J	*28*	*29.908*	*29.968*	*30.066*	*30.112*	*30.146*	*30.121*	*30.116*	*30.110*	*30.059*	*29.998*	*29.987*	*29.872*	*30.040*
San Francisco, Cal	*60*	*29.913*	*29.883*	*29.862*	*29.983*	*30.085*	*30.116*	*30.078*	*30.103*	*30.046*	(*a*)30.027	*29.946*	*29.896*	*29.995*
Santa Fé, N. M	*7,106*	*23.399*	*23.376*	*23.293*	*23.300*	(*j*)23.241	(*k*)	*23.169*	*23.199*	*23.187*	*23.132*	*23.157*	*23.260*	.....
Savannah, Ga	*87*	*29.916*	*29.911*	*29.982*	*30.058*	*30.104*	*30.098*	*30.120*	*30.130*	*30.069*	*29.965*	(*a*)29.963	*29.937*	*30.021*
Shreveport, La	*227*	*29.776*	*29.730*	*29.767*	*29.838*	*29.916*	*29.936*	*29.889*	*29.857*	*29.850*	*29.747*	*29.723*	*29.754*	*29.815*
Silver City, N. M	*5,890*	*24.345*	*24.337*	*24.287*	*24.298*	*24.290*	*24.329*	*24.202*	*24.253*	*24.262*	*24.196*	*24.207*	*24.277*	*24.274*
Sitka, Alaska	*63*	(*l*)29.900	*m*29.903	*29.824*	(*h*)29.883	(*i*)29.753	(*i*)29.369	*29.777*	*29.407*	*29.849*	*29.709*	*29.900*	*m*29.888	*29.764*
Smithville, N. C	34	29.969	29.993	30.062	30.129	30.165	30.154	30.164	30.172	30.108	30.014	30.002	29.962	30.074
Spokane Falls, Wash	1,910	27.951	27.937	27.942	27.995	28.110	28.026	28.011	27.959	28.003	27.943	27.957	27.895	27.977
Springfield, Ill	644	29.362	29.340	29.294	29.406	29.428	29.446	29.460	29.367	29.375	29.324	29.291	29.245	29.362
Springfield, Mass	120	29.794	29.871	29.968	29.996	30.019	29.996	29.978	29.992	29.936	29.866	29.884	29.746	29.920
Springfield, Mo	1,351	.....	.....	.....	.....	.....	.....	(*g*)28.660	28.606	28.621	28.548	28.532	28.539	.....
Stockton, Tex	3,010	26.988	26.979	26.956	27.014	27.056	27.098	27.004	27.010	27.024	26.920	26.893	26.929	26.989
Thatchers' Island, Mass	48	29.870	29.946	30.069	30.069	30.078	30.058	30.015	30.035	29.984	29.924	29.956	29.809	29.984
Toledo, Ohio	651	29.303	29.340	29.311	29.393	29.383	29.392	29.408	29.346	29.345	29.336	29.290	29.206	29.338
Tucson, Ariz	2,369	27.446	27.432	27.394	27.483	27.570	27.635	27.552	27.621	27.580	27.493	27.447	27.465	27.510
Umatilla, Oreg	340	29.613	29.600	29.630	29.706	29.886	29.791	29.796	29.751	29.757	29.675	29.662	29.564	29.703
Uvalde, Tex	930	(*n*)28.977	(*n*)28.984	(*d*)28.974	(*d*)29.052	(*d*)29.133	(*i*)29.178	(*o*)29.076	*m*29.082	(*d*)29.083	28.965	28.941	28.976	29.035
Vicksburg, Miss	244	29.785	29.742	29.769	29.849	29.919	29.914	29.893	29.878	29.870	29.756	29.742	29.765	29.824
Visalia, Cal	348	29.503	29.469	29.477	29.621	29.737	29.783	29.720	29.762	29.706	(*e*)29.644	(*e*)29.544	(*h*) 29.507	29.623
Washington, D. C	105	29.861	29.936	29.979	30.048	30.101	30.077	30.086	30.055	30.016	29.947	29.916	29.830	29.988
West Las Animas, Colo	3,905	.....	.....	.....	(*a*)26.020	(*m*)26.096	(*f*)26.112	(*f*)25.970	(*p*)25.982	26.003	25.927	25.971	25.976	.....
Williamsport, Pa	561	.....	.....	.....	.....	.....	.....	(*q*)29.494	29.512	29.471	29.417	29.401	29.305	.....
Wilmington, N. C	52	29.932	29.964	30.035	30.112	30.146	30.129	30.138	30.145	30.082	29.986	29.971	29.929	30.047
Winnemucca, Nev	4,327	25.614	25.579	25.601	25.608	25.761	25.738	25.641	25.639	(*n*)25.652	25.558	25.576	25.551	25.626
Wood's Holl, Mass	35	29.891	29.961	30.065	30.086	30.104	30.084	(*l*)30.081	.....	.....	.....	.....	.....	.....
Yankton, Dak	1,228	28.712	28.647	28.595	28.732	28.745	28.755	28.732	28.683	28.716	28.653	28.656	28.594	28.683
Yuma, Ariz	141	29.652	29.642	29.623	29.737	29.888	29.944	29.890	29.950	29.882	29.762	29.662	29.640	29.775

a Mean for 29 days only.
b Mean for 18 days only.
c Mean for 7 days only.
d Mean for 16 days only.
e Mean for 23 days only.
f Observations discontinued December 31, 1881.
g Mean for 14 days only.
h Mean for 30 days only.
i Mean for 27 days only.
j Mean for 20 days only.
k No record on station.
l Mean for 24 days only.
m Mean for 28 days only.
n Mean for 18 days only.
o Record incomplete. Observer sick.
p Mean for 25 days only.
q Mean 26 days only.

APPENDIX 19.

Annual and mean annual temperatures at stations of the Signal Service, United States Army, from the commencement of observations to December 31, 1881.

(Computed from the three (3) telegraphic observations.)

Station.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.		Mean annual temperature.
	°	°	°	°	°	°	°	°	°	°	°		°
Albany, N. Y.				46.3	43.8	47.0	48.1	48.7	46.4	50.4	51.4	8	47.7
Alpena, Mich			39.7	41.2	37.2	40.9	43.3	45.0	41.3	42.2	42.1	9	41.4
Atlanta, Ga									61.5	62.1	62.0	3	61.9
Atlantic City, N. J				51.6	49.2	51.1	52.5	53.0	51.5	53.3	52.7	8	51.9
Augusta, Ga		61.8	62.9	64.4	63.3	63.4	64.3	65.2	65.3	65.4	65.7	10	64.2
Baltimore, Md	56.1	55.6	54.3	55.4	53.1	54.9	56.3	56.9	55.6	56.4	57.1	11	55.6
Barnegat, N. J				51.0	48.8	51.0	52.1	52.4	50.7	52.4	51.6	8	51.2
Bismarck, Dak					35.0	36.8	42.4	44.8	39.5	38.4	40.1	7	39.6
Block Island, R. I											50.3	1	50.3
Boisé City, Idaho								52.4	51.4	48.9	50.0	4	50.7
Boston, Mass	48.9	48.5	48.3	48.7	46.2	47.3	49.2	49.2	47.8	49.4	48.5	11	48.4
Brackettville, Tex								69.1	70.7	66.4	68.1	4	68.7
Brownsville, Tex								72.7	73.7	72.6	72.5	3	72.8
Buffalo, N. Y	48.3	47.4	46.0	46.2	42.7	45.8	47.8	48.8	46.4	47.5	47.3	11	46.7
Burlington, Vt								47.6	44.2	46.8	46.4	4	46.2
Cairo, Ill		56.2	56.8	58.4	55.7	57.1	58.5	60.1	59.6	59.0	59.6	10	58.1
Campo, Cal						54.2		54.3	55.0	53.2	54.2	5	54.2
Camp Thomas, Ariz											60.7	1	60.7
Cape Henry, Va				59.1	57.6	58.4	58.3	59.6	58.8	60.6	59.5	8	59.0
Cape May, N. J		51.1	51.7	52.2	50.2	53.6	54.8	56.0	54.2	55.6	54.7	10	53.4
Castroville, Tex									70.6	67.4	68.5	3	68.8
Cedar Keys, Fla										70.9	70.5	2	70.7
Champaign, Ill											51.6	1	51.6
Charleston, S. C	65.5	64.4	64.6	65.7	64.8	65.5	66.1	66.5	66.7	67.2	66.8	11	65.8
Charlotte, N. C									60.4	60.3	61.4	3	60.7
Chattanooga, Tenn									60.7	60.3	60.8	3	60.6
Cheyenne, Wyo	45.6	43.1	44.8	45.5	42.5	44.3	44.2	44.2	46.5	42.9	45.8	11	44.5
Chicago, Ill		45.6	47.2	50.4	45.4	49.0	50.3	51.4	49.9	50.6	49.4	10	48.9
Chincoteague, Va											54.7	1	54.7
Cincinnati, Ohio		54.4	55.0	57.0	53.0	55.2	56.2	57.0	56.2	56.8	57.7	10	55.8
Cleveland, Ohio	50.0	48.0	48.6	50.5	45.9	48.0	50.0	50.5	49.1	50.0	49.8	11	49.1
Columbus, Ohio									53.2	53.5	53.7	3	53.5
Concho, Tex								63.7	66.3	62.3	63.9	4	64.0
Corsicana, Tex					64.0	64.9	64.5	66.1	68.4	66.2	(a)	6	65.7
Davenport, Iowa		48.7	49.0	49.6	45.4	48.8	50.8	52.2	50.0	51.0	50.4	10	49.6
Dayton, Wash										47.9	49.3	2	48.6
Deadwood, Dak										40.8	(a)	1	40.8
Decatur, Tex									66.8	64.3	64.9	3	65.2

Delaware Breakwater, Del											54.4	1	54.4
Denison, Tex						62.6	62.0	63.7	64.8	62.6	64.4	6	63.4
Denver, Colo		47.6	48.1	49.8	48.6	49.5	48.8	49.5	50.8	47.4	50.8	10	49.1
Des Moines, Iowa									49.8	49.9	49.2	3	49.6
Detroit, Mich	47.2	46.0	46.2	48.3	44.1	47.2	49.0	49.6	48.0	48.7	51.2	11	47.8
Dodge City, Kans					52.4	53.2	53.2	54.4	54.3	52.0	53.0	7	53.2
Dubuque, Iowa				48.9	44.8	47.6	49.6	50.6	48.6	48.6	48.6	8	48.4
Duluth, Minn	39.4	38.3	39.3	39.8	36.3	37.9	43.5	45.3	40.0	38.7	40.4	11	39.9
Eagle Pass, Tex								69.5	72.0	69.9	70.6	4	70.5
Eagle Rock, Idaho											42.4	1	42.4
Eastport, Me				41.1	38.6	40.8	42.6	43.0	40.6	42.3	42.1	8	41.4
El Paso, Tex									66.3	63.0	62.9	3	64.1
Erie, Pa				50.1	46.4	49.0	50.3	51.8	49.7	50.4	50.0	8	49.7
Escanaba, Mich		39.3	39.2	40.4	36.1	39.8	42.5	44.6	40.9	41.3	41.1	10	40.5
Florence, Ariz						69.9	71.6	68.0	69.5	66.4	66.9	6	68.7
Fort Apache, Ariz									53.4	50.8	52.4	3	52.2
Fort Bennett, Dak											43.8	1	43.8
Fort Benton, Mont		42.4	42.5	43.3	42.1					40.3	43.6	6	42.4
Fort Buford, Dak									39.0	36.6	39.4	3	38.3
Fort Custer, Mont										43.0	45.3	2	44.2
Fort Davis, Tex									62.0	58.0	(a)	2	60.0
Fort Elliott, Tex										54.4	54.9	2	54.6
Fort Gibson, Ind. Ter				60.8	59.8	59.2	59.0	60.0	61.3	59.4	60.8	8	59.8
Fort Grant, Ariz									63.2	59.1	59.8	3	60.7
Fort Griffin, Tex								63.7	65.2	63.4	65.4	4	64.4
Fort Keogh, Mont									64.0	41.4	44.8	3	43.4
Fort McKavett, Tex									66.1	62.5	63.9	3	64.2
Fort Macon, N. C											62.4	1	62.4
Fort Missoula, Mont											42.3	1	42.3
Fort Shaw, Mont											42.1	1	42.1
Fort Sill, Ind. T							59.5	61.6	62.0	59.4	61.2	5	60.7
Fort Stevenson, Dak										36.5	37.9	2	37.2
Fort Saint Michael's, Alaska					26.2	24.3	25.2	25.6	26.4	23.2	28.9	7	25.7
Fort Verde, Ariz							62.7		62.2	58.4	60.3	4	60.9
Fredericksburg, Tex									68.9	63.8	65.9	3	66.2
Galveston, Tex		69.4	69.3	70.5	69.8	70.1	69.0	70.0	70.8	69.8	70.1	10	69.9
Grand Haven, Mich		44.4	45.2	47.5	43.3	46.9	48.9	50.1	47.8	48.3	48.1	10	47.0
Hatteras, N. C. (b)					60.7	61.6	61.2	61.9	60.9	62.4	61.9	7	61.5
Helena, Mont											43.8	1	43.8
Henrietta, Tex											63.0	1	63.0
Indianapolis, Ind		51.4	51.0	54.6	50.2	52.9	54.3	55.0	53.8	53.9	54.7	10	53.3
Indianola, Tex			69.6	70.6	69.4	69.7	69.4	70.7	71.1	69.5	70.1	9	70.0
Jacksborough, Tex								63.6	66.1	(a)	64.7	3	64.8
Jacksonville, Fla		67.1	68.2	69.8	68.8	68.4	69.1	69.3	69.3	70.2	70.2	10	69.0
Keokuk, Iowa		51.4	50.5	52.6	48.5	51.0	52.9	55.0	52.9	53.5	52.6	10	52.1
Key West, Fla	77.2	77.2	77.0	77.8	78.1	77.0	77.0	77.1	77.1	78.7	78.1	11	77.5
Kittyhawk, N. C						59.3	59.3	60.1	59.3	61.3	59.7	6	59.8
Knoxville, Tenn	58.0	55.1	56.5	57.8	55.5	55.7	57.0	57.6	58.8	58.5	58.7	11	57.2
La Crosse, Wis			43.5	47.5	43.1	45.5	48.8	50.9	47.6	46.9	48.0	9	46.9
La Mesilla, N. Mex								59.8	62.2	59.7	60.7	4	60.6

a Record incomplete. *b* Record for Cape Hatteras, N. C., used prior to December 1, 1880.

APPENDIX 19.—*Annual and mean annual temperatures at stations of the Signal Service, United States Army, &c.*—Continued.

Stations.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.		Mean annual temperature.
	°	°	°	°	°	°	°	°	°	°	°	°	
Laredo, Tex								72.2	74.3	71.4		3	72.6
Leavenworth, Kans		52.0	51.7	54.2	51.0	53.2	53.8	55.4	54.5	54.1	54.1	10	53.4
Lewiston, Idaho										49.5	51.1	2	50.3
Little Rock, Ark										61.9	63.0	2	62.4
Los Angeles, Cal								60.7	60.6	58.4	61.1	4	60.2
Louisville, Ky		54.8	55.7	57.8	54.5	56.2	57.5	57.8	57.2	57.4	58.2	10	56.7
Lynchburg, Va		54.5	55.0	56.6	55.3	57.1	59.2	58.7	58.4	58.2	59.8	10	57.3
Madison, Wis									48.0	47.1	46.7	3	47.3
Marquette, Mich		39.2	39.2	41.2	37.8	40.8	44.4	46.5	42.5	42.0	41.0	10	41.4
Mason, Tex								65.3	67.2	64.2	65.2	4	65.5
Memphis, Tenn		59.8	59.6	62.4	59.4	60.1	60.9	61.9	61.6	61.0	62.5	10	60.9
Milwaukee, Wis	45.2	43.7	43.9	45.0	40.8	43.0	45.8	48.5	46.2	46.7	46.3	11	45.1
Mobile, Ala	67.5	65.4	66.0	67.9	66.7	66.0	66.8	67.3	67.0	(*a*)	68.0	10	66.9
Montgomery, Ala			64.2	66.1	65.2	64.6	65.3	65.8	65.6	65.8	66.1	9	65.4
Moorhead, Minn. (*b*)			35.9	37.7	34.5	35.6	40.2	43.5	38.6	(*a*)	37.9	8	38.0
Morgantown, W. Va				53.7	51.1	52.7	54.0	54.2	55.2	54.8	54.7	8	53.8
Mount Washington, N. H		24.9	25.4	25.8	23.5	25.9	27.8	28.0	25.8	27.6	27.6	10	26.2
Nashville, Tenn		57.7	59.1	61.5	58.4	58.9	59.5	60.0	60.5	60.2	61.2	10	59.7
New London, Conn		47.8	47.4	49.1	47.3	49.5	51.0	51.3	49.7	50.8	50.3	10	49.4
New Haven, Conn			47.8	49.2	48.2	50.7	52.4	52.9	50.7	51.6	49.8	9	50.4
New Orleans, La	69.2	67.4	68.0	69.9	68.8	68.4	68.3	68.9	69.8	69.4	69.7	11	68.9
Newport, R. I						48.9	50.4	51.0	49.2	50.8	49.9	6	50.0
New York, N. Y	51.6	50.6	50.2	51.4	48.6	50.5	52.6	52.9	51.3	52.2	52.2	11	51.3
Norfolk, Va	60.6	58.0	58.1	58.7	57.6	59.0	58.9	59.8	59.2	60.5	59.9	11	59.1
North Platte, Nebr					46.3	47.5	48.2	49.7	48.1	47.1	47.9	7	47.8
Olympia, Wash								50.8	49.0	47.7	49.7	4	49.3
Omaha, Nebr	50.1	48.1	48.6	50.0	46.3	48.6	50.9	52.5	51.5	50.3	49.7	11	49.7
Oswego, N. Y	47.1	46.1	46.3	46.9	44.2	47.2	49.0	51.2	48.3	49.1	48.2	11	47.6
Pensacola, Fla										68.3	68.3	2	68.3
Philadelphia, Pa	54.5	52.0	51.5	52.6	50.1	52.5	53.9	54.6	53.4	54.5	54.2	11	53.1
Phœnix, Ariz							69.6	68.6	70.4	68.9	67.1	5	68.9
Pike's Peak, Colo				18.9	18.2	19.0	18.4	19.4	21.9	17.9	20.7	8	19.3
Pioche, Nev								50.1	51.5	48.4	50.8	4	50.2
Pittsburgh, Pa		50.0	50.4	51.7	48.8	51.5	52.8	52.8	52.1	53.4	54.0	10	51.8
Port Huron, Mich					41.7	44.9	46.3	47.9	45.3	46.9	45.8	7	45.5
Portland, Me		43.6	43.7	44.8	44.1	48.0	48.3	49.1	47.1	48.7	48.4	10	46.6
Portland, Oreg		51.7	52.6	53.6	53.3	53.1	53.9	53.3	52.4	50.4	52.2	10	52.6
Prescott, Ariz								52.3	54.7	50.6	52.5	4	52.5
Punta Rassa, Fla		72.8	72.5	73.5	73.9	73.0	73.5	73.3	73.1	74.2	73.5	10	73.3
Red Bluff, Cal								64.0	64.2	61.8	62.1	4	63.0
Rio Grande City, Tex									74.2	72.8	73.2	3	73.4

Rochester, N. Y	*47.1*	*44.7*	*45.1*	*46.7*	*43.9*	*46.8*	*48.6*	*49.6*	*47.4*	*48.7*	*48.6*	*11*	*47.0*
Roseburg, Oreg								*53.1*	*52.2*	*50.6*	*52.2*	*4*	*52.0*
Sacramento, Cal								*61.3*	*60.3*	*57.2*	*59.2*	*4*	*59.5*
Saint Louis, Mo	*57.5*	*54.1*	*53.7*	*56.3*	*53.9*	*55.4*	*56.4*	*57.4*	*55.7*	*55.1*	*55.9*	*11*	*55.6*
Saint Paul, Minn	*43.6*	*(a)*	*41.6*	*43.3*	*39.8*	*42.3*	*47.5*	*48.2*	*45.5*	*44.0*	*45.2*	*10*	*44.1*
Saint Vincent, Minn (c)				*34.6*	*(a)*	*31.7*	*37.1*	*40.7*	*33.2*	*33.8*	*35.5*	*7*	*35.2*
Salt Lake City, Utah					*52.4*	*51.2*	*51.4*	*51.9*	*53.0*	*48.6*	*51.8*	*7*	*51.5*
San Antonio, Tex								*68.8*	*71.2*	*67.4*	*68.5*	*4*	*69.0*
San Diego, Cal		*60.4*	*60.6*	*59.6*	*61.6*	*61.0*	*62.1*	*60.6*	*60.1*	*58.5*	*60.4*	*10*	*60.5*
Sandusky, Ohio								*52.0*	*50.8*	*51.4*	*51.3*	*4*	*51.4*
Sandy Hook, N. J				*49.8*	*49.1*	*51.9*	*53.3*	*53.4*	*51.6*	*53.5*	*53.3*	*8*	*52.0*
San Francisco, Cal		*56.1*	*55.9*	*55.7*	*55.6*	*56.3*	*57.3*	*56.5*	*56.1*	*54.2*	*55.8*	*10*	*56.0*
Santa Fé, N. Mex		*47.9*	*48.6*	*48.0*	*48.0*	*47.5*	*47.6*	*47.5*	*50.2*	*45.4*	*(a)*	*9*	*47.9*
Savannah, Ga	*66.6*	*64.3*	*65.0*	*66.5*	*65.8*	*66.6*	*67.0*	*67.8*	*67.4*	*68.0*	*67.8*	*11*	*66.6*
Shreveport, La		*63.7*	*64.5*	*68.0*	*65.2*	*64.7*	*64.8*	*65.6*	*66.9*	*65.6*	*66.4*	*10*	*65.5*
Silver City, N. Mex									*55.5*	*52.7*	*52.9*	*3*	*53.7*
Smithville, N. C						*63.1*	*63.2*	*63.7*	*63.1*	*65.0*	*63.4*	*6*	*63.6*
Springfield, Ill										*54.1*	*53.8*	*2*	*54.0*
Springfield, Mass					*46.1*	*49.6*	*51.2*	*51.4*	*48.9*	*50.3*	*50.0*	*7*	*49.6*
Stockton, Tex								*62.9*	*65.7*	*61.3*	*62.7*	*4*	*63.2*
Thatcher's Island, Mass						*46.0*	*47.8*	*48.4*	*46.8*	*48.3*	*47.6*	*6*	*47.5*
Toledo, Ohio	*49.5*	*48.1*	*49.3*	*49.3*	*46.7*	*50.2*	*52.1*	*52.8*	*51.2*	*51.9*	*51.8*	*11*	*50.3*
Tucson, Ariz						*66.9*	*67.2*	*65.4*	*69.0*	*67.4*	*67.1*	*6*	*67.2*
Umatilla, Oreg								*54.8*	*52.2*	*52.6*	*50.7*	*4*	*52.6*
Uvalde, Tex									*70.7*	*67.5*	*69.1*	*3*	*69.1*
Vicksburg, Miss		*65.1*	*65.8*	*66.0*	*64.6*	*64.3*	*64.9*	*66.0*	*66.3*	*65.2*	*66.8*	*10*	*65.5*
Visalia, Cal								*61.9*	*62.8*	*59.7*	*60.9*	*4*	*61.3*
Washington, D. C	*54.8*	*55.6*	*54.8*	*55.9*	*52.2*	*54.4*	*55.5*	*56.0*	*55.1*	*55.6*	*55.9*	*11*	*55.1*
Wickenburg, Ariz							*64.5*	*61.6*		*60.7*	*61.9*	*4*	*62.2*
Wilmington, N. C	*64.3*	*62.4*	*63.0*	*63.6*	*61.5*	*61.6*	*62.4*	*62.2*	*62.6*	*63.6*	*64.2*	*11*	*62.9*
Winnemucca, Nev								*49.8*	*50.4*	*48.7*	*49.2*	*4*	*49.5*
Woods Holl, Mass			*47.8*	*48.5*	*46.7*	*49.0*	*50.4*	*50.8*	*49.5*	*50.7*	*49.7*	*9*	*49.2*
Yankton, Dak				*46.7*	*41.2*	*43.5*	*46.7*	*48.2*	*47.3*	*46.5*	*45.4*	*8*	*45.7*
Yuma, Ariz						*74.0*	*73.7*	*72.0*	*73.3*	*70.2*	*71.9*	*6*	*72.5*

a Record incomplete. *b* Record for Breckinridge, Minn., used prior to January 1, 1881. *c* Record for Pembina, Dak., used prior to September 4, 1880.

APPENDIX 20.

Monthly and annual mean temperatures at stations of observation of the Signal Service, U. S. Army, for the year ending June 30, 1882.

(Computed from the three telegraphic observations.)

Station.	Height of thermometer above ground.	1881.						1882.						Annual mean.
		July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	Feet.	°	°	°	°	°	°	°	°	°	°	°	°	°
Albany, N. Y	51	73.9	73.3	70.9	55.1	43.5	38.7	27.4	32.6	38.8	47.0	55.9	69.9	52.2
Alpena, Mich	54	68.2	66.5	62.4	45.9	33.8	30.3	20.2	28.6	27.3	36.7	(*j*)44.4	57.8	43.5
Atlanta, Ga	78	80.9	78.1	74.9	66.6	52.3	49.3	48.1	52.2	57.0	64.3	66.2	76.2	63.8
Atlantic City, N. J	10	73.2	71.7	72.6	61.2	48.8	42.2	34.0	37.9	41.4	46.7	53.2	66.6	54.1
Augusta, Ga	18	84.2	80.5	79.4	70.6	56.6	53.5	52.7	55.9	60.9	66.5	69.8	78.6	67.4
Baltimore, Md	33	78.6	76.9	76.9	63.1	49.1	43.8	34.7	41.3	44.9	52.0	59.4	74.0	57.9
Barnegat, N. J	5	72.4	71.1	71.6	59.8	47.3	40.8	32.7	36.3	40.1	45.9	52.2	66.2	53.0
Bismarck, Dak	18	72.4	70.1	52.8	40.5	24.7	26.1	11.8	22.1	22.1	39.6	51.6	63.4	41.4
Block Island, R. I	8	68.2	68.8	66.8	57.3	47.8	42.2	32.5	34.7	37.9	43.2	48.9	63.0	50.9
Boisé City, Idaho	19	71.2	67.3	56.6	45.8	36.2	33.0	24.9	(*e*)30.0	36.8	47.6	57.5	66.1	47.8
Boston, Mass	156	68.5	69.5	65.7	53.3	42.4	37.8	26.4	30.4	35.3	42.0	49.8	65.9	48.9
Brackettville, Tex	6	84.6	84.7	79.0	71.1	57.1	(*a*)57.3	(*s*)						
Brownsville, Tex	19	84.5	83.6	79.9	(*b*)78.1	64.9	62.7	(*b*)62.8	69.0	70.5	74.8	78.3	81.8	74.2
Buffalo, N. Y	107	70.3	71.5	71.3	54.0	40.8	36.6	26.1	32.6	33.5	40.8	49.3	62.4	49.1
Burlington, Vt	56	70.0	69.2	66.2	48.6	37.5	33.2	19.7	24.9	29.8	38.7	51.3	64.6	46.1
Cairo, Ill	44	82.3	82.8	75.1	65.1	47.5	45.1	38.5	49.0	51.9	60.5	63.8	76.2	61.5
Campo, Cal	5	69.7	66.1	(*c*)61.6	51.2	45.0	44.8	(*d*)37.2	(*l*)40.2	46.8	(*k*)50.9	56.3	59.6	50.9
Camp Thomas, Ariz	3	81.9	(*e*)78.7	71.0	(*f*)55.7	44.4	43.5	(*g*)41.8	45.1	53.8	59.5	68.0	76.7	60.0
Cape Henry, Va	16	79.0	76.0	77.5	67.7	56.0	48.7	41.9	46.5	48.7	54.0	61.2	73.1	60.9
Cape May, N. J	19	(*h*)75.4	(*i*)73.5	74.5	(*b*)62.7	(*h*)51.6	(*d*)43.3	36.0	40.8	45.0	(*h*)49.6	(*l*) 55.1	(*l*)68.5	56.3
Castroville, Tex	26	(*j*)85.4	(*j*)84.8	(*i*)79.2	(*b*)73.7	57.6	(*k*)55.8	54.8	60.6	63.7	(*v*)			
Cedar Keys, Fla	20	83.1	81.7	80.7	75.6	67.2	61.8	62.6	62.3	67.2	73.4	75.2	79.9	72.6
Champaign, Ill		76.9	76.7	70.8	57.4	39.7	37.6	28.7	39.4	(*b*)41.8	51.7	55.8	69.1	53.8
Charleston, S. C	40	83.4	81.0	80.7	72.0	60.6	55.5	(*b*)55.1	57.3	62.0	66.6	71.6	79.3	68.8
Charlotte, N. C	35	82.6	80.9	77.4	65.8	50.9	46.4	42.7	49.4	53.6	60.8	65.3	77.4	62.8
Chattanooga, Tenn	43	80.6	80.0	74.6	65.2	50.2	46.6	45.0	50.2	55.1	62.6	64.5	75.8	62.5
Cheyenne, Wyo	15	69.7	68.0	53.5	43.9	31.6	33.8	25.3	30.7	34.6	40.3	45.7	59.2	44.7
Chicago, Ill	70	72.9	75.0	69.5	55.9	39.9	37.1	28.3	38.2	38.3	45.9	51.7	63.6	51.4
Chincoteague, Va	22	74.9	72.6	74.2	63.5	52.1	(*d*)44.6	37.0	42.0	44.5	49.0	56.2	69.7	56.7
Cincinnati, Ohio	68	80.8	79.5	76.1	63.1	47.5	43.6	37.5	46.5	49.0	55.4	61.0	73.0	59.4
Cleveland, Ohio	73	73.2	72.1	71.7	57.1	41.9	37.7	28.3	37.0	38.3	44.4	51.9	66.2	51.6
Columbus, Ohio	82	78.1	75.2	73.7	59.7	43.6	39.7	32.4	41.2	44.2	50.3	57.0	68.9	55.3
Concho, Tex	6	83.0	82.5	75.0	67.6	51.2	49.3	46.2	54.5	59.2	65.5	71.0	80.0	65.4
Corsicana, Tex		85.8	87.1	78.9	72.3									

Davenport, Iowa	*46*	*77.6*	*77.2*	*69.8*	*56.5*	*39.7*	*38.2*	*28.9*	*40.3*	*40.3*	*51.3*	*55.6*	*68.6*	*53.7*
Dayton, Wash	*6*	*67.0*	*64.8*	*57.5*	*46.7*	*36.1*	*37.1*	*31.6*	*32.6*	*41.0*	*46.2*	*54.4*	*63.6*	*48.2*
Deadwood, Dak	*16*	*(n)*	*74.3*	*50.5*	*39.9*	*30.9*	*32.6*	*22.6*	*28.5*	*31.6*	*37.5*	*47.0*	*57.7*	.....
Decatur, Tex	*17*	*(b)85.4*	*(i)86.9*	*(d)78.1*	*(a)70.1*	*52.1*	*(l)51.0*	*(i)43.4*	*(h)52.9*	*(h)58.9*	*(h)64.8*	*(p)66.4*	*(r)80.5*	*65.9*
Delaware Breakwater, Del	*13*	*73.7*	*72.7*	*74.2*	*63.6*	*51.7*	*44.4*	*36.3*	*40.1*	*42.8*	*47.8*	*55.0*	*67.9*	*55.8*
Denison, Tex	*16*	*85.3*	*(j)88.3*	*77.2*	*69.2*	*50.4*	*49.8*	*43.9*	*53.7*	*60.0*	*(i)65.3*	*(j)67.9*	*79.5*	*65.9*
Denver, Col	*73*	*75.3*	*72.6*	*59.9*	*(j)50.3*	*36.1*	*39.1*	*29.7*	*37.6*	*(j)43.2*	*47.4*	*52.4*	*64.9*	*50.7*
Des Moines, Iowa	*35*	*76.2*	*77.9*	*66.2*	*54.7*	*35.8*	*35.0*	*26.7*	*36.0*	*37.8*	*51.1*	*54.8*	*67.9*	*51.7*
Detroit, Mich	*61*	*74.3*	*74.1*	*72.3*	*57.6*	*44.5*	*40.2*	*31.0*	*39.9*	*(j)40.1*	*45.9*	*53.2*	*(b)67.2*	*53.4*
Dodge City, Kans	*15*	*77.8*	*78.6*	*67.7*	*56.5*	*37.7*	*36.9*	*31.2*	*38.1*	*46.8*	*52.5*	*(d)56.5*	*73.1*	*54.4*
Dubuque, Iowa	*32*	*75.2*	*74.5*	*66.3*	*53.2*	*36.2*	*34.7*	*24.1*	*35.7*	*37.0*	*48.5*	*54.4*	*67.2*	*50.6*
Duluth, Minn	*19*	*70.8*	*67.0*	*55.9*	*45.3*	*27.1*	*25.7*	*15.2*	*25.6*	*27.8*	*37.5*	*46.1*	*57.9*	*41.8*
Eagle Pass, Tex	*6*	*88.8*	*87.7*	*82.2*	*73.4*	*58.0*	*54.5*	*54.3*	*61.4*	*65.2*	*74.0*	*77.4*	*85.4*	*71.8*
Eagle Rock, Idaho	*12*	*67.7*	*64.5*	*52.5*	*40.0*	*24.9*	*21.4*	*9.9*	*14.8*	*23.9*	*40.5*	*50.2*	*60.7*	*39.2*
Eastport, Me	*33*	*60.2*	*59.9*	*57.1*	*46.0*	*37.0*	*32.0*	*20.3*	*23.5*	*29.2*	*35.0*	*(j)45.3*	*56.2*	*41.8*
El Paso, Tex	*17*	*80.3*	*78.4*	*72.8*	*66.2*	*47.0*	*45.2*	*44.0*	*47.1*	*55.2*	*61.7*	*69.8*	*79.0*	*62.2*
Erie, Pa	*32*	*72.9*	*72.6*	*71.7*	*57.6*	*43.1*	*39.1*	*29.5*	*36.5*	*37.6*	*43.9*	*51.3*	*65.1*	*51.7*
Escanaba, Mich	*25*	*69.9*	*66.9*	*59.4*	*45.5*	*32.0*	*28.8*	*18.9*	*26.8*	*28.1*	*36.6*	*46.6*	*59.5*	*43.2*
Florence, Ariz	*5*	*87.9*	*84.5*	*77.5*	*67.4*	*52.4*	*52.2*	*46.4*	*49.5*	*57.3*	*62.1*	*(w)*	.....	.....
Fort Apache, Ariz	*5*	*72.6*	*68.3*	*(e)60.9*	*53.7*	*37.4*	*38.3*	*34.5*	*37.5*	*44.0*	*48.6*	*55.8*	*64.8*	*51.4*
Fort Assinniboine, Mont	*5*	*(h)67.0*	*64.5*	*50.7*	*30.2*	*28.0*	*31.3*	*17.5*	*24.4*	*26.3*	*41.0*	*51.4*	*62.5*	*41.2*
Fort Bennett, Dak	*12*	*(m)74.0*	*74.4*	*(d)57.2*	*(h)43.8*	*(b)30.4*	*30.9*	*18.5*	*28.9*	*31.9*	*45.1*	*53.8*	*65.6*	*46.2*
Fort Benton, Mont	*24*	*70.0*	*67.2*	*52.5*	*32.1*	*30.7*	*35.2*	*20.2*	*26.5*	*30.3*	*42.4*	*53.8*	*(p)63.7*	*43.7*
Fort Buford, Dak	*8*	*69.9*	*68.1*	*51.4*	*38.6*	*23.1*	*24.0*	*12.9*	*21.4*	*23.2*	*40.4*	*51.6*	*62.0*	*40.6*
Fort Custer, Mont	*4*	*74.1*	*71.6*	*54.5*	*42.5*	*31.8*	*32.3*	*18.3*	*26.8*	*33.9*	*44.0*	*52.8*	*62.9*	*45.5*
Fort Davis, Tex	*4*	*79.7*	*73.1*	*(n)*	*63.0*	*(n)*	*(i)45.2*	*45.2*	*49.2*	*54.8*	*59.4*	*66.7*	*74.5*	.....
Fort Elliott, Tex	*6*	*77.9*	*78.5*	*68.2*	*59.9*	*40.5*	*38.9*	*34.0*	*41.6*	*49.8*	*55.2*	*59.1*	*72.5*	*56.3*
Fort Gibson, Ind. Ter	*19*	*83.0*	*86.9*	*77.3*	*65.7*	*47.0*	*45.7*	*40.8*	*50.1*	*56.5*	*62.4*	*(x)65.6*	.....	.....
Fort Grant, Ariz	*6*	*75.8*	*71.7*	*67.4*	*61.6*	*45.6*	*45.6*	*41.6*	*43.7*	*51.4*	*56.4*	*65.2*	*72.5*	*58.2*
Fort Griffin, Tex	*7*	*86.9*	*(b)87.3*	*(i)78.4*	*69.5*	*52.5*	*49.6*	*(d)44.0*	*52.5*	*(p)56.3*	*(u)64.4*	.....	.....	.....
Fort Keogh, Mont	*9*	*74.1*	*72.6*	*54.9*	*42.1*	*31.5*	*29.2*	*18.6*	*24.8*	*32.7*	*43.8*	*(j)53.3*	*64.6*	*45.2*
Fort McKavett, Tex	*4*	*(m)82.4*	*(l)81.4*	*(k)75.3*	*(h)63.3*	*(a)50.9*	*49.9*	*47.8*	*55.0*	*60.0*	*66.4*	*70.3*	*78.7*	*65.5*
Fort Macon, N. C	*8*	*78.4*	*78.0*	*78.2*	*69.8*	*58.8*	*51.2*	*48.1*	*51.5*	*54.4*	*59.5*	*66.7*	*75.4*	*64.2*
Fort Missoula, Mont	*7*	*65.7*	*62.1*	*50.2*	*38.7*	*28.2*	*22.8*	*19.2*	*23.9*	*29.1*	*42.6*	*51.4*	*62.4*	*41.4*
Fort Shaw, Mont	*7*	*64.8*	*61.6*	*49.8*	*33.5*	*30.5*	*34.8*	*20.0*	*26.1*	*28.3*	*38.7*	*49.5*	*59.1*	*41.4*
Fort Sill, Ind. Ter	*6*	*84.8*	*87.1*	*75.7*	*65.1*	*46.8*	*46.4*	*39.6*	*47.4*	*55.0*	*61.1*	*65.4*	*77.8*	.....
Fort Stevenson, Dak	*8*	*70.2*	*(d)66.5*	*51.1*	*38.1*	*21.9*	*20.8*	*8.4*	*17.6*	*(l)20.4*	*(q)38.5*	*49.5*	*62.1*	*38.8*
Fort Saint Michaels, Alaska	.....	*55.1*	*53.3*	*46.6*	*39.5*	*25.2*	*−3.8*	*9.8*	*−14.5*	*13.1*	*18.4*	*34.5*	*49.8*	*27.2*
Fort Verde, Ariz	*6*	*83.1*	*78.6*	*69.5*	*(b)60.7*	*43.6*	*42.7*	*35.1*	*42.3*	*51.8*	*57.5*	*67.4*	*76.1*	*59.0*
Fort Washakie, Wyo	*5*	.....	.....	.....	.....	.....	.....	.....	*(o)18.1*	*31.9*	*39.7*	*46.9*	*58.4*	.....
Fredericksburg, Tex	*16*	*(k)81.4*	*(j)81.7*	*(b)76.5*	*69.6*	*56.1*	*(d)54.1*	*(e)52.7*	*58.4*	*61.4*	*66.6*	*(i)69.2*	*77.3*	*67.1*
Galveston, Tex	*50*	*84.9*	*84.6*	*81.2*	*77.0*	*61.7*	*58.8*	*58.6*	*63.1*	*67.8*	*72.5*	*75.2*	*81.3*	*72.2*

a Mean for 16 days only.
b Mean for 29 days only.
c Mean for 22 days only.
d Mean for 28 days only.
e Mean for 23 days only.
f Mean for 17 days only.
g Mean for 21 days only.
h Mean for 25 days only.
i Mean for 26 days only.
j Mean for 30 days only.
k Mean for 27 days only.
l Mean for 24 days only.
m Mean for 13 days only.
n Record incomplete.
o Mean for 14 days only.
p Mean for 20 days only.
q Mean for 7 days only.
r Mean for 19 days only.
s Observations discontinued after December 16, 1881.
t Observations discontinued after October 31, 1881.
u Observations discontinued after April 15, 1882.
v Observations discontinued after March 29, 1882.
w Observations discontinued after April 30, 1882.
x Mean for 12 days only.

APPENDIX 20.—*Monthly and annual mean temperatures at stations of observation of the Signal Service, U. S. Army, &c.*—Continued.

Station.	Height of thermometer above ground.	1881.						1882.						Annual mean.
		July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	Feet.	°	°	°	°	°	°	°	°	°	°	°	°	°
Grand Haven, Mich	23	71.1	71.1	67.4	52.5	39.9	36.9	27.9	35.9	35.3	43.6	51.9	62.9	49.7
Hatteras, N. C	6	78.6	78.0	78.7	70.6	59.9	52.1	48.1	51.0	51.5	57.1	64.3	74.5	63.7
Helena, Mont		68.3	66.1	54.6	37.9	28.8	30.8	20.0	24.4	31.1	40.5	50.4	60.7	42.8
Henrietta, Tex		(c)82.4	(f)87.4	79.6	70.9	(f)49.0	47.7	41.6	(d)51.0	(h)57.3	63.8	(e)68.3	(c)80.9	64.9
Huron, Dak	18	71.5	71.7	55.5	44.8	28.2	27.9	17.6	24.7	30.0	44.2	51.8	64.7	44.4
Indianapolis, Ind	52	79.4	79.0	73.5	60.2	42.8	40.2	31.6	42.2	44.8	53.2	58.5	71.6	56.4
Indianola, Tex	29	84.6	83.0	80.4	77.1	62.4	59.6	58.8	65.3	67.7	73.1	75.8	81.1	72.4
Jacksborough, Tex	6	85.3	86.8	77.2	68.3	51.2	50.6	44.4	52.8	58.5	(o)68.8	68.8	80.6	66.1
Jacksonville, Fla	37	83.7	81.5	79.6	74.6	65.6	61.4	62.5	61.7	66.7	70.9	74.5	81.1	72.0
Keokuk, Iowa	47	79.0	79.2	72.4	57.0	39.6	37.6	28.1	39.5	41.7	53.7	56.8	71.1	54.6
Key West, Fla	20	86.0	84.5	82.8	80.3	77.1	73.1	73.1	73.4	75.2	78.5	80.0	84.3	79.0
Kittyhawk, N. C	4	78.3	76.1	77.4	68.3	57.3	49.9	44.7	48.3	49.5	53.4	61.4	73.0	61.5
Knoxville, Tenn	72	78.3	77.0	74.1	63.8	48.1	44.0	42.4	48.5	52.2	60.3	63.0	72.8	60.4
La Crosse, Wis		74.4	74.5	64.6	52.8	36.1	34.6	22.9	34.6	35.5	48.8	55.7	(b)68.5	50.3
La Mesilla, N. Mex	17	79.5	76.5	69.5	63.7	45.6	44.4	42.2	45.7	53.1	58.3	65.7	75.3	60.0
Laredo, Tex		88.9	86.3	(j)	74.2	(e)62.0	(a)62.0							
Leavenworth, Kans	35	80.2	81.7	70.1	58.4	40.2	40.2	32.4	42.0	45.8	56.1	58.7	73.5	56.6
Lewiston, Idaho	22	72.3	68.9	58.4	48.0	39.1	37.1	31.9	33.5	42.8	48.9	58.0	69.4	50.7
Little Rock, Ark	26	82.6	84.3	76.4	67.8	51.0	49.2	44.6	54.0	58.9	64.0	66.1	78.9	64.8
Los Angeles, Cal	58	68.9	69.4	67.9	60.9	57.5	54.7	49.4	50.5	55.3	56.4	61.7	64.4	59.8
Louisville, Ky	89	80.9	81.1	75.9	63.9	47.8	44.8	38.3	47.9	50.0	57.3	(g)62.5	73.4	60.3
Lynchburg, Va	30	81.6	80.2	78.4	65.2	50.5	45.5	39.0	45.7	49.2	(b)56.5	62.8	75.4	60.8
Madison, Wis	33	73.2	73.2	64.8	51.6	34.6	33.1	22.4	33.5	34.4	44.9	51.7	64.5	48.5
Marquette, Mich	36	69.0	65.9	57.6	44.9	30.8	30.8	20.8	28.1	27.6	36.5	46.0	56.5	42.9
Mason, Tex	16	83.2	82.5	76.8	69.3	52.7	51.6	(b)48.6	(h)57.0	(b)62.0	(p)66.3			
Memphis, Tenn	53	83.2	83.7	76.7	68.3	50.6	48.0	43.4	52.9	57.4	63.5	67.1	79.1	64.5
Milwaukee, Wis	105	70.7	71.3	64.3	51.9	36.6	34.8	25.1	35.5	35.3	42.8	48.7	61.4	48.2
Mobile, Ala	36	83.3	81.4	79.3	73.5	59.1	56.6	58.3	59.1	65.1	70.5	72.5	81.3	70.0
Montgomery, Ala	34	84.1	81.1	77.8	71.2	56.4	53.9	55.2	57.4	62.2	68.0	70.4	79.6	68.1
Moorhead, Minn	23	71.2	68.4	53.2	40.3	20.1	20.3	5.5	16.9	19.4	39.4	50.8	62.7	39.0
Morgantown, W. Va	10	72.8	71.4	72.0	59.0	47.7	43.1	37.1	43.3	45.6	51.6	57.8	68.5	55.8
Mount Washington, N. H	6	48.2	50.0	48.6	29.3	19.0	16.6	3.8	10.0	11.6	16.7	26.8	41.8	26.9
Nashville, Tenn	34	82.6	83.1	75.6	66.5	49.8	46.6	42.7	51.7	54.8	61.6	65.0	76.7	63.1
New London, Conn	29	69.9	70.2	68.3	56.8	45.3	39.3	29.4	33.3	38.1	44.7	51.5	65.9	51.1
New Haven, Conn	112	70.5	71.2	69.6	55.9	43.1	37.6	26.8	31.6	36.9	43.5	51.3	66.2	50.4
New Orleans, La	45	84.3	82.8	80.1	76.2	61.2	59.2	52.4	62.5	67.9	72.5	74.4	81.2	72.0
Newport, R. I	19	68.8	68.7	68.7	58.3	46.1	40.6	30.9	(h)33.5	37.6	43.1	49.8	64.2	50.5

New York, N. Y	148	72.6	73.1	72.2	59.1	46.3	40.7	30.5	35.6	39.8	46.1	53.5	68.2	53.1
Norfolk, Va	20	79.8	76.9	77.5	66.8	55.0	49.0	42.7	48.7	51.0	55.7	63.0	75.2	61.8
North Platte, Nebr	21	73.7	77.4	60.3	48.0	33.2	32.6	24.7	33.2	41.6	47.5	54.1	67.4	49.5
Olympia, Wash	23	59.5	59.8	55.1	47.4	43.6	42.4	38.0	36.7	41.9	45.6	53.3	60.2	48.6
Omaha, Nebr	58	78.9	80.2	66.0	54.4	36.9	36.0	27.5	36.3	40.2	(b)52.0	56.6	71.0	53.0
Ooglasmie (Point Barrow) Alaska					(r)	− 1.6	−21.2	−16.8	−26.9	− 6.3	2.9	21.4	34.2	
Oswego, N. Y	35	70.4	71.2	70.3	52.6	41.3	37.2	26.5	32.4	34.6	41.4	50.4	62.8	49.3
Palestine, Tex	34						(m)53.4	(n)52.3	(a)60.7	(d)64.3	67.5	69.5	79.1	
Pensacola, Fla	20	82.9	81.0	78.7	73.7	61.2	58.5	60.0	59.5	64.8	70.4	72.8	79.8	70.3
Philadelphia, Pa	54	75.5	75.0	74.8	60.8	47.5	41.7	31.2	39.5	43.9	50.0	57.3	72.9	55.8
Phœnix, Ariz	4	87.7	85.1	75.2	66.5	51.8	51.5	(q)						
Pike's Peak, Colo	5	44.0	41.0	31.6	23.4	7.2	9.0	2.3	5.8	8.2	13.5	19.9	30.3	19.7
Pioche, Nev	9	72.1	69.8	61.5	48.9	35.9	36.7	26.4	28.8	36.4	43.6	54.0	61.8	48.0
Pittsburg, Pa	88	75.2	74.4	75.4	60.1	45.3	41.0	32.7	39.8	43.0	50.9	57.2	69.7	55.4
Port Eads, La	7	82.7	81.7	81.0	77.2	65.3	59.9	61.6	61.5	67.2	72.7	74.1	79.4	72.0
Port Huron, Mich	80	69.4	70.1	68.4	52.0	37.6	33.8	23.9	32.4	32.8	39.6	47.6	61.3	47.4
Portland, Me	28	68.4	69.6	64.2	51.1	41.2	37.0	24.6	29.7	35.9	43.3	51.5	65.1	48.5
Portland, Oreg	45	63.7	62.6	59.2	49.9	43.4	43.0	39.3	37.7	43.7	48.5	56.3	62.8	50.8
Portsmouth, N. C	8	79.7	78.5	79.0	70.6	60.3	52.3	48.6	50.6	52.6	58.3	66.4	(i)	
Prescott, Ariz	10	72.0	68.4	61.4	52.9	38.4	39.7	30.4	33.6	43.2	48.4	57.3	65.9	51.0
Provincetown, Mass	23								(k)32.1	35.7	41.7	48.0	64.1	
Punta Rassa, Fla	14	82.9	(b)80.6	79.9	77.2	72.1	67.7	67.9	67.9	70.8	(b)75.4	76.7	80.5	75.0
Red Bluff, Cal	20	78.7	76.4	71.5	57.5	51.1	45.9	44.1	44.4	52.5	56.6	67.4	75.6	60.1
Rio Grande City, Tex	6	86.8	85.1	83.0	76.1	63.3	59.8	59.6	68.7	70.1	76.6	79.7	85.4	74.5
Rochester, N. Y	149	71.7	71.8	71.2	52.5	39.9	36.1	25.3	32.6	33.6	41.3	50.1	63.3	49.1
Roseburg, Oreg	20	62.7	62.5	58.8	47.7	42.6	42.5	38.6	39.1	43.9	48.6	(g)55.5	63.0	50.5
Sacramento, Cal	37	71.1	68.2	67.8	56.8	50.8	46.2	45.1	46.3	53.0	55.8	64.0	(b)68.1	57.8
Saint Louis, Mo	104	81.0	82.5	75.3	61.0	43.7	40.8	32.;	43.9	47.1	57.6	59.5	73.4	58.2
Saint Paul, Minn	32	72.6	72.9	59.3	48.4	30.5	29.3	19.1	29.2	31.3	45.6	54.0	66.1	46.5
Saint Paul's Island, Alaska		44.3	48.5											
Saint Vincent, Minn	9	68.6	65.9	50.7	36.7	16.5	13.9	−0.2	7.0	12.1	33.1	48.3	59.2	34.3
Salt Lake City, Utah	52	74.9	73.1	59.8	50.2	33.5	33.8	24.2	27.6	36.8	46.0	56.7	67.0	48.6
San Antonio, Tex	22	84.5	83.9	78.9	72.7	57.7	56.2	54.5	60.7	64.4	70.4	73.5	81.5	69.9
San Diego, Cal	19	67.2	68.2	66.7	61.5	56.8	55.0	50.4	(h)51.2	55.1	56.6	61.9	64.3	59.6
Sandusky, Ohio	53	75.2	74.2	72.5	57.7	42.4	38.3	29.7	38.0	39.4	46.0	52.8	67.0	52.8
Sandy Hook, N. J	16	74.0	74.9	74.1	61.3	49.1	41.9	31.9	36.6	40.5	46.8	54.3	68.7	54.5
San Francisco, Cal	48	58.7	57.9	58.5	55.9	54.2	50.5	48.8	48.0	52.9	(b)52.4	56.2	57.0	54.3
Santa Fé, N. Mex	52	68.6	65.5	58.8	49.9	(l)33.4	(i)	29.3	32.5	41.4	46.1	53.6	63.6	
Savannah, Ga	41	84.7	80.3	80.0	72.4	61.3	56.8	57.3	58.5	63.7	68.0	(b)72.8	80.3	69.7
Shreveport, La	33	85.1	85.9	77.7	70.7	53.5	52.3	50.4	57.3	63.9	68.0	70.4	80.4	68.0
Silver City, N. Mex	5	71.8	68.5	63.5	56.6	39.6	39.3	36.6	38.7	45.8	50.9	58.4	66.9	53.0

a Mean for 16 days only.
b Mean for 29 days only.
c Mean for 28 days only.
d Mean for 23 days only.
e Mean for 25 days only.
f Mean for 26 days only.
g Mean for 30 days only.
h Mean for 27 days only.
i Record incomplete.
j Record incomplete; observer sick.
k Mean for 14 days only.
l Mean for 20 days only.
m Mean for 18 days only.
n Mean for 7 days only.
o Mean for 19 days only.
p Observations discontinued after April 15, 1882.
q Station closed December 31, 1881.
r Observations commenced October 17, 1881.

APPENDIX 20.—*Monthly and annual mean temperatures at stations of observation of the Signal Service, U. S. Army, &c.*—Continued.

Station.	Height of thermometer above ground.	1881.						1882.						Annual mean.
		July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	Feet.	°	°	°	°	°	°	°	°	°	°	°	°	°
Sitka, Alaska	.....	(*i*)54.2	(*b*)56.7	54.0	(*g*)46.3	(*h*)41.9	(*h*)34.8	34.8	30.8	30.8	39.9	47.3	51.7	43.6
Smithville, N. C	18	79.9	78.9	77.8	69.2	58.0	51.2	49.0	52.0	56.0	62.2	68.0	76.9	64.9
Spokane Falls, Wash	22	65.6	61.9	53.5	42.9	33.0	31.3	22.8	26.1	36.5	44.4	54.5	64.7	44.8
Springfield, Ill	39	79.0	78.5	72.1	58.7	42.0	39.9	31.7	42.2	44.3	55.2	57.9	71.4	56.1
Springfield, Mass	54	71.6	71.8	68.9	53.7	41.8	37.1	26.0	31.0	37.4	45.7	53.3	68.7	50.6
Springfield, Mo	41	.....	.....	.....	.....	.....	.....	(*a*)37.2	46.2	50.6	58.5	59.7	74.9	.....
Stockton, Tex	6	81.3	79.2	75.0	66.2	49.9	46.7	45.6	51.5	57.2	62.6	68.8	77.2	63.4
Thatcher's Island, Mass	7	65.1	65.7	63.8	52.1	42.1	38.2	28.4	31.8	35.9	42.7	47.8	61.7	47.9
Toledo, Ohio	64	75.6	74.2	72.1	57.1	42.7	39.1	30.9	39.1	40.7	46.5	53.4	68.1	53.3
Tucson, Ariz	6	83.8	82.1	76.8	68.2	53.6	52.9	48.5	50.0	58.0	63.4	72.8	80.2	65.9
Umatilla, Oreg	7	69.0	67.1	61.1	49.3	40.5	36.1	33.6	35.9	44.9	50.4	59.0	68.4	51.3
Uvalde, Tex	4	(*g*)84.0	(*g*)84.7	(*b*)80.7	(*b*)73.4	(*b*)58.1	(*h*)56.5	(*j*)61.0	(*d*)63.3	(*b*)66.5	72.1	75.2	82.6	71.5
Vicksburg, Miss	32	83.8	83.9	77.7	71.0	55.7	54.3	53.9	59.2	64.5	68.3	71.4	80.4	68.7
Visalia, Cal	22	76.5	74.2	68.9	56.1	47.9	47.2	42.8	45.5	54.4	(*f*)57.5	(*e*)67.2	72.6	59.2
Washington, D. C	44	77.4	76.4	77.0	62.8	47.5	41.7	33.2	40.4	44.1	50.8	59.2	73.8	57.0
West Las Animas, Colo	15	.....	.....	.....	(*m*)	(*m*)	(*m*)	(*m*)	33.9	43.2	50.0	56.2	69.5	.....
Wickenburg, Ariz	4	84.8	(*h*)80.0	(*h*)71.1	60.7	47.3	47.2	(*i*)42.3	44.6	(*h*)52.5	58.0	(*m*)	(*m*)	.....
Williamsport, Pa	45	.....	.....	.....	.....	.....	.....	(*f*)28.9	34.9	39.8	46.2	55.3	69.2	.....
Wilmington, N. C	28	80.5	79.1	78.8	69.8	58.7	52.8	51.6	54.5	58.3	63.2	68.5	76.9	66.1
Winnemucca, Nev	7	69.4	67.0	56.4	42.5	32.5	31.7	24.7	24.7	(*g*)34.0	44.4	53.6	63.9	45.4
Wood's Holl, Mass	6	68.0	67.8	65.5	56.3	46.9	41.5	(*k*)31.3	.....	.....	.....	.....	.....	.....
Yankton, Dak	20	75.0	76.8	60.1	48.9	32.4	32.8	23.1	29.2	34.4	47.6	54.5	68.0	48.6
Yuma, Ariz	5	91.9	88.6	82.7	70.4	58.3	57.0	50.2	54.4	62.3	67.1	77.2	83.0	70.3

a Mean for 29 days only.
b Mean for 28 days only.
c Mean for 23 days only.
d Mean for 17 days only.
e Mean for 21 days only.
f Mean for 25 days only.
g Mean for 30 days only.
h Mean for 27 days only.
i Mean for 24 days only.
j Mean for 7 day only.
k Observations discontinued after January 31, 1882.
l Mean for 12 days only.
m Record incomplete.

APPENDIX 21.

Table showing the mean temperatures at the military post hospitals named below for each month of the year ending June 30, 1882.

Stations.	1881.						1882.						Annual mean.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	°	°	°	°	°	°	°	°	°	°	°	°	°
Alcatraz Island, Cal	56.0	57.0	56.7	55.7	55.5	48.8	49.3	48.8	51.2	51.9	54.3	55.8	53.4
Angel Island, Cal	62.8	62.5	61.5	57.1	55.8	49.7	49.7	50.9	53.8	54.3	58.5	(a)	.....
Benicia Barracks, Cal	70.1	67.8	68.5	57.8	54.7	47.1	47.0	45.6	53.1	53.8	62.7	64.3	57.7
Fort Adams, R. I	67.3	68.0	65.6	55.0	44.4	38.4	29.8	31.3	36.9	41.7	48.0	64.3	49.2
Fort A. Lincoln, Dak	75.0	72.0	59.3	39.6	23.6	24.4	10.5	20.8	20.5	37.4	51.9	61.0	40.8
Fort Apache, Ariz	77.4	71.8	65.6	56.3	48.4	38.3	39.8	41.0	49.7	50.0	57.0	67.4	55.2
Fort Assinniboine, Mont	69.3	63.4	52.8	29.9	27.3	30.2	15.3	20.4	25.6	40.9	52.2	64.3	41.0
Fort Barrancas, Fla	85.3	88.5	81.4	75.9	72.9	67.4	61.2	60.1	66.3	71.2	74.2	80.8	73.4
Fort Bidwell, Cal	(a)	72.0	64.7	48.8	41.0	37.9	34.1	26.3	37.3	45.9	55.7	61.2	.....
Fort Bowie, Ariz	79.4	75.9	74.1	67.2	49.4	48.3	44.4	45.7	55.9	63.0	70.4	76.7	62.5
Fort Brady, Mich	65.3	65.4	58.0	41.1	29.2	27.5	15.0	22.8	22.7	36.1	46.9	(a)	.....
Fort Bridger, Wyo	63.1	61.3	49.1	38.5	26.2	23.9	16.0	22.2	26.3	37.7	47.3	57.1	39.0
Fort Brooke, Fla	82.3	80.6	80.7	77.2	71.4	65.7	67.1	66.5	70.1	75.0	77.1	81.1	74.6
Fort Brown, Tex	84.6	83.5	80.3	77.5	64.5	63.2	62.7	68.7	70.1	74.3	78.3	81.8	74.1
Fort Buford, Dak	72.3	69.3	50.5	46.8	22.9	28.8	11.8	20.4	22.9	41.1	54.3	66.6	41.9
Fort Canby, Wash	58.1	60.7	57.6	51.3	45.9	45.1	41.1	39.6	48.4	47.2	54.6	59.6	50.4
Fort Columbus, N. Y. Harbor	73.7	74.6	73.2	60.0	46.7	40.2	30.6	34.7	39.6	47.1	54.6	70.1	53.8
Fort Concho, Tex	86.3	85.9	79.3	59.6	56.7	51.0	46.5	55.7	61.4	62.3	74.2	81.9	66.7
Fort Davis, Tex	78.0	76.1	71.9	64.3	(a)	45.3	45.2	49.2	54.8	59.4	66.7	74.4	.....
Fort Douglass, Utah	75.6	73.8	59.8	49.0	31.4	31.1	22.3	26.5	37.6	44.2	59.2	68.2	48.2
Fort Ellis, Mont	69.2	64.8	48.2	35.1	23.9	25.6	15.4	20.9	25.5	38.6	48.0	(a)	.....
Fort Fetterman, Wyo	78.4	74.9	56.6	43.8	39.5	35.6	29.2	(a)	(a)	(a)	(a)	(a)	.....
Fort Garland, Colo	68.7	64.0	57.4	46.0	23.6	25.2	18.7	20.6	33.5	39.4	47.9	58.9	42.0
Fort Gaston, Cal	68.8	67.0	62.9	51.2	43.7	43.2	39.0	40.6	47.0	51.7	58.8	67.8	53.5
Fort Grant, Ariz	77.2	73.4	67.8	59.5	49.7	50.7	43.8	45.6	52.5	57.5	62.8	72.5	59.4
Fort Hale, Dak	76.0	76.3	58.7	46.9	30.2	28.6	19.5	26.8	32.7	46.6	55.1	69.6	47.2
Fort Hamilton, N. Y. Harbor	72.9	73.1	72.3	60.4	47.2	44.5	31.5	35.5	39.7	47.1	54.5	68.6	53.9
Fort Keogh, Mont	77.9	76.7	56.2	41.5	28.4	29.2	15.1	24.8	33.3	43.8	53.3	64.6	45.4
Fort Klamath, Oreg	64.7	62.1	46.9	34.7	30.0	26.0	21.6	18.3	26.7	33.6	33.8	(a)	.....
Fort Lapwai, Idaho	71.4	(a)	59.0	48.0	38.5	35.1	31.2	32.9	41.7	49.1	58.1	69.5	.....
Fort Leavenworth, Kans	77.7	80.5	68.3	58.1	40.8	39.7	31.3	41.2	46.3	55.7	59.3	73.9	56.1

a No reports received.

APPENDIX 21—*Table showing the mean temperatures at the military post hospitals named below*—Continued.

Stations.	1881.						1882.						Annual mean.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	°	°	°	°	°	°	°	°	°	°	°	°	°
Fort Lewis, Colo	70.3	67.2	55.1	45.9	27.1	30.7	23.5	26.4	35.3	41.5	50.6	60.8	44.5
Fort Lowell, Ariz	86.4	82.7	77.0	67.0	51.0	49.9	45.2	47.2	56.5	63.3	69.7	81.0	64.7
Fort Lyon, Colo	81.9	81.2	(a)	(a)	33.3	32.9	27.3	34.8	44.5	52.2	59.4	72.7	.....
Fort McDermitt, Nev	83.1	68.9	47.8	36.6	27.5	31.3	20.4	24.8	32.3	42.4	54.9	67.1	44.8
Fort McDowell, Ariz	92.3	87.7	81.1	69.2	54.1	52.5	46.7	50.8	60.0	65.3	77.2	85.8	68.6
Fort Maginnis, Mont	67.7	65.4	49.8	36.8	28.6	34.1	19.7	31.3	28.5	37.4	49.2	59.4	42.3
Fort McHenry, Md	78.6	76.9	77.6	66.3	51.8	43.9	33.2	40.6	45.1	52.0	58.0	73.3	58.1
Fort Meade, Dak	77.1	75.8	56.4	42.7	34.0	35.9	22.1	32.3	36.6	41.6	51.8	63.7	47.5
Fort Mohave, Ariz	94.5	92.8	84.1	70.8	57.1	54.1	45.8	50.2	62.6	69.0	80.5	82.7	70.4
Fort Monroe, Va	80.2	74.4	78.9	68.4	54.2	46.7	39.3	45.1	48.3	53.7	61.0	73.3	60.3
Fort Niagara, N. Y	72.0	71.9	71.0	53.1	40.6	37.0	26.0	32.3	33.8	42.0	49.2	62.7	49.3
Fort Pembina, Dak	72.3	66.5	50.8	35.1	14.2	12.7	0.9	9.1	13.9	35.4	50.8	61.7	35.3
Fort Porter, N. Y	71.8	73.3	71.9	54.1	40.9	36.5	25.7	32.1	33.7	42.0	51.0	63.8	49.7
Fort Preble, Me	63.4	64.8	62.5	(a)	(a)	35.0	22.4	27.7	33.0	39.8	48.0	64.2	.....
Fort Randall, Dak	76.5	79.9	64.3	48.8	33.1	31.6	23.3	29.5	35.9	48.5	56.4	69.6	49.8
Fort Ringgold, Tex	88.6	87.3	82.6	76.3	(a)	60.4	59.6	(a)	(a)	(a)	(a)	(a)	.....
Fort Shaw, Mont	67.7	64.9	51.8	34.6	30.4	34.7	20.4	26.4	28.8	38.6	49.5	59.1	42.2
Fort Sisseton, Dak	71.7	70.0	53.3	40.1	22.1	22.8	8.8	19.0	20.4	39.4	50.7	63.0	40.1
Fort Snelling, Minn	73.1	76.7	59.8	47.3	27.8	26.6	15.3	26.3	28.7	46.3	53.8	67.2	45.7
Fort Stanton, N. Mex	(a)	(a)	64.6	(a)	39.8	38.0	35.3	(a)	44.5	47.8	(a)	(a)	.....
Fort Stevens, Oreg	57.3	58.1	55.9	48.8	43.9	42.8	39.6	37.2	42.0	46.1	50.5	52.6	47.9
Fort Stevenson, Dak	73.5	71.1	52.3	38.9	23.4	22.0	8.5	18.4	20.0	39.5	53.4	65.0	40.5
Fort Sully, Dak	75.1	75.6	57.7	45.9	29.6	30.0	16.6	28.3	32.4	46.6	55.0	67.5	46.7
Fort Totten, Dak	71.6	69.7	52.6	36.4	18.3	19.4	3.8	12.8	15.4	35.1	51.2	63.5	37.5
Fort Townsend, Wash	60.0	59.4	(a)	48.9	44.4	42.1	49.8	36.6	41.8	46.7	55.1	59.6	.....
Fort Union, N. Mex	70.5	67.4	59.9	50.9	33.9	36.7	29.5	36.4	41.7	(a)	53.6	65.3	.....
Fort Verde, Ariz	82.9	79.8	72.6	60.4	43.6	42.7	35.1	42.3	51.8	57.5	67.4	76.1	59.4
Fort Wallace, Kans	78.5	80.6	64.1	53.7	(a)	35.3	27.5	32.7	43.8	48.8	(a)	(a)	.....
Fort Warren, Mass	66.4	67.8	65.7	54.3	41.5	38.1	26.5	29.9	35.0	41.1	49.1	64.3	48.3
Fort Washakie, Wyo	(a)	69.8	53.7	39.9	27.8	26.6	13.4	22.0	32.9	41.0	48.8	60.9	.....
Fort Wingate, N. Mex	75.0	70.8	63.1	53.4	34.3	34.5	28.4	29.8	39.9	48.3	57.5	66.7	50.1
Fort Yates, Dak	(a)	(a)	(a)	(a)	(a)	(a)	12.4	23.3	25.7	42.9	54.9	68.1	.....
Fort Yuma, Cal	95.5	94.8	90.6	71.9	60.3	57.0	50.1	53.5	63.3	70.7	77.2	83.0	72.3
Jefferson Barracks, Mo	(a)	(a)	(a)	(a)	(a)	(a)	31.0	43.8	49.3	58.9	69.5	75.1	.....
Madison Barracks, N. Y	71.0	71.6	70.4	59.5	39.0	34.3	21.7	28.4	31.7	40.3	50.6	62.9	47.7

McPherson Barracks, Ga	84.0	81.5	77.0	68.5	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Pagosa Springs, Colo	69.6	68.7	65.3	47.0	26.3	25.9	19.7	22.9	33.2	42.1	50.7	(a)	.....
Platteburg, N. Y	58.7	57.8	58.9	54.6	35.6	31.1	18.0	22.4	28.0	37.1	50.3	63.6	44.7
Point San José, Cal	57.8	57.4	57.0	54.8	52.6	48.5	47.6	46.3	50.8	52.0	57.0	58.3	53.6
Presidio, Cal	81.0	80.1	79.5	75.4	52.8	49.8	48.0	46.9	50.8	51.4	56.1	57.1	53.3
Saint Augustine, Fla	72.7	74.4	(a)	54.0	67.4	61.5	62.8	61.0	65.3	69.6	73.2	78.7	71.3
West Point, N. Y					42.6	(a)	27.0	(a)	37.7	45.6	53.9	71.0	.....

a No reports received.

APPENDIX 22.

Table showing the mean temperature at voluntary stations of the Signal Service, United States Army (including reports received from the Indiana and Missouri State Weather Services), for each month of the year ending June 30, 1882.

Stations.	1881.						1882.						Annual mean.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	°	°	°	°	°	°	°	°	°	°	°	°	°
Accotink, Va	79.7	77.6	77.8	64.2	48.7	47.7	35.2	42.0	46.3	53.9	61.7	75.8	59.2
Aiken, S. C	86.0	(a)	80.0	70.9	59.8	51.8	49.7	54.7	(a)	(a)	(a)	(a)	.....
Albany, Oreg	63.2	62.5	58.4	46.0	41.5	42.4	35.2	37.5	43.7	48.4	56.6	63.2	49.9
Ames, Iowa	78.7	77.1	65.6	52.7	33.3	31.3	22.4	32.1	35.0	50.0	54.4	69.7	50.2
Amherst, Mass	69.8	69.7	66.8	52.1	40.2	35.6	23.5	27.9	34.8	43.6	51.8	65.9	48.5
Anna, Ills	83.4	85.5	77.3	63.5	46.6	45.5	35.2	48.0	48.9	61.3	62.7	76.3	61.2
Ardenia, Phillipstown, N. Y	73.0	71.0	72.0	56.0	44.0	38.0	28.0	30.0	39.0	(a)	53.0	69.0	.....
Argyle, N. Y	71.9	71.7	68.0	47.9	36.0	31.1	18.8	(a)	(a)	(a)	(a)	(a)	.....
Ashland, Wis	(a)	74.0	62.0	45.0	30.0	(a)	(a)	20.0	25.0	(a)	(a)	(a)	.....
Ashwood, Tenn	82.0	86.0	76.0	64.5	47.6	48.0	41.5	51.0	56.0	62.9	65.0	79.0	63.3
Atco, N. J	75.5	78.9	73.8	60.7	46.2	41.1	32.2	36.5	40.9	48.4	58.1	71.0	54.9
Atlantic City, N. J	74.1	71.3	72.3	61.0	(a)	41.8	33.6	38.4	(a)	(a)	(a)	(a)	.....
Auburn, Ala	78.0	78.0	76.4	69.3	53.4	50.0	51.9	53.0	58.0	65.2	67.0	77.5	64.8
Auburn, N. H	69.4	71.5	69.0	54.5	39.7	28.0	20.0	25.0	32.0	(a)	(a)	(a)	.....
Austin, Tenn	83.1	84.6	78.2	61.2	50.2	46.3	43.3	51.1	53.1	61.8	65.9	75.6	62.9
Austin, Tex	85.6	85.3	72.3	72.5	56.0	53.5	53.7	58.6	63.1	(a)	(a)	(a)	.....
Bainbridge Island, Wash	62.5	61.7	56.3	50.0	46.7	44.0	39.0	(a)	44.3	49.0	57.0	62.7	.....
Battle Creek, Mich	75.9	(a)	76.5	54.0	35.5	37.0	26.0	35.0	40.0	48.0	56.0	64.5	.....
Bellefontaine, Ohio	77.5	76.4	73.6	58.3	40.1	35.9	27.9	37.2	40.7	48.1	56.4	70.2	53.5
Beloit, Wis	74.6	74.3	67.7	52.0	34.2	31.3	21.5	33.2	34.7	45.3	52.6	66.3	49.0
Bethel, Ohio	75.2	77.8	71.0	58.2	44.0	39.0	32.4	42.4	46.4	56.0	59.4	70.8	56.0
Blackfeet Agency, Mont	(a)	(a)	(a)	(a)	(a)	31.7	19.4	22.3	26.5	39.3	50.7	(a)	.....
Blooming Grove, Pa	70.9	78.5	75.0	50.7	39.8	35.4	24.0	27.0	34.5	41.6	50.8	(a)	.....
Boston, Mass	(a)	(a)	(a)	(a)	(a)	(a)	28.3	32.1	37.2	44.3	51.6	68.9	.....
Bowling Green, Ky	(a)	(a)	(a)	(a)	45.0	43.0	38.1	44.8	48.9	57.0	62.8	74.3	.....
Brook Haven, N. Y	73.5	68.6	69.0	56.6	38.5	39.3	32.2	34.6	38.9	44.6	51.9	(a)	.....
Carson City, Nev	70.3	66.5	59.0	48.5	31.4	34.8	28.4	29.3	33.6	45.9	55.9	64.8	47.2
Catawissa, Pa	73.0	72.7	73.7	58.2	44.2	40.5	27.0	37.0	43.0	46.2	(a)	(a)	.....
Cedar Rapids, Iowa	(a)	(a)	(a)	(a)	(a)	(a)	25.4	36.3	36.7	51.0	55.0	69.0	.....
Centralia, Ill	82.0	(a)	(a)	(a)	44.0	(a)	30.0	40.0	(a)	(a)	(a)	(a)	.....
Chambersburg, Pa	78.0	75.0	75.5	59.0	44.5	42.5	28.5	36.0	(a)	(a)	(a)	(a)	.....
Charleston, Ill	79.0	86.0	73.0	62.5	41.0	39.6	29.0	38.0	45.0	55.0	58.0	75.0	56.8
Charlotte, Vt	73.0	73.3	71.9	49.3	39.8	34.3	21.5	26.9	30.0	38.3	50.7	64.3	47.7
Cincinnati, Ohio	81.7	80.0	76.3	62.0	46.0	41.6	34.4	44.0	47.0	54.9	60.5	70.8	58.3

Clarksville, Tex	91.8	94.8	84.1	74.7	57.5	54.9	50.7	59.4	64.2	71.2	73.9	85.3	71.8
Clay Centre, Kans	82.3	83.5	66.9	62.0	37.9	42.0	27.5	39.0	46.7	56.2	59.2	(a)	.....
Clear Creek, Nebr	77.0	79.2	62.3	52.4	33.2	32.2	24.2	32.4	36.0	50.2	55.8	70.2	.....
Cleveland, Ohio	73.7	71.9	71.6	57.0	42.2	38.1	29.7	37.5	39.5	45.4	52.3	66.7	52.1
Clinton, Iowa	77.2	75.2	67.3	53.5	34.4	32.0	22.4	33.6	36.3	48.8	53.5	67.4	50.1
Coalville, Utah	69.1	66.5	54.0	42.6	(a)	(a)	15.3	38.3	29.3	(a)	49.9	58.0	.....
Coldwater, Mich	71.2	(a)	71.3	56.0	38.3	33.8	24.0	39.6	38.4	45.6	53.0	(a)	.....
College Hill, Ohio	82.2	79.4	76.6	63.3	45.0	43.9	33.7	42.8	41.9	54.3	58.8	72.6	57.9
Columbia, S. C	87.5	81.0	80.0	70.0	56.3	52.2	49.5	54.0	60.0	(a)	70.0	78.7	.....
Contoocookville, N. H	71.0	73.3	65.8	50.5	38.5	33.8	20.5	25.3	31.5	41.3	52.5	(a)	.....
Cooperstown, N. Y	68.0	67.0	66.7	49.6	36.3	33.0	20.7	26.2	30.5	39.0	49.0	62.0	45.7
Cornell University, Ithaca, N. Y	70.9	71.5	71.2	52.5	39.9	35.4	24.3	31.6	34.1	41.9	52.2	65.4	49.2
Corning, Mo	80.6	81.1	69.8	57.7	38.5	37.6	29.0	38.8	43.7	56.2	56.7	(a)	.....
Cornish, Me	68.2	69.0	62.6	47.2	35.2	31.4	17.9	24.3	29.3	37.7	49.4	64.2	44.7
Council Grove, Kans	(a)	(a)	(a)	57.8	(a)	(a)	29.5	(a)	45.3	55.8	(a)	(a)	.....
Cresco, Iowa	71.9	72.6	61.4	48.0	28.9	27.4	15.2	27.1	29.8	43.2	50.5	64.6	45.0
Cumberland, Md	73.5	74.8	72.9	59.3	43.3	38.5	31.3	37.9	42.7	50.5	57.6	69.3	54.3
Deer Park, Md	(a)	(a)	(a)	(a)	(a)	(a)	25.0	32.5	42.0	(a)	(a)	(a)	.....
Des Moines, Iowa	78.6	77.9	68.4	55.9	35.2	38.6	25.0	35.2	38.3	52.6	57.1	70.2	52.3
De Soto, Nebr	75.9	78.0	63.7	51.7	33.5	31.8	24.2	32.0	38.6	52.0	56.3	69.7	50.6
Dexter, Me	(a)	(a)	61.0	48.0	32.0	23.3	(a)	27.5	26.8	35.0	50.0	(a)	.....
Dyberry, Pa	68.8	67.4	66.9	50.2	38.2	32.8	21.6	26.0	32.6	38.7	48.4	62.8	46.2
Edgerton, Wis	(a)	80.0	70.8	60.0	39.0	38.0	21.0	(a)	(a)	(a)	(a)	(a)	.....
Elmira, Ill	75.7	75.2	67.6	53.2	33.3	31.0	21.3	32.7	36.0	47.9	52.9	67.1	49.5
Ellsworth, N. C	75.5	74.8	68.5	62.1	45.8	(a)	45.1	47.3	(a)	(a)	(a)	(a)	.....
Embarrass, Wis	73.7	71.8	63.0	49.6	38.7	28.9	17.3	28.5	30.3	43.9	54.3	65.5	46.7
Emporia, Kans	81.7	79.7	71.3	57.4	39.4	37.9	31.6	40.7	45.4	55.4	57.9	74.8	56.1
Eola, Oreg	61.4	61.2	57.1	47.4	40.8	42.2	36.0	37.0	40.9	40.5	53.5	61.6	48.3
Fall River, Mass	70.0	68.8	66.8	54.3	44.3	39.4	28.9	31.7	35.9	43.2	48.7	65.7	49.8
Fallsington, Pa	75.9	74.4	74.0	59.6	46.4	41.4	30.2	35.0	42.0	49.0	56.3	70.6	54.6
Fallston, Md	92.4	(a)	74.6	60.5	46.1	39.9	30.3	36.8	41.5	47.7	55.4	70.4	.....
Fayette, Miss	81.1	81.2	76.8	69.2	53.1	52.6	53.2	57.1	63.6	66.2	68.7	77.4	66.7
Federalsburg, Md	(a)	(a)	(a)	62.9	47.9	41.3	33.7	40.0	42.7	48.8	58.3	(a)	.....
Flushing, N. Y	72.0	69.0	71.0	58.0	44.0	41.0	29.0	33.0	39.0	48.0	53.8	69.0	52.2
Forsyth, Ga	85.7	80.9	79.8	72.4	56.9	53.3	53.3	56.2	61.7	67.7	70.6	78.7	68.1
Fort Madison, Iowa	(a)	80.0	72.5	59.5	85.5	82.0	30.5	38.0	44.0	56.0	(a)	(a)	.....
Fort Scott, Kans	82.2	79.8	74.1	66.0	42.0	40.4	35.0	44.0	(a)	(a)	(a)	(a)	.....
Fort Wayne, Ind	(a)	72.6	71.7	57.8	42.3	39.5	32.2	(a)	40.4	51.0	57.6	(a)	.....
Franklin, Ark	(a)	(a)	69.5	64.0	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Franklin, N. C	72.0	71.7	67.5	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Franklin, Pa	66.3	66.3	66.8	50.5	36.1	31.8	23.3	30.3	33.3	40.1	48.6	60.6	46.2
Franklin, Wis	(a)	(a)	(a)	(a)	33.3	30.0	20.6	32.6	33.0	42.7	50.8	63.3	.....
Freehold, N. J	73.5	72.3	71.6	57.5	44.4	38.8	29.2	33.7	38.5	45.6	53.8	69.5	52.4
Friendship, N. Y	68.8	66.9	72.0	51.1	36.9	29.7	17.0	26.3	27.1	37.5	42.7	64.9	45.1
Gardiner, Me	66.0	67.1	61.2	47.1	37.3	31.6	15.8	21.1	28.9	37.0	49.3	61.9	43.7
Genesco, Ill	74.0	75.3	67.4	53.0	35.8	33.6	23.0	34.7	36.3	48.7	(a)	(a)	.....
Genoa, Nebr	75.3	77.6	61.5	49.5	31.2	30.6	22.4	29.5	36.7	48.2	54.0	68.8	48.8
Germantown, Pa	80.0	80.0	79.0	59.0	45.5	44.0	26.0	39.0	43 5	52.0	62.0	(a)	.....
Golconda, Ill	83.0	(a)	73.1	64.8	46.0	(a)	35.3	47.7	(a)	(a)	(a)	(a)	.....
Grayville, Ill	80.0	(a)	(a)	72.0	45.0	(a)	(a)	41.0	(a)	(a)	(a)	(a)	.....
Great Falls, Md	(a)	(a)	(a)	(a)	(a)	42.0	32.1	37.9	42.6	50.4	59.6	76.9	.....
Grafton, N. H	(a)	67.5	66.5	52.5	40.0	27.0	11.5	20.0	(a)	(a)	53.0	62.9	.....

Table showing the mean temperature at voluntary stations of the Signal Service, United States Army, for each month of the year ending June 30, 1882— Continued.

Stations.	1881.						1882.						Annual mean.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	°	°	°	°	°	°	°	°	°	°	°	°	°
Greensborough, N. C	80.0	79.1	77.5	66.7	51.3	45.5	43.5	48.9	51.1	56.6	64.8	76.0	61.8
Green Springs, Ala	81.2	81.1	76.4	69.5	54.3	52.5	53.2	56.6	60.8	65.4	68.6	79.0	66.6
Guttenberg, Iowa	73.2	73.0	64.1	51.1	33.0	30.1	18.3	30.1	33.6	46.1	52.1	64.0	47.4
Heath, Mass	71.8	72.5	(a)	49.6	28.0	28.5	25.0	23.0	27.0	37.0	(a)	65.0	.....
Helvetia, West Va	69.2	66.8	67.9	56.8	43.0	39.2	35.6	40.6	44.7	49.9	57.0	65.4	53.0
Hermosa, Colo	71.2	68.5	59.8	(a)	(a)	(a)	(a)	(a)	(a)	46.0	55.0	62.9	.....
Highlands, N. C	64.7	66.3	63.8	56.5	44.0	37.9	33.8	40.4	44.5	52.5	(a)	(a)	.....
Holton, Kans	80.0	86.0	71.0	57.0	39.0	38.1	30.0	38.0	45.0	57.0	59.4	75.0	56.3
Houston, Fla	86.1	86.0	82.5	75.2	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Howard, Nebr	75.1	81.3	68.0	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Hudson, Ohio	73.1	73.2	72.1	56.8	40.2	35.3	27.4	35.5	37.6	42.5	52.5	(a)	.....
Independence, Iowa	74.4	73.8	64.2	51.1	32.6	31.0	19.0	33.0	33.8	47.9	54.4	66.9	48.5
Independence, Kans	81.1	85.3	74.9	63.0	43.9	42.1	36.1	45.7	51.5	59.7	62.9	75.2	60.1
Jacksonburg, Ohio	80.2	81.2	75.9	60.5	42.1	38.5	29.6	40.9	43.7	51.3	58.9	70.4	56.1
Johnsontown, Va	80.3	77.9	79.8	69.2	55.6	42.9	40.2	46.7	49.2	55.0	62.9	76.4	61.3
Johnstown, N. Y	67.2	68.2	65.4	48.5	35.7	31.2	19.5	24.7	30.9	39.9	50.9	(a)	.....
Kalamazoo, Mich	73.0	73.0	69.0	52.0	37.0	34.0	24.0	35.0	35.0	46.0	52.0	65.6	49.6
Laconia, Ind	(a)	80.3	70.5	56.5	45.4	40.9	34.7	44.8	48.9	55.3	62.7	73.2	.....
Lafayette, Ind	(a)	(a)	(a)	(a)	(a)	(a)	29.9	38.0	41.3	50.1	55.0	68.0	.....
Lansing, Mich	75.4	74.6	71.3	53.6	38.8	35.3	25.7	35.9	36.1	44.8	53.1	66.9	51.0
Lawrence, Kans	79.7	81.2	70.6	59.3	40.4	40.1	32.3	41.7	46.9	(a)	60.3	74.1	.....
Lenoir, N. C	77.6	79.0	77.0	60.5	46.0	43.0	38.0	42.5	52.5	59.0	62.5	71.5	59.1
Lincoln, Nebr	82.0	86.0	60.0	(a)	41.1	35.3	24.7	32.8	43.5	55.0	(a)	(a)	.....
Litchfield, Mich	72.2	70.0	67.7	53.5	33.4	33.7	25.3	33.4	35.3	44.2	52.3	67.1	49.0
Little Mountain, Ohio	71.7	72.0	70.2	56.5	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Logan, Iowa	79.5	79.6	66.9	54.3	35.8	34.7	26.0	33.4	39.6	51.9	56.6	72.5	52.6
Logansport, Ind	77.2	80.0	73.8	59.9	41.5	39.5	31.2	43.0	45.8	54.5	58.2	75.2	56.6
Lunenburgh, Vt	65.7	66.3	62.9	44.2	32.0	28.5	11.7	20.0	25.3	34.2	46.8	61.9	41.6
Manhattan, Kans	81.1	83.7	72.5	56.6	39.1	38.5	31.7	40.4	46.8	56.1	(a)	73.9	.....
Manitowoc, Wis	70.3	71.0	63.0	60.9	35.5	33.6	23.9	33.6	34.1	42.5	50.6	62.7	48.4
Margueretta Township, Ohio	75.7	73.7	74.1	57.6	42.5	37.2	26.0	38.1	41.2	46.2	57.2	67.2	53.1
Marysville, Nebr	75.0	81.0	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Mayport, Fla	82.3	81.6	80.8	76.3	67.2	60.9	62.7	61.8	66.6	70.9	73.7	79.4	72.0
Mazatlan, Mex	82.9	81.9	81.2	80.4	74.2	70.8	(a)	66.2	40.2	48.6	56.0	69.9	.....
McDonogh, Md	74.4	72.3	73.1	59.0	44.8	(a)	(a)	36.2	40.2	48.6	56.0	69.9	.....

McGill College, Montreal, Canada	69.2	69.4	64.1	49.0	32.7	28.5	12.2	21.0	25.0	35.6	49.7	62.7	43.2
Meadville, Pa	74.2	(a)	(a)	(a)	40.7	38.5	30.1	36.6	36.8	45.8	53.8	67.9	.....
Mendon, Mass	70.2	67.0	67.6	57.7	40.0	35.0	33.1	27.7	33.8	43.0	52.3	67.7	49.6
Milton, Mass	69.0	(a)	(a)	53.0	41.1	38.6	(a)	(a)	(a)	(a)	49.0	64.0	.....
Milton, Pa	(a)	67.8	88.8	53.9	40.2	37.9	26.3	28.9	30.4	45.3	(a)	(a)	.....
Minneapolis, Minn	72.3	72.3	58.1	46.3	26.8	24.7	14.4	25.0	28.0	43.7	52.8	66.0	44.2
Mission House, Wis	69.4	71.8	60.6	48.5	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Monticello, Iowa	74.4	72.5	65.0	52.8	33.4	32.0	21.3	33.9	35.0	48.2	53.8	68.0	49.2
Moorestown, N. J	74.8	72.2	73.6	58.7	45.2	39.8	30.0	34.4	39.9	47.0	54.4	(a)	.....
Morrison, Ill	76.2	76.4	69.3	54.6	35.3	33.3	23.2	35.0	37.4	(a)	(a)	68.4	.....
Morriston, Dak	(a)	80.0	69.0	54.0	35.5	30.0	15.0	(a)	(a)	50.0	(a)	(a)	.....
Mount Forest, Ontario, Canada	67.5	71.0	68.5	43.9	34.0	31.0	6.5	26.0	23.7	38.2	50.0	61.0	43.4
Mount Ida, Ark	83.0	82.0	72.3	65.3	47.3	45.0	43.0	50.3	54.3	62.0	65.0	75.0	62.5
Mount Saint Mary's College, Emmittsburg, Md	76.4	76.0	76.5	61.1	45.4	39.6	30.4	37.3	41.4	49.8	56.8	70.3	55.1
Murphy, N. C	(a)	76.0	72.5	64.0	43.5	41.5	36.0	45.0	54.5	(a)	60.0	71.0	.....
Muscatine, Iowa	75.2	76.7	69.6	54.0	33.5	35.0	23.1	36.4	41.2	49.5	55.0	69.3	51.5
Neillsville, Wis	71.4	70.7	60.0	47.6	29.8	28.3	14.9	28.3	(a)	(a)	(a)	64.0	.....
New Athens, Ohio	(a)	(a)	(a)	(a)	(a)	37.4	29.8	37.6	41.4	49.4	56.6	68.2	.....
New Bedford, Mass	67.8	68.5	61.2	54.4	43.8	38.3	28.0	31.3	36.5	42.9	49.4	54.7	48.1
New Castle, Pa	75.2	75.0	73.5	58.6	42.3	37.9	28.3	37.2	40.8	49.7	56.4	69.4	53.7
New Corydon, Ind	77.4	75.2	72.3	58.6	44.3	41.1	33.1	43.3	45.8	52.5	59.8	71.6	56.2
New Harmony, Ind	82.4	82.0	74.0	62.3	44.5	42.4	34.2	47.4	49.1	59.0	63.0	76.9	59.8
Newport, Vt	68.9	68.8	63.3	46.4	33.6	29.7	14.3	20.3	26.6	34.9	49.8	62.8	43.3
New Tacoma, Wash	66.7	69.0	60.0	51.0	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
New Ulm, Tex	82.4	(a)	75.2	73.9	55.2	58.5	49.4	61.0	59.6	65.4	73.4	80.3	.....
Niles, Mich	73.4	74.0	78.0	54.0	35.0	32.5	29.0	40.5	38.5	55.5	(a)	67.0	.....
Nora Springs, Iowa	74.0	71.0	62.0	49.0	30.0	29.9	18.0	27.0	31.0	46.0	52.0	68.5	46.5
Northfield, Minn	(a)	77.0	60.7	48.9	29.4	22.5	21.7	30.8	33.5	44.0	56.2	68.1	.....
North Lewisburg, Ohio	76.6	74.3	73.0	56.9	42.3	36.6	29.4	38.3	42.0	52.0	55.6	69.8	53.9
Northport, Mich	73.6	73.1	66.0	49.7	36.0	33.1	22.3	30.5	30.3	41.9	51.0	62.3	47.5
North Volney, N. Y	70.0	(a)	69.2	50.6	37.7	33.7	22.3	28.4	31.6	39.2	50.2	62.8	.....
New Brunswick, N. J	(a)	(a)	(a)	(a)	(a)	(a)	29.5	35.0	41.3	44.3	(a)	(a)	.....
New Market, N. H	(a)	(a)	(a)	(a)	(a)	(a)	(a)	26.3	32.0	39.7	50.4	65.4	.....
Oakland, Cal	(a)	60.4	59.3	54.6	50.5	48.2	46.4	45.8	52.0	52.6	57.8	59.2	.....
Olivet, Dak	74.9	76.1	58.8	47.3	29.8	30.0	17.3	25.1	32.0	47.3	(a)	68.9	.....
Oregon, Mo	79.2	(a)	70.0	56.9	37.3	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Orono, Me	65.8	67.5	60.0	44.9	35.5	30.3	15.9	21.3	28.6	35.7	48.5	61.8	43.0
Palermo, N. Y	67.9	68.2	67.8	46.9	34.3	39.1	20.3	26.4	29.6	33.6	49.8	62.4	45.5
Paramaribo, Dutch Guiana, So. America	79.9	80.0	81.9	81.1	80.4	78.6	77.4	77.4	78.4	78.5	78.2	(a)	.....
Paterson, N. J	74.0	77.0	73.0	58.0	45.0	38.0	30.0	35.0	38.0	45.0	56.0	66.0	52.9
Peoria, Ill	80.2	80.5	73.3	58.3	39.9	37.3	28.4	39.3	42.5	54.0	58.6	72.4	55.4
Philadelphia, Pa	80.5	79.6	78.7	64.4	43.0	45.1	(a)	(a)	(a)	(a)	(a)	(a)	.....
Phillipsburg, N. J	(a)	(a)	(a)	57.1	42.3	32.6	27.4	31.9	38.7	45.9	53.4	68.0	.....
Pierce City, Mo	77.1	81.0	69.2	61.2	41.7	40.1	36.2	45.6	51.5	57.3	59.1	72.1	57.7
Point Pleasant, La	83.1	83.3	77.3	(a)	54.7	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Port Angeles, Wash	62.7	62.0	58.0	50.0	45.5	41.0	(a)	(a)	(a)	(a)	(a)	(a)	.....
Port Jervis, N. Y	70.9	70.0	69.2	53.1	39.8	35.8	24.6	29.6	35.7	44.0	52.4	65.8	49.2
Portsmouth, Ohio	77.8	75.3	73.4	60.9	44.8	41.1	34.8	42.6	47.5	51.6	60.0	(a)	.....
Poway, Cal	71.6	70.9	69.4	61.7	54.4	51.3	46.0	46.8	52.5	54.9	62.0	64.5	58.8
Princeton, Cal	77.3	74.8	72.1	59.4	51.6	46.3	46.5	47.3	55.1	59.0	69.2	74.7	61.1
Princeton, N. J	(a)	(a)	(a)	58.9	44.6	38.2	28.5	33.9	40.5	(a)	(a)	(a)	.....

Table showing the mean temperature at voluntary stations of the Signal Service, United States Army (including reports received from the Indiana and Missouri Weather Services), for each month of the year ending June 30, 1882—Continued.

Stations.	1881.						1882.						Annual mean.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	°	°	°	°	°	°	°	°	°	°	°	°	°
Princeton, Mass	65.1	67.0	63.5	49.5	36.0	32.0	20.7	25.0	31.0	38.5	(a)	(a)	.....
Protem, Mo	(a)	(a)	(a)	(a)	44.0	46.5	40.5	48.0	55.4	63.3	63.0	76.1	.....
Quitman, Ga	(a)	(a)	(a)	(a)	55.5	55.0	51.5	56.0	64.6	70.2	(a)	(a)	.....
Readington, N. J	(a)	(a)	(a)	(a)	(a)	(a)	30.0	35.0	(a)	47.2	56.6	69.0	.....
Riley, Ill	72.5	72.9	65.2	51.4	33.2	30.5	20.6	32.4	33.8	43.7	50.9	63.7	47.6
Rio Magna, San Domingo, W. Indies	(a)	80.0	78.1	(a)	78.0	68.0	71.4	72.0	73.3	78.9	(a)	(a)	.....
Rio Vista, Cal	71.8	69.7	69.1	57.2	51.9	44.9	44.4	45.1	52.0	55.2	64.2	(a)	.....
Rising Sun, Ind	(a)	77.2	72.1	60.6	40.5	37.6	32.0	39.9	44.3	48.0	57.3	69.8	.....
Rockford, Ill	73.4	73.8	62.4	52.3	34.7	33.0	22.1	33.4	35.1	45.5	52.3	65.2	48.6
Rowe, Mass	67.2	67.2	64.6	49.1	36.7	33.2	20.4	25.9	30.1	38.7	48.4	63.2	45.4
Ruggles, Ohio	73.4	71.9	70.7	57.0	40.9	37.2	27.7	36.0	39.2	44.6	52.7	67.3	51.6
Saint Helena Mount, Cal	(a)	(a)	68.8	(a)	51.2	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Saint Louis, Mo	82.0	83.6	75.2	(a)	44.4	(a)	(a)	43.8	47.6	(a)	(a)	74.1	.....
Saint Marie, Ill	81.4	(a)	73.4	62.6	49.0	(a)	31.7	44.3	(a)	(a)	(a)	(a)	.....
Saint Meinrad Abbey, Ind	83.2	87.0	71.0	63.2	46.0	40.9	34.6	44.3	49.2	58.0	63.3	75.6	59.7
Salinas City, Cal	58.3	58.3	56.5	52.0	47.5	49.1	43.2	42.1	50.1	50.5	55.2	58.5	51.8
San Buenaventura, Cal	64.0	(a)	69.0	(a)	(a)	58.0	47.5	49.0	59.0	(a)	(a)	(a)	.....
Sandy Springs, Md	75.6	73.7	74.3	60.6	45.6	40.2	31.5	37.9	42.3	49.9	57.4	71.3	55.0
San Gorgonio, Cal	69.2	66.2	64.0	(a)	(a)	45.8	37.0	37.2	44.4	47.9	56.0	59.5	.....
Santa Barbara, Cal	57.0	70.0	66.5	59.0	54.5	55.0	(a)	(a)	(a)	(a)	(a)	(a)	.....
Snowville, Va	73.7	74.5	74.0	58.0	42.0	41.0	38.0	41.0	54.5	53.0	60.0	68.5	56.5
Somerset, Mass	72.2	72.4	69.2	55.8	43.3	37.9	26.5	30.1	36.4	44.3	51.7	68.4	50.7
Somerville, N. J	(a)	74.6	73.8	58.3	43.8	39.0	29.0	32.5	39.5	46.5	55.6	(a)	.....
Southington, Conn	69.1	69.7	68.4	52.3	39.4	34.4	24.3	28.5	34.8	43.3	52.3	67.6	48.7
South Lee, Mass	69.7	68.3	69.5	50.1	37.3	32.5	21.4	27.3	27.5	36.3	49.6	64.1	46.1
South Orange, N. J	71.3	73.5	71.8	56.7	43.0	37.7	27.8	33.5	38.3	45.2	53.0	68.1	51.6
Spiceland, Ind	77.6	77.2	71.8	(a)	40.2	37.1	28.5	39.0	42.3	49.9	56.6	(a)	.....
Springfield Armory, Mass	72.6	76.3	69.3	58.9	41.0	35.8	24.6	(a)	(a)	(a)	(a)	(a)	.....
State Agricultural Farm, New Brunswick, N. J	71.7	79.5	72.4	58.4	44.1	39.2	29.0	31.8	37.9	48.0	55.5	70.3	53.2
Stateburg, S. C	83.5	78.5	78.5	67.0	53.0	50.0	49.0	51.5	62.5	62.5	68.5	75.0	65.0
Strafford, Vt	67.0	69.6	64.4	48.0	34.9	29.5	14.9	22.7	27.8	37.6	50.5	66.2	44.4
Swanwick, Ill	79.3	83.0	73.5	59.3	(a)	(a)	31.9	44.2	49.2	57.4	61.0	74.8	.....
Thomasville, Ga	(a)	(a)	(a)	(a)	60.3	(a)	58.7	59.2	(a)	(a)	(a)	(a)	.....
Thornville, Mich	75.0	74.5	71.0	53.7	41.3	31.0	26.0	34.8	35.9	44.1	52.3	66.9	50.6
Upper Alton, Ill	81.4	(a)	75.6	60.5	42.9	(a)	32.0	42.9	(a)	(a)	(a)	(a)	.....

Vevay, Ind	80.2	80.7	76.8	64.2	46.4	42.2	36.0	45.5	50.2	56.6	62.4	72.8	59.5
Vineland, N. J	77.9	76.4	76.8	61.7	48.6	42.0	34.6	38.0	41.5	48.3	56.7	71.7	56.2
Wabash, Ind	78.6	78.9	78.6	58.6	39.3	37.8	28.5	38.5	43.0	51.6	58.7	70.6	54.8
Walla Walla, Wash	69.0	66.4	58.8	48.0	37.1	38.0	33.1	34.7	42.7	49.6	56.9	68.1	50.2
Warrenton, Mo	(a)	(a)	(a)	(a)	(a)	(a)	31.0	41.5	46.0	(a)	61.4	(a)	----
Washburn College, Topeka, Kans	80.5	83.1	70.4	56.7	38.1	37.8	30.0	39.0	43.9	55.1	58.6	72.4	55.5
Waterburg, N. Y	70.6	70.0	71.0	51.5	38.7	34.5	24.2	30.7	33.1	41.0	56.4	64.8	48.9
Waynesville, N. C	(a)	(a)	(a)	(a)	46.0	43.0	39.0	41.0	(a)	(a)	(a)	(a)	----
Weldon, N. C	81.2	79.0	78.0	66.0	55.7	44.0	39.7	45.5	49.9	55.3	65.0	76.0	61.3
Wellington, Kans	79.4	82.7	72.0	58.5	40.3	38.5	31.3	40.1	47.4	55.7	58.2	72.6	56.4
Wellsborough, Pa	75.8	71.3	73.8	54.2	40.6	39.5	29.0	32.4	37.6	41.3	50.5	63.1	50.8
Westborough, Mass	71.1	71.6	67.5	57.9	40.2	37.0	23.8	28.7	35.0	42.8	50.8	68.0	49.0
West Chester, Pa	73.8	73.5	72.8	58.2	43.8	38.5	28.5	34.4	39.3	51.0	53.9	68.7	52.0
Westerville, Ohio	75.3	71.8	71.1	56.8	40.7	36.7	30.1	37.7	41.7	47.5	55.1	67.6	52.7
West-Virginia College, Flemington, West Va	72.7	69.5	70.5	56.7	41.5	36.6	32.4	39.6	(a)	(a)	(a)	(a)	----
White Plains, N. Y	72.2	72.1	71.6	64.8	45.2	39.4	34.0	34.7	39.0	47.1	54.3	68.9	53.6
Williamstown, Mass	70.6	67.6	65.3	49.5	38.1	32.3	21.6	25.4	32.5	40.4	49.6	63.2	46.3
Windsor, Vt	70.5	70.6	65.6	49.0	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	----
Woodstock, Md	78.5	73.8	70.7	59.5	48.5	39.2	31.2	37.5	42.3	49.5	57.0	79.9	55.6
Woodstock, Vt	68.5	67.9	62.6	46.6	34.5	30.1	16.4	21.4	(a)	38.0	50.3	64.3	----
Wooster, Ohio	73.8	72.8	72.0	55.6	40.3	35.5	28.2	37.1	40.3	46.3	54.1	(a)	----
Worcester, Mass	76.5	74.5	69.2	53.5	38.9	33.0	22.1	25.0	32.7	41.7	(a)	70.5	----
Wytheville, Va	73.4	72.4	70.1	57.9	45.2	39.3	36.4	42.0	45.6	54.4	57.9	66.9	55.1
Yates Center, Kans	79.6	82.3	70.4	57.9	37.2	37.2	30.5	39.6	46.5	56.6	56.8	74.6	55.8
York Factory, Hudson's bay Territory, Canada	66.5	54.2	40.7	22.2	—3.0	—12.0	—27.3	— 4.0	— 9.5	18.9	35.1	51.8	19.5
Ypsilanti, Mich	(a)	(a)	(a)	(a)	41.0	39.0	(a)	37.5	(a)	(a)	(a)	(a)	----

a No report.

APPENDIX 23.

Table of comparative mean temperatures at the principal stations of the Signal Service, U. S. Army, for each month of the year ending December 31, 1881.

Station.	Station established.	January.			February.			March.			April.			May.			June.		
		Mean to include 1880.	Mean for 1881.	Departure +or−	Mean to include 1880.	Mean for 1881.	Departure +or−	Mean to include 1880.	Mean for 1881.	Departure +or−	Mean to include 1880.	Mean for 1881.	Departure +or−	Mean to include 1880.	Mean for 1881.	Departure +or−	Mean to include 1880.	Mean for 1881.	Departure +or−
		°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
Albany, N. Y	Dec. 22, 1873	23.0	20.2	− 2.8	23.4	27.2	+ 3.8	31.3	36.9	+ 5.6	44.0	46.9	+ 2.9	58.8	65.6	+ 6.8	68.0	65.4	− 2.6
Alpena, Mich	Sept. 10, 1872	20.4	14.0	− 6.4	19.1	15.9	− 3.2	24.2	26.3	+ 2.1	36.4	34.3	− 2.1	49.9	54.0	+ 4.1	60.1	56.3	− 3.8
Atlanta, Ga	Sept. 25, 1878	49.1	40.8	− 8.3	47.2	46.8	− .4	56.3	49.3	− 7.0	61.9	59.5	− 2.4	69.8	71.1	+ 1.3	75.7	78.6	+ 2.9
Atlantic City, N. J	Dec. 10, 1873	32.7	27.7	− 5.0	34.3	30.3	− 4.0	38.6	38.4	− .2	46.5	44.7	− 1.8	57.8	57.1	− .7	67.2	64.6	− 2.6
Augusta, Ga	Nov. 2, 1870	49.1	42.5	− 6.6	49.9	50.8	+ .9	57.5	53.0	− 4.5	63.5	62.2	− 1.3	72.7	75.1	+ 2.4	79.0	81.7	+ 2.7
Baltimore, Md	June 1, 1871	35.8	30.8	− 5.0	36.7	34.8	− 1.9	42.9	42.0	− .9	52.4	52.0	− .4	64.9	67.9	+ 3.0	74.2	71.2	− 3.0
Barnegat, N. J	Dec. 10, 1873	32.1	26.7	− 5.4	32.3	29.4	− 2.9	38.0	37.1	− .9	45.7	43.3	− 2.4	57.7	55.9	− 1.8	67.0	63.2	− 3.8
Bismarck, Dak	Sept. 15, 1874	7.8	−1.3	− 9.1	12.4	9.6	− 2.8	21.1	23.7	+ 2.6	40.4	37.9	− 2.5	55.4	60.9	+ 5.5	62.4	66.3	+ 3.9
Boisé City, Idaho	July 1, 1877	32.9	31.6	− 1.3	37.4	39.2	+ 1.8	44.1	45.4	+ 1.3	50.8	54.8	+ 4.0	55.2	60.9	+ 5.7	65.8	67.1	+ 1.3
Boston, Mass	Nov. 1, 1870	27.2	22.4	− 4.8	27.8	27.9	+ .1	34.1	36.6	+ 2.5	43.1	43.4	+ .3	57.5	55.2	− 2.3	66.2	60.6	− 5.6
Brackettville, Tex	Sept. 1, 1875	53.6	42.6	−11.0	55.3	52.7	− 2.6	64.4	62.0	− 2.4	71.4	69.5	− 1.9	77.4	73.7	− 3.7	83.4	82.8	− .6
Brownsville, Tex	Aug. 25, 1875	62.3	50.8	−11.5	61.5	60.5	− 1.0	69.4	67.7	− 1.7	75.1	74.0	− 1.1	80.6	78.9	− 1.7	83.7	84.4	+ .7
Buffalo, N. Y	Nov. 1, 1870	26.0	18.8	− 7.2	25.4	21.8	− 3.6	30.5	29.5	− 1.0	40.7	36.8	− 3.9	53.9	57.0	+ 3.1	64.8	59.8	− 5.0
Burlington, Vt	May 24, 1871	20.8	14.1	− 6.7	21.6	22.2	+ .6	29.1	33.0	+ 3.9	41.8	41.2	− .6	56.1	59.6	+ 3.5	66.4	61.6	− 4.8
Cairo, Ill	June 1, 1871	38.8	30.0	− 8.8	41.1	38.3	− 2.8	48.4	46.0	− 2.4	58.3	56.7	− 1.6	68.8	72.6	+ 3.8	75.0	77.9	+ 2.9
Campo, Cal	January 1874	42.5	42.9	+ .4	45.1	46.7	+ 1.6	47.7	47.7	Normal	51.2	54.5	+ 3.3	56.0	58.8	+ 2.8	61.8	60.8	− 1.0
Cape Henry, Va	Dec. 15, 1873	42.0	35.4	− 6.6	42.5	38.5	− 4.0	47.7	44.7	− 3.0	54.6	52.0	− 2.6	64.3	65.5	+ 1.2	73.7	72.9	− .8
Cape May, N. J	May 24, 1871	35.4	29.6	− 5.8	36.0	33.6	− 2.4	41.0	40.5	− .5	48.3	45.9	− 2.4	59.3	59.6	+ .3	68.8	66.5	− 2.3
Castroville, Tex	Sept. 29, 1875	57.0	42.6	−14.4	54.7	53.4	− 1.3	61.4	62.2	+ .8	71.8	67.8	− 4.0	78.7	75.2	− 3.5	83.2	84.3	+ 1.1
Charleston, S. C	Jan. 5, 1871	51.4	47.0	− 4.4	51.7	52.3	+ .6	59.1	54.6	− 4.5	64.4	60.3	− 4.1	72.4	73.1	+ .7	79.7	81.8	+ 2.1
Charlotte, N. C	Oct. 6, 1878	50.6	37.2	−13.4	44.7	43.6	− 1.1	52.8	47.5	− 5.3	60.0	55.8	− 4.2	69.8	71.0	+ 1.2	75.5	78.7	+ 3.2
Chattanooga, Tenn	Jan. 8, 1879	40.9	37.6	− 3.3	43.8	44.4	+ .6	53.5	47.2	− 6.3	59.7	57.9	− 1.8	70.5	71.4	+ .9	75.2	77.0	+ 1.8
Cheyenne, Wyo	Nov. 1, 1870	25.1	23.9	− 1.2	28.8	28.8	Normal	31.8	33.4	+ 1.6	40.2	46.3	+ 6.1	55.4	54.3	− 1.1	60.8	67.7	+ 6.9
Chicago, Ill	Nov. 1, 1870	27.8	20.0	− 7.8	30.3	25.1	− 5.2	36.1	32.4	− 3.7	45.8	41.7	− 4.1	58.1	60.7	+ 2.6	66.7	63.2	− 3.5
Cincinnati, Ohio	Nov. 1, 1870	36.1	30.6	− 5.5	37.5	36.5	− 1.0	43.7	42.1	− 1.6	54.2	51.2	− 3.0	66.1	71.6	+ 5.5	74.1	74.0	− .1
Cleveland, Ohio	Nov. 1, 1870	28.1	20.5	− 7.6	28.3	25.3	− 3.0	34.4	31.8	− 2.6	44.9	40.2	− 4.7	59.1	62.3	+ 3.2	67.7	64.3	− 3.4
Columbus, Ohio	July 1, 1878	34.6	25.0	− 9.6	33.7	29.5	− 4.2	40.9	37.4	− 3.5	52.1	47.6	− 4.5	66.9	68.2	+ 1.3	71.8	70.5	− 1.3
Concho, Tex	Oct. 10, 1875	46.6	36.9	− 9.7	48.5	46.5	− 2.0	61.5	56.3	− 5.2	66.2	64.8	− 1.4	76.1	71.0	− 5.1	79.9	82.6	+ 2.7
Corsicana, Tex	Sept. 15, 1874	47.6	40.2	− 7.4	51.5	49.5	− 2.0	59.1	58.4	− .7	65.7	68.4	+ 2.7	73.2	76.2	+ 3.0	77.8	86.2	+ 8.4
Davenport, Iowa	May 24, 1871	23.7	14.2	− 9.5	28.3	20.1	− 8.2	35.7	29.2	− 6.5	48.9	45.3	− 3.6	62.4	69.6	+ 7.2	69.8	70.3	+ .5
Denison, Tex	Dec. 10, 1874	45.4	33.7	−11.7	49.4	43.6	− 5.8	56.2	53.2	− 3.0	63.2	64.6	− .6	72.1	73.7	+ 1.6	77.1	84.4	+ 7.3
Denver, Colo	Nov. 19, 1871	26.9	26.0	− .9	32.1	29.9	− 2.2	38.0	37.8	− .2	46.4	53.5	+ 7.1	57.8	60.1	+ 2.3	66.6	73.6	+ 7.0

Des Moines, Iowa	*Aug. 1, 1878*	*27.6*	*14.4*	*—13.2*	*28.6*	*20.7*	*— 7.9*	*38.4*	*29.1*	*— 9.3*	*50.2*	*44.2*	*— 6.0*	*65.0*	*67.4*	*+ 2.4*	*70.7*	*71.3*	*+ .6*			
Detroit, Mich	*Nov. 1, 1870*	*26.0*	*17.7*	*— 8.3*	*26.1*	*26.5*	*+ .4*	*32.5*	*34.2*	*+ 1.7*	*44.4*	*44.9*	*+ .5*	*58.4*	*64.7*	*+ 6.3*	*67.3*	*65.3*	*— 2.0*			
Dodge City, Kans	*Sept. 15, 1874*	*27.3*	*20.1*	*— 7.2*	*35.5*	*29.6*	*— 8.9*	*39.2*	*39.9*	*+ .7*	*53.3*	*54.0*	*+ .7*	*65.0*	*64.4*	*— .6*	*72.9*	*78.5*	*+ 5.6*			
Dubuque, Iowa	*July 10, 1873*	*22.3*	*13.1*	*— 9.2*	*25.5*	*20.5*	*— 5.0*	*33.7*	*31.2*	*— 2.5*	*48.0*	*45.0*	*— 3.0*	*62.1*	*68.7*	*+ 6.6*	*69.0*	*68.9*	*— .1*			
Duluth, Minn	*Nov. 1, 1870*	*14.6*	*5.5*	*— 8.5*	*17.4*	*15.7*	*— 1.7*	*24.7*	*28.2*	*+ 3.5*	*38.4*	*38.1*	*— .3*	*49.6*	*51.1*	*+ 1.5*	*58.0*	*56.8*	*— 1.2*			
Eagle Pass, Tex	*Jan. 19, 1875*	*53.4*	*43.7*	*— 9.7*	*56.8*	*54.9*	*— 1.9*	*66.1*	*65.4*	*— .7*	*73.5*	*73.1*	*— .4*	*80.6*	*77.8*	*— 2.8*	*84.8*	*88.0*	*+ 3.2*			
Eastport, Me	*Apr. 1, 1873*	*20.5*	*18.1*	*— 2.4*	*21.6*	*25.2*	*+ 3.6*	*28.5*	*33.4*	*+ 4.9*	*37.9*	*38.1*	*+ .2*	*47.6*	*47.1*	*— .5*	*55.0*	*52.4*	*— 2.6*			
Erie, Pa	*May 25, 1873*	*29.4*	*23.0*	*— 6.4*	*28.3*	*25.4*	*— 2.9*	*34.0*	*32.3*	*— 1.7*	*44.2*	*40.4*	*— 3.8*	*58.6*	*60.5*	*+ 1.9*	*68.4*	*61.2*	*— 7.2*			
Escanaba, Mich	*May 24, 1871*	*17.1*	*7.6*	*— 9.5*	*17.1*	*13.2*	*— 3.9*	*23.2*	*24.0*	*+ .8*	*35.6*	*32.6*	*— 3.0*	*50.3*	*54.5*	*+ 4.2*	*60.4*	*59.0*	*— 1.4*			
Florence, Ariz	*Nov. 12, 1874*	*50.5*	*45.7*	*— 4.8*	*54.3*	*54.7*	*+ .4*	*59.2*	*54.7*	*— 4.5*	*67.7*	*68.0*	*+ .3*	*74.0*	*74.8*	*+ .8*	*85.1*	*83.4*	*— 1.7*			
Fort Apache, Ariz	Oct. 9, 1877	34.0	33.0	— 1.0	36.2	40.6	+ 4.4	46.1	43.0	— 3.1	50.6	57.3	+ 6.7	56.8	63.5	+ 6.7	66.9	74.0	+ 7.1			
Fort Gibson, Ind. T	Apr. 1, 1873	39.0	27.5	—11.5	43.1	36.7	— 6.4	50.8	47.9	— 2.9	59.7	61.2	+ 1.5	69.9	71.6	+ 1.7	75.9	81.9	+ 6.0			
Fort Grant, Ariz	Nov. 1, 1875	45.5	41.3	— 4.2	45.9	49.4	+ 3.5	54.5	49.9	— 4.6	58.5	62.5	+ 4.0	68.1	68.3	+ .2	76.7	78.1	+ 1.4			
Fort Griffin, Tex	July 1, 1875	44.3	34.5	— 9.8	47.8	43.9	— 3.9	58.8	56.1	— 2.7	65.6	66.0	+ .4	75.2	72.6	— 2.6	81.9	86.9	+ 5.0			
Fort Keogh, Mont	Nov. 18, 1878	21.6	5.6	—16.0	18.0	18.0	Normal	28.7	36.1	+ 7.4	44.9	46.8	+ 1.9	56.3	59.4	+ 3.1	64.2	66.7	+ 2.5			
Fort McKavett, Tex	Oct. 19, 1875	50.2	37.1	—13.1	49.1	46.6	— 2.5	59.7	56.7	— 3.0	66.4	65.6	— .8	75.6	70.9	— 4.7	79.3	81.8	+ 2.5			
Fort Sill, Ind. T	June 23, 1875	39.2	27.4	—11.8	44.3	37.5	— 6.8	52.2	49.4	— 2.8	62.9	61.5	— 1.4	70.7	70.0	— .7	76.3	83.2	+ 6.9			
Fort Saint Michael's, Alaska	June 28, 1874	3.5	17.6	+14.1	—.3	1.2	+ 1.5	7.2	3.3	— 3.9	20.9	23.8	+ 2.9	31.4	31.9	+ .5	43.8	46.6	+ 2.8			
Fort Verde, Ariz	Nov. 9, 1874	41.1	38.1	— 3.0	46.8	46.8	Normal	56.5	48.7	— 7.8	59.2	64.0	+ 4.8	67.6	69.6	+ 2.0	77.4	78.1	+ .7			
Fredericksburg, Tex	Mar. 14, 1876	54.5	42.6	—11.9	53.4	52.1	— 1.3	61.0	59.6	— 1.4	67.6	65.4	— 2.2	73.3	71.4	— 1.9	78.5	80.0	+ 1.5			
Galveston, Tex	Apr. 19, 1871	54.6	47.2	— 7.4	56.9	54.8	— 2.1	64.3	61.2	— 3.1	69.1	68.1	— 1.0	76.6	77.5	+ .9	82.4	85.0	+ 2.6			
Grand Haven, Mich	May 24, 1871	27.9	19.7	— 8.2	27.2	23.3	— 3.9	32.6	30.9	— 1.7	43.8	40.6	— 3.2	56.4	62.4	+ 6.0	64.6	63.0	— 1.6			
Indianapolis, Ind	Feb. 10, 1871	32.7	24.2	— 8.5	34.4	30.3	— 4.1	40.8	37.3	— 3.5	52.4	48.0	— 4.4	64.6	71.3	+ 6.7	72.1	73.4	+ 1.3			
Indianola, Tex	May 1, 1872	54.6	45.4	— 9.2	56.7	55.3	— 1.4	65.1	63.8	— 1.3	69.9	69.8	— .1	76.3	77.7	+ 1.4	81.9	85.0	+ 3.1			
Jacksonville, Fla	Sep. 11, 1871	56.3	53.0	— 3.3	57.4	58.0	+ .6	64.0	60.0	— 4.0	68.9	67.4	— 1.5	74.7	75.8	+ 1.1	80.6	83.2	+ 2.6			
Keokuk, Iowa	July 16, 1871	28.2	19.1	— 9.1	32.1	25.2	— 6.9	38.8	34.0	— 4.8	51.4	47.5	— 3.9	64.3	70.8	+ 6.5	72.0	73.0	+ 1.0			
Key West, Fla	Nov. 1, 1870	70.4	72.3	+ 1.9	71.5	70.9	— .6	74.2	70.2	— 4.0	76.4	74.6	— 1.8	79.7	80.2	+ .5	83.0	84.7	+ 1.7			
Kittyhawk, N. C	Jan. 15, 1875	42.9	36.8	— 6.1	43.1	39.5	— 3.6	49.1	44.8	— 4.3	55.3	50.9	— 4.4	64.1	63.7	— .4	73.2	72.7	— .5			
Knoxville, Tenn	Jan. 1, 1871	39.4	35.5	— 3.9	40.6	41.8	+ 1.2	48.9	44.0	— 4.9	56.6	54.6	— 2.0	66.8	70.6	+ 3.8	73.3	74.0	+ .7			
La Crosse, Wis	Oct. 15, 1872	19.9	9.6	—10.3	24.0	18.9	— 5.1	32.3	30.8	— 1.5	47.0	45.3	— 1.7	61.6	68.2	+ 6.6	68.0	69.4	+ 1.4			
La Mesilla, N. Mex	June 16, 1876	41.9	37.7	— 4.2	46.3	47.6	+ 1.3	54.7	50.5	— 4.2	59.0	63.8	+ 4.8	70.0	70.0	Normal	77.2	79.6	+ 2.4			
Laredo, Tex	Dec. 16, 1875	58.8	47.3	—11.5	59.9	58.9	— 1.0	69.5	68.3	— 1.2	77.2	74.6	— 2.6	83.0	79.7	— 3.3	85.7	87.8	+ 2.1			
Leavenworth, Kans	May 21, 1871	28.9	21.1	— 7.8	34.0	25.5	— 8.5	41.5	36.8	— 4.7	53.6	50.8	— 2.8	66.2	70.1	+ 3.9	73.1	77.6	+ 4.5			
Los Angeles, Cal	July 1, 1877	52.8	51.7	— 1.1	53.5	57.5	+ 4.0	55.2	56.1	+ .9	57.5	61.2	+ 3.7	61.4	62.6	+ 1.2	64.7	65.3	+ .6			
Louisville, Ky	Sept. 1, 1871	37.0	29.8	— 7.2	38.7	33.9	— 4.8	45.6	41.7	— 3.9	55.8	52.4	— 3.4	67.5	72.2	+ 4.7	75.0	74.8	— .2			
Lynchburg, Va	May 24, 1871	38.7	34.0	— 4.7	40.6	38.8	— 1.8	47.6	43.9	— 3.7	56.1	54.4	— 1.7	66.8	70.6	+ 3.8	75.2	76.0	+ .8			
Madison, Wis	Sept. 29, 1878	26.5	12.6	—13.9	24.8	18.9	— 5.9	34.8	28.5	— 6.3	47.0	40.9	— 6.1	62.7	66.2	+ 3.5	68.1	66.4	— 1.7			
Marquette, Mich	May 1, 1871	19.8	10.1	— 9.7	19.4	14.3	— 5.1	25.9	24.8	— 1.1	37.7	35.2	— 2.5	51.4	53.3	+ 1.9	59.1	55.1	— 4.0			
Mason, Tex	Feb. 7, 1876	49.7	38.7	—11.0	50.8	48.4	— 2.4	61.5	58.7	— 2.8	67.6	65.8	— 1.8	75.4	71.9	— 3.5	80.0	82.6	+ 2.6			
Memphis, Tenn	Feb. 28, 1871	42.6	34.0	— 8.6	44.9	43.1	— 1.8	52.6	50.5	— 2.1	60.8	60.0	— .8	70.5	74.1	+ 3.6	77.5	81.5	+ 4.0			
Milwaukee, Wis	Nov. 1, 1870	22.2	16.6	— 5.6	24.8	23.0	— 1.8	30.8	30.1	— .7	42.0	40.8	— 1.2	54.7	58.3	+ 3.6	63.1	60.4	— 2.7			
Mobile, Ala	Nov. 7, 1870	52.2	47.9	— 4.3	53.7	53.7	Normal	60.9	57.0	— 3.9	66.4	65.6	— .8	74.6	76.9	+ 2.3	80.7	83.0	+ 2.3			
Montgomery, Ala	Nov. 9, 1870	50.5	45.2	— 5.3	51.7	51.1	— .6	58.7	54.3	— 4.4	64.4	64.4	Normal	73.6	76.2	+ 2.6	79.7	82.9	+ 3.2			
Morgantown, W. Va	Jan. 25, 1873	35.9	32.2	3.7	37.1	34.9	— 2.2	41.9	41.7	— .2	51.8	49.4	— 2.4	63.0	66.0	+ 3.0	71.0	68.5	— 2.5			
Mount Washington, N. H	Dec. 1, 1870	6.1	2.4	— 3.7	5.9	7.2	+ 1.3	12.2	14.7	+ 2.5	20.8	16.1	— 4.7	34.3	39.0	+ 4.7	44.3	38.8	— 5.5			
Nashville, Tenn	Nov. 1, 1870	41.2	34.9	— 6.3	43.1	41.9	— 1.2	50.4	46.9	— 3.5	59.1	57.8	— 1.3	69.9	73.9	+ 4.0	77.5	78.7	+ 1.2			
New Haven, Conn	Dec. 10, 1872	30.2	21.7	— 8.5	30.6	26.9	— 3.7	36.5	36.1	— .4	46.6	44.1	— 2.5	59.7	58.5	— 1.2	68.9	62.5	— 6.4			
New London, Conn	Jan. 10, 1871	30.0	24.7	— 5.3	30.3	29.1	— 1.2	36.1	37.5	+ 1.4	45.2	44.1	— 1.1	57.4	56.7	— .7	66.3	61.8	— 4.5			
New Orleans, La	Nov. 1, 1870	55.8	50.4	— 5.4	57.2	56.3	— .9	63.7	59.9	— 3.8	68.3	67.2	— 1.1	75.3	77.0	+ 1.7	80.8	84.8	+ 4.0			
Newport, R. I	Aug. 1, 1875	31.5	26.5	— 5.0	31.4	29.7	— 1.7	36.6	37.5	+ .9	45.2	42.7	— 2.5	55.4	54.0	— 1.4	65.1	61.2	— 3.9			
New York, N. Y	Nov. 1, 1870	31.3	26.0	— 5.3	31.5	29.8	— 1.7	37.7	37.1	— .6	46.5	46.1	— .4	59.6	60.4	+ .8	68.8	64.2	— 4.6			
Norfolk, Va	Jan. 1, 1871	41.9	34.5	— 7.4	42.6	39.6	— 3.0	48.7	45.6	— 3.1	55.7	52.5	— 3.2	66.4	67.1	+ .7	75.9	74.4	— 1.5			

APPENDIX 23.—*Table of comparative mean temperatures at the principal stations of the Signal Service, U. S. Army, for each month of the year ending December 31, 1881*—Continued.

Station.	Station established.	January.			February.			March.			April.			May.			June.		
		Mean to include 1880.	Mean for 1881.	Departure + or −	Mean to include 1880.	Mean for 1881.	Departure + or −	Mean to include 1880.	Mean for 1881.	Departure + or −	Mean to include 1880.	Mean for 1881.	Departure + or −	Mean to include 1880.	Mean for 1881.	Departure + or −	Mean to include 1880.	Mean for 1881.	Departure + or −
		°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
North Platte, Nebr	Sept. 18, 1874	22.0	13.5	− 8.5	28.8	21.7	− 7.1	34.9	34.3	− .6	47.2	48.3	+ 1.1	59.5	62.2	+ 2.7	67.9	71.9	+ 4.0
Olympia, Wash	July 1, 1877	37.9	38.8	+ .9	40.5	43.8	+ 3.3	44.0	46.6	+ 2.6	47.8	50.9	+ 3.1	52.7	53.0	+ .3	58.2	58.1	− .1
Omaha, Nebr	Nov. 1, 1870	23.6	11.8	−11.8	28.4	18.6	− 9.8	35.9	28.1	− 7.8	50.0	45.1	− 4.9	63.8	68.4	+ 4.6	70.5	75.9	+ 5.4
Oswego, N. Y	Nov. 1, 1870	27.9	21.1	− 6.8	26.9	25.2	− 1.7	32.7	33.7	+ 1.0	41.4	40.8	− .6	55.6	58.4	+ 2.8	65.2	58.5	− 6.7
Philadelphia, Pa	Jan. 1, 1871	32.8	25.9	− 6.9	33.4	30.7	− 2.7	39.5	38.8	− .7	49.3	48.7	− .6	62.3	64.1	+ 1.8	71.6	67.4	− 4.2
Phoenix, Ariz	May 9, 1877	49.9	45.5	− 4.4	54.8	55.4	+ .6	62.4	58.4	− 4.0	67.5	69.3	+ 1.8	74.8	75.6	+ 1.3	86.4	82.9	− 3.5
Pike's Peak, Colo	Nov. 1, 1873	3.9	Zero.	− 3.9	2.7	5.3	+ 2.6	7.5	5.0	− 2.5	12.7	18.7	+ 6.0	22.3	25.6	+ 3.3	32.5	40.2	+ 7.7
Pioche, Nev	July 29, 1877	29.7	29.8	+ .1	33.1	37.8	+ 4.2	41.4	39.4	− 2.0	46.9	54.6	+ 7.7	54.6	60.6	+ 6.0	64.4	70.2	+ 5.8
Pittsburg, Pa	Nov. 1, 1870	32.3	28.2	− 4.1	32.7	30.1	− 2.6	38.6	37.1	− 1.5	49.3	47.4	− 1.9	61.9	66.7	+ 4.8	71.1	68.7	− 2.4
Port Huron, Mich	July 25, 1874	23.8	16.4	− 7.4	24.9	21.9	− 3.0	30.0	29.0	− 1.0	42.0	37.2	− 4.8	54.5	56.3	+ 1.8	63.8	58.0	− 5.8
Portland, Me	Jan. 15, 1871	24.2	22.4	− 1.8	26.2	28.6	+ 2.4	33.6	38.1	+ 4.5	43.3	43.9	+ .6	55.9	54.8	− 1.1	64.1	60.5	− 3.6
Portland, Oreg	Nov. 1, 1871	39.6	39.0	− .6	43.6	45.5	+ 1.9	46.9	49.2	+ 2.3	52.2	55.1	+ 2.9	55.9	58.1	+ 2.2	61.6	60.8	− .8
Portsmouth, N. C	Apr. 23, 1876	47.4	39.1	− 8.3	48.5	42.8	− 5.7	52.7	49.6	− 3.1	59.6	53.4	− 6.2	68.6	68.2	− .4	74.8	75.4	+ .6
Prescott, Ariz	Nov. 19, 1873	34.0	34.7	+ 1.7	36.0	40.8	+ 4.8	45.7	40.9	− 4.8	48.8	56.8	+ 8.0	57.1	62.2	+ 5.1	67.1	71.3	+ 4.2
Punta Rassa, Fla	Aug. 15, 1871	65.0	64.8	− .2	66.1	65.5	− .6	69.7	65.4	− 4.3	72.3	70.0	− 2.3	76.2	76.5	+ .3	80.2	82.1	+ 1.9
Red Bluff, Cal	July 1, 1877	45.5	49.4	+ 3.9	50.1	52.9	+ 2.8	54.0	55.8	+ 1.8	59.2	64.2	+ 5.0	64.7	70.5	+ 5.8	71.2	74.6	+ 3.4
Rio Grande City, Tex	May 28, 1875	63.6	50.1	−13.5	61.2	61.1	− .1	71.3	68.3	− 3.0	76.4	75.3	− 1.1	82.3	80.1	− 2.2	85.1	86.8	+ 1.7
Rochester, N. Y	Nov. 1, 1870	26.3	20.7	− 5.6	25.2	24.0	− 1.2	31.4	32.0	+ .6	43.0	41.8	− 1.2	57.7	62.1	+ 4.4	66.9	61.4	− 5.5
Roseburg, Oreg	July 15, 1877	40.9	42.8	+ 1.9	43.1	47.4	+ 4.3	47.1	49.0	+ 1.9	50.3	55.7	+ 5.4	54.0	57.9	+ 3.9	61.0	60.2	− .8
Sacramento, Cal	July 1, 1877	46.2	49.2	+ 3.0	50.7	53.6	+ 2.9	54.3	56.0	+ 1.7	58.1	62.0	+ 3.9	62.1	66.7	+ 4.6	70.5	68.0	+ 2.5
Saint Louis, Mo	Nov. 1, 1870	34.5	22.0	−12.5	36.3	30.3	− 6.0	43.6	38.9	− 4.7	54.9	51.4	− 3.5	66.6	71.5	+ 4.9	74.2	75.5	+ 1.3
Saint Paul, Minn	Nov. 1, 1870	14.7	7.9	− 6.8	18.2	17.2	− 1.0	28.4	31.7	+ 3.3	44.4	44.0	− .4	59.7	64.5	+ 4.8	66.1	67.9	+ 1.8
Saint Vincent, Minn	Sept. 5, 1880	1.0	−5.6	− 6.6	5.1	5.8	+ .7	14.4	10.6	+ 5.2	35.0	31.8	− 3.2	53.4	58.7	+ 5.3	61.3	62.6	+ 1.3
Salt Lake City, Utah	Mar. 22, 1874	29.4	32.1	+ 2.7	34.6	38.2	+ 3.6	41.9	41.9	Normal	48.9	54.5	+ 5.6	56.9	61.5	+ 4.6	66.9	71.6	+ 4.7
Saint Antonio, Tex	Sept. 22, 1875	54.8	43.8	−11.0	55.5	54.0	− 1.5	65.2	63.4	− 1.8	70.9	69.4	− 1.5	76.7	76.4	− .3	81.3	86.2	+ 4.9
San Diego, Cal	Nov. 1, 1871	54.0	52.4	− 1.6	54.5	54.9	+ .4	55.4	54.2	− 1.2	56.8	60.7	+ 3.9	61.0	62.4	+ 1.4	64.3	64.2	− .1
Sandusky, Ohio	Aug. 2, 1877	32.8	23.0	− 9.8	32.3	27.0	− 5.3	39.4	33.3	− 6.1	50.0	43.2	− 6.8	61.8	64.3	+ 2.5	68.2	66.8	− 1.4
Sandy Hook, N. J	Dec. 10, 1873	31.8	26.3	− 5.5	31.8	29.2	− 2.6	37.3	37.4	+ .1	45.8	45.7	− .1	59.1	60.5	+ 1.4	68.9	65.1	− 3.8
San Francisco, Cal	Mar. 8, 1871	50.3	53.8	+ 3.5	52.4	55.0	+ 2.6	53.2	54.0	+ .8	54.7	57.1	+ 2.4	56.5	56.8	+ .3	59.0	57.7	− 1.3
Sante Fé, N. Mex	Nov. 20, 2871	28.8	24.0	− 4.8	31.6	33.0	+ 1.4	37.7	37.6	− .1	45.1	52.6	+ 7.5	56.1	59.0	+ 2.9	65.2	71.4	+ 6.2
Savannah, Ga	Jan. 1, 1871	53.1	48.5	− 4.6	52.9	53.8	+ .9	61.1	56.7	− 4.4	66.4	63.3	− 3.1	73.6	74.2	+ .6	80.4	82.6	+ 2.2
Shreveport, La	Sept. 8, 1871	48.0	41.2	− 7.7	51.6	48.9	− 2.7	59.7	56.2	− 3.5	65.5	67.6	+ 2.1	74.2	75.6	+ 1.4	80.3	85.3	+ 5.0
Silver City, N. Mex	May 13, 1878	30.1	33.8	− 5.3	41.5	42.3	+ .8	49.0	44.9	− 4.1	52.9	57.5	+ 4.6	62.7	62.8	+ .1	70.3	74.0	+ 3.7

Smithville, N. C.	*Oct. 15, 1875*	*48.2*	*43.6*	*— 4.6*	*49.1*	*47.4*	*— 1.7*	*55.4*	*51.5*	*— 3.9*	*61.7*	*57.4*	*— 6.3*	*69.6*	*70.2*	*+ .6*	*77.0*	*78.5*	*+ 1.5*
Springfield, Mass	*July 19, 1873*	*26.6*	*20.9*	*— 5.7*	*28.8*	*26.8*	*— 1.5*	*35.1*	*36.8*	*+ 1.7*	*47.1*	*46.1*	*— 1.0*	*60.4*	*61.8*	*+ 1.4*	*68.8*	*64.3*	*— 4.5*
Stockton, Tex	*Feb. 26, 1876*	*46.9*	*38.1*	*— 8.8*	*48.9*	*46.8*	*— 2.1*	*58.4*	*54.2*	*— 4.2*	*64.4*	*64.6*	*+ .2*	*75.7*	*69.7*	*— 6.0*	*79.1*	*80.3*	*+ 1.2*
Thatcher's Island, Mass	*Dec. 26, 1875*	*29.2*	*24.3*	*— 4.9*	*30.0*	*28.4*	*— 1.6*	*34.4*	*37.5*	*+ 3.1*	*43.3*	*41.9*	*— 1.4*	*53.2*	*52.6*	*— .6*	*62.3*	*58.9*	*— 3.4*
Toledo, Ohio	*Nov. 1. 1870*	*30.0*	*22.8*	*— 7.2*	*30.8*	*26.9*	*— 3.9*	*36.3*	*35.0*	*— 1.3*	*47.9*	*45.2*	*— 2.7*	*61.5*	*66.3*	*+ 4.8*	*70.0*	*67.1*	*— 2.9*
Tucson, Ariz	Dec. 2, 1875	48.8	45.8	— 3.0	52.4	55.8	+ 3.4	58.9	57.2	— 1.7	63.9	69.0	+ 5.1	73.0	75.5	+ 2.5	86.2	84.6	— 1.6
Umatilla, Oreg	July 15, 1877	34.6	25.3	— 9.3	38.1	34.6	— 3.5	47.7	48.9	+ 1.2	53.1	56.3	+ 3.2	58.5	60.5	+ 2.0	67.7	66.1	— 1.6
Uvalde, Tex	Sept. 6, 1875	55.8	43.9	—11.9	55.1	54.1	— 1.0	65.4	63.7	— 1.7	71.5	70.4	— 1.1	78.2	75.7	— 2.5	83.6	84.2	+ .6
Vicksburg, Miss	Sept. 10, 1871	50.0	43.2	— 6.8	52.0	50.3	— 1.7	59.7	56.2	— 3.5	64.6	66.9	+ 2.3	73.6	76.8	+ 3.2	79.3	84.6	+ 5.3
Visalia, Cal	July 1, 1877	45.4	48.1	+ 2.7	50.7	53.9	+ 3.2	54.8	55.7	+ .9	59.1	63.2	+ 4.1	65.1	70.6	+ 5.5	75.1	74.1	— 1.0
Washington, D. C	Nov. 1, 1870	35.1	28.2	— 6.9	36.3	33.2	— 3.1	42.7	40.7	— 2.0	52.2	50.8	— 1.4	64.6	67.9	+ 3.3	73.7	70.9	— 2.8
Wickenburg, Ariz	Jan. 6, 1874	43.9	40.4	— 3.5	48.0	46.5	— 1.5	55.0	51.5	— 3.5	59.7	64.5	+ 4.8	65.7	70.5	+ 4.8	79.3	78.7	— .6
Wilmington, N. C	Jan. 1, 1871	47.6	43.1	— 4.5	48.2	49.1	+ .9	55.3	52.1	— 3.2	61.1	57.8	— 3.3	68.4	70.1	+ 1.7	75.6	78.4	+ 2.8
Winnemucca, Nev	July 1, 1877	30.0	34.9	+ 4.9	35.5	39.9	+ 4.4	41.2	41.7	+ .5	46.9	54.0	+ 7.1	52.0	59.0	+ 7.0	64.1	66.8	+ 2.7
Wood's Holl, Mass	Jan. 1, 1873	31.0	27.2	— 3.8	30.8	30.1	— .7	35.8	37.5	+ 1.7	43.4	42.2	— 1.2	53.9	53.7	— .2	63.2	59.9	— 3.3
Yankton, Dak	Apr. 1, 1873	16.9	6.9	—10.0	21.4	14.6	— 6.8	29.9	23.4	— 6.5	46.2	39.5	— 6.7	61.1	66.8	+ 5.7	67.5	72.7	+ 5.2
Yuma, Ariz	Nov. 18, 1873	53.6	52.3	— 1.3	60.0	61.4	+ 1.4	65.5	63.5	— 2.0	69.4	73.5	+ 4.1	78.2	79.4	+ 1.2	86.8	86.6	— .2

a Record incomplete.

APPENDIX 23.—*Table of comparative mean temperatures at the principal stations of the Signal Service, U. S. Army, for each month of the year ending December 31, 1881*—Continued.

Station.	Station established.	July.			August			September.			October.			November.			December.		
		Mean to include 1880.	Mean for 1881.	Departure+or−	Mean to include 1880.	Mean for 1881.	Departure+or−	Mean to include 1880.	Mean for 1881.	Departure+or−	Mean to include 1880.	Mean for 1881.	Departure+or−	Mean to include 1880.	Mean for 1881.	Departure+or−	Mean to include 1880.	Mean for 1881.	Departure+or−
		°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
Albany, N. Y	Dec. 22, 1873	72.2	73.9	+ 1.7	70.1	73.3	+ 3.2	61.8	70.9	+ 9.1	49.8	55.1	+ 5.3	37.3	43.5	+ 6.2	26.5	38.7	+12.2
Alpena, Mich	Sept. 10 1872	66.5	68.2	+ 1.7	64.8	66.5	+ 1.7	56.9	62.4	+ 5.5	45.2	45.9	+ .7	32.3	33.8	+ 1.5	23.1	30.3	+ 7.2
Atlanta, Ga	Sept. 25, 1878	79.3	80.9	+ 1.6	74.7	78.1	+ 3.4	69.0	74.9	+ 5.9	61.3	66.6	+ 5.3	50.6	52.3	+ 1.7	44.6	49.3	+ 4.7
Atlantic City, N. J	Dec. 10, 1873	72.2	73.2	+ 1.0	72.2	71.7	— .5	66.3	72.6	+ 6.3	56.0	61.2	+ 5.2	43.5	48.8	+ 5.3	34.5	42.2	+ 7.7
Augusta, Ga	Nov. 2, 1870	82.4	84.2	+ 1.8	79.3	80.5	+ 1.2	74.2	79.4	+ 5.2	63.6	70.6	+ 7.0	54.3	56.6	+ 2.3	47.5	53.5	+ 6.0
Baltimore, Md	Jan. 1, 1871	78.9	78.6	— .3	74.9	76.9	+ 2.0	67.2	76.9	+ 9.7	57.0	63.1	+ 6.1	45.2	49.1	+ 3.9	36.5	43.8	+ 7.3
Barnegat, N. J	Dec. 10, 1873	72.3	72.4	+ .1	71.6	71.1	— .5	65.7	71.6	+ 5.9	55.7	59.8	+ 4.1	42.8	47.3	+ 4.5	33.5	40.8	+ 7.3
Bismarck, Dak	Sept. 15, 1874	70.2	72.4	+ 2.2	67.1	70.1	+ 3.0	55.6	52.8	— 2.8	43.3	40.5	— 2.8	24.1	24.7	+ .6	12.7	26.1	+13.4
Boisé City, Idaho	July 1, 1877	72.8	71.2	— 1.6	72.6	67.3	— 5.3	61.4	56.6	— 4.8	48.7	45.8	— 2.9	38.2	36.2	— 2.0	32.0	33.0	+ 1.0
Boston, Mass	Nov. 1, 1870	71.6	68.5	— 3.1	69.2	69.5	+ .3	62.0	65.7	+ 3.7	51.8	53.3	+ 1.5	39.2	42.4	+ 3.2	29.2	37.8	+ 8.6
Brackettville, Tex	Sept. 1, 1875	84.8	84.6	— .2	81.4	84.7	+ 3.3	77.8	79.0	+ 1.2	69.5	71.1	+ 1.6	54.8	57.1	+ 2.3	52.9	57.3	+ 4.4
Brownsville, Tex	Aug. 25, 1875	84.3	84.5	+ .2	82.3	83.6	+ 1.3	79.5	79.9	+ .4	73.6	78.1	+ 4.5	64.3	64.9	+ .6	60.8	62.7	+ 1.9
Buffalo, N. Y	Nov. 1, 1870	70.4	70.3	— .1	69.3	71.5	+ 2.2	61.2	71.3	+10.1	50.5	54.0	+ 3.5	37.4	40.8	+ 3.4	27.7	36.6	+ 8.9
Burlington, Vt	May 24, 1871	71.1	70.0	— 1.1	68.8	69.2	+ .4	60.7	66.2	+ 5.5	49.6	48.6	— 1.0	35.5	37.5	+ 2.0	23.1	33.2	+10.1
Cairo, Ill	June 1, 1871	80.0	82.3	+ 2.3	77.5	82.8	+ 5.3	69.2	75.1	+ 5.9	59.1	65.1	+ 6.0	45.8	47.5	+ 1.7	38.6	45.1	+ 6.5
Campo, Cal	Jan. —, 1874	66.4	69.7	+ 3.3	69.2	66.1	— 3.1	63.3	61.6	— 1.7	55.5	51.2	— 4.3	46.0	45.0	— 1.0	44.6	44.8	+ .2
Cape Henry, Va	Dec. 15, 1873	78.4	79.0	+ .6	76.3	76.0	— .3	71.2	77.5	+ 6.3	62.0	67.7	+ 5.7	51.1	56.0	+ 4.9	43.0	48.7	+ 5.7
Cape May, N. J	May 24, 1871	73.6	75.4	+ 1.8	73.3	73.5	+ .2	67.9	74.5	+ 6.6	58.7	62.7	+ 4.0	46.5	51.6	+ 5.1	37.3	43.3	+ 6.0
Castroville, Tex	Sept. 29, 1875	84.7	85.4	+ .7	83.0	84.8	+ 1.8	79.1	79.2	+ .1	70.1	73.7	+ 3.6	54.5	57.6	+ 3.1	56.0	55.8	— .2
Charleston, S. C	Jan. 5, 1871	82.9	83.4	+ .5	80.9	81.0	+ .1	75.8	80.7	+ 4.9	66.2	72.0	+ 5.8	57.5	60.6	+ 3.1	51.5	55.5	+ 4.0
Charlotte, N. C	Oct. 6, 1878	78.8	82.6	+ 3.8	73.9	80.9	+ 7.0	68.7	77.4	+ 8.7	62.1	65.8	+ 3.7	48.4	50.9	+ 2.5	43.7	46.4	+ 2.7
Chattanooga, Tenn	Jan. 8, 1879	79.0	80.6	+ 1.6	74.9	80.0	+ 5.1	67.6	74.6	+ 7.0	61.6	65.2	+ 3.6	48.5	50.2	+ 1.7	43.3	46.6	+ 3.3
Cheyenne, Wyo	Nov. 1, 1870	68.0	69.7	+ 1.7	65.2	68.0	+ 2.8	55.4	53.5	— 1.9	45.0	43.9	— 1.1	32.2	31.6	— .6	27.4	33.8	+ 6.4
Chicago, Ill	Nov. 1, 1870	73.3	72.9	— .4	71.9	75.0	+ 3.1	63.5	69.8	+ 6.0	52.4	55.9	+ 3.5	39.0	39.9	+ .9	30.4	37.1	+ 6.7
Cincinnati, Ohio	Nov. 1, 1870	78.9	80.8	+ 1.9	75.1	79.5	+ 4.4	67.1	76.1	+ 9.0	56.7	63.1	+ 6.4	44.5	47.5	+ 3.0	37.1	43.6	+ 6.5
Cleveland, Ohio	Nov. 1, 1870	72.1	73.2	+ 1.1	70.2	72.1	+ 1.9	63.0	71.7	+ 8.7	52.6	57.1	+ 4.5	38.9	41.9	+ 3.0	29.7	37.7	+ 8.0
Columbus, Ohio	July 1, 1878	77.5	78.1	+ .6	72.8	75.2	+ 2.4	63.1	73.7	+10.6	55.3	59.7	+ 4.4	40.0	43.6	+ 3.6	30.9	39.7	+ 8.8
Concho, Tex	Oct. 10, 1875	82.5	83.0	+ .5	78.9	82.5	+ 3.6	73.2	75.0	+ 1.8	65.3	67.6	+ 2.3	49.9	51.2	+ 1.3	45.3	49.3	+ 4.0
Corsicana, Tex	Sept. 15, 1874	83.3	85.8	+ 2.5	81.8	87.1	+ 5.3	75.5	78.9	+ 3.4	66.4	72.3	+ 5.9	54.5	(a)	.....	48.3	(a)	.....
Davenport, Iowa	May 24, 1871	76.1	77.6	+ 1.5	73.0	77.2	+ 4.2	63.4	69.8	+ 6.4	52.3	56.5	+ 4.2	36.4	39.7	+ 3.3	26.6	38.2	+11.6
Denison, Tex	Dec. 16, 1874	81.9	85.3	+ 3.4	80.1	88.3	+ 8.2	73.5	77.2	+ 3.7	63.4	69.2	+ 5.8	50.3	50.4	+ .1	43.8	49.8	+ 6.0
Denver, Col	Nov. 19, 1871	72.4	75.3	+ 2.9	70.2	72.6	+ 2.4	60.8	59.9	— .9	51.2	50.3	— .9	36.4	36.1	— .3	30.0	39.1	+ 9.1
Des Moines, Iowa	Aug. 1, 1878	75.4	76.2	+ .8	74.4	77.9	+ 3.5	63.0	66.2	+ 3.2	52.9	54.7	+ 1.8	36.2	35.8	— .4	20.3	35.0	+14.7

Detroit, Mich	*Nov. 1, 1870*	*71.9*	*74.3*	+ 2.4	*69.8*	*74.1*	+ 4.3	*61.8*	*72.3*	+10.5	*50.7*	*57.6*	+ 6.9	*36.9*	*44.5*	− 7.6	*27.7*	*40.2*	+12.5
Dodge City, Kans	*Sept. 15, 1874*	*78.0*	*77.8*	− .2	*75.7*	*78.6*	+ 2.9	*67.1*	*67.7*	+ .6	*55.1*	*56.5*	+ 1.4	*37.9*	*37.7*	− .2	*30.3*	*6.9*	+ 6.6
Dubuque, Iowa	*July 10, 1873*	*75.4*	*75.2*	− .2	*72.5*	*74.5*	+ 2.0	*62.6*	*66.3*	+ 3.7	*51.5*	*53 3*	+ 1.8	*34.5*	*36.2*	+ 1.7	*24.5*	*34.7*	+10.2
Duluth, Minn	*Nov. 1, 1870*	*67.5*	*70.8*	+ 3.3	*66.4*	*67.0*	+ .6	*56.6*	*59.9*	+ 3.3	*44.6*	*45.3*	+ .7	*28.8*	*27.1*	− 1.7	*17.4*	*25.7*	+ 8.3
Eagle Pass, Tex	*Jan. 19, 1875*	*86.8*	*88.8*	+ 2.0	*82.4*	*87.7*	+ 5.3	*79.0*	*82.2*	+ 3.2	*70.9*	*73.4*	+ 2.5	*58.1*	*58.0*	− .1	*52.9*	*54.5*	+ 1.6
Eastport, Me	Apr. 1, 1873	60.4	60.2	− 0.2	60.6	59.9	− .7	55.6	57.1	+ 1.5	47.2	46.0	− 1.2	35.5	37.0	+ 1.5	24.2	32.0	+ 7.8
Erie, Pa	May 25, 1873	73.2	72.9	− .3	71.0	72.6	+ 1.6	63.5	71.7	+ 8.2	53.0	57.6	+ 4.5	40.4	43.1	+ 2.7	31.5	39.1	+ 7.6
Escanaba, Mich	May 24, 1871	67.5	69.9	+ 2.4	65.4	66.9	+ 1.5	56.7	59.4	+ 2.7	44.2	45.5	+ 1.3	31.0	32.0	+ 1.0	21.2	28.8	+ 7.6
Florence, Ariz	Nov. 12, 1874	90.4	87.9	− 2.5	89.0	84.5	− 4.5	81.9	77.5	− 4.4	69.7	67.4	− 2.3	54.0	52.4	− 1.6	49.6	52.2	+ 2.6
Fort Apache, Ariz	Oct. 9, 1877	71.2	72.6	+ 1.4	69.7	68.3	− 1.4	65.3	60.9	− 4.4	53.0	53.7	+ .7	38.7	37.4	− 1.3	36.0	38.3	+ 2.3
Fort Gibson, Ind. Ter	Apr. 1, 1873	81.2	83.0	+ 1.8	79.4	86.9	+ 7.5	71.6	77.3	+ 5.7	59.8	65.7	+ 5.9	46.5	47.0	+ .5	39.0	45.7	+ 6.7
Fort Grant, Ariz	Nov. 1, 1875	78.1	75.8	− 2.3	76.6	71.7	− 4.9	73.0	67.4	− 5.6	63.7	61.6	− 2.1	50.9	45.6	− 5.3	44.0	45.6	+ 1.6
Fort Griffin, Tex	July 1, 1875	83.6	86.9	+ 3.3	80.2	87.3	+ 7.1	74.0	78.4	+ 4.4	64.5	69.5	+ 5.0	48.7	52.5	+ 3.8	44.1	49.6	+ 5.5
Fort Keogh, Mont	Nov. 18, 1878	71.5	74.1	+ 2.6	69.6	72.6	+ 3.0	58.3	54.9	− 3.4	46.2	42.1	− 4.1	27.2	31.5	+ 4.3	5.6	29.2	+23.6
Fort McKavett, Tex	Oct. 19, 1875	82.1	82.4	+ .3	77.7	81.4	+ 3.7	73.2	75.3	+ 2.1	64.1	68.3	+ 4.2	51.3	50.9	− .4	46.4	49.9	+ 3.5
Fort Sill, Ind. Ter	June 23, 1875	81.4	84.8	+ 3.4	78.9	87.1	+ 8.2	72.3	75.7	+ 3.4	61.1	65.1	+ 4.0	46.8	46.8	Normal	36.6	46.4	+ 9.8
Fort Saint Michael's, Alaska	June 28, 1874	53.1	55.1	+ 2.0	52.1	53.3	+ 1.2	43.3	46.6	+ 3.3	28.0	39.5	+11.5	18.3	25.2	+ 6.9	8.9	−3.8	−12.7
Fort Verde, Ariz	Nov. 9, 1874	82.8	83.1	+ .3	81.8	78.6	− 3.2	73.5	69.5	− 4.0	60.1	60.7	+ .6	48.0	43.6	− 4.4	40.2	42.7	+ 2.5
Fredericksburg, Tex	Mar. 14, 1876	79.6	81.4	+ 1.8	79.3	81.7	+ 2.4	75.7	76.5	+ .8	69.0	69.6	+ .6	53.9	56.1	+ 2.2	51.3	54.1	+ 2.8
Galveston, Tex	Apr. 19, 1871	84.5	84.9	+ .4	83.4	84.6	+ 1.2	78.8	81.2	+ 2.4	71.7	77.0	+ 5.3	61.7	61.7	Normal	55.8	58.8	+ 3.0
Grand Haven, Mich	May 24, 1871	70.4	71.1	+ .7	68.5	71.1	+ 2.6	60.8	67.4	+ 6.6	50.7	52.5	+ 1.8	37.7	39.9	+ 2.2	29.9	36.9	+ 7.0
Indianapolis, Ind	Feb. 10, 1871	77.4	79.4	+ 2.0	73.9	79.0	+ 5.1	65.1	73.5	+ 8.4	54.9	60.2	+ 5.3	41.0	42.8	+ 1.8	33.0	40.2	+ 7.2
Indianola, Tex	May 1, 1872	83.9	84.6	+ .7	82.9	83.0	+ .1	78.9	80.4	+ 1.5	72.1	77.1	+ 5.0	61.8	62.4	+ .6	55.9	59.6	+ 3.7
Jacksonville, Fla	Sept. 11, 1871	83.2	83.7	+ .5	80.8	81.5	+ .7	77.6	79.6	+ 2.0	70.0	74.6	+ 4.6	62.0	65.6	+ 3.6	55.8	61.4	+ 5.6
Keokuk, Iowa	July 16, 1871	78.4	79.0	+ .6	75.3	79.2	+ 3.9	65.8	72.4	+ 6.6	54.4	57.0	+ 2.6	38.3	39.6	+ 1.3	29.1	37.6	+ 8.5
Key West, Fla	Nov. 1, 1870	83.9	86.0	+ 2.1	84.3	84.5	+ .2	82.9	82.8	− .1	79.0	80.3	+ 1.3	75.0	77.1	+ 2.1	70.1	73.1	+ 3.0
Kittyhawk, N. C	Jan. 15, 1875	79.1	78.3	− .8	77.1	76.2	− .9	71.8	77.4	+ 5.6	62.6	68.3	+ 5.7	52.3	57.3	+ 5.0	44.0	49.9	+ 5.9
Knoxville, Tenn	Jan. 1, 1871	77.2	78.3	+ 1.1	74.2	77.0	+ 2.8	67.4	74.1	+ 6.7	56.7	63.8	+ 7.1	46.2	48.1	+ 1.9	39.2	44.0	+ 4.8
La Crosse, Wis	Oct. 15, 1872	74.3	74.4	+ .1	71.3	74.5	+ 3.2	61.2	64.6	+ 3.4	50.1	52.8	+ 2.7	33.5	36.1	+ 2.6	23.4	34.6	+11.2
La Mesilla, N. Mex	June 16, 1876	79.3	79.5	+ .2	77.7	76.5	− 1.2	72.3	69.5	− 2.8	60.5	63.7	+ 3.2	46.9	45.6	− 1.3	42.0	44.4	+ 2.4
Laredo, Tex	Dec. 16, 1875	86.5	88.9	+ 2.4	84.4	86.3	+ 1.9	80.9	(a)	.....	73.3	74.2	+ .9	59.8	62.0	+ 2.2	57.5	62.0	+ 4.5
Leavenworth, Kans	May 21, 1871	78.7	80.2	+ 1.5	77.0	81.7	+ 4.7	66.3	70.1	+ 3.8	55.5	58.4	+ 2.9	40.5	40.2	− .3	30.7	40.2	+ 9.5
Los Angeles, Cal	July 1, 1877	67.4	68.9	+ 1.5	68.7	69.4	+ .7	66.8	67.9	+ 1.1	63.2	60.9	− 2.3	57.8	57.5	− .3	54.4	54.7	+ .3
Louisville, Ky	Sept. 1, 1871	79.9	80.9	+ 1.0	76.3	81.1	+ 4.8	67.6	75.9	+ 8.3	57.5	63.9	+ 6.4	44.9	47.8	+ 2.9	38.7	44.8	+ 6.1
Lynchburg, Va	May 24, 1871	80.1	81.6	+ 1.5	75.6	80.2	+ 4.6	68.1	78.4	+10.3	57.8	65.2	+ 7.4	46.2	50.5	+ 4.3	38.9	45.5	+ 6.6
Madison, Wis	Sept. 29, 1878	72.9	73.1	+ .2	71.0	73.2	+ 2.2	59.6	64.8	+ 5.2	51.9	51.6	− .3	31.6	34.6	+ 3.0	19.4	33.1	+13.7
Marquette, Mich	May 1, 1871	66.9	69.0	+ 2.1	66.3	65.9	− .4	57.3	57.6	+ .3	45.9	44.9	− 1.0	31.7	30.8	− .9	23.0	30.8	+ 7.8
Mason, Tex	Feb. 7, 1876	83.1	83.2	+ .1	80.5	2.5	+ 2.0	74.2	76.8	+ 2.6	65.5	69.3	+ 3.8	51.6	52.7	+ 1.1	47.8	51.6	+ 3.8
Memphis, Tenn	Feb. 28, 1871	81.8	83.2	+ 1.4	78.8	83.7	+ 4.9	70.7	76.7	+ 6.0	60.6	68.3	+ 7.7	49.0	50.6	+ 1.6	42.4	48.0	+ 5.6
Milwaukee, Wis	Nov. 1, 1870	69.8	70.7	+ .9	68.9	71.3	+ 2.4	60.8	64.3	+ 3.5	48.8	51.9	+ 3.1	34.4	36.6	+ 2.2	24.5	34.8	+10.3
Mobile, Ala	Nov. 7, 1870	82.7	83.3	+ .6	80.7	81.4	+ .7	76.3	79.3	+ 3.0	66.7	73.5	+ 6.8	57.6	59.1	+ 1.5	51.6	56.6	+ 5.0
Montgomery, Ala	Nov. 9, 1870	82.8	84.1	+ 1.3	80.4	81.1	+ .7	74.8	77.8	+ 3.0	64.4	71.2	+ 6.8	55.4	56.4	+ 1.0	49.1	53.9	+ 4.8
Morgantown, West Va	Jan. 25, 1873	75.4	72.8	− 2.6	71.0	71.4	+ .4	64.2	72.0	+ 7.8	53.9	59.0	+ 5.1	42.9	47.7	+ 4.8	36.3	43.1	+ 6.8
Mount Washington, N. H	Dec. 1, 1870	48.4	48.2	− .2	47.2	50.0	+ 2.8	40.3	48.6	+ 8.3	30.4	29.3	− 1.1	17.1	19.0	+ 1.9	9.0	16.6	+ 7.6
Nashville, Tenn	Nov. 1, 1870	81.2	82.6	+ 1.4	78.0	83.1	+ 5.1	69.6	75.6	+ 6.0	59.2	66.5	+ 7.3	47.9	49.8	+ 1.9	40.7	46.6	+ 5.9
New Haven, Conn	Dec. 10, 1872	74.1	70.5	+ 3.6	71.4	71.2	− .2	63.7	69.6	+ 5.9	53.9	55.9	+ 2.0	41.6	43.1	+ 1.5	32.1	37.6	+ 5.5
New London, Conn	Jan. 10, 1871	71.7	69.9	− 1.8	70.1	70.2	+ .1	63.4	68.3	+ 4.9	53.6	56.8	+ 3.2	41.6	45.3	+ 3.7	32.0	39.3	+ 7.3
New Orleans, La	Nov. 1, 1870	82.6	84.3	+ 1.7	81.9	82.8	+ .9	78.0	80.1	+ 2.1	69.3	75.2	+ 5.9	61.1	61.2	+ .1	55.2	59.2	+ 4.0
Newport, R. I	Aug. 1, 1875	70.8	68.8	− 2.0	69.4	68.7	− .7	63.1	66.7	+ 3.6	54.0	56.3	+ 2.3	42.1	46.1	+ 4.0	32.8	40.6	+ 7.8
New York, N. Y	Nov. 1, 1870	74.2	72.6	− 1.6	73.0	73.1	+ .1	65.2	72.2	+ 7.0	54.7	59.1	+ 4.4	42.6	46.3	+ 3.7	32.6	40.7	+ 8.1

a Record incomplete.

APPENDIX 23.—*Table of comparative mean temperatures at the principal stations of the Signal Service, U. S. Army, for each month of the year ending December 31, 1881*—Continued.

Station.	Station established.	July.			August.			September.			October.			November.			December.		
		Mean to include 1880.	Mean for 1881.	Departure +or−	Mean to include 1880.	Mean for 1881.	Departure +or−	Mean to include 1880.	Mean for 1881.	Departure +or−	Mean to include 1880.	Mean for 1881.	Departure +or−	Mean to include 1880.	Mean for 1881.	Departure +or−	Mean to include 1880.	Mean for 1881.	Departure +or−
		°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
Norfolk, Va	Jan. 1, 1871	80.1	79.8	— .3	76.7	76.9	+ .2	70.0	77.5	+ 7.5	60.2	66.8	+ 6.6	49.4	55.0	+ 5.6	41.8	49.0	+ 7.2
North Platte, Nebr	Sept. 18, 1874	74.0	73.7	— .3	72.2	77.4	+ 5.2	61.3	60.3	— 1.0	49.4	48.0	— 1.4	34.0	33.2	— .8	24.5	32.6	+ 8.1
Olympia, Wash	July 1, 1877	62.0	59.5	— 2.5	62.2	59.8	— 2.4	55.7	55.1	— 5.6	48.9	47.4	— 1.5	43.1	43.6	+ .5	40.2	42.4	+ 2.2
Omaha, Nebr	Nov. 1, 1870	77.0	78.9	+ 1.9	74.4	80.2	+ 5.8	60.4	66 0	+ 5.6	52.4	54.4	+ 2.0	35.4	36.9	+ 1.5	25.3	36.0	+10.7
Oswego, N. Y	Nov. 1, 1870	71.0	70.4	— .6	69.9	71.2	+ 1.3	62.6	70.3	+ 7.7	51.4	52.6	+ 1.2	39.6	41.3	+ 1.7	29.7	37.2	+ 7.5
Philadelphia, Pa	Jan. 1, 1871	76.1	75.5	— .6	73.5	75.0	+ 1.5	66.0	74.8	+ 8.8	55.7	60.8	+ 5.1	43.4	47.5	+ 4.1	33.9	41.7	+ 7.8
Phœnix, Ariz	May 9, 1877	91.9	87.7	— 4.2	89.8	85.1	+ 4.7	82.2	75.2	— 7.0	69.5	66.5	— 3.0	54.7	51.8	— 2.9	50.9	51.5	+ .6
Pike's Peak, Colo	Nov. 1, 1873	39.8	44.0	+ 4.2	38.7	41.0	+ 2.3	31.5	31.6	+ 0.1	21.5	23.4	+ 1.9	9.3	7.2	— 2.1	5.7	9.0	+ 3.3
Pioche, Nev	July 29, 1877	72.4	72.1	— .3	71.7	69.8	— 1.9	63.5	61.5	— 2.0	54.7	48.9	— 5.8	41.7	35.9	— 5.8	34.7	36.7	+ 2.0
Pitteburg, Pa	Nov. 1, 1870	74.6	75.2	+ .6	71.7	74.4	+ 2.7	63.8	75.4	+11.6	53.2	60.1	+ 6.9	40.5	45.3	+ 4.8	33.2	41.0	+ 7.8
Port Huron, Mich	July 25, 1874	69.4	69.4	Normal	68.2	70.1	+ 1.9	60.3	68.4	+ 8.1	49.3	52.0	+ 2.7	35.0	37.6	+ 2.6	26.2	33.8	+ 7.6
Portland, Me	Jan. 15, 1871	69.9	68.4	— 1.5	68.2	69.6	+ 1.4	60.6	64.2	+ 3.6	50.7	51.1	+ .4	38.4	41.2	+ 2.8	27.9	37.0	+ 9.1
Portland, Oreg	Nov. 1, 1871	66.6	63.7	— 2.9	65.3	62.6	— 2.7	61.5	59.2	— 2.3	54.7	49.9	— 4.8	45.4	43.4	— 2.0	41.9	43.0	+ 1.1
Prescott, Ariz	Nov. 19, 1873	75.5	72.0	— 3.5	72.0	68.4	— 3.6	65.0	61.4	— 3.6	53.3	52.9	— .4	40.5	38.4	— 2.1	35.0	39.7	+ 4.7
Portsmouth, N. C	Apr. 23, 1876	78.7	79.7	+ 1.0	77.5	78.5	+ 1.0	72.8	79.0	+ 6.2	67.5	70.6	+ 3.1	52.8	60.3	+ 7.5	48.3	52.3	+ 4.0
Punta Rassa, Fla	Aug. 15, 1871	81.4	82.9	+ 1.5	81.2	80.6	— .6	80.1	79.9	— .2	75.4	77.2	+ 1.8	70.1	72.1	+ 2.0	64.4	67.7	+ 3.3
Red Bluff, Cal	July 1, 1877	81.6	78.7	— 2.9	80.9	76.4	— 4.5	76.5	71.5	— 5.0	64.7	57.5	— 7.2	52.6	51.1	— 1.5	47.2	45.9	— 1.3
Rio Grande City, Tex	May 28, 1875	86.3	86.8	+ 5.0	82.3	85.1	+ 2.8	80.1	83.0	+ 2.9	72.0	76.1	+ 4.1	63.0	63.3	+ .3	58.9	59.8	+ .9
Rochester, N. Y	Nov. 1, 1870	71.5	71.7	+ .2	69.5	71.8	+ 2.3	61.6	71.2	+ 9.6	50.3	52.5	+ 2.2	37.3	39.9	+ 2.6	27.8	36.1	+ 8.3
Roseburg, Oreg	July 15, 1877	66.4	62.7	— 3.7	66.2	62.5	— 3.7	60.7	58.8	— 1.9	51.3	47.7	— 3.6	44.0	42 6	— 1.4	41.4	42.5	+ 1.1
Sacramento, Cal	July 1, 1877	72.6	71.1	— 1.5	72.7	68.2	— 4.5	70.0	67.8	— 2.2	62.3	56.8	— 5.5	51.9	50.8	— 1.1	47.5	46.2	— 1.3
Saint Louis, Mo	Nov. 1, 1870	79.6	81.0	+ 1.4	76.4	82.5	+ 6.1	67.6	75.3	+ 7.7	57.3	61.0	+ 3.7	42.1	43.7	+ 1.6	34.3	40.8	+ 6.5
Saint Paul, Minn	Nov. 1, 1870	73.2	72.6	— 6.0	69.9	72.9	+ 3.0	59 1	59.3	+ .2	46.9	48.4	+ 1.5	29.9	30.5	+ .6	19.3	29.3	+10.0
Saint Vincent, Minn	Sept. 5, 1880	67.4	68.6	+ 1.2	63.9	65.9	+ 2.0	52.9	50.7	— 2.2	40.4	36.7	— 3.7	19.7	16.5	— 3.2	3.8	13.9	+10.1
Salt Lake City, Utah	Mar. 22, 1874	75.7	74.9	— .8	74.7	73.1	— 1.6	64.7	59.8	— 4.9	53.4	50.2	— 3.2	41.7	33.5	— 8.2	32.8	33.8	+ 1.0
San Antonio, Tex	Sept. 22, 1875	83.2	84.5	+ 1.3	82.3	83.9	+ 1.6	78.0	78.9	+ .9	69.6	72.7	+ 3.1	57.7	57.7	Normal	53.7	56.2	+ 2.5
San Diego, Cal	Nov. 1, 1871	67.0	67.2	+ .2	68 5	68.2	— .3	66.4	66.7	+ .3	63.3	61.5	— 1.8	58.2	56.8	— 1.4	55.4	55.0	— .4
Sandusky, Ohio	Aug. 2, 1877	74.1	75.2	+ 1.1	72.7	74.2	+ 1.5	64.0	72.5	+ 8.5	55.0	57.7	+ 2.7	39.9	42.4	+ 2.5	31.9	38.3	+ 6.4
Sandy Hook, N. J	Dec. 10, 1873	74.3	74.0	— .3	72.6	74.9	+ 2.3	66.0	74.1	+ 8.1	56.0	61.3	+ 5.3	44.0	49.1	+ 5.1	34.1	41.9	+ 7.8
San Francisco, Cal	Mar. 8, 1871	58.2	58.7	+ .5	58.7	57.9	— .8	59.7	58.5	— 1.2	60.0	55.9	— 4.1	51.5	54.2	+ 2.7	51.8	50.5	— 1.3
Sante Fé, N. Mex	Nov. 20, 1871	67.8	68.6	+ .8	61.3	65.5	— .8	58.8	58.8	Normal	49.4	49.9	+ .5	36.3	33.4	— 2.9	29.3	(a)	.....
Savannah, Ga	Jan. 1, 1871	83.3	84.7	+ 1.4	80.9	80.3	— .6	75.6	80.0	+ 4.4	65.9	72.4	+ 6.5	58.2	61.3	+ 3.1	52.3	56.8	+ 4.5
Shreveport, La	Sept. 3, 1871	82.9	85.1	+ 2.2	81.9	85.9	+ 4.0	74.2	77.7	+ 3.5	65.6	70.7	+ 5.1	54.8	56.5	— 1.3	49.2	52.3	+ 3.1

Silver City, N. Mex	*May 15, 1878*	*70.8*	*71.8*	*+ 1.0*	*67.1*	*68.5*	*+ 1.4*	*63.0*	*63.5*	*+ .5*	*53.2*	*56.6*	*+ 3.4*	*41.4*	*39.6*	*— 1.8*	*38.5*	*39.3*	*+ .8*
Smithville, N. C	*Oct. 15, 1875*	*81.6*	*79.9*	*— 1.7*	*80.1*	*78.9*	*— 1.2*	*74.3*	*77.8*	*+ 3.5*	*64.0*	*69.2*	*+ 5.2*	*54.8*	*58.0*	*+ 3.2*	*47.6*	*51.3*	*+ 3.7*
Springfield, Mass	*July 19, 1873*	*73.7*	*71.6*	*— 2.1*	*70.8*	*71.8*	*+ 1.0*	*62.5*	*68.9*	*+ 6.4*	*52.2*	*53.7*	*+ 1.5*	*39.6*	*41.8*	*+ 2.2*	*29.7*	*37.1*	*+ 7.4*
Stockton, Tex	Feb. 26, 1876	80.4	81.3	+ 1.9	77.7	79.2	+ 1.5	72.2	75.0	+ 2.8	63.1	66.2	+ 3.1	49.6	49.9	+ .3	44.8	46.7	+ 1.9
Thatcher's Island, Mass	Dec. 26, 1875	66.7	65.1	— 1.6	66.3	65.7	— .6	60.5	63.8	+ 3.3	51.6	52.1	+ .5	39.4	42.1	+ 2.7	31.1	38.2	+ 7.1
Toledo, Ohio	Nov. 1, 1870	74.4	75.6	+ 1.2	71.5	74.2	+ 2.7	63.5	72.1	+ 8.6	53.1	57.1	+ 4.0	39.9	42.7	+ 2.8	31.2	39.1	+ 7.9
Tucson, Ariz	Dec. 2, 1875	86.3	83.8	— 2.5	84.0	82.1	— 1.9	79.4	76.8	— 2.6	69.5	68.2	— 1.3	56.5	53.6	— 2.9	49.9	52.9	+ 3.0
Umatilla, Oreg	July 15, 1877	72.6	69.0	— 3.6	73.5	67.1	— 6.4	64.0	61.1	— 2.9	51.9	49.3	— 2.6	40.1	40.5	+ .4	32.1	36.1	+ 4.0
Uvalde, Tex	Sept. 6, 1875	85.4	84.0	— 1.4	80.0	84.7	+ 4.7	76.3	80.7	+ 4.4	67.3	73.4	+ 6.1	58.2	58.1	— .1	53.8	56.5	+ 2.7
Vicksburg, Miss	Sept. 10, 1871	82.1	83.8	+ 1.7	79.7	83.9	+ 4.2	74.0	77.7	+ 3.7	64.1	71.0	+ 6.9	54.9	55.7	+ .8	50.0	54.3	+ 4.3
Visalia, Cal	July 1, 1877	78.7	76.5	— 2.2	78.0	74.2	— 3.8	72.4	68.9	— 3.5	61.1	56.1	— 5.0	50.5	47.9	— 2.6	48.6	47.2	— 1.4
Washington, D. C	Nov. 1, 1870	78.7	77.4	— 1.3	74.2	76.4	+ 2.2	66.9	77.0	+10.1	56.1	62.8	+ 6.7	44.0	47.5	+ 3.5	35.4	41.7	+ 6.3
Wickenburg, Ariz	Jan. 6, 1874	86.0	84.8	— 1.2	84.6	80.0	— 4.6	76.2	71.1	— 5.1	62.0	60.7	— 1.3	49.7	47.3	— 2.4	43.1	47.2	+ 4.1
Wilmington, N. C	Jan. 1, 1871	80.0	80.5	+ .5	77.8	79.1	+ 1.3	72.6	78.8	+ 6.2	62.8	69.8	+ 7.0	53.9	58.7	+ 4.8	47.2	52.8	+ 5.6
Winnemucca, Nev	July 1, 1877	72.2	69.4	— 2.8	71.2	67.0	— 4.2	61.3	56.4	— 4.9	47.9	42.5	— 5.4	36.1	32.5	— 3.6	29.4	31.7	+ 2.3
Wood's Holl, Mass	Jan. 1, 1873	69.2	68.0	— 1.2	68.6	67.8	— .8	62.6	65.5	+ 2.9	54.4	56.3	+ 1.9	43.1	46.9	+ 3.8	33.9	41.5	+ 7.6
Yankton, Dak	Apr. 1, 1873	74.1	75.0	+ .9	71.8	76.8	+ 5.0	60.9	60.1	— .8	48.8	48.9	+ .1	30.5	32.4	+ 1.9	19.7	32.8	+13.1
Yuma, Ariz	Nov. 18, 1873	92.1	91.9	— .2	91.7	88.6	— 3.1	84.7	82.7	— 2.0	73.2	70.4	— 2.8	60.9	58.3	— 2.6	55.2	57.0	+ 1.8

a Record incomplete.

APPENDIX 24.

Table showing the mean temperature of the several States and Territories of the United States. Compiled from observations taken during a period of from one to eleven years and including 1881.

State or Territory.	1870 to 1881.												Annual mean.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
	°	°	°	°	°	°	°	°	°	°	°	°	°
Alabama	52.2	53.4	58.9	66.2	75.2	81.0	82.1	80.7	76.3	67.1	55.4	51.2	66.6
Arizona	43.0	46.1	50.9	61.6	69.9	78.7	81.6	79.2	73.6	62.0	49.3	45.6	61.8
Arkansas	45.8	46.8	52.4	63.3	73.4	78.4	81.4	79.0	72.0	63.0	48.9	44.3	62.4
California	48.0	50.4	51.7	57.3	62.0	65.4	69.6	68.7	66.1	59.0	52.5	49.5	58.3
Colorado	26.8	32.7	38.8	47.2	57.9	67.1	72.8	70.5	60.7	51.1	36.4	30.0	49.3
Connecticut	30.2	30.9	36.3	46.2	60.2	65.8	71.5	70.2	66.6	54.0	40.5	31.7	50.3
Dakota	8.0	13.7	23.2	40.2	57.2	64.9	70.6	68.9	55.7	43.4	25.1	13.9	40.4
Delaware	32.1	34.0	40.0	48.4	60.9	68.4	73.8	73.0	70.3	58.6	44.9	34.6	53.2
District of Columbia	34.2	35.8	42.3	52.0	64.9	73.3	78.5	74.5	68.1	56.1	42.9	35.0	54.8
Florida	62.0	62.8	66.2	70.4	76.4	81.9	83.2	81.5	79.5	74.2	65.9	62.0	72.2
Georgia	50.1	52.2	56.1	63.5	72.8	80.0	82.3	79.1	75.3	66.6	53.7	50.3	65.2
Idaho	27.0	32.8	40.4	49.5	55.3	63.1	70.4	67.0	56.6	45.8	30.6	29.2	47.3
Illinois	30.5	32.5	38.7	50.1	67.9	71.2	76.9	77.1	69.0	55.5	37.1	28.5	52.9
Indiana	31.6	33.8	40.4	51.8	65.3	72.2	77.7	74.5	66.1	54.9	41.0	33.0	53.5
Indian Territory	38.3	41.0	49.0	62.6	72.0	78.8	80.8	82.4	73.4	61.6	44.8	36.2	60.1
Iowa	26.0	26.8	33.8	47.6	67.9	71.1	75.9	75.7	65.6	52.7	34.5	22.0	50.0
Kansas	29.9	31.0	39.5	53.0	67.7	75.5	77.5	77.5	67.0	54.7	35.8	25.7	52.9
Kentucky	38.2	40.6	47.4	57.1	69.3	76.2	80.8	77.5	69.5	58.3	46.4	39.1	58.4
Louisiana	53.6	54.4	59.7	68.1	76.1	82.4	82.7	82.3	78.2	69.2	57.1	53.3	68.1
Maine	24.8	26.6	32.5	40.6	52.8	59.1	65.3	64.7	60.2	48.9	36.1	26.1	44.8
Maryland	35.0	36.5	42.7	52.3	65.2	73.8	78.9	75.1	68.4	57.0	45.2	36.5	55.5
Massachusetts	29.6	30.4	35.6	44.6	58.1	64.1	69.4	68.4	64.0	52.6	39.6	30.9	48.9
Michigan	23.3	22.6	28.1	39.2	58.0	62.0	68.8	67.6	61.8	48.0	31.1	22.7	44.4
Minnesota	9.2	14.5	23.9	40.7	56.3	64.2	70.2	67.9	56.5	44.5	26.9	15.6	40.9
Mississippi	49.4	51.6	58.1	64.5	73.8	79.9	82.3	80.2	74.5	64.2	55.1	49.5	65.3
Missouri	29.8	34.9	41.1	53.8	66.0	73.9	79.8	77.6	68.5	55.3	38.7	30.5	54.2
Montana	11.6	22.0	37.2	42.9	54.0	62.0	68.5	65.7	54.7	41.1	23.3	8.5	41.0
Nebraska	23.0	24.9	32.3	47.5	65.1	71.7	75.2	75.9	62.4	49.8	31.3	17.4	48.0
Nevada	31.8	33.8	36.9	49.1	55.3	64.6	71.7	68.5	60.3	47.5	34.1	31.4	48.7
New Hampshire	21.9	23.8	31.8	42.5	56.2	64.7	70.3	68.6	61.2	50.1	36.9	25.5	46.1
New Jersey	34.2	34.5	39.0	47.4	61.1	67.6	73.4	72.3	70.3	58.8	43.3	35.0	53.1
New Mexico	34.6	38.3	44.1	54.6	63.1	72.9	72.6	69.4	63.2	54.9	40.8	37.0	53.7

New York	*28.6*	*28.3*	*33.8*	*44.3*	*61.8*	*65.1*	*71.8*	*70.8*	*67.5*	*52.7*	*37.8*	*28.3*	*49.2*
North Carolina	*45.7*	*47.2*	*50.4*	*57.9*	*69.8*	*76.3*	*79.9*	*78.0*	*75.8*	*66.1*	*52.2*	*47.8*	62.3
Ohio	*33.3*	*33.1*	*37.2*	*48.8*	*66.7*	*69.7*	*75.0*	*73.9*	*68.9*	*55.4*	*38.7*	*30.7*	*52.6*
Oregon	*38.4*	*39.3*	*44.8*	*52.3*	*55.4*	*61.3*	*66.4*	*64.7*	*60.2*	*50.6*	*39.9*	*37.2*	*50.9*
Pennsylvania	*33.7*	*32.8*	*36.5*	*48.2*	*65.4*	*68.6*	*78.9*	*73.4*	*69.0*	*56 1*	*40.0*	*32.1*	*52.5*
Rhode Island	*30.3*	*31.8*	*36.9*	*43.3*	*54.7*	*62.1*	*69.2*	*68.9*	*65.7*	*55.3*	*40.4*	*32.8*	*49.3*
South Carolina	*49.5*	*50.8*	*57.7*	*63.6*	*72.6*	*79.6*	*82.8*	*80.2*	*75.6*	*64.8*	*55.9*	*49.5*	*65.2*
Tennessee	*40.6*	*43.2*	*50.1*	*59.3*	*70.3*	*76.3*	*80.1*	*77.6*	*70.1*	*60.4*	*47.9*	*41.9*	*59.8*
Texas	*48.6*	*51.2*	*58.5*	*67.2*	*74.1*	*82.6*	*82.1*	*80.9*	*75.7*	*66.2*	*53.8*	*51.1*	*66.0*
Utah	*29.8*	*35.2*	*41.8*	*49.5*	*57.2*	*67.3*	*75.6*	*74.5*	*64.1*	*53.4*	*39.4*	*31.4*	*51.6*
Vermont	*19.9*	*21.1*	*29.5*	*41.6*	*56.5*	*65.8*	*71.0*	*68.8*	*61.4*	*49.6*	*35.5*	*23 1*	*45.3*
Virginia	*38.7*	*40.1*	*44.8*	*56.1*	*69.7*	*75.0*	*79.4*	*77.1*	*74.1*	*60.0*	*48.0*	*42.5*	*58.8*
Washington Territory	*32.7*	*38.9*	*45.0*	*49.1*	*53.1*	*59.1*	*64.5*	*62.0*	*55.5*	*46.8*	*36.0*	*33.3*	*48.0*
West Virginia	*35.4*	*36.4*	*41.9*	*52.1*	*63.3*	*70.7*	*75.1*	*71.4*	*65.2*	*53.9*	*42.9*	*36.3*	*53.7*
Wisconsin	*22.8*	*23.6*	*30.9*	*44.4*	*60.3*	*66.0*	*71.6*	*71.6*	*62.3*	*50.0*	*31.2*	*18.6*	*46.1*
Wyoming	*22.9*	*25.2*	*32.0*	*42.6*	*53.6*	*62.8*	*69.7*	*67.3*	*55.7*	*45.4*	*31.0*	*18.6*	*43.9*

APPENDIX 25.

Table showing the mean temperature in the several geographical districts of the United States during each month of the year. Computed from observations covering a period of from one to eleven years.

Geographical district.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	°	°	°	°	°	°	°	°	°	°	°	°
Eastern Gulf states	46.8	49.5	56.0	64.0	72.5	78.7	81.9	79.5	73.5	63.4	53.5	46.7
Florida peninsula	61.6	63.2	67.6	72.1	77.0	80.6	82.4	82.2	80.4	74.0	67.4	62.5
Lower Lake region	25.3	25.3	31.7	48.3	56.3	66.0	71.0	69.6	61.6	50.6	36.6	27.5
Middle Atlantic states	33.7	34.3	41.1	49.7	61.2	70.8	75.6	73.8	66.4	56.2	43.6	34.9
Middle eastern Rocky mountain slope	30.0	35.9	43.2	52.6	63.6	71.6	76.3	74.5	65.8	51.2	39.7	31.8
Middle Pacific coast region	47.3	50.2	53.9	57.5	61.8	69.9	71.8	71.2	68.5	62.1	54.4	48.5
Missouri valley	14.7	19.6	28.6	44.8	60.0	67.5	74.0	71.8	59.6	47.7	29.2	16.9
New England states	25.3	26.4	32.4	42.9	55.3	64.8	69.2	68.1	61.6	50.9	38.2	28.0
Northern Rocky mountain slope	21.0	26.9	32.2	43.5	55.1	63.7	69.5	69.1	57.3	46.8	30.9	21.0
North Pacific coast region	39.4	42.0	44.4	49.9	54.5	61.0	65.5	65.1	59.1	51.9	43.9	40.8
Northern plateau district	28.7	36.8	45.5	52.3	59.2	69.0	74.4	72.8	64.0	52.2	40.0	29.3
Ohio valley and Tennessee	36.3	38.6	45.0	55.8	66.7	73.3	78.5	75.7	67.4	57.0	44.3	37.1
Rio Grande valley	55.6	60.9	68.2	74.4	80.4	84.3	85.3	84.5	80.5	72.6	62.4	57.1
South Atlantic states	48.1	49.0	55.2	62.3	70.3	77.2	80.9	78.9	73.9	64.0	54.8	47.9
Southeastern Rocky mountain slope	42.3	46.5	54.5	62.1	71.1	77.1	80.7	78.9	72.4	62.3	48.9	42.3
South Pacific coast region	53.7	54.1	55.5	57.8	61.2	64.4	66.9	68.5	66.4	63.0	58.3	54.9
Southern plateau district	39.3	44.0	50.1	56.3	65.9	75.6	78.9	76.5	70.5	58.4	45.1	40.9
Upper Lake region	20.9	22.4	28.4	40.8	53.4	63.6	69.1	67.9	59.0	47.8	33.0	23.3
Upper Mississippi valley	22.5	27.0	35.5	49.4	62.8	71.1	76.1	73.6	62.3	51.6	35.1	25.5
Western Gulf states	47.9	51.9	58.8	65.7	73.9	79.5	82.8	81.5	75.5	65.8	55.0	48.3

NOTES.

Eastern Gulf states.—Eastern Mississippi, Alabama, and northwestern Florida.
Lower Lake region.—Lakes Erie and Ontario, with adjacent territory.
Middle Atlantic states.—New York, New Jersey, Pennsylvania, Delaware, Maryland, District of Columbia, and Virginia as the middle states, and that part of those States lying east of the Alleghanies as the middle Atlantic states.
Middle eastern Rocky mountain slope.—Eastern Colorado, southern Nebraska, Kansas, northwestern portion of Indian Territory, portion of northern Texas, also a portion of northeastern New Mexico.
Middle Pacific coast region.—Those portions of California west of the Sierra Nevadas and north of the 37th parallel of latitude.
Missouri valley.—A belt of country two hundred miles broad, from Fort Sully, Dak., to Jefferson City, Mo.
New England States.—Maine, New Hampshire, Vermont, Massachusetts, Connecticut, and Rhode Island.
Northern Rocky mountain slope.—Those portions of Montana and Wyoming lying east of the Rocky Mountains, southwestern Dakota, and northwestern Nebraska.

North Pacific region.—Those portions of Oregon and Washington Territory lying west of the Cascade range.
Northern plateau district.—Portion of western Wyoming, western Montana, Idaho, and the portions of Oregon and Washington Territory lying east of the Cascade range.
Ohio valley.—The belt of country, about two hundred miles broad, from Pittsburg, Pa., to Cairo, Ill.
Rio Grande valley.—Southwestern Texas below the junction of the Rio Pecos with the Rio Grande.
South Atlantic states.—North Carolina, South Carolina, Georgia, and northern and eastern Florida.
Southeastern Rocky mountain slope.—Southeastern New Mexico, central and western Texas.
South Pacific coast region.—Those portions of California west of the Sierra Nevadas and south of the 37th parallel of latitude.
Southern plateau district.—Western New Mexico, Arizona, and southeastern California.
Upper Lake region.—Lakes Superior, Huron, and Michigan, with adjacent country.
Upper Mississippi valley.—The belt of country, about two hundred miles broad, from Saint Paul to Cairo.
Western Gulf states.—Western Louisiana, western Arkansas, eastern Texas, southern Missouri, and southeastern portion of Indian Territory.

APPENDIX 26.

Monthly and annual mean temperatures at stations on the Central Pacific and Southern Pacific Railroads and connecting branches, July, 1881, to June, 1882, inclusive.

Stations.	1881.						1882.						Annual mean.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	°	°	°	°	°	°	°	°	°	°	°	°	°
Alta, Cal	73.9	71.1	65.2	51.8	47.1	44.1	36.3	36.1	42.7	48.5	61.7	65.3	53.6
Anaheim, Cal	74.4	74.8	72.4	64.1	59.5	56.2	51.4	52.1	57.7	61.2	69.9	69.2	63.6
Antioch, Cal	76.3	75.9	74.9	64.2	46.0	47.8	38.1	50.6	55.6	59.3	66.6	67.5	60.2
Auburn, Cal	73.5	71.4	70.8	56.0	48.2	44.4	39.8	40.1	48.2	(a)	61.7	66.7	.....
Battle Mountain, Nev	78.0	72.3	60.1	44.7	32.4	30.0	19.9	19.8	33.2	44.4	57.5	66.4	46.6
Benson, Ariz	(a)	81.1	71.5	69.4	52.9	(a)	42.1	45.7	44.0	51.4	72.9	82.0	.....
Beowawe, Nev	76.6	72.8	61.3	45.6	31.3	32.6	18.8	22.4	36.2	47.7	61.4	71.7	48.2
Blue Creek, Utah	81.0	79.7	67.0	53.6	34.6	31.9	22.3	26.5	38.8	49.0	61.3	73.1	51.6
Boca, Cal	62.9	52.4	59.3	41.5	22.7	23.9	31.5	18.1	25.7	34.4	47.3	56.4	39.7
Borden, Cal	79.8	81.6	76.1	65.7	54.6	51.0	45.6	45.8	54.8	56.5	68.9	75.7	63.0
Brentwood, Cal	77.6	73.2	71.2	58.1	52.1	48.2	42.5	48.2	54.4	55.5	62.3	64.6	59.0
Brighton, Cal	75.1	72.5	70.8	58.4	49.9	46.7	44.3	45.1	53.5	56.6	66.4	70.1	59.1
Browns, Nev	79.4	77.5	64.5	49.0	36.3	34.1	27.9	35.5	40.7	49.4	61.3	69.0	52.0
Byron, Cal	87.7	77.4	74.7	63.4	55.3	49.1	47.1	49.9	58.9	65.2	75.1	77.0	65.1
Caliente, Cal	79.6	79.5	76.9	60.3	53.0	57.9	53.1	47.9	55.9	57.2	70.4	79.5	64.3
Calistoga, Cal	80.5	72.8	68.5	55.8	(a)	45.9	45.1	44.5	52.6	57.5	67.8	68.1	.....
Carlin, Nev	77.9	66.3	55.3	41.1	28.9	24.8	13.3	17.6	29.6	41.1	54.2	65.4	43.0
Casa Grande, Ariz	91.1	88.4	82.8	73.1	54.7	(a)	45.0	51.7	60.5	69.8	82.3	86.1	.....
Chico, Cal	87.5	82.6	78.2	59.3	50.2	46.6	43.0	45.1	56.8	61.1	68.8	79.5	63.2
Cisco, Cal	62.5	62.9	57.5	43.4	37.8	34.4	27.6	29.0	32.1	36.0	47.1	58.3	44.0
Colfax, Cal	78.4	70.9	69.3	51.8	49.0	48.0	41.4	39.1	48.2	53.5	61.3	72.4	56.9
Colton, Cal	83.7	80.1	75.7	60.3	52.7	52.3	44.9	46.7	54.2	57.9	69.4	69.1	62.2
Corinne, Utah	78.4	76.3	61.8	50.3	37.4	29.5	30.3	22.2	35.6	47.0	60.6	72.6	50.2
Davis, Cal	79.4	74.7	73.7	60.7	50.9	46.4	46.4	47.3	55.7	60.1	70.4	75.0	61.7
Delano, Cal	83.4	85.3	80.2	62.8	53.4	51.4	45.6	47.4	59.3	58.8	70.5	76.6	64.6
Dunnigan, Cal	83.2	76.6	68.3	59.9	53.0	41.9	43.2	46.8	53.4	61.1	78.2	80.5	62.2
Elko, Nev	73.0	67.8	55.4	40.0	28.1	25.3	15.8	18.0	30.1	42.7	55.8	68.1	43.3
Emigrant Gap, Cal	64.6	(a)	59.9	45.2	42.7	38.9	(a)	32.4	33.5	38.5	49.1	57.3	.....
Farmington, Cal	77.6	72.5	72.5	60.5	54.2	43.8	42.5	44.6	51.6	56.8	67.7	72.9	59.8
Fresno City, Cal	85.6	83.9	73.3	61.0	(a)	50.5	43.9	47.8	54.3	59.6	73.7	77.3	.....
Galt, Cal	78.8	73.1	76.0	62.8	52.2	47.3	45.2	46.5	53.3	59.6	69.0	72.8	61.4
Gilroy, Cal	68.6	65.6	66.8	58.6	49.1	48.1	43.7	43.8	55 3	55.1	61.7	63.9	56.7
Golconda, Nev	76.9	71.6	63.5	(a)	41.0	41.6	31.1	28.9	37.7	49.8	61.0	72.3	.....
Goshen, Utah	84.7	84.7	76.4	63.3	51.6	45.8	41.8	43.4	53.2	(a)	78.4	77.7	.....

Halleck, Nev	76.2	69.8	58.3	37.3	25.4	21.2	12.7	17.2	28.4	41.3	55.9	68.4	42.7
Hollister, Cal	65.4	64.9	64.3	57.0	50.4	49.3	50.0	49.8	(a)	59.2	61.0	60.0	.....
Hot Springs, Nev	77.0	73.3	63.5	46.5	31.6	(a)	24.8	30.5	40.0	46.1	57.0	65.6	.....
Humboldt, Nev	72.8	70.3	61.3	48.9	37.0	30.8	25.2	26.9	36.2	43.8	56.8	61.8	47.6
Indio, Cal	97.1	93.8	86.1	73.1	57.9	58.9	47.2	54.4	65.3	72.6	81.3	87.2	72.9
Ione, Cal	86.4	81.4	76.3	64.8	55.0	48.8	45.1	48.5	53.5	57.0	66.7	72.4	63.0
Keene, Cal	78.3	74.7	68.1	53.2	49.5	48.3	42.5	40.8	50.7	53.3	61.6	68.7	57.-
Kelton, Utah	78.4	(a)	55.5	43.5	29.5	21.4	21.6	21.1	38.5	48.6	61.9	74.9	.....
Kingsburgh, Cal	84.9	83.1	74.4	60.6	48.6	47.9	41.7	48.1	57.4	59.4	75.3	79.8	6-.1
Knight's Landing, Cal	77.8	74.6	71.9	58.1	53.5	45.1	45.1	47.3	53.7	59.6	68.1	65.8	60.9
Lathrop, Cal	75.6	66.8	68.4	56.4	46.1	47.0	46.0	44.6	54.5	57.1	67.5	61.6	57.6
Lemoore, Cal	89.4	(a)	82.2	61.8	50.7	(a)	43.9	45.7	47.0	55.9	72.7	75.4	.....
Livermore, Cal	72.8	68.1	68.5	61.6	55.4	(a)	48.1	48.1	54.5	56.7	62.3	62.1	.....
Los Angeles, Cal	74.6	74.0	72.1	62.5	58.4	56.3	50.0	51.8	56.3	63.2	68.3	71.1	63.2
Mammoth Tank, Cal	98.1	94.3	87.3	74.3	59.9	56.6	48.3	53.7	62.4	74.0	83.5	90.3	73.6
Maricopa, Ariz	94.5	91.2	80.5	(a)	66.7	(a)	58.9	59.4	65.3	70.0	77.9	85.6	.....
Martinez, Cal	72.2	70.2	68.0	63.3	53.8	48.2	47.2	47.0	53.7	57.3	64.2	65.5	59.2
Marysville, Cal	77.9	78.9	76.5	62.1	56.1	48.3	46.9	45.9	(a)	58.3	69.1	78.0	.....
Menlo Park, Cal	69.7	66.8	63.2	56.0	50.3	49.0	46.6	45.4	52.1	55.7	65.5	66.6	57.2
Merced, Cal	81.1	75.3	71.1	57.8	54.6	50.4	45.1	51.9	53.9	58.4	70.0	73.4	61.9
Modesto, Cal	78.2	75.2	70.5	60.2	51.0	(a)	45.1	46.6	53.4	60.1	70.8	73.0	.....
Mojave, Cal	81.9	81.0	75.0	59.8	50.5	48.8	38.7	42.8	51.7	57.7	73.2	75.6	61.4
Monterey, Cal	61.3	60.5	60.0	55.6	51.2	51.5	47.3	45.0	51.8	51.6	57.8	59.5	54.4
Napa City, Cal	72.8	67.6	63.5	52.7	46.5	45.1	44.7	44.6	53.7	58.9	68.1	71.4	57.5
Newhall, Cal	75.8	74.1	73.5	58.8	50.3	47.1	43.7	43.7	51.9	57.0	64.8	60.1	58.4
Niles, Cal	75.8	65.6	76.2	54.1	51.0	49.1	44.2	45.4	51.3	54.3	63.8	62.3	57.8
Oakland, Cal	69.3	71.3	68.6	59.3	52.0	52.1	59.9	51.3	55.2	59.9	69.1	63.1	60.9
Ogden City, Utah	77.6	76.1	(a)	55.4	37.3	35.5	29.3	32.6	36.0	48.9	60.3	70.6	.....
Otego, Nev	70.6	69.4	57.1	44.2	30.3	27.4	16.9	18.8	30.1	39.8	52.6	62.3	43.3
Pajaro, Cal	63.6	61.3	59.3	53.1	46.8	49.1	46.0	45.1	49.7	51.8	54.8	56.2	53.1
Palisade, Nev	76.0	70.3	61.8	40.4	31.3	29.2	19.9	26.6	34.2	46.5	59.0	(a)	.....
Pantano, Ariz	83.0	(a)	78.4	72.0	54.8	51.5	49.4	50.6	55.6	66.7	75.0	85.2	.....
Petaluma, Cal	67.3	65.4	64.5	56.9	51.3	48.7	44.8	(a)	51.0	51.6	57.8	60.9	.....
Pleasanton, Cal	76.8	70.8	71.8	61.2	50.7	46.5	46.1	45.1	53.3	58.3	62.4	70.3	59.4
Promontory, Utah	78.1	74.2	59.0	47.8	29.9	25.6	16.2	22.7	33.8	45.7	57.9	72.8	47.0
Ravenna, Cal	78.6	75.9	71.0	59.0	50.5	(a)	41.8	44.1	50.4	58.3	61.6	58.8	.....
Red Bluff, Cal	79.8	81.5	74.1	62.6	54.2	48.7	45.8	43.9	51.5	57.0	69.2	73.4	61.8
Redding, Cal	82.4	81.5	76.5	58.8	52.3	47.9	43.8	46.4	52.1	54.0	(a)	81.6	.....
Reno, Nev	70.0	62.9	58.8	45.8	28.1	32.3	23.4	28.3	31.7	43.3	56.9	63.4	45.4
Rocklin, Cal	80.2	76.0	72.0	58.7	48.6	43.1	44.1	44.5	52.2	58.2	68.9	73.7	60.0
Sacramento, Cal	76.1	70.8	68.5	56.8	48.9	45.3	37.3	45.5	53.0	57.4	68.2	72.8	58.4
Salinas, Cal	63.0	59.9	58.0	50.0	49.2	46.8	44.0	44.9	52.4	54.7	62.8	60.8	53.9
San Fernando, Cal	73.0	72.6	71.2	62.7	57.4	55.5	46.1	48.6	56.1	61.7	65.5	65.9	61.4
San José, Cal	66.3	64.3	62.2	56.8	49.7	47.0	45.4	45.3	52.1	51.9	58.9	61.9	55.1
San Mateo, Cal	62.0	60.6	58.8	51.6	46.4	45.6	43.5	42.5	47.7	49.1	56.5	58.5	51.9
Santa Cruz, Cal	64.5	66.8	60.8	57.3	54.9	52.1	48.7	47.0	53.2	55.6	51.4	62.3	56.2
Soledad, Cal	66.7	63.2	63.2	58.3	47.7	54.8	42.4	44.4	52.8	58.0	(a)	66.3	.....
South Vallejo, Cal	67.8	63.6	64.2	59.7	54.6	48.8	48.8	49.1	54.2	57.4	66.4	66.2	58.4
Spadra, Cal	72.4	72.5	70.2	63.3	56.8	(a)	57.4	51.6	58.2	60.8	67.7	69.0	.....
Stockton, Cal	70.9	68.0	67.2	56.7	50.8	44.2	43.0	47.0	54.0	60.4	66.5	67.8	58.0
Suisun, Cal	74.3	71.7	77.1	63.3	56.5	49.0	48.8	49.4	56.4	60.7	68.9	70.8	62.2
Sumner, Cal	87.0	84.0	79.9	60.9	47.9	46.7	44.5	47.0	60.6	(a)	73.5	78.8	.....

APPENDIX 26.—*Monthly and annual mean temperatures at stations on the Central Pacific and Southern Pacific Railroads, &c.*—Continued.

Stations.	1881.						1882.						Annual mean.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	°	°	°	°	°	°	°	°	°	°	°	°	°
Summit, Cal	55.6	52.0	48.2	40.6	32.0	31.4	23.3	27.1	28.6	33.0	42.7	54.1	39.0
Tecoma, Nev	82.1	77.8	60.5	38.6	30.0	24.3	17.6	21.5	29.3	41.4	56.2	65.1	45.4
Tehama, Cal	81.7	75.8	71.3	60.7	50.5	45.3	42.8	(a)	50.4	60.0	70.1	83.7	.....
Tehichipa, Cal	77.8	68.0	59.0	47.7	42.2	31.5	32.7	33.0	41.8	48.3	60.1	71.3	51.1
Tennant, Cal	74.5	72.3	70.8	58.4	51.5	48.5	42.8	(a)	56.2	56.5	66.9	(a)	.....
Terrace, Utah	79.9	74.7	60.7	49.2	32.2	25.8	13.9	16.0	37.7	45.4	50.6	66.1	46.0
Texas Hill, Ariz	100.6	96.8	89.7	75.8	58.4	56.3	51.2	55.3	64.0	73.0	83.5	91.1	74.6
Toana, Nev	71.5	71.0	56.4	43.1	26.1	23.7	14.2	20.2	27.9	39.9	52.7	65.0	42.6
Tracy, Cal	82.5	76.8	73.5	59.5	54.0	48.9	47.7	52.7	57.9	56.9	70.0	67.5	62.3
Truckee, Cal	66.0	61.0	55.6	42.6	28.9	28.6	22.0	22.7	28.0	36.7	51.0	(a)	.....
Tucson, Ariz	84.1	83.2	76.8	67.8	55.9	54.9	50.6	51.1	63.2	63.4	81.4	79.5	67.7
Tulare, Cal	79.5	77.4	73.8	59.7	46.4	46.8	41.8	45.5	53.7	61.2	73.0	77.5	61.4
Tuohey's Ranche, Cal	(a)	(a)	71.8	(a)	(a)	47.7	43.1	44.9	54.3	(a)	70.3	77.1	.....
Turlock, Cal	77.1	75.8	74.1	59.9	52.4	47.0	41.1	44.5	51.1	52.9	69.9	66.4	59.3
Wadsworth, Nev	74.5	71.5	63.3	49.4	35.0	32.4	26.2	32.6	39.1	47.9	60.4	70.6	50.2
Wells, Nev	78.3	76.2	62.4	50.2	33.1	33.8	22.2	22.2	31.4	44.9	58.1	60.2	47.7
White Water, Cal	91.7	89.9	79.9	67.6	59.2	(a)	52.0	51.2	60.5	65.7	76.5	78.8	.....
Willcox, Ariz	87.1	84.5	(a)	63.1	45.3	46.3	43.3	44.7	54.2	63.5	72.5	(a)	.....
Williams, Cal	80.3	75.4	74.8	56.4	51.4	46.8	43.7	45.4	53.6	62.3	70.8	79.9	61.7
Willow, Cal	86.4	77.2	75.6	58.2	51.4	46.5	43.6	41.8	53.6	57.8	72.3	82.7	62.3
Winnemucca, Nev	70.5	72.4	59.9	47.1	38.3	32.2	27.5	25.8	37.4	48.6	56.7	69.1	48.8
Woodland, Cal	80.8	77.0	74.3	64.1	51.0	49.2	46.1	45.4	52.8	61.0	72.2	74.7	62.4
Yuma, Ariz	91.6	88.5	87.3	73.6	60.1	58.2	50.8	55.3	63.5	72.3	80.8	83.0	72.1

a No report.

APPENDIX 27.

Maximum and minimum temperatures at stations of observation of the Signal Service, United States Army, for each month of the year ending June 30, 1882.

Stations.	Station established.	1881.											
		July.		August.		September.		October.		November.		December.	
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
		°	°	°	°	°	°	°	°	°	°	°	°
Albany, N. Y	Dec. 22, 1873	91	59.5	92.5	55.3	96	52.5	84	31	67	18	63	10.5
Alpena, Mich	Sept. 10, 1872	91	53	89	45	92	43	68	26	60	9	49	10
Atlanta, Ga	Sept. 25, 1878	97.5	59.5	96.2	65	90.5	60	84.5	47.5	75	20	66.5	29
Atlantic City, N. J	Dec. 10, 1873	92	57	91.8	57	92	55	83	34.6	70	22	62	18.8
Augusta, Ga	Nov. 2, 1870	102.3	64.3	100.1	66.1	96.8	64.4	90	48.2	81.4	26	74.6	31.8
Baltimore, Md	Jan. 1, 1871	96	65	98	60	101	59	89	39	71	24	71	24
Barnegat, N. J	Dec. 10, 1873	92	60	88	59	96	58.2	82.5	38.5	70.5	22.5	60	21
Bismarck, Dak	Sept. 15, 1874	102	46	97	49	90	29	71	17	63	−13	60	− 8
Block Island, R. I	Sept. 1, 1880	86	59.8	81.2	65	86.5	57.2	75.4	35.2	70	24.2	59.1	19
Boisé City, Idaho	July 1, 1877	101	46.5	100	39	88	30	73	23	61	18	53.5	16
Boston, Mass	Nov. 1, 1870	89	53.6	96.8	53.4	101.5	49	90	28	71	15	66	10
Brackettville, Tex	Sept. 1, 1875	101	68	101	68	96	50	87	45	80	30	77	29
Brownsville, Tex	Aug. 25, 1875	96	73	97	69	93	58	90	65	84	35	80	39
Buffalo, N. Y	Nov. 1, 1870	85	55	90.8	50	86.8	45.3	76.3	29.2	68.3	18.6	56.8	19.7
Burlington, Vt	May 24, 1871	90	52	93.5	50	89.7	41.2	74	25	64.7	3	56.3	4
Cairo, Ill	June 1, 1871	99	66	103	66	97	50	88	44	71.5	19	67	21.5
Campo, Cal	Jan. 1874	101.3	32.8	101.7	30	98.2	33	88.5	19.3	77.8	16	76.3	15
Camp Thomas, Ariz	Sept. 22, 1877	109	65.5	101.5	55	98	45	87	30	72	19	72	18.5
Cape Henry, Va	Dec. 15, 1873	98	60	103	60	94	66	89	48	79	26	74	23
Cape May, N. J	May 24, 1871	87	62	87	58	85	55	81	30	67	27	62	20
Castroville, Tex	Sept. 29, 1875	104	68	103	68	101	53	91	44	84	27	79	29
Cedar Keys, Fla	Nov. 7, 1879	94	69	93	69	94	68	89	57	81	33	78	42
Champaign, Ill	Oct. 13, 1880	95.2	53.7	99.5	53.7	95	47.7	78	38.8	62	10.8	60	11.6
Charleston, S. C	Jan. 5, 1871	103	67	97.5	69	92.5	68	89	54	80	28	76	33
Charlotte, N. C	Oct. 6, 1878	100.4	63.2	100.5	64.4	94	61	87	42	74.8	20	70	28
Chattanooga, Tenn	Jan. 8, 1879	99	62.5	100.5	65	96	55	85	45	75	21	64	28.5
Cheyenne, Wyo	Nov. 1, 1870	100.5	45	95.2	47.5	86.3	31.5	76.3	17.5	56.1	9	57.6	11.2
Chicago, Ill	Nov. 1, 1870	93	56.7	97.9	58.5	93.9	49	76.8	41.3	64.1	14.5	59	12.8
Chincoteague, Va	Mar. 16, 1880	94	62	91	60	86	59	82	42	70	23	64	25
Cincinnati, Ohio	Nov. 1, 1870	103.5	63.5	101	62.3	95	58	83.5	43.3	70	20.6	65	21
Cleveland, Ohio	Nov. 1, 1870	93	56	98.7	50.8	98	49.8	83	36.8	72	15.1	61.5	16.8
Columbus, Ohio	July 1, 1878	103	60	98	56	98	50	84	39	72	15	63	17
Concho, Tex	Oct. 10, 1875	105	66	103	65	98	51	88	40	84	25	74	23
Corsicana, Tex	Sept. 15, 1874	108	69	106	73	99	49	92	47	(a)			
Davenport, Iowa	May 24, 1871	94	57	96.3	53.5	94	46	79	37	65	6	55	12

APPENDIX 27.—*Maximum and minimum temperatures at stations of observation of the Signal Service, &c.*—Continued.

Stations.	Station established.	1881.											
		July.		August.		September.		October.		November.		December.	
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
		°	°	°	°	°	°	°	°	°	°	°	°
Dayton, Wash	July 1, 1879	99	37.4	96	38.4	91.3	29	71	19	57	5	59.8	11.5
Deadwood, Dak	Nov. 1, 1878	102	44	101	43	91	29	73	17	60	−2	58	6
Decatur, Tex	Feb. 1, 1876	105	70	107	71	100	49	90	48	78	27	73	28
Delaware Breakwater, Del	Jan. 28, 1880	90	60	93	60	93	63	84	47	73	26	69	22
Denison, Tex	Dec. 16, 1874	109	68	107	74	103	48	89	44	78.3	24.4	72.5	32
Denver, Col	Nov. 19, 1871	99	57	95.8	53.1	88	37	81.7	28	66	10.5	67	18
Des Moines, Iowa	Aug. 1, 1878	98.5	56	103	57	93	40	83	32	60	6	56	10
Detroit, Mich	Nov. 1, 1870	95.2	54.5	98.8	52.6	94	50	75.2	36.8	66	18.8	59.8	23.9
Dodge City, Kans	Sept. 15, 1874	103.7	57.7	101.6	62.3	99.3	38.9	89	29.3	68.7	13.3	72	17
Dubuque, Iowa	July 10, 1873	93.2	57.2	97.3	51	94.2	42.5	80	35.5	62.2	5.5	49.2	7.8
Duluth, Minn	Nov. 1, 1870	95	54	93	52	76	41	72	26	54	−2	47	−6
Eagle Pass, Texas	Jan. 19, 1875	112	73	108.1	72.1	103.5	59	91	53	82.7	35	78.4	28.1
Eagle Rock, Idaho	Dec. 3, 1880	96	35	101	35	86	17	78	9	52	−1	40	−10
Eastport, Me	Apr. 1, 1873	77	49	82	51	81	41	70	24	56	3	52	Zero.
El Paso, Tex	Nov. 5, 1877	104.3	60	98.3	58	99.1	48.2	93.1	34.2	76.1	21.4	74.8	17.7
Erie, Pa	May 25, 1873	92	60	93	57	92	53	81	36	72	17	61	19
Escanaba, Mich	May 24, 1871	90	53	85	42	79	43	70	25	52	9	43	4
Florence, Ariz	Nov. 12, 1874	112	64	110	62	103.9	50.2	98.4	36.7	80.3	26.8	81.6	28 8
Fort Alexander, Alaska	Aug. 1, 1881	.....	.....	69.5	46	63	34	65	27	47	2	40	−29
Fort Apache, Ariz	Oct. 9, 1877	102.5	55	89.5	48	87	38	83	26	68	13	70	13
Fort Assinniboine, Mont	Oct. 6, 1879	94	35	95	37	79	31	58	−16	53	−18	56	−3
Fort Bennett, Dak	Dec. 22, 1879	101	50	104	49	91	34	72	24	65	−3	62	4
Fort Benton, Mont	Oct. 11, 1879	107	47	108	34	95	32	61	−6	63	−14	67	−3
Fort Buford, Dak	Oct. 23, 1878	104	43	102	43	87	28	70	9	58	−20	51	−20
Fort Custer, Mont	Dec. 5, 1878	103	45	100	41	88	33	68	12	60	−7	61	Zero.
Fort Davis, Tex	Dec. 24, 1877	110	53	97	56	(*b*)	(*b*)	90	36	(*b*)	(*b*)	80	16
Fort Elliott, Tex	Nov. 29, 1879	102	55	101	63	98	42	87	33	71	13	68	18
Fort Gibson, Ind. T	Apr. 1, 1873	105	63	105.6	64.6	104.5	32	88.4	38.1	74.1	18.5	72.8	25.1
Fort Grant, Ariz	Nov. 1, 1875	(*b*)	62	(*b*)	58	(*b*)	47	(*b*)	(*b*)	(*b*)	23	60.5	25 -
Fort Griffin, Tex	July 1, 1875	106.8	72	106.6	69.4	102	53	91.3	45.1	86	24	78.5	25.5
Fort Keogh, Mont	Nov. 18, 1878	109	48	103	47	93	32	73	13	60	−3	57	1
Fort McKavett, Tex	Oct. 19, 1875	103.8	68.5	103	65.8	97.7	48.5	86.8	42.2	78	22.7	74.2	20
Fort Macon, N. C	May 23, 1878	88	65	87	63	87	64	87	53	77	28	69	30
Fort Missoula, Mont	Dec. 15, 1879	95	38	100	33	80	23	61	7	53	Zero.	45	−10
Fort Shaw, Mont	Apr. 1, 1880	96	39	99	40	81	30	59	−2	57.5	−17.5	53	3
Fort Sill, Ind. T	June 23, 1875	106	64	105	67	100	45.5	88	41	75.5	22	71.5	27.8
Fort Stevenson, Dak	Sept. 10, 1878	101	44	95	45	89	28	66	16	56	−21	51	−13

Fort Saint Michaels, Alaska	*June 28, 1874*	*74*	*33*	*65*	*43*	*62*	*33*	*60*	*20*	*40*	*− 3*	*35*	*−35*
Fort Verde, Ariz	*Nov. 9, 1874*	*114*	*61*	*104.1*	*52.3*	*95.2*	*34*	*95*	*27.3*	*73.1*	*14.9*	*68.8*	*17.7*
Fredericksburg, Tex	*Mar. 14, 1876*	98	68	100	68	93	52	89	43	80	28	79	27
Galveston, Tex	Apr. 19, 1871	92	70	93	73.5	91	66	87	59	79.4	36	75	42
Grand Haven, Mich	May 24, 1871	87	56.5	92	53	85	50	71.5	35	58	20	49	21
Hatteras, N. C	Dec. 1, 1880	92	63	92	64	90	67	90	54	78	32	68	30
Helena, Mont	Oct. 15, 1879	89	45	93	42	78	35	61	10	55	−17	47	3
Henrietta, Tex	Feb. 1, 1877	104	70	105	72	100	56	92	42	77	23	75	28
Huron, Dak	July 1, 1881	91.2	53.8	95.6	49	88	33.8	74	21	64.9	− 6	58	− 3.2
Indianapolis, Ind	Feb. 10, 1871	101	57	101	55.5	94.5	48	81	39	63	10	63	14
Indianola, Tex	May 1, 1872	96.1	75.8	93.8	72.1	92.5	64	88	55.3	82.1	36.6	77.8	40.4
Jacksborough, Tex	May 8, 1875	107	67	106	69	101	53	91	45	80	27	77	29
Jacksonville, Fla	Sept. 11, 1871	99	70	96	70	94	69	88	54	83	32	79	41
Keokuk, Iowa	July 16, 1871	97.5	59.4	100.2	55.5	97	47	79.4	38.5	65.3	95	59.5	14.5
Key West, Fla	Nov. 1, 1870	96	76.7	95.4	74	94	73	91.3	72.9	87.5	63	83.1	61
Kittyhawk, N. C	Jan. 15, 1875	99	62	99	62	92	63	90	50	77	27	72	26
Knoxville, Tenn	Jan. 1, 1871	98.6	59.1	100	63	97.1	56	87.3	41.3	80.5	15	63.3	23.3
La Crosse, Wis	Oct. 15, 1872	93	58	96	55	87	46	73	32	60	5	54	1
La Mesilla, N. Mex	June 16, 1876	105.2	62.2	99.7	55	99.8	44.3	91.7	33.7	76.3	23.5	79.7	17.5
Laredo, Tex	Dec. 16, 1875	108	74	104.5	74	(a)	(a)	91	51	85	37	79	32
Leavenworth, Kans	May 21, 1871	100	60	105	63	96	43	86	39	69.5	11	62	17
Lewiston, Idaho	July 1, 1879	103	48	100	47	87	37	67	28	61	18	52.3	23
Little Rock, Ark	July 1, 1879	100	67	102	71	97	47	90	44	71	25	69	34
Los Angeles, Cal	July 1, 1877	96.1	51.2	99.8	52.1	102	50	82.3	43	80.8	34.2	79.3	35.3
Louisville, Ky	Sept. 11, 1871	101	62.5	104.6	63	99	54	86.5	43	74	19	67	19
Lynchburg, Va	May 24, 1871	101.8	62	100	62	98.3	63.2	87.3	43	76.5	23.5	69.8	22
Madison, Wis	Sept. 29, 1878	92	56	95	52	92	46	77	33	59	6	49	6
Marquette, Mich	May 1, 1871	97	45	91	41	80	42	72	27	58	8	48	8
Mason, Tex	Feb. 7, 1876	100	69	100	66	95	50	85	40	79.1	19	73	25
Memphis, Tenn	Feb. 28, 1871	99	67	102	68	98	52	89	44.5	77.5	22	70	31
Milwaukee, Wis	Nov. 1, 1870	92	55	94	52	92	46	75	36	59	7	49	8
Mobile, Ala	Nov. 7, 1870	100.8	69.2	96	68.1	96	58	89	51	81	27	75	36.8
Montgomery, Ala	Nov. 9, 1870	106.9	65	96.8	67.7	96.4	56.9	92	48.7	79.7	24.6	72.4	33.2
Moorhead, Minn	Jan. 1, 1881	95.1	47	92.5	45	83	30	69	17	48	−15	43	− 9
Morgantown, W. Va	Jan. 25, 1873	89.5	55	92.2	51.5	91	50.1	83.5	35.5	76.2	26	68	21.5
Mount Washington, N. H	Dec. 1, 1870	72	32.6	67	35	63.5	28	54	− 3	47.3	−15.5	40.7	−20.5
Nashville, Tenn	Nov. 1, 1870	101.2	60.4	103.2	64.9	98.2	49.6	89	42.8	74.6	21	67.6	26
New Haven, Conn	Dec. 10, 1872	89	54	90	53	100	47	86	28	66	16.5	57.5	12.5
New London, Conn	Jan. 10, 1871	90	58	85	56	92	49	82	31	64	20	58	14
New Orleans, La	Nov. 1, 1870	94.8	73.5	94.2	74.5	92	63	88	57.5	80	31.5	77	40.3
Newport, R. I	Aug. 1, 1875	86.9	57.5	85.1	53.6	88.3	51	77.9	33.8	62.8	20.3	60	15.3
New York, N. Y	Nov. 1, 1870	91	57.5	96	55	100.2	50	88.3	34	68	24	66.2	22
Norfolk, Va	Jan. 1, 1871	102	62	99	61	92	64	89	46	78	27	71	27
North Platte, Nebr	Sept. 18, 1874	104	58	101.5	52	101	29.5	84.3	25	67.3	− 5	59.3	9
Olympia, Wash	July 1, 1877	87	41	84	42	78	39	61	23	57	32	58	26
Omaha, Nebr	Nov. 1, 1870	101.2	58.2	101	59	98.8	36	84.6	31.5	64.3	4.8	59	9.4
Ooglaamie (Point Barrow), Alaska	Oct. 17, 1881	.....	.....	.....	.....	.....	.....	41.7	2.5	30.4	−28	11.5	−52.6
Oswego, N. Y	Nov. 1, 1870	96	56.6	96.8	56.1	93.4	49.8	77.2	32	65.6	13	59	17.2
Palestine, Tex	Dec. 3, 1881	.....	.....	.....	.....	.....	.....	.....	.....	.....	(b)	76	34
Pensacola, Fla	Oct. 27, 1879	97	71	93	69	93	62	89	51	79.2	28.1	74.1	38.3

a Observations discontinued October 31, 1881.

b Record incomplete.

APPENDIX 27.—*Maximum and minimum temperatures at stations of observation of the Signal Service, &c.*—Continued.

Stations.	Station established.	1881.											
		July.		August.		September.		October.		November.		December.	
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
		°	°	°	°	°	°	°	°	°	°	°	°
Philadelphia, Pa	Jan. 1, 1871	94	60	99	59	101.5	54	87	36	69.5	24	69.4	21.5
Phœnix, Ariz	May 9 1877	106.2	65.4	104	59	97	48	93	34	76.8	25.5	77	25
Pike's Peak, Colo	Nov. 1, 1873	62	30	57	29	50	10	44	2	27	−12	27	−11
Ploche, Nev	July 29, 1877	93	49	92	50	88	36	74	25	60	15	65	16
Pittsburg, Pa	Nov. 1, 1870	102.7	57	99.8	53.8	101.6	51	89	35	75.6	17.6	66.7	15.3
Port Eads, La	Apr. 10, 1881	93.1	74.7	90.9	71.1	92.7	68.7	89.1	58.1	80.1	42	76.7	45
Port Huron, Mich	July 25, 1874	93.5	52	96.5	48	97	46.3	77.8	31.2	60	13	53.5	13.8
Portland, Me	Jan. 15, 1871	84.5	54	88.5	53	94.5	50.5	83	30	61	14	57	9
Portland, Oreg	Nov. 1, 1871	90.5	46.3	85.4	46.1	84.2	40.4	63.8	32	58	29	58.2	29.2
Portsmouth, N. C	Apr. 23, 1876	93	64	87	62	88	66	87	53	80	28	70	27
Prescott, Ariz	Nov. 19, 1873	97	51	93	41	88	34	86	21	70	12	70	13
Punta Rassa, Fla	Aug. 15, 1871	92	73	91	70	91	71	89	66	86	46	82.5	48
Red Bluff, Cal	July 1, 1877	103	53	100	52	100	50	81.5	32	75.5	32.5	65	31
Rio Grande City, Tex	May 28, 1875	106	73	104	70	102	59	93	47	89	32	83	30
Rochester, N. Y	Nov. 1, 1870	96	54	96	53	98	46	80	30	70	17	58	16
Roseburg, Oreg	July 15, 1877	90.7	41.5	87.6	43	89	34.6	62.8	22.5	57.8	30.1	62.8	27.2
Sacramento, Cal	July 1, 1877	98.6	51.9	94.6	51	96.1	50	81	36.4	71	32	62	31.9
Saint Louis, Mo	Nov. 1, 1870	104	61.6	106.4	63	101.5	49	85.2	42.8	71.5	15	63.5	14.8
Saint Paul, Minn	Nov. 1, 1870	91	55	96.2	52.4	91	40	71.6	30	57.2	2	52.5	Zero.
Saint Paul's Island, Alaska	Aug. 18, 1872	57	35	56	43	53	38	50	32	43	24	42	12
Saint Vincent, Minn	Sept. 5, 1880	92.5	40	88	36	78	23.5	63	18	47	−18	40	−20
Salt Lake City, Utah	Mar. 22, 1874	96	46	100	48	87	36	82	25	56	13	49	17
San Antonio, Tex	Sept. 22, 1875	101	67	102	69	98	53.5	90	46	84	28	78	32
San Diego, Cal	Nov. 1, 1871	79.5	57.1	81.5	56	85.5	52	72.5	46	75.6	38	76.8	38.7
Sandusky, Ohio	Aug. 2, 1877	95	61	98	59	95.8	53	81.5	40	66.8	17	60	19
Sandy Hook, N. J	Dec. 10, 1873	89.2	63.2	96.2	60.9	101	58	87	39	73	26	68.5	23
San Francisco, Cal	Mar. 8, 1871	83	49	70	52	80	50	72	45	66	44	63	43
Santa Fé, N. Mex	Nov. 20, 1871	93.7	53	83.5	51	81	35	78	27	56	12	(a)	(a)
Savannah, Ga	Jan. 1, 1871	101.5	71	96.5	66	92	67	86	53	80.5	28.5	77	33
Shreveport, La	Sept. 8, 1871	105	66.5	105	68	101	47	94	47	79	23	75	31
Silver City, N. Mex	May 15, 1878	98	57	90	46	88	41	83	30	69	13	72	11
Sitka, Alaska	Mar. 30, 1881	67	43	79	43.9	63.8	40.5	57.8	32	52.8	22.5	44.9	14
Smithville, N. C	Oct. 15, 1875	93	61	89	62	86	60	84	48	76	23	70	31
Spokane Falls, Wash	Feb. 5, 1881	96	43	92	36	83	31	63	18	58	3	50	10
Springfield, Ill	July 1, 1879	99.1	57.1	99.5	54.4	94.7	47	77.1	41.7	64.2	14.5	61.5	15
Springfield, Mass	July 19, 1873	88.6	56.5	91.4	53	94.3	46	86.1	28.8	67.2	13	61.6	11.6
Stockton, Tex	Feb. 26, 1876	102.2	62.8	100.2	63.7	97.2	53	88.3	37	86.7	23	81	20.5

Thatcher's Island, Mass	*Dec. 26, 1875*	*76*	*54*	*81*	*49.4*	*95*	*53.2*	*78*	*28.5*	*60.1*	*15*	*67.4*	*9.5*
Toledo, Ohio	*Nov. 1, 1870*	*95*	*55*	*97*	*55*	*95*	*53*	*78*	*35*	*66*	*18*	*59*	*20.5*
Tucson, Ariz	Dec. 2, 1875	109	68	106	60	105	51	97	38	81	23	82	29
Umatilla, Oreg	July 15, 1877	105.5	46.5	99	43.7	91.3	35.4	68.9	20.5	69.6	20	56	21.4
Unalashka, Alaska	Aug. 18, 1878	72	37	78	43	68	43	62	36	58	28	50	18
Uvalde, Tex	Sept. 6, 1875	104	65	104	67	99	50	93	42	91	28	78	31
Vicksburg, Miss	Sept. 10, 1871	100	62	99	71	98	51	90	45	80	25	75	33
Visalia, Cal	July 1, 1877	104	49	100.7	50	97	44	85	30	75	26.5	68	27.5
Washington, D. C	Nov. 1, 1870	97.6	61.6	101	57.3	104.3	59.8	92.3	37	76.1	21.4	69.6	21.2
West Las Animas, Colo	Oct. 1, 1881	.....	.....	.....	.....	.....	(c)	90	30	63	11	60.9	12
Wickenburg, Ariz	Jan. 6, 1874	(a)	64	(a)	51	(a)	49	(a)	33	(a)	23	(a)	25
Wilmington, N. C	Jan. 1, 1871	96	62	94	62	90	62	87	47	81	26	73	31
Winnemucca, Nev	July 1, 1877	97	40	100	34	90	22	75	11	61	5	47	7
Wood's Holl, Mass	Jan. 1, 1873	84.5	58	81	54	77	53	73	33	67	22	58	15
Yankton, Dak	Apr. 1, 1873	98.5	54	101	52	100	36	76	24	65	— 1	57	4
Yuma, Ariz	Nov. 18, 1873	113.3	71.2	109.6	65.6	107.4	58.8	98.2	47.2	83.4	35.5	79.5	36.8

a Record incomplete.. b Observations commenced December 3, 1882. c Observations commenced October 1, 1882.

APPENDIX 27.—*Maximum and minimum temperatures at stations of observation of the Signal Service, &c.*—Continued.

Stations.	Station established.	1882.												Annual range of temperature.
		January.		February.		March.		April.		May.		June.		
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
		°	°	°	°	°	°	°	°	°	°	°	°	°
Albany, N. Y.	Dec. 22, 1873	48	−14	56	7	58	18	69	25	79	36	90	51	110
Alpena, Mich	Sept. 10, 1872	38	−27	54	2	55	Zero.	60	12	68	25	85	39	119
Atlanta Ga	Sept. 25, 1878	73	22.2	72	31	81	33.5	82.2	42.8	84.2	45	93.2	55.5	75.
Atlantic City, N. J	Dec. 10, 1873	58.6	Zero.	53.7	20.3	65.5	21	71	24.3	82.2	33.7	86.8	50	92
Augusta, Ga	Nov. 2, 1870	75.6	25.5	78	30.7	89.3	37.3	87	45	90	48	97	57	76.8
Baltimore, Md	Jan. 1, 1871	59	7	69	23	69	26	82	29	83	38	97	53	94
Barnegat, N. J	Dec. 10. 1873	54	− 1	52	18	60. 2	20	74	26. 6	75. 8	36	95. 6	52	97
Bismarck, Dak	Sept. 15, 1874	40	−22	60	−24	67	−20	72	17	77	24	89	37	126
Block Island, R. I	Sept. 1, 1880	49	− 4	51. 5	14	51. 4	20	59. 4	29	69	36	81. 5	50	90. 5
Boisé City, Idaho	July 1, 1877	49	3	55	− 5	73	9	73. 5	29	87	38	95	36	106
Boston, Mass	Nov. 1, 1870	52. 5	−13	60	4	61	15	68	19	81. 2	31	94	47. 5	114. 5
Brackettville, Tex	Sept. 1, 1875	77	26	79	34	86	27	95	32	95	52	102	66	76
Brownsville, Tex	Aug. 25, 1875	79	33	82	43	85	48	94	48	92	64	92	67	64
Buffalo, N. Y	Nov. 1, 1870	50. 5	− 5	57. 5	13	56. 9	16	64. 5	19. 4	68. 5	29. 6	83. 1	45. 5	95. 8
Burlington, Vt	May 24, 1871	48. 8	−24. 8	51. 3	− 5. 5	54	3. 5	59. 3	14. 5	75. 7	27. 3	87. 5	44	118. 3
Cairo, Ill	June 1, 1871	64	13	69	28	73	35	82	33	82. 5	47	94	56	90
Campo, Cal	January, 1874	75. 5	6. 5	67. 4	17. 3	84. 8	15. 4	89	27	95	30	97. 2	30. 7	95. 2
Camp Thomas, Ariz	Sept. 22, 1877	66. 5	16. 5	66. 5	21. 5	84. 5	23. 5	91. 5	30	93	40	101. 5	49. 5	92. 5
Cape Henry, Va	Dec. 15, 1873	64	19	74	27	76	33	82	34	88	42	92	52	84
Cape May, N. J	May 24, 1871	52	5	58	23	63	23	66	29	75	34	83	53	82
Castroville, Tex	Sept. 24, 1875	78	30	82	34	87	32	(a)						
Cedar Keys, Fla	Nov. 7, 1879	74	34	76	40. 5	82	47	85	60	90	54	91	68	61
Champaign, Ill	Oct. 13, 1880	60. 8	3. 1	63	12. 3	68. 8	21	78. 8	26	79	32. 6	90. 2	44. 5	96. 4
Charleston, S. C	Jan. 5, 1871	76	26	78	32	85	40	86	46	87	51. 5	97	63	77
Charlotte, N. C	Oct. 6, 1878	67	16. 2	73	25. 5	76	30. 2	83	36	87	45	96. 5	61. 4	84. 3
Chattanooga, Tenn	Jan. 8. 1879	67	21	72	29. 5	82. 5	34	85	41	87	45	94. 5	52	79. 5
Cheyenne, Wyo.	Nov. 1, 1870	60	−11. 8	55. 2	4. 3	69. 2	2. 5	74	15	77. 4	23. 4	88. 6	38. 4	112. 3
Chicago, Ill	Nov. 1, 1870	58. 5	0. 6	62. 2	10. 5	63	21. 8	75. 5	25. 2	75. 8	34. 4	88. 3	41. 8	97. 3
Chincoteague, Va	Mar. 16, 1880	60	8	53	21	72. 2	28	74	30	80	42	92	50. 3	86
Cincinnati, Ohio	Nov. 1, 1870	63	18. 6	63. 8	23. 5	70. 2	31. 2	81. 8	28	82. 8	41	95. 5	52	84. 9
Cleveland, Ohio	Nov. 1, 1870	60	1. 5	58	17. 2	66	22	76. 8	21. 8	74	31	91	46. 2	97. 2
Columbus, Ohio	July 1, 1878	59	11	63	20	69	25	81	23	78	38	91	48	92
Concho, Tex	Oct. 10, 1375	74	18	76	31	89	26	96	29	97	47	110	54	92
Davenport, Iowa	May 24, 1871	58. 2	Zero.	66. 7	6	64. 7	10	78. 2	28	78. 7	33	89. 2	43	96. 3
Dayton, Wash	July 1, 1879	49. 8	Zero.	52. 2	− 4. 5	77. 2	19. 2	73	28. 8	85. 8	30. 2	92. 7	42	103. 5
Deadwood, Dak	Nov. 1, 1878	49	−11	59. 8	−13. 5	78	− 1	76. 8	14	70	30	82	41	115. 5
Decatur, Tex	Feb. 1, 1876	75	16	76	33	84	26	90	38	88	45	102	42	91

Delaware Breakwater, Del	*Jan. 28, 1880*	*58*	*10*	*61*	*24*	*62*	*28*	*72*	*29*	*76*	*42*	*68*	*50*	*83*
Denison, Tex	*Dec. 16, 1874*	*75*	*16*	*74.5*	*29*	*85*	*32*	*94*	*40*	*89*	*46*	*102.5*	*57*	*93*
Denver, Colo	*Nov. 19, 1871*	*67*	*1.2*	*61*	*10.5*	*71*	*10*	*76*	*21*	*78*	*34*	*88.2*	*43*	*97.8*
Des Moines, Iowa	*Aug. 1, 1878*	51	− 1	65	1	74	10	88	31	83	33	92	44	104
Detroit, Mich	Nov. 1, 1870	56.1	8	57.5	20	63.6	23.1	71	24.3	70.5	32.7	86	46.1	90.8
Dodge City, Kans	Sept. 15, 1874	67	Zero.	68.5	6.5	81	13.5	86.7	26	87.1	38.5	100	43	103.7
Dubuque, Iowa	July 10, 1873	52.2	− 5.2	67.2	1.8	61.8	15.3	81.3	25.3	81.8	31	91.2	40.5	102.5
Duluth, Minn	Nov. 1, 1870	47	−24	53	Zero.	50	− 5	67	20	74	27	86	42	119
Eagle Pass, Tex	Jan. 19, 1875	76.5	30.1	87.4	40	90.4	30.6	102.6	40	104.5	57.4	110.2	66	83.9
Eagle Rock, Idaho	Dec. 3, 1880	39	−30	43	−29	59	−16	67	21	80	24	88	34	131
Eastport, Me	April 1, 1873	43	−14	44	− 4.5	45	9.5	53	9	65	29	79	42	96
El Paso, Tex	Nov. 5, 1877	68.2	20.2	71	21	88	26	94	29	99	42	110	52	92.3
Erie, Pa	May 25, 1873	59	− 2	57	20	66	21	74	21	75	32	89	45	95
Escanaba, Mich	May 24, 1871	42	−10	43	2	47	6	58	18	61	20	85.5	37	100
Florence, Ariz	Nov. 12, 1874	79.4	23.7	72.7	27.2	92	25.7	100.6	32.5	(*b*)	.....	.....	.....	.....
Fort Alexander, Alaska	Aug. 1, 1881	40	−18	36	−26	38	− 6	48	8	61	23	78	35	.....
Fort Apache, Ariz	Oct. 9, 1877	67	Zero.	62	11	78	13	86	21	85	32	95	36	102.5
Fort Assinniboine, Mont	Oct. 6, 1879	46	−28	56	−30	67	−13	72	24	76	29	86	40	125
Fort Bennett, Dak	Dec. 22, 1879	55	−18	63	−18	78	− 6	86	27	82	31	90	33	122
Fort Benton, Mont	Oct. 11, 1879	52	−35	62	−33	74	−14	79	24	84	29	90	43	143
Fort Buford, Dak	Oct. 23, 1878	45	−27	57	−24	70	−19	75	20	79	22	91	38	131
Fort Custer, Mont	Dec. 5, 1878	57	−20	60	−14	76	1	80	25	84	33	93	43	123
Fort Davis, Tex	Dec. 24, 1877	72	9	73	22	83	19	93	25	91	44	98	53	.....
Fort Elliott, Tex	Nov. 29, 1879	74	4	72	13	85	18	92	24	90	38	99	44	98
Fort Gibson, Ind. T	April 1, 1873	73.5	13	70.5	22.3	80.4	32.3	85	34.4	88.7	41	(*c*)	.....	.....
Fort Grant, Ariz	Nov. 1, 1875	68	21	62.8	23	79	21	85	32	86	37	94.9	51	.....
Fort Griffin, Tex	July 1, 1875	77	15	79	27	89	25	89	38	(*d*)	.....	.....	.....	.....
Fort Keogh, Mont	Nov. 18, 1878	50	−20	59	−27	76	Zero.	84	26	85	30	96	45	136
Fort McKavett, Tex	Oct. 19, 1875	74.2	18.3	74.1	29.9	88	24.6	90	29	92	45	103	58	85.5
Fort Macon, N. C	May 23, 1878	63	24	70	31	68	33	71	41	83	48	87	57	64
Fort Missoula, Mont	Dec. 15, 1879	42	−31	50	−28	70	− 8	68	19	88	25	91	32	131
Fort Shaw, Mont	April 1, 1880	50	−29	56	−24.5	71	−18	74	14	81	23	88	38	128
Fort Sill, Ind. T	June 23, 1875	73	8	72.5	21.5	86	23	94	37.5	96	44	102	52.5	98
Fort Stevenson, Dak	Sept. 19, 1878	36	−32	52	−35	57	−23	63	10	80	24	89	33	136
Fort Saint Michaels, Alaska	June 28, 1874	38	−16	36	−38	41	−20	44	−18	52	12	66	32	112
Fort Verde, Ariz	Nov. 9, 1874	63.2	6	68.3	18.1	84.9	23.9	92	29.9	93.8	40.1	101.6	48.8	108
Fort Washakie, Wyo	Feb. 15, 1882	.....	(*e*)	56.1	−25.7	74.3	− 3.4	74	18.8	77.2	25	90	32.9	.....
Fredericksburg, Tex	Mar. 14, 1876	75	35	76	35	86	33	90	39	87	54	93	58	73
Galveston, Tex	Apr. 19, 1871	75	37.5	75	46	79	44	82.5	53	87	62	91.5	70	57
Grand Haven, Mich	May 24, 1871	49	3	56.5	17	52	18.5	71	21.5	76	29	83	43	89
Hatteras, N. C	Dec. 1, 1880	64	28	69	33	69	36	74	40	81	47	91	60	64
Helena, Mont	Oct. 15, 1879	45	−15	52	−23	65	− 2	65	26	77	31	82	41	116
Henrietta Tex	Feb. 1, 1877	74	14	70	25	83	24	90	34	97	44	104	57	91
Huron, Dak	July 1, 1881	45.5	−16.2	57.2	−17.8	74.8	− 6	82.2	19.2	76.8	28	89.2	37	113.4
Indianapolis, Ind	Feb. 10, 1871	61.5	7	65	15	70.5	24	80	24	80.5	37	94	45	94
Indianola, Tex	May 1, 1872	76.6	32.1	78.7	43.5	81.1	38.9	86.8	48.6	90	60	93	68.7	64
Jacksborough, Tex	May 8, 1875	75	13	74	27	86	27	93	44	95	43	109	56	96
Jacksonville, Fla	Sept. 11, 1871	78	32	79	38	88	47	85	56	89.5	54	95.5	65	67
Keokuk, Iowa	July 16, 1871	60	4.5	69	11.5	70	19	81.5	27	80.5	36	92	49.5	95.7

a Observations discontinued March 29, 1882.
b Observations discontinued April 30, 1882.
c Observations discontinued May 13, 1882.
d Observations discontinued April 15, 1882.
e Observations commenced February 15, 1882.

APPENDIX 27.—*Maximum and minimum temperatures at stations of observation of the Signal Service, &c.*—Continued.

Stations.	Station established.	1882.												Annual range of temperature.
		January.		February.		March.		April.		May.		June.		
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
		°	°	°	°	°	°	°	°	°	°	°	°	°
Key West, Fla	Nov. 1, 1870	83	57.5	84.8	60.4	86.8	68	88.4	67.6	90.8	68.8	93.2	71.2	38.5
Kittyhawk, N. C	Jan. 15, 1875	65	23	70	29	76	32.5	80.5	37.5	87	44	95.5	57	76
Knoxville, Tenn	Jan. 1, 1871	63.9	18	72.5	24.5	83	28.6	84	36	84.4	41.2	91.4	50	85
La Crosse, Wis	Oct. 15, 1872	45	−11	65	3	60	10	76	21	80	35	85	45	107
La Mesilla, N. Mex	June 16, 1876	71.8	18.2	72.2	20.3	87.3	19.2	94.5	24.5	94.5	39.2	105.3	45.5	87.8
Laredo, Tex	Dec. 16, 1875	80	31	91.8	44	92	44	101	49	101.5	62	105	65	.....
Leavenworth, Kans	May 21, 1871	62	5	69	11	77	15	86	32.5	88.5	40	96	45	100
Lewiston, Idaho	July 1, 1879	51	10.3	54	2.5	78.5	25	78.2	32.8	87.9	39	95.5	46.3	100.5
Little Rock, Ark	July 1, 1879	70	24	77	28	88	39	85	43	87	49	98	55	78
Los Angeles, Cal	July 1, 1877	74.2	33	76.7	32	87.8	35.3	80	40.2	86.1	42.1	87.1	49.6	70
Louisville, Ky	Sept. 11, 1871	65	16	67	20	74.6	30.5	84.5	31	85	44	95	50	88.6
Lynchburg, Va	May 24, 1871	62.2	17	66	25.7	74.8	30.5	84.6	30	85.5	39.5	95	52	84.8
Madison, Wis	Sept. 29, 1878	48	− 8	63	4	62	14	78	22	78	33	87	42	103
Marquette, Mich	May 1, 1871	40	−10	52	7	51	1	66	17	75	23	80	38	107
Mason, Tex	Feb. 7, 1876	76	18	78	28	86.6	27.7	88.8	37	(a)	.....	.....	.....	.....
Memphis, Tenn	Feb. 28, 1871	71	21	76	27	79	38	88	41	90	49	97.5	55	81
Milwaukee, Wis	Nov. 1, 1870	52	− 6	60	9	62	16	72	23	69	31	84	40	100
Mobile, Ala	Nov. 7, 1870	78	32	76	35	82	46.5	89	49	91.5	50.4	100	66.5	73.8
Montgomery, Ala	Nov. 9, 1870	78.5	24.3	79.8	32	86.3	42	85.6	47.6	90	47.9	97.6	60.8	82.6
Moorhead, Minn	Jan. 1, 1881	33	−36	40	−19	50	−20	63	7	76	26	85	35	131.1
Morgantown, W. Va	Jan. 25, 1873	64	8.7	69.5	21.5	72	21.5	77	23	78.5	31	85	44.5	83.5
Mount Washington, N. H	Dec. 1, 1870	34	−39	34.8	−20.5	36.7	−19.5	36.3	−13.2	45.5	4	63	21.4	111
Nashville, Tenn	Nov. 1, 1870	67.6	18.8	72.3	25.2	81.7	32.5	84.1	36.5	87.4	41.5	95.9	49.8	82.2
New Haven, Conn	Dec. 10, 1872	50.5	−12.5	54	7	59	13	71.5	21	76	30.5	90.5	46	112.5
New London, Conn	Jan. 10, 1871	50	−10	55	11	59	17	68	27	72	32	87	47	102
New Orleans, La	Nov. 1, 1870	77.2	41.5	79	39	82.5	53	86	56	88.3	58.5	91.8	67.2	63.3
Newport, R. I	Aug. 1, 1875	49.7	− 7.8	53.3	10	56.7	17.8	62.4	24	75.4	35.3	85.5	48.9	96.1
New York, N. Y	Nov. 1, 1870	50	− 1	62.4	17.5	67.4	20	70	27	78	36	91	52	101.2
Norfolk, Va	Jan. 1, 1871	66	21	71	29	75	32	80	34	88.5	45	96	56	81
North Plate, Nebr	Sept. 18, 1874	54.6	− 7.5	68.3	− 4	76.3	8	82.3	25	87.3	33	88.8	38	111.5
Olympia, Wash	July 1, 1877	51	16	47	13.5	66	26	79	30	83	30	91	41	77.5
Omaha, Nebr	Nov. 1, 1870	50	Zero.	63.8	3.7	77.3	5.1	83.7	31.3	81.1	38.1	93.1	45.7	101.2
Ooglaamie (Point Barrow), Alaska	Oct. 17, 1881	19.6	−45.6	− 4.2	−52.5	22.1	−30.4	31.8	−23.5	36.6	− 1.7	53.3	24.5	.....
Oswego, N. Y	Nov. 1, 1870	52	−13	54	7.7	63	15.2	67.4	22.3	76	32.6	90.5	46.7	109.8
Palestine, Tex	Dec. 3, 1881	72	24	78	35	84	34	86.5	43.5	86	50	96	55	.....
Pensacola, Fla	Oct. 27, 1879	73.6	32.1	73.8	36.8	79.2	46.7	83.7	52	85.7	52.1	90.9	66	68.9
Philadelphia, Pa	Jan. 1, 1871	51.5	0.5	59	18	66	24.5	78	28.5	82.5	40	94	56	101

Phœnix, Ariz	*May*	*9, 1877*	*74.5*	*19*	*72*	*23*	*89.5*	*32*	*104.9*	*36.5*	*102.2*	*50.5*	*109.3*	*54.5*	*90.3*
Pike's Peak, Colo	Nov.	*1, 1873*	26	−22	21	−17	33	24.5	36	− 5	35	4	47	2	86.5
Pioche, Nev	July	29, 1877	58	5	52	6	72	8	76.8	18	79	32.8	85	39	88
Pittsburg, Pa	Nov.	1, 1870	61	1.8	60	19.8	75	22.5	83.3	22.5	81.7	33.5	97	45.6	100.9
Port Eads, La	Apr.	10, 1881	74.5	43.7	76.7	46.3	80.2	57	83	60.4	87	61	92	69.2	51.1
Port Huron, Mich	July	25, 1874	50.5	− 7.1	55	11	57.8	15	68.5	19	70.6	26.2	87.6	41	104.1
Portland, Me	Jan.	15, 1871	46.5	−11.5	51	5	54	17	61.5	20.6	72	35	92.5	50.5	106
Portland, Oreg	Nov.	1, 1871	55.2	26	52.5	18	69.6	29	78	31	85	36.4	94.5	48	76.5
Portsmouth, N. C	Apr.	23, 1876	67	26	69	27	70	36	74	38	81	50	81	59	67
Prescott, Ariz	Nov.	19, 1873	71	− 8	62	5	80	13	85	21	86	33	94	36	105
Provincetown, Mass	Feb.	15, 1882	.....	(*b*)	47	14.4	55	19	64	23	71.5	34	90	45.5	.....
Punta Rassa, Fla	Aug.	15, 1871	80	42	81	49	83.5	57	85	64	90	64	91	68	50
Red Bluff, Cal	July	1, 1877	60.1	27	61.8	26.6	81.8	31.8	86.1	34.9	101.4	42.4	101.6	52.8	76.4
Rio Grande City, Tex	May	28, 1875	83	34	92	38	96	40	107	47	102	63	102.3	64	76
Rochester, N. Y	Nov.	1, 1870	53	− 7	57	10	64	16	73	19	73	29	85	44	105
Roseburg, Oreg	July	15, 1877	53.1	26.2	57.9	15.7	75	27	80.4	31	86.5	34	94.6	43.6	78.9
Sacramento, Cal	July	1, 1877	62	29	62.8	30.9	80	34.1	82.2	40.5	94.6	40	94.6	51.2	69.6
Saint Louis, Mo	Nov.	1, 1870	69	6.2	73.2	19.2	79.3	25	87.2	28.7	89	42	97	48.3	100.2
Saint Paul, Minn	Nov.	1, 1870	42	−11	57	− 5	58	2	82	24	77	32	88	43	107.2
Saint Paul's Island, Alaska	Aug.	18, 1872	98	19	39	3	38	11	42	10	50	19	52	31	54
Saint Vincent, Minn	Sept.	5, 1880	32	−42	42	−35	39	−25	55	− 8	76	21	83	36	134.5
Salt Lake City, Utah	Mar.	22, 1874	47	Zero.	49.5	4	68	11	73	26	83.3	38	91	46	100
San Antonio, Tex	Sept.	22, 1875	77	27	79	36	88	33	93	41	94	57	102	62	75
San Diego, Cal	Nov.	1, 1871	64	34.2	70	37.4	78.6	39	70	43.3	73.2	48.4	75.3	53.2	51.3
Sandusky, Ohio	Aug.	2, 1877	58	7	58.3	19	64.9	22.3	74.7	23.3	75	34.9	90	47	91
Sandy Hook, N. J	Dec.	10, 1873	50	Zero.	58.5	20	58	20	69	27	79	38	91	50.5	101
San Francisco, Cal	Mar.	8, 1871	60	39.5	61	38	73	41	74	44	74	45	68	49	45
Santa Fé, N. Mex	Nov.	20, 1871	59.8	6.8	55	11.3	69.3	9	75.2	18	77.4	32	90.2	42	.....
Savannah, Ga	Jan.	1, 1871	76.5	27	78	32.5	87	41	87	49	91	50	96.5	62	74.5
Shreveport, La	Sept.	3, 1871	74	30	78	33	90	41	93	47	93	49	101	59	82
Silver City, N. Mex	May	15, 1878	65	12	60	12	79	13	85	20	84	34	94	42	87
Sitka, Alaska	Mar.	30, 1881	50.8	8.5	42	4	44.9	5.5	61.8	25.5	69.2	32	69.6	38	75
Smithville, N. C	Oct.	15, 1875	65	20	67	24	71	32	77	40	83	43	92	54	73
Spokane Falls, Wash	Feb.	5, 1881	42	−17	45	−14	68	7	69	29	84	32	94.5	39	113
Springfield, Ill	July	1, 1879	62.5	10	72	17	73	23	82.9	27.8	79.8	40	92.5	48.7	89.5
Springfield, Mass	July	19, 1873	49.7	−12	51.3	3	58.8	14.9	70.6	22	77.4	33	91.3	46.9	106.3
Springfield, Mo	Jan.	3, 1882	68.6	6	72	13	77	24	88.5	36	86	40.5	98.1	46	.....
Stockton, Tex	Feb.	26, 1876	76.3	14.6	81.3	20.9	91.5	23	94	24.2	94.3	41.5	102.2	54.2	87.6
Thatcher's Island, Mass	Dec.	26, 1875	50.2	− 8	49	10	55.5	16.5	66	23	67	32	87	46.5	103
Toledo, Ohio	Nov.	1, 1870	57	9	60	22	64.5	25	78	22	74	32	90	46	88
Tucson, Ariz	Dec.	2, 1875	80	24	74	27	93	27	100	35	100	45	108	51	86
Umatilla, Oreg	July	15, 1877	52.8	4.1	56	4	77	21.2	77.5	30	95.5	34	101	46	101.5
Unalashka, Alaska	Aug.	18, 1878	52	25	51	14	50	20	51	21	60	24	60	36	64
Uvalde, Tex	Sept.	6, 1875	79	38	81	35	88	37	98	38	98	47	101	61	76
Vicksburg, Miss	Sept.	10, 1871	74	30	80	32	84	43	86	47	90	52	99	57	75
Visalia, Cal	July	1, 1877	64	18	65	28.5	84.4	30.5	91.4	34	101	43.5	102.5	52.5	86
Washington, D. C	Nov.	1, 1870	58.5	8.4	61.9	19.7	70.6	23.4	84.2	27.4	86.1	37	95	51.1	95.9
West Las Animas, Colo	Oct.	1, 1881	55.5	4	68	4	77	6	82.5	18	85	36	100	46	.....
Wickenburg, Ariz	Jan.	6, 1874	68	15	67.3	10.8	85.2	22	94.9	31.3	.....	.....	.....	.....	.....

a Observations discontinued April 15, 1882.

b Observations commenced February 15, 1882.

APPENDIX 27.—*Maximum and minimum temperatures at stations of observation of the Signal Service, &c.*—Continued.

Stations.	Station established.	1882.												Annual range of temperature.
		January.		February.		March.		April.		May.		June.		
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
		°	°	°	°	°	°	°	°	°	°	°	°	°
Williamsport, Pa	Jan. 1, 1882	47	− 1	57	20	66	22	72	23	80	32	95	46	
Wilmington, N. C	Jan. 1, 1871	73	24	77	29	82	36	82	42	85.5	47	93.5	58	72
Winnemucca, Nev	July 1, 1877	50	− 4	51	−17	72	− 3	78	18	86	23	92	36	117
Wood's Holl, Mass	Jan. 1, 1873	48	− 8.5	(a)										
Yankton, Dak	Apr. 1, 1873	54	− 6	64	− 7	80	Zero.	86	29	88	35	93	42	108
Yuma, Ariz	Nov. 18, 1873	76.4	27.2	78.1	35.8	91.7	38.9	102.8	43.7	103.5	53.8	108.7	58.2	86.1

a Observations *discontinued* January 31, 1882.

APPENDIX 28.

Table showing the maximum and minimum temperatures and annual range of temperature at the military post hospitals named below, July, 1881, to June, 1882, inclusive.

Stations.	1881.											
	July.		August.		September.		October.		November.		December.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°	°	°
Alcatraz Island, Cal	80	46	68	46	72	48	71	44	74	45	59	41
Angel Island, Cal	88	51	85	51	83	52	77	43	76	43	64	40
Benicia Barracks, Cal	91	57	88	56	95	54	81	43	71	41	61	36
Fort Adams, R. I	91	56	93	53	96	53	81	31	69	20	56	14
Fort Abraham Lincoln, Dak	103	45	98	48	99	30	71	17	58	−15	46	−12
Fort Apache, Ariz	104	63	93	60	89	44	81	28	80	15	70	13
Fort Assinniboine, Mont	100	38	101	39	84	29	62	−17	57	−17	61	− 5
Fort Barrancas, Fla	99	66	96	65	97	55	84	45	85	19	80	25
Fort Bidwell, Cal	95	52	97	49	90	49	79	26	65	22	59	22
Fort Bowie, Ariz	101	68	94	64	95	60	88	46	79	32	77	26
Fort Brady, Mich	86	45	91	41	83	40	72	20	66	− 5	57	− 6
Fort Bridger, Wyo	89	32	86	33	89	15	78	− 3	50	− 7	46	− 9
Fort Brooke, Tampa, Fla	93	74	95	73	98	72	94	58	88	38	87	42
Fort Brown, Tex	97	74	98	71	95	64	91	59	85	37	87	32
Fort Buford, Dak	104	38	103	39	98	23	74	5	60	−21	64	−25
Fort Canby, Wash	70	44	72	44	71	42	65	27	58	29	54	28
Fort Columbus, New York Harbor	94	61	95	58	101	53	88	36	68	24	62	21
Fort Concho, Tex	106	65	102	64	98	59	90	40	86	28	74	23
Fort Davis, Tex	95	43	92	57	91	52	86	38	(a)	(a)	80	16
Fort Douglas, Utah	93	42	95	47	83	34	80	22	50	17	44	12
Fort Ellis, Mont	99	32	102	30	85	21	65	− 1	56	−17	52	− 6
Fort Fetterman, Wyo	103	43	98	46	88	28	75	15	63	− 3	58	− 4
Fort Garland, Colo	90	44	87	34	78	29	74	15	50	− 8	56	− 2
Fort Gaston, Cal	105	41	102	43	97	35	77	26	65	30	63	22
Fort Grant, Ariz	101	46	95	53	92	43	86	32	80	18	78	31
Fort Hale, Dak	94	50	100	54	90	34	81	18	60	− 8	61	3
Fort Hamilton, New York Harbor	93	60	98	55	98	51	87	36	66	24	62	20
Fort Keogh, Mont	105	48	103	46	92	27	67	6	60	−13	57	1
Fort Klamath, Oreg	93	20	89	20	90	16	69	6	58	6	50	− 1
Fort Lapwai, Idaho	106	42	102	39	90	31	73	20	60	15	48	20

Table showing the maximum and minimum temperatures and annual range of temperature at the military post hospitals named below, &c.—Continued.

Stations.	1881.											
	July.		August.		September.		October.		November.		December.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°	°	°
Fort Leavenworth, Kans	99	60	106	63	98	42	89	37	72	8	65	14
Fort Lewis, Colo	95	48	87	43	78	25	75	22	55	− 2	51	10
Fort Lowell, Ariz	111	64	115	50	104	42	105	29	85	20	86	19
Fort Lyon, Colo	104	58	101	63	(a)	(a)	(a)	(a)	66	6	66	2
Fort McDermit, Nev	104	60	104	42	71	33	63	16	51	9	50	12
Fort McDowell, Ariz	111	59	110	46	106	61	103	41	83	16	85	23
Fort Maginnis, Mont	99	37	98	37	81	25	71	7	55	−10	64	− 4
Fort McHenry, Md	94	65	95	62	99	60	89	43	74	23	68	22
Fort Meade, Dak	108	47	107	50	90	31	75	12	67	− 9	61	5
Fort Mohave, Ariz	111	73	112	61	107	57	94	41	78	37	73	32
Fort Monroe, Va	101	63	99	61	90	58	89	49	73	22	69	30
Fort Niagara, N. Y	95	53	95	50	98	49	87	32	71	18	59	19
Fort Pembina, Dak	93	39	89	36	80	23	68	15	47	−21	30	−20
Fort Porter, N. Y	87	54	92	48	89	55	74	28	67	18	53	15
Fort Preble, Me	84	49	88	46	90	42	(a)	(a)	(a)	(a)	54	14
Fort Randall, Dak	97	53	104	50	102	33	77	21	78	− 6	57	4
Fort Ringgold, Tex	113	77	111	75	104	63	99	49	(a)	(a)	85	30
Fort Shaw, Mont	94	39	99	40	81	30	59	2	60	−19	53	3
Fort Sisseton, Dak	89	51	91	48	83	30	71	20	57	−15	45	−11
Fort Snelling, Minn	92	47	96	51	91	33	75	22	55	− 3	52	− 2
Fort Stanton, N. Mex	(a)	(a)	(a)	(a)	85	45	(a)	(a)	66	− 2	70	− 1
Fort Stevens, Oreg	72	43	71	44	68	43	63	32	53	30	55	32
Fort Stevenson, Dak	103	44	96	45	90	27	67	13	58	−22	55	−13
Fort Sully, Dak	104	53	106	52	94	34	76	22	67	− 4	62	5
Fort Totten, Dak	95	52	95	47	83	45	64	14	45	−18	49	−12
Fort Townsend, Wash	80	43	73	44	(a)	(a)	62	28	59	28	56	23
Fort Union, N. Mex	96	45	84	40	84	25	79	18	57	− 5	70	Zero
Fort Verde, Ariz	106	63	99	58	98	46	95	27	73	15	69	18
Fort Wallace, Kans	105	43	102	47	100	29	93	11	(a)	(a)	72	10
Fort Warren, Mass	81	59	88	55	86	55	77	33	64	18	61	14
Fort Washakie, Wyo	(a)	(a)	94	40	86	19	71	6	58	− 5	55	− 9
Fort Wingate, N. Mex	91	54	87	49	86	32	75	25	59	8	60	10
Fort Yates, Dak	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Fort Yuma, Cal	114	81	112	57	110	50	100	38	84	44	80	37
Madison Barracks, N. Y	88	50	94	45	95	39	70	17	68	− 2	54	− 2
McPherson Barracks, Ga	101	58	101	63	95	58	89	45	(a)	(a)	(a)	(a)

Pagosa Springs, Colo	*107*	*49*	*95*	*40*	*84*	*30*	*78*	*16*	*55*	*Zero*	*55*	*— 2*
Plattsburg, N. Y	*91*	*50*	*96*	*47*	*97*	*40*	*72*	*25*	*64*	*Zero*	*51*	*Zero*
Point San José, Cal	78	51	69	52	73	50	68	42	67	43	60	42
Presidio, Cal	89	46	71	40	84	45	77	41	72	36	61	37
Saint Augustine, Fla	98	70	96	68	89	71	87	54	85	33	77	40
West Point, N. Y	97	50	99	50	(a)	(a)	93	22	70	10	(a)	(a)

(a) No reports received.

APPENDIX 28.—*Table showing the maximum and minimum temperatures and annual range of temperature at the military post hospitals, &c.*—Continued.

Stations.	1882.												Annual range.
	January.		February.		March.		April.		May.		June.		
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
	°	°	°	°	°	°	°	°	°	°	°	°	°
Alcatraz Island Cal	66	40	61	40	72	41	72	42	71	32	66	47	48
Angel Island, Cal	66	34	65	31	78	34	80	40	84	49	(a)	(a)	.....
Benicia Barracks, Cal	63	31	59	31	82	37	83	42	94	37	88	53	64
Fort Adams, R. I	50	3	53	8	64	10	62	26	70	33	93	45	93
Fort Abraham Lincoln, Dak	42	—24	50	—25	66	—21	72	15	73	22	85	37	128
Fort Apache, Ariz	72	3	62	18	84	22	89	27	82	34	90	50	101
Fort Assininiboine, Mont	50	—30	59	—31	61	—16	78	21	82	29	92	38	132
Fort Barrancas, Fla	80	22	78	26	83	41	84	50	90	47	95	61	80
Fort Bidwell, Cal	60	5	50	—12	64	21	75	30	82	28	85	36	109
Fort Bowie, Ariz	71	25	70	27	85	30	89	40	87	46	99	59	76
Fort Brady, Mich	46	—34	55	—11	45	—12	63	11	67	21	(a)	(a)	.....
Fort Bridger, Wyo	52	—22	47	—14	61	—16	73	12	71	19	80	28	111
Fort Brooke, Tampa, Fla	84	37	84	43	85	52	86	64	95	63	95	70	61
Fort Brown, Tex	81	47	84	43	84	48	95	53	92	65	92	67	66
Fort Buford, Dak	46	—39	56	—33	73	—19	85	18	84	27	94	39	143
Fort Canby, Wash	52	26	51	22	64	22	80	31	76	35	85	40	63
Fort Columbus, New York Harbor	49	— 3	58	14	64	18	70	27	78	39	90	50	104
Fort Concho, Tex	73	18	84	31	89	27	97	30	94	52	107	57	89
Fort Davis, Tex	72	9	73	22	83	19	93	25	91	44	98	53	.....
Fort Douglas, Utah	45	1	46	3	60	20	[illegible]	26	83	31	93	44	94
Fort Ellis, Mont	41	—18	58	—29	50	—10		10	77	25	(a)	(a)	.....
Fort Fetterman, Wyo	58	—20	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Fort Garland, Colo	40	—15	49	—18	66	— 7	70	3	71	25	83	30	108
Fort Gaston, Cal	56	23	58	20	84	29	87	32	103	33	103	42	85
Fort Grant, Ariz	74	16	70	20	82	20	83	32	92	33	95	51	83
Fort Hale, Dak	48	—19	63	—14	68	— 6	88	25	82	31	89	37	119
Fort Hamilton, New York Harbor	52	— 2	54	15	57	17	75	25	77	36	93	47	100
Fort Keogh, Mont	50	—37	59	—27	75	Zero	84	26	85	30	96	45	142
Fort Klamath, Oreg	46	—10	40	—25	59	—10	74	7	87	14	(a)	(a)	.....
Fort Lapwai, Idaho	43	2	52	Zero	80	21	82	29	86	35	97	42	106
Fort Leavenworth, Kans	57	— 2	70	10	80	15	88	31	90	40	98	43	108
Fort Lewis, Colo	55	— 3	50	Z ro	66	— 7	69	12	74	22	85	32	102
Fort Lowell, Ariz	85	13	76	21	90	21	98	29	98	40	107	47	102
Fort Lyon, Colo	63	—17	69	3	77	5	86	16	83	34	100	44	.....
Fort McDermit, Nev	53	5	52	— 8	75	10	83	18	80	30	94	40	112
Fort McDowell, Ariz	84	15	79	22	94	22	102	31	100	41	107	51	96
Fort Maginnis, Mont	47	—18	59	—20	68	— 4	70	21	72	25	83	31	119

Fort McHenry, Md	50	10	59	20	68	24	79	27	83	39	92	53	89
Fort Meade, Dak	55	—14	62	—18	71	1	81	18	78	25	84	39	126
Fort Mohave, Ariz	68	25	71	31	90	37	99	45	103	49	108	61	.....
Fort Monroe, Va	58	17	69	26	73	30	77	32	81	46	92	57	84
Fort Niagara, N. Y	56	— 3	53	12	60	17	68	20	77	32	87	45	101
Fort Pembina, Dak	30	—40	40	—34	41	—24	58	— 6	77	23	85	36	133
Fort Porter, N. Y	49	— 6	57	13	54	16	64	21	69	28	85	47	98
Fort Preble, Me	46	—10	48	6	47	15	59	25	77	36	88	52	.....
Fort Randall, Dak	57	— 8	70	— 8	85	— 1	86	25	91	33	90	41	112
Fort Ringgold, Tex	86	36	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Fort Shaw, Mont	50	—29	57	—25	72	—19	74	14	81	23	88	38	128
Fort Sisseton, Dak	37	—26	51	—23	60	—14	76	6	73	25	80	37	117
Fort Snelling, Minn	41	—16	58	—14	58	— 7	80	21	76	25	87	37	112
Fort Stanton, N. Mex	69	—10	(a)	(a)	76	4	80	5	(a)	(a)	(a)	(a)	.....
Fort Stevens, Oreg	50	27	50	24	61	28	70	33	75	36	81	36	57
Fort Stevenson, Dak	38	—30	54	—37	57	—30	66	14	79	24	89	33	140
Fort Sully, Dak	53	—16	66	—18	78	— 6	88	28	85	32	91	39	124
Fort Totten, Dak	30	—31	42	—25	43	—20	62	2	78	25	85	40	126
Fort Townsend, Wash	52	16	51	3	62	24	75	30	76	32	82	40	.....
Fort Union, N. Mex	66	—11	60	Zero	74	—12	(a)	(a)	79	23	91	32	.....
Fort Verde, Ariz	63	6	68	18	85	24	92	36	94	40	102	49	100
Fort Wallace, Kans	64	—15	71	— 5	78	5	87	18	(a)	(a)	(a)	(a)	(a)
Fort Warren, Mass	46	— 9	49	7	52	18	62	26	71	36	86	48	97
Fort Washakie, Wyo	52	—36	56	—28	73	— 4	74	18	72	26	90	40	.....
Fort Wingate, N. Mex	53	5	52	3	69	6	73	18	75	30	85	38	88
Fort Yates, Dak	46	—28	56	—30	54	—20	78	21	81	18	92	34	.....
Fort Yuma, Cal	80	28	78	25	94	42	104	48	104	54	109	58	89
Jefferson Barracks, Mo	68	— 1	73	19	79	24	88	29	89	34	97	43	.....
Madison Barracks, N. Y	47	—20	53	— 1	58	8	64	22	69	26	83	41	115
Pagosa Springs, Colo	52	—20	56	—10	80	— 8	79	22	85	30	(a)	(a)	.....
Plattsburg, N. Y	45	—23	51	— 3	52	5	58	11	72	25	89	43	.....
Point San José, Cal	60	37	61	36	70	40	75	46	74	49	69	52	42
Presidio, Cal	64	32	62	33	79	35	80	39	79	40	69	45	57
Saint Augustine, Fla	81	31	79	38	85	45	88	58	89	56	94	63	67
West Point, N. Y	52	—20	(a)	(a)	65	10	73	19	88	30	97	44	.....

a No report received.

APPENDIX 29.

Maximum and minimum temperatures and annual range of temperature at the voluntary stations of the Signal Service, United States Army, July, 1881, to June, 1882, inclusive.

Stations.	1881.											
	July.		August.		September.		October.		November.		December.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°	°	°
Accotink, Va	98	66	100	64	104	61	91	36	76	21	72	26
Aiken, S. C	100	64	(a)	(a)	95	65	88	45	80	22	75	28
Albany, Oreg	86	54	86	57	80	39	64	30	56	28	56	22
Ames, Iowa	86.3	68.1	87	68	83	47	72	38	52	9	41	7
Amherst, Mass	87.2	59.2	91	57	94	49	80	29	67	14	61	9
Anna, Ill	100	67	109	71	102	60	90	45	70	19	64	20
Ardenia, Phillipstown, N. Y	90	60	94	60	99	55	87	30	63	23	64	10
Argyle, N. Y	93	59	93	55	92	47	74	23	60	6	55	5
Ashland, Wis	92	56	92	56	78	46	60	30	52	8	(a)	(a)
Ashwood, Tenn	102	62	106	66	100	52	87	42	78	17	68	28
Atco, N. J	96	56	100	54	104	53	88	27	71	19	70	14
Atlantic City, N. J	92	58	90	54	89	58	84	38	70	22	62	22
Auburn, Ala	100	66	94	67	93	57	87	44	77	19	72	28
Auburn, N. H	98	44	98	52	95	48	88	26	64	14	48	6
Austin, Tenn	102	72	106	70	98	54	88	42	76	18	68	25
Austin, Tex	99	68	97	75	94	57	87	45	80	26	76	30
Bainbridge Island, Wash	84	46	80	46	80	42	64	27	55	34	56	28
Battle Creek, Mich	90	68	(a)	(a)	94	59	75	33	58	13	55	19
Bellefontaine, Ohio	103	60	104	61.5	97	52	82	34	68.5	11	59	13
Beloit, Wis	93	54	97	49	94	42	78	34	60	5	45.5	3
Bethel, Ohio	103	65	103	62	99	50	83	36	69	13	54	15
Blackfeet Agency, Mont	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	52	5
Blooming Grove, Pa	92	59	100	57	100	50	89	26	67	17	58	10
Bowling Green, Ky	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	75	15	66	21
Brook Haven, N. Y	88	59	86	56	97	48	82	24	58	24	58	12
Carson City, Nev	98	37.5	97.5	34.5	91.5	27.5	78	20	68	Zero	56	15
Catawissa, Pa	91.5	54	96	50	98.5	49	87	30	70	19	63	18
Centralia, Ill	101	62	(a)	(a)	(a)	(a)	(a)	(a)	67	16	(a)	(a)
Chambersburg, Pa	96	60	98	52	98	53	87	31	65	24	65	20
Charleston, Ill	103	59	108	64	102	54	84	41	66	16	61	16
Charlotte, Vt	99	56	102	54	92	50	75	30	68	6	51	6
Cincinnati, Ohio	103	62	100	61	98	53	85	40	72	16	63	19
Clarksville, Tex	105	75	107	77	102	58	91	48	77	30	74	34
Clay Centre, Kans	109	62	114	63	109	34	94	30	73	4	70	14

Clear Creek, Nebr	*98*	*59*	*102*	*60*	*103*	*36*	*89*	*29*	*62*	*2*	*56*	*9*
Cleveland, Ohio	93	62	97	55	94	53	82	37	71	20	60	21
Clinton, Iowa	96.5	51	102	48	99	39	85	31	61	1.5	49	6
Coalville, Utah	94	39	93	30	81	26	71	13	(a)	(a)	(a)	(a)
Coldwater (State School), Mich	95	56	96	(a)	94	54	76	36	62	7	58	16
College Hill, Ohio	109	65	102	62	102	56	85	40	66	18	60	24
Columbia, S. C	100	70	95	67	95	66	88	47	79	24	74	28
Contoocookville, N. H	93	58	93	56	95	48	87	27	67	8	62	7
Cooperstown, N. Y	89	55	90	48	92	46	76	25	60	5	51	8
Cornell University, Ithaca, N. Y	95	53	95.5	48	96	49	79	26	68	14	58	12
Corning, Mo	101	62	101	65	98	44	89	33	70	8	61	18
Cornish, Me	92	56	90	54	88	46	82	22	60	6	60	4
Council Grove, Kans	(a)	(a)	(a)	(a)	(a)	(a)	91	32	(a)	(a)	(a)	(a)
Cresco, Iowa	90	58	98	54	89	46	72	26	54	— 1	46	Zero
Cumberland, Md	90	60	90	56	96	54	82	36	66	22	58	22
Des Moines, Iowa	100	63	(a)	(a)	98	44	86	33	61	5	56	10
De Soto, Nebr	97	57	100	63	99	36	85	29	65	2	54	9
Dexter, Me	(a)	(a)	(a)	(a)	86	36	74	22	60	— 4	48	— 3
Distributing Reservoir, D. C	97	63	96	60	97	58	87	33	72	22	71	21
Dyberry, Pa	94	47	92	43	95	40	84	20	69	8	56	12
Edgerton, Wis	(a)	(a)	103	53	98	42	82	39	58	7	55	9
Elmira, Ill	96	61	98	57	96	43	82	29	59	3	48	4
Elsworth, N. C	94	55	94	56	90	56	82	38	70	14	(a)	(a)
Embarrass, Wis	95	54	96	50	90	45	70	26	62	5	52	Zero
Emporia, Kans	99	57	98	63	100	36	86	35	71	9	65	16
Eola, Oreg	90	49	85	49	84	47	63	30	56	22	57	25
Fall River, Mass	86	55	84	51	93	45	80	28	65	16	58	12
Fallsington, Pa	92.5	65.5	97	62	103	55	88	31	64	25	63	22
Fallston, Md	93	62	(a)	(a)	102	60	90	32	70	19	74	21
Fayette, Miss	98	71	100	68	98	48	88	46	77	22	73	32
Flushing, N. Y	90	64	88	61	87	56	83	36	67	25	60	18
Forsyth, Ga	106	70	101	72	100	68	93	52	82	26	78	30
Fort Madison, Iowa	100	65	100	60	98	47	86	33	65	6	55	9
Fort Scott, Kans	104	61	95.5	64.2	105	37	92	40	76	8	72	22
Fort Wayne, Ind	(a)	(a)	93	58	95	50	78	41	60	18	60	22
Federalsburg, Md	(a)	(a)	(a)	(a)	(a)	(a)	90	29	77	20	71	13
Franklin, Ark	(a)	(a)	(a)	(a)	98	41	88	40	(a)	(a)	(a)	(a)
Franklin, N. C	91	53	90	58	87	55	(a)	(a)	(a)	(a)	(a)	(a)
Franklin, Pa	94	44	94	44	98	38	76	25	62	14	50	10
Franklin, Wis	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	59	9	43	2
Freehold, N. J	90.2	56	96	54	102	46	85	31	69	20	68	17
Friendship, N. Y	93	57	93	48	94	40	79	22	68	10	54	11
Gardiner, Me	83	49	87	50	86	38	79	25	59	8	47	4
Geneseo, Ill	94	58	99	56	97	47	83	36	75	6	49	7
Genoa, Nebr	94	59	101	60	103	40	78	28	65	— 2	54	6
Germantown, Pa	91	65	98	62	102	50	85	33	68	23	66	22
Golconda, Ill	104	68	(a)	(a)	99	55	90	43	70	18	(a)	(a)
Grafton, N. H	93	50	93	48	90	43	81	24	60	20	52	— 2
Grayville, Ill	100	60	(a)	(a)	(a)	(a)	80	44	72	18	(a)	(a)
Great Falls, Md	90	65	94	59	100	57	88	33	68	21	70	14

a No report.

APPENDIX 29—*Maximum and minimum temperatures and annual range of temperature at the voluntary stations of the Signal Service, &c.*—Continued.

Stations.	1881.											
	July.		August.		September.		October.		November.		December.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°	°	°
Greensborough, N. C	100	68	99	63	92	67	88	44	78	23	66	25
Green Springs, Ala	103	68	94	69	98	56	84	48	73	29	63	33
Guttenberg, Iowa	98	56	102	52	96	38	76	28	60	4	48	4
Heath, Mass	90	50	91	54	(a)	(a)	80	20	52	4	56	1
Helvetia, West Va	92	49	92	50	94	44	82	31	74	14	60	15
Hermosa, Colo	102	52	93	48	82	33	(a)	(a)	(a)	(a)	(a)	(a)
Highlands, N. C	85	52	86	53	82	59	77	37	70	8	64	12
Holton, Kans	104	63	110	64	102	45	88	34	70	7	65	20
Houston, Fla	100	70	100	72	95	70	95	60	(a)	(a)	(a)	(a)
Howard, Nebr	107	57	108	63	99	44	(a)	(a)	(a)	(a)	(a)	(a)
Hudson, Ohio	97.4	61.4	95	58	97	52	80	36	69	17	59	18
Independence, Kans	104	65	108	71	105	40	93	40	74	12	73	23
Independence, Iowa	87	56	95	51	88	44	77	31	58	4	45	6
Jacksonburg, Ohio	104	60	104	58	100	52	86	40	66	12	58	16
Johnsontown, Va	97	68	99	65	93	62	90	43	79	29	73	20
Johnstown, N. Y	92.5	43	93	42	93	40	79	22	65	5	57	2
Kalamazoo, Mich	95	55	98	52	96	48	75	32	62	9	55	15
Laconia, Ind	101	57	105	57	101	46	86	35	73	15	65	18
Lansing, Mich	97	56	100	49	99	47	77	32	67	13	57	15
Lawrence, Kans	102	57.5	104	62	99	42.5	91	40	72	11	63	18
Lenoir, N. C	98	58	94	64	92	62	83	38	75	17	66	20
Lincoln, Nebr	109	54	112	68	100	40	(a)	(a)	74	8	60	9
Litchfield, Mich	83.5	61.2	98	53	81	60	62	29	60	16	49.8	23
Little Mountain, Ohio	96	58	96	60	97	56	76	38	(a)	(a)	(a)	(a)
Logan, Iowa	98	60	103	60	98	40	86	30	64	2	50	10
Logansport, Ind	102	56	104	56	96	44	84	38	68	15	62	16
Lunenburg, Vt	90	54	88	51	87	39	68	23	62	— 4	48	Zero
Manhattan, Kans	103	64	105	65	101	40	88	32	68	7	65	16
Manitowoc, Wis	93	60	95	53	77	48	70	32	63	10	47	12
Margaretta Township, Ohio	88.3	70.2	88	59	86	64	74	43	61	23	58	22
Mayport, Fla	100	76	97	73	88	75	86	59	84	34	80	37
Mazatlan, Mexico	92	68	92	69	91	70	91	65	86	61	82.5	53
McDonough Institute, Owing's Mills, Md	91	60	90	55	94	56	83	31	70	20	(a)	(a)
McGill College, Montreal, Can	93.9	53.7	91	52	87	42	72	26	63	— 5.5	44	— 1
Meadville, Pa	98	63	(a)	(a)	(a)	(a)	(a)	(a)	70	16	61	16
Mendon, Mass	85	59	88	55	92	53	83	30	65	12	63	10
Milton, Mass	86	54	(a)	(a)	(a)	(a)	80	29	63	14	60	9
Milton, Pa	104	56	115	46	105	46	95	26	75	28	55	14

Minneapolis, Minn	91	59	94	58	88	39	74	25	54	− 2	44	− 3
Mission House, Wis	97	55.4	97	52	91.5	49.1	75	32	(a)	(a)	(a)	(a)
Monticello, Iowa	93	55	95	52	93	42	81	34	61	5	40	10
Moorestown, N. J	94	65	98	59	103	52	90	31	71	26	69	21
Morrison, Ill	95	56	101	48	98	46	83	32	64	6	48	8
Morriston, Dak	100	65	100	60	98	40	86	20	70	− 1	60	Zero
Mount Forest, Ontario, Can	89	46	95.5	48	94	43	74	23	61	7	51	11
Mount Ida, Ark	98	50	100	68	88	34	90	32	80	16	68	22
Mount Saint Mary's College, Emmittsburg, Md	93	60	95	58	(a)	(a)	86	36	72	18	70	21
Murfreesborough, Tenn	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	74	18	67	27
Murphy, N. C	95	55	95	57	90	55	83	45	75	12	63	20
Muscatine, Iowa	97	53	104	51	103	42	83	32	61	6	50	9
Neillsville, Wis	92	50	101	49	87	34	73	24	59	− 2	56	− 4
New Athens, Ohio	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	62	15
New Bedford, Mass	83	58	85	54	93	54	79	30	68	16	57	10
New Castle, Pa	100	52	97	50	97	47	80	32	70	17	60	17
New Corydon, Ind	98	61	99	58	95	50	81	38	66	16	64	20
New Harmony, Ind	97	57	103	58	93	50	84	40	66	18	58	19
New Market, N. H	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Newport, Vt	96	54	93	49	91	42	70	22	60	− 7	50	Zero
New Tacoma, Wash	89	52	80	58	70	50	62	40	(a)	(a)	(a)	(a)
New Ulm, Tex	88.5	76.3	(a)	(a)	95	68	90	56	73	37	72	45
Niles, Mich	95	57	96	52	96	51	75	33	60	10	58	7
Nora Springs, Iowa	92	50	95	50	91	37	74	29	58	2	56	− 10
Northfield, Minn	(a)	(a)	93	48	91	35	69	25	(a)	(a)	44	1
North Lewisburg, Ohio	98	56	96	52	94	48	78	35	64	12	58	18
Northport, Mich	90	54	93	60	86	50	68	33	63	18	52	18
North Volney, N. Y	93	60	(a)	(a)	97	45	73	25	61	7	55	13
Oakland, Cal	(a)	(a)	74	53	84	18	74	34	69	31	60	34
Olivet, Dak	100	50	97	60	97	36	76	28	70	− 2	62	Zero
Oregon, Mo	98.5	57.5	(a)	(a)	96	37	88	35	70	5	(a)	(a)
Orono, State College, Me	88	50.7	91	48	86	33	74	23	59	3	55	Zero
Palermo, N. Y	91	58	94	55	95	43	70	25	60	4	53	11
Paramaribo, colony of Surinam, South America	89	75	90	74	92	75	92	74	92	74	86	74
Paterson, N. J	92	66	95	60	98	56	84	31	64	24	57	16
Peoria, Ill	101	57	101	58	98	44	81	37	65	9	57	12
Philadelphia, Pa. (2014 Vine street)	96	69	98	66	102	61	88	43	71	28	69	27
Philadelphia, Pa	(a)	(a)	(a)	(a)	(a)	(a)	90	40	71	25	(a)	(a)
Phillipsburg, N. J	(a)	(a)	(a)	(a)	(a)	(a)	88	34	59	22	59	21
Pierce City, Mo	101	54	105	61	100	34	90	39	71	10	70	19
Point Pleasant, La	102	70	104	73	104	52	(a)	(a)	81	24	(a)	(a)
Port Angeles, Wash	72	52	72	52	68	48	58	35	56	36	50	32
Port Jervis, N. Y	90	56	95	51	97	47	86	29	60	16	53	17
Portsmouth, Ohio	98	62	93	57	95	49	86	37	80	15	73	17
Poway, Cal	97	56	97	58	101	54	81	42	84	31	82	31
Princeton, Cal	101	54	98	46	102	48	85	33	75	26	62	28
Princeton, Mass	83.6	53.1	88	51	78.6	54.7	81	24	62	10	57	4
Princeton, N. J	(a)	(a)	(a)	(a)	(a)	(a)	88	32	68	23	68	19
Protem, Mo	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	73	15	69	24
Quitman, Ga	99	(a)	97	(a)	(a)	(a)	(a)	(a)	83	28	77	33

a No report.

APPENDIX 29.—*Maximum and minimum temperatures and annual range of temperature at the voluntary stations of the Signal Service, &c.*—Continued.

Stations.	1881.											
	July.		August.		September.		October.		November.		December.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°	°	°
Receiving Reservoir, D. C	95	63	97	59	(a)	(a)	(a)	(a)	72	20	73	18
Riley, Ill	93.5	54	97	50	93	42	76	32	59	6	48	5
Rio Vista, Cal	98	52	96	53	94	49	78	36	72	28	61	30
Rising Sun, Ind	(a)	(a)	98	64	94	53	88	44	67	16	61	17
Rock Creek, D. C	98	70	100	65	103	64	91	36	74	22	72	20
Rockford, Ill	93	60	94	51	92	47	72	35	59	7	46	5
Rowe, Mass	86	50	90	48	89	46	80	22	67	8	50	4
Ruggles, Ohio	100	63	99	54	98	48	82	38	68	14	60	16
Saint Helena, Mount, Cal	(a)	(a)	(a)	(a)	93	40	(a)	(a)	71	30	(a)	(a)
Saint Louis, Mo*	101.2	61	104	63	101	49	(a)	(a)	71	15	(a)	(a)
Saint Louis, Mo	(a)	(a).4	(a)	(a)	(a)	(a)	(a)	(a)	68	16	63	14
Saint Marie, Ill	102	62	(a)	(a)	98	46	85	35	66	16	(a)	(a)
Saint Meinrad, Ind	100	68	104	68	95	47	84	37	66	18	64	16
Salinas City, Cal	86	52	70	51	78	45	70	31	74	29	71	33
San Buenaventura, Cal	70	58	(a)	(a)	79	55	(a)	(a)	(a)	(a)	73	43
Sandy Springs, Md	95	61	94	56	98	57	87	32	71	20	69	21
San Gorgonio, Cal	94	56	98	41	92	42	(a)	(a)	(a)	(a)	78	30
Santa Barbara, Cal	87	57	84	56	80	53	73	45	73	36	72	38
Snowville, Va	102	50	100	49	100	48	85	31	71	13	68	14
Somerset, Mass	96	52	91	54	99	52	86	26	70	12	59	6
Somerville, N. J	(a)	(a)	95	60	102	52	86	29	70	22	63	6
Southington, Conn	85	57	73	56	100	47	86	22	70	13	61	8
South Lee, Mass	87	49	90	51	90	45	81	23	65	6	56	8
South Orange, N. J	93	62	99	60	103	54	90	29	70	22	66	15
Spiceland, Ind	100	53	101	52	95	45	(a)	(a)	63	10	59	14
Springfield, Mass	90	56	92	53	97	46	89	28	67	12	60	9
State Agricultural College, New Brunswick, N. J	90	60	99	60	103	59	89	35	69	22	57	19
Stateburg, S. C	103	64	93	64	92	65	88	46	80	26	72	28
Strafford, Vt	96	55	94	54	88	46	74	26	58	5	50	Zero
Swanwick, Ill	104	66	110	68	100	51	84	40	(a)	(a)	(a)	(a)
Thomasville, Ga	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	80	28	(a)	(a)
Thornville, Mich	99	48	101	49	100	46	78	28	63	16	56	15
Upper Alton, Ill	104	62	(a)	(a)	101	52	78	44	66	16	(a)	(a)
Vevay, Ind	102	57	104	60	100	47	86	41	75	18	64	18
Vineland, N. J	96	60	100	58	104	58	92	30	78	24	68	18
Wabash, Ind	100	59	102	61	96	48	79	36	61	13	54	14
Washburn College, Topeka, Kans	100	61	105	59	99	39	88	31	72	6	63	8

Waterburgh, N. Y	94	60	99	49	99	50	73	30	65	10	57	13
Waynesville, N. C	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	70	22	64	22
Weldon, N. C	102	64	107	00	97	62	92	35	78	21	74	22
Wellsborough, Pa	95	45	96	40	98	45	78	22	74	20	68	16
Wellington, Kans	104	63	105	04	100	31	95	32	69	8	64	17
Westborough, Mass	94	54	96	52	98	50	86	26	70	10	63	6
West Chester, Pa	91.5	56	97	55	99	52	88	33	68	30	59	17
Westerville, Ohio	101	48	95	48	96	43	82	32	69	12	61	16
West Virginia College, Flemington, West Va	98	50	93	47	99	44	86	29	73	19	62	17
White Plains, N. Y	86	60	87	61	91	55	78	29	69	20	59	18
Williamstown, Mass	84.8	47.6	87	49	87	43	80	26	63	12	54	8
Windsor, Vt	90	50	90	50	90	39	81	21	(a)	(a)	(a)	(a)
Woodstock, Md	91	63	93	61	96	58	86	28	77	20	69	15
Woodstock, Vt	97.8	46	95	44	93	35	83	17	64.5	2.5	62	−1
Wooster, Ohio	97.5	60	93.5	52	95	48	80	36	67.5	15	58	15
Worcester, Mass	85	58	89	60	94	55	83	27	63	11	63	3
Wytheville, Va	96	50	94	51	96	48	86	34	77	10	64	12
Yates Center, Kans	102.6	56	104	64	103	31	90	32	66	8	67	8
York Factory, Hudson's Bay Territory, British America	100	38	98	33	60	28	40	Zero	34	−32	24	−32
Ypsilanti, Mich	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	65	17	57	21

a No report.

* Professor F. E. Nipher.

APPENDIX 29.—*Maximum and minimum temperatures and annual range of temperature at the voluntary stations of the Signal Service, &c.*—Continued.

Stations.	1882.												Annual range.
	January.		February.		March.		April.		May.		June.		
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
	°	°	°	°	°	°	°	°	°	°	°	°	°
Accotink, Va	60	10	62	19	70	28	86	30	88	43	96	56	94
Aiken, S. C	75	21	75	27	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Albany, Oreg	47	18	49	16	70	28	80	36	88	42	92	49	76
Ames, Iowa	39	3	58	4.8	50	20	77	27	68	41	98	48	95
Amherst, Mass	45	—15	47	— 6	56	17	68	24	78	39	90	52	109
Anna, Ill	66	11	69	24	78	30	86	37	85	37	90	50	98
Ardenia, Phillipstown, N. Y	45	— 8	52	10	61	18	(a)	(a)	79	41	90	56	.....
Argyle, N. Y	41	—34	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Ashland, Wis	(a)	(a)	40	Zero	52	— 2	56	10	64	36	(a)	(a)	.....
Ashwood, Tenn	67	16	72	30	80	32	88	36	88	42	97	54	90
Atco, N. J	54	Zero	60	13	66	20	81	27	87	28	95	54	104
Atlantic City, N. J	60	— 2	56	20	65	21	71	24	82	34	87	50	94
Auburn, Ala	76	20	75	28	81	33	84	46	86	47	93	59	81
Auburn, N. H	44	—18	56	— 2	58	10	(a)	(a)	(a)	(a)	(a)	(a)	.....
Austin, Tenn	69	17	74	28	76	39	86	30	84	42	94	53	89
Austin, Tex	74	26	78	35	82	37	(a)	(a)	(a)	(a)	(a)	(a)	.....
Bainbridge Island, Wash	54	21	(a)	(a)	68	30	76	34	86	38	88	49	.....
Battle Creek, Mich	54	— 2	56	14	62	18	71	26	75	37	81	48	.....
Bellefontaine, Ohio	55	5	59	15	68	21	80	22	81	37	94	52	99
Beloit, Wis	51	— 8	57	3	67	16	79	23	81	34	92	41	105
Bethel, Ohio	59	15	62	21	67	25	80	25	77	44	92	50	90
Blackfeet Agency, Mont	52	—30	50	—36	52	18	66	10	78	30	(a)	(a)	.....
Blooming Grove, Pa	50	—19	50	4	59	10	71	24	79	28	93	50	119
Boston, Mass	50	—13	58	— 3	62	16	68	30	82	39	91	51	.....
Bowling Green, Ky	65	18	68	20	79	30	84	31	84	32	97	52	.....
Brook Haven, N. Y	49	3	58	20	59	16	70	28	74	34	(a)	(a)	.....
Carson City, Nev	54	1	56	— 6	73	2	82	21	90	26	92	38	104
Catawissa, Pa	49	— 5	59	15	66	20	71	22	(a)	(a)	90	47	.....
Cedar Rapids, Iowa	52	— 5	72	— 2	74	9	91	24	85	31	97	41	.....
Centralia, Ill	60	4	69	20	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Chambersburg, Pa	53	2	54	18	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Charleston, Ill	60	4	65	19	73	27	86	31	87	42	97	53	104
Charlotte, Vt	43	—20	54	Zero	50	10	62	21	80	32	92	53	122
Cincinnati, Ohio	62	15	64	21	72	27	84	29	82	39	95	54	88
Clarksville, Tex	70	24	85	34	88	40	90	49	88	53	102	62	83
Clay Centre, Kans	63	— 8	76	3	84	10	94	30	96	40	102	44	12
Clear Creek, Nebr	47	— 2	60	2	78	7	89	32	88	42	95	44	.....

Cleveland, Ohio	60	5	56	20	66	26	77	26	73	35	89	50	92	
Clinton, Iowa	56	− 9	67	0.5	65	8	83	20	84	26	95	33	111	
Coalville, Utah	41	−25	50	−18	63	Zero	(a)	(a)	77	27	87	57	.....	
Coldwater (State school), Mich	52	− 4	58	18	62	21	72	23	78	28	88	46	.....	
College Hill, Ohio	50	16	59	22	66	29	86	35	78	42	94	53	93	
Columbia, S. C	70	22	78	28	82	37	(a)	(a)	90	51	95	51	.....	
Contoocookville, N. H	46	−15	53	− 2	52	11	64	21	80	35	(a)	(a)	.....	
Cooperstown, N. Y	43	−27	55	− 1	56	5	64	20	78	30	85	49	119	
Cornell University, Ithaca, N. Y	52	−15	53	6	60	9	71	19	80	29	95	42	111	
Corning, Mo	61	2	69	13	77	9	87	33	74	40	(a)	(a)	.....	
Cornish, Me	43	−18	52	− 2	48	10	57	14	76	32	86	50	110	
Council Grove, Kans	61	−11	(a)	(a)	78	10	88	30	(a)	(a)	(a)	(a)	.....	
Cresco, Iowa	38	−17	62	−12	52	7	75	20	78	26	83	48	115	
Cumberland, Md	50	8	56	24	72	24	79	26	78	36	90	50	88	
Deer Park, Md	58	− 8	56	9	71	13	(a)	(a)	(a)	(a)	(a)	(a)	.....	
Des Moines, Iowa	49	− 5	70	− 2	74	10	86	30	83	39	91	52	.....	
De Soto, Nebr	45	− 1	61	4	77	5	87	33	89	35	91	50	101	
Dexter, Me	37	−26	47	− 8	52	− 1	62	2	75	30	(a)	(a)	.....	
Distributing Reservoir, D. C	60	10	63	21	69	25	85	30	85	38	96	53	87	
Dyberry, Pa	43	−18	48	− 2	58	8	68	14	76	20	90	36	113	
Edgerton, Wis	49	−12	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....	
Elmira, Ill	56	− 7	65	2	63	12	79	26	85	35	92	43	105	
Ellsworth, N. C	69	12	70	20	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....	
Embarrass, Wis	39	−20	58	5	56	10	72	20	80	30	85	44	116	
Emporia, Kans	62	3	71	8	78	9	86	33	89	38	95	41	97	
Eola, Oreg	48	9	48	13	70	27	80	28	84	37	95	51	86	
Fall River, Mass	48	−10	50	8	50	15	68	26	68	32	86	46	103	
Fallsington, Pa	48	2	58	15	64	24	75	29	83	40	93	57	101	
Fallston, Md	51	4	55	19	66	20	82	24	83	32	93	59	.....	
Fayette, Miss	75	28	78	28	86	41	83	46	88	50	93	60	78	
Flushing, N. Y	48	− 3	54	16	55	22	73	30	76	41	91	59	94	
Forsyth, Ga	76	24	78	31	87	39	86	48	88	50	97	65	82	
Fort Madison, Iowa	60	1	67	9	70	16	82	30	81	37	93	49	99	
Fort Scott, Kans	70	Zero	76	12	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....	
Fort Wayne, Ind	54	10	60	18	66	28	82	27	78	35	(a)	(a)	.....	
Federalsburg, Md	61	6	64	19	69	23	81	29	84	36	(a)	(a)	.....	
Franklin, Pa	48	−14	52	10	64	14	74	18	74	30	86	42	112	
Franklin, Wis	38	− 9	54	8	56	15	69	23	74	32	84	41	.....	
Freehold, N. J	48	− 3	56	17	61	16	75	24	82	30	94	47	105	
Friendship, N. Y	44	−27	46	Zero	59	4	64	12	72	32	90	48	121	
Gardiner, Me	45	−27	43	− 7	45	4	57	7	70	28	85	42	114	
Genesco, Ill	60	− 4	76	4	65	8	82	25	(a)	(a)	(a)	(a)	.....	
Genoa, Nebr	45	− 6	58	− 7	81	2	88	31	79	40	92	47	110	
Germantown, Pa	50	2	58	20	64	23	76	28	82	42	95	53	100	
Golconda, Ill	64	8	70	24	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....	
Grafton, N. H	43	−22	46	− 6	(a)	(a)	(a)	(a)	76	30	90	42	.....	
Grayville, Ill	(a)	(a)	62	20	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....	
Great Falls, Md	58	8	56	17	64	28	80	29	86	40	94	55	92	
Greensborough, N. C	68	19	68	30	72	40	76	39	80	50	95	62	81	

a No report.

APPENDIX 29.—*Maximum and minimum temperatures and annual range of temperature at the voluntary stations of the Signal Service, &c.*—Continued.

Stations.	1882.												Annual range.
	January.		February.		March.		April.		May.		June.		
	Max.	Min.	Max.	Min.	Max.	Min.	Max	Min.	Max	Min.	Max.	Min.	
	°	°	°	°	°	°	°	°	°	°	°	°	°
Green Springs, Ala	75	26	75	35	83	41	80	45	86	49	94	69	.....
Guttenberg, Iowa	36	—16	68	— 4	60	12	82	24	86	24	92	40	118
Heath, Mass	60	—10	44	2	50	4	60	14	80	26	90	40	.....
Helvetia, W. Va	58	12	64	12	76	20	80	20	84	30	86	42	82
Hermosa, Colo	(a)	(a)	(a)	(a)	(a)	(a)	72	20	80	30	89	38	.....
Highlands, N. C	59	6	64	19	69	28	71	37	75	36	(a)	(a)	.....
Holton, Kans	60	— 4	71	6	79	13	90	34	87	42	99	52	114
Hudson, Ohio	56	Zero	56	19	64	21	78	22	74	33	(a)	(a)	.....
Independence, Kans	60	7	72	14	81	24	88	35	88	44	95	54	101
Independence, Iowa	42	7	63	— 2	56	10	75	29	74	32	84	45	97
Jacksonburg, Ohio	54	11	60	18	72	26	82	28	74	36	94	52	.....
Johnsontown, Va	63	16	68	26	72	32	81	35	84	49	98	63	83
Johnstown, N. Y	50	—27	45	—10. 5	53	2	55	20	77	24	(a)	(a)	.....
Kalamazoo, Mich	54	1	55	17	56	20	75	20	79	26	86	44	97
Laconia, Ind	62	15	66	18	78	24	84	31	84	36	98	52	90
Lafayette, Ind	59	1	59	13	69	22	79	25	81	34	93	42	.....
Lansing, Mich	53	— 4	59	15	63	17	75	19	78	27	89	43	104
Lawrence, Kans	65	5	73	12	79	17	(a)	(a)	90	37	99	45	.....
Lenoir, N. C	64	12	67	18	74	31	80	38	81	40	90	53	86
Lincoln, Nebr	48	— 4	62	— 1	89	4	86	31	81	46	(a)	(a)	.....
Litchfield, Mich	44	13	54	12	61	20	71	27	80	30	81	45	86
Logan, Iowa	44	— 2	64	— 4	78	4	85	28	86	36	91	45	107
Logansport, Ind	60	4	68	18	72	24	83	26	90	32	97	50	100
Lunenburg, Vt	42	—29	48	—15	47	— 7	52	— 2	75	28	85	48	119
Manhattan, Kans	60	— 1	69	7	78	12	86	32	(a)	(a)	97	40	.....
Manitowoc, Wis	40	— 6	56	12	58	19	64	24	66	34	83	45	101
Margaretta Township, Ohio	54	16	57	21	59	28	65	29	66	39	81	53	72. 3
Mayport, Fla	81	32	81	41	86	51	88	61	89	59	96	69	68
Mazatlan, Mexico	77	55	78	49	84	51	83	55	89	62	(a)	(a)	.....
McDonough Institute, Owing's Mills, Md	(a)	(a)	55	17	65	20	78	24	80	33	88	49	.....
McGill College, Montreal, Can	42	—26	46	— 8. 5	47	1. 4	57	13	68	27	87	44	119. 9
Meadville, Pa	56	— 9	56	16	68	20	77	24	81	32	94	46	.....
Mendon, Mass	45	—12	51	Zero	59	17	65	27	76	37	89	55	104
Milton, Mass	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	76	31	90	44	.....
Milton, Pa	57	4	55	8	65	20	72	22	(a)	(a)	(a)	(a)	.....
Minneapolis, Minn	37	—18	54	— 9	49	— 7	78	25	79	32	83	45	112
Monticello, Iowa	49	— 6	66	2	60	11	80	28	80	37	88	49	101

Moorestown, N. J	50	— 1	56	20	62	21	77	97	85	37	(a)	(a)	.....
Morrison, Ill	57	— 7	67	4	65	8	(a)	(a)	(a)	(a)	92	45	.....
Morriston, Dak	40	—10	60	—16	65	2	68	32	82	40	98	46	116
Mount Forest, Ontario, Can	43	—20	47	4	45	2.5	61	16	70	30	82	40	125.5
Mount Ida, Ark	65	15	76	16	84	29	84	34	86	38	93	42	85
Mount Saint Mary s College, Emmittsburg, Md	54	24	57	15	70	18	86	24	87	30	91	45	.....
Murfreesborough, Tenn	68	17	71	25	81	31.5	82	36	(a)	(a)	93	57	.....
Murphy, N. C	65	7	71	19	82	27	81	37	80	40	92	50	88
Muscatine, Iowa	59	— 2	70	5	67	11	83	23	78	29	92	41	106
Neillsville, Wis	38	—20	63	— 8	(a)	(a)	(a)	(a)	(a)	(a)	93	37	.....
New Athens, Ohio	57	4	56	18	66	18	79	20	78	30	91	42	.....
New Bedford, Mass	47	—10	53	6	60	16	64	27	72	37	83	50	103
New Brunswick, N. J	48	— 3	56	16	64	20	76	27	(a)	(a)	95	55	.....
New Castle, Pa	56	— 4	56	14	64	20	80	22	78	32	94	45	104
New Corydon, Ind	60	11	64	19	69	26	78	25	78	40	89	49	88
New Harmony, Ind	57	14	63	21	73	25	82	31	87	38	95	49	89
New Market, N. H	(a)	(a)	52	— 4	52	13	62	11	78	30	92	42	.....
Newport, Vt	43	—26	48	—13	44	— 6	57	12	76	30	86	44	122
New Ulm, Tex	71	23	73	49	77	43	79	51	91	61	94	72	.....
New Westminster, British Columbia	47	9	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Niles, Mich	53	5	68	13	63	14	79	32	(a)	(a)	91	43	.....
Nora Springs, Iowa	46	—12	51	— 7	60	6	79	22	79	24	90	49	108
Northfield, Minn	40	—15	52	— 9	54	Zero	76	22	78	26	85	40	.....
North Lewisburg, Ohio	54	8	57	18	67	20	78	21	78	30	88	45	90
Northport, Mich	38	— 4	58	10	62	10	68	18	82	28	86	42	97
North Volney, N. Y	45	—19	53	4	60	9	68	23	76	32	88	46	.....
Oakland, Cal	58	31	62	30	76	34	79	39	79	44	70	51	.....
Olivet, Dak	54	—10	70	—14	82	1	86	32	78	34	99	50	114
Orono, State College, Me	43	—22	52	— 7	45	— 2.7	53	10	68	29	84	46	113
Palermo, N. Y	40	—23	49	— 5	51	11	67	20	77	33	88	47	118
Paramaribo, colony of Surinam, South America	87	69	88	71	88	69	89	69	87	69	(a)	(a)	.....
Paterson, N. J	51	— 5	52	16	61	24	73	30	71	43	95	56	103
Peoria, Ill	60	2	69	9.5	69	20	82	26	83	36	97	47	99
Phillipsburg, N. J	46	— 1	51	18	62	23	68	24	80	36	86	55	.....
Pierce City, Mo	67	9	72	13	80	23	88	29	86	36	96	37	96
Port Jervis, N. Y	44	—11	52	8	59	14	70	24	79	35	90	46	108
Portsmouth, Ohio	67	15	72	23	84	22	90	24	90	30	(a)	(a)	.....
Poway, Cal	75	27	77	33	80	38	80	42	80	50	84	54	74
Princeton, Cal	67	26	65	28	84	28	89	36	102	42	101	54	76
Princeton, Mass	43.1	— 0.3	47	1	52	10	62	17	(a)	(a)	(a)	(a)	.....
Princeton, N. J	48	— 2	60	14	66	18	(a)	(a)	(a)	(a)	(a)	(a)	.....
Protem, Mo	72	9	75	19	86	30	90	37	84	42	96	48	.....
Quitman, Ga	77	26	80	33	87	43	86	54	(a)	(a)	(a)	(a)	.....
Readington, N. J	50	— 2	54	27	(a)	(a)	72	28	88	38	92	54	.....
Receiving Reservoir, D. C	60	10	60	18	70	30	84	31	86	38	97	59	.....
Riley, Ill	52	—12	61	2.5	63	14	75	18	77	27	89	39	109
Rio Vista, Cal	62	21	62	28	80	33	85	36	94	40	(a)	(a)	.....
Rising Sun, Ind	56	16	60	20	68	25	84	27	84	34	93	52	.....
Rock Creek, D. C	59	10	60	17	70	28	86	34	88	46	99	62	93
Rockford, Ill	53	— 6	62	4	60	15	76	23	78	35	87	42	100

a No report.

APPENDIX 29.—*Maximum and minimum temperatures and annual range of temperature at the voluntary stations of the Signal Service, &c.*—Continued.

Stations.	1882.												Annual range.
	January.		February.		March.		April.		May.		June.		
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
	°	°	°	°	°	°	°	°	°	°	°	°	°
Rowe, Mass	48	—21	56	2	52	8	62	22	74	28	86	48	111
Ruggles, Ohio	56	2	58	18	62	18	80	20	80	38	95	48	98
Saint Louis, Mo	(a)	(a)	71	19	81	24	(a)	(a)	(a)	(a)	95	48	.....
Saint Louis, Mo	67	7	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Saint Marie, Ill	53	3.5	65	21	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Saint Meinrad, Ind	61	15	63	23	73	25	83	31	80	41	95	49	89
Salinas City, Cal	65	23	66	28	77	33	70	42	72	44	71	53	63
San Buenaventura, Cal	60	35	65	33	73	45	67	50	68	61	(a)	(a)	.....
Sandy Springs, Md	58	4	59	13	66	21	80	24	83	34	94	50	94
San Gorgonio, Cal	70	19	68	12	78	24	87	32	88	41	84	44	.....
Santa Barbara, Cal	(a)	(a)	69	33	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Snowville, Va	66	10	68	14	89	20	82	25	88	32	92	45	92
Somerset, Mass	50	—14	56	3	63	10	77	20	76	28	96	50	113
Somerville, N. J	48	— 3	53	8	59	19	74	21	85	35	(a)	(a)	.....
Southington, Conn	53	—14	52	5	59	11	69	22	85	32	95	52	114
South Lee, Mass	45	—24	52	3	52	3	63	18	78	27	89	41	114
South Orange, N. J	48	— 4	62	14	66	18	74	26	82	36	92	54	107
Spiceland, Ind	59	4	56	15	67	21	80	23	78	33	(a)	(a)	.....
Springfield, Mass	47	—14	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
State Agricultural College, New Brunswick, N. J	48	— 2	55	15	59	23	75	28	84	40	96	56	105
Statesburg, S. C	73	25	74	29	89	36	83	42	88	49	90	60	78
Strafford, Vt	38	—28	44	— 7	48	10	64	10	74	34	88	48	124
Swanwick, Ill	67	4	67	14	75	28	82	31	84	43	94	53	.....
Thomasville, Ga	79	24	80	31	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Thornville, Mich	53	— 8	56	14	60	21	69	22	75	26	88	44	109
Upper Alton, Ill	67	7	70	20	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Vevay, Ind	65	15	65	22	71	27	86	24	85	35	94	51	80
Vineland, N. J	62	Zero	60	18	62	21	80	26	86	32	96	50	104
Wabash, Ind	54	3	57	12	67	28	79	24	82	34	89	48	99
Warrenton, Mo	64	Zero	72	17	76	26	(a)	(a)	(a)	(a)	(a)	(a)	.....
Washburn College, Topeka, Kans	59	— 5	72	6	77	9	87	30	88	37	94	41	110
Waterburg, N. Y	46	—13	51	2.5	58	11	73	21	81	29	93	42	112
Waynesville, N. C	62	16	62	20	74	26	(a)	(a)	(a)	(a)	(a)	(a)	.....
Weldon, N. C	69	5	72	24	76	32	85	34	90	48	99	59	102
Wellsborough, Pa	44	—14	56	Zero	64	16	70	22	78	24	94	37	.....
Wellington, Kans	60	— 1	70	12	78	12	88	32	82	34	99	47	106
Westborough, Mass	49	—16	51	—10	56	12	70	25	83	30	94	50	114

West Chester, Pa	*48*	*— 2*	*55*	*13*	*64*	*20*	*78*	*24*	*80*	*30*	*93*	*47*	*101*
Westerville, Ohio	*59*	*6*	*61*	*8*	*68*	*20*	*79*	*23*	*81*	*31*	*99*	*40*	*95*
West Virginia College, Flemington, W. Va	*62*	*8*	*63*	*16*	*(a)*	*(a)*	*(a)*	*(a)*	*(a)*	*(a)*	*(a)*	*(a)*	.....
White Plains, N. Y	48	— 7	55	7	60	16	71	28	76	41	85	57	98
Williamstown, Mass	42	—19	50	— 6	58	8	63	16	72	27	82	42	106
Woodstock, Md	56	3	57	11	67	20	80	24	81	29	90	50	93
Woodstock, Vt	50	—28	49	—12	(a)	(a)	63	9	81	23	93	38	.....
Wooster, Ohio	58	11	59	17	65	23	79	24	77	32	(a)	(a)	.....
Worcester, Mass	46	—18	49	1	57	12	66	19	77	33	89	52	112
Wytheville, Va	65	11	64	12	75	20	79	24	83	32	88	45	86
Yates Centre, Kans	67	—1.5	71	8	78.5	16.5	87	32	88	36	96	40	105.8
York Factory, Hudson's Bay Territory, British America	Zero	—52	41	—49	31	—31	42	—18	81	.....	.....	.....	.....
Ypsilanti, Mich	66	2	55	20	(a)	(a)	71	32	(a)	(a)	(a)	(a)	.....

a No report

APPENDIX 30.

Maximum and minimum temperatures and annual range of temperature at stations on the Central Pacific and Southern Pacific Railroads and connecting branches, July, 1881, to June, 1882, inclusive.

Stations.	1881.												1882.												Annual range.
	July.		August.		September.		October.		November.		December.		January.		February.		March.		April.		May.		June.		
	Max.	Min.	Max.	Min	Max.	Min.	Max.	Min.	Max	Min.	Max	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max	Min.	
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
Alta, Cal	98	55	98	50	95	42	74	28	68	26	58	32	58	10	52	20	74	20	78	34	89	41	90	48	88
Anaheim, Cal	96	60	100	60	102	56	86	44	83	38	84	32	75	34	75	34	86	40	80	52	88	54	82	62	70
Antioch, Cal	102	58	100	58	106	54	100	42	84	32	70	26	70	26	76	28	98	38	92	40	100	48	98	50	80
Auburn, Cal	99	54	93	50	94	52	78	40	70	27	59	30	58	23	60	25	79	23	(a)	(a)	92	43	92	48	....
Battle Mountain, Nev	100	56	100	52	94	32	78	18	66	10	52	14	52	—12	48	—16	68	10	76	28	86	32	90	46	116
Benson, Ariz	(a)	(a)	98	71	90	57	90	40	72	32	(a)	(a)	66	20	59	20	62	20	70	30	95	58	103	67	....
Beowawe, Nev	96	57	96	45	89	39	79	14	60	2	51	7	51	—23	53	—21	74	9	80	26	84	40	90	45	119
Blue Creek, Utah	102	58	101	58	90	38	87	26	53	20	50	16	44	— 3	56	— 5	80	8	80	30	82	39	98	51	107
Boca, Cal	88	44	78	38	89	24	70	15	49	—24	50	—10	45	—21	40	—20	62	20	70	2	87	28	89	28	118
Borden, Cal	110	58	108	56	103	54	80	40	81	29	70	27	73	15	70	26	92	31	92	37	111	41	112	49	97
Brentwood, Cal	98	65	95	56	109	59	89	48	68	38	65	28	61	30	65	30	79	40	79	38	98	47	99	49	81
Brighton, Cal	104	57	103	56	105	50	82	39	80	32	65	32	78	25	68	32	86	36	90	40	97	50	100	55	80
Browns, Nev	100	60	100	57	96	40	80	28	57	15	55	17	57	4	60	4	70	21	84	32	85	45	94	50	96
Byron, Cal	106	68	92	64	103	56	80	50	76	32	73	28	64	28	68	32	80	42	92	48	101	54	102	62	78
Caliente, Cal	108	60	104	56	104	54	84	44	74	30	76	34	78	28	76	30	74	34	76	44	104	50	95	61	80
Calistoga, Cal	100	58	97	55	100	50	80	32	(a)	(a)	65	25	70	25	65	25	86	29	86	40	98	48	95	50	....
Carlin, Nev	96	50	98	44	90	34	80	12	60	Zero	48	— 2	44	—26	46	—24	64	Zero	80	24	86	30	88	40	124
Casa Grande, Ariz	108	77	105	73	102	59	100	47	82	34	(a)	(a)	58	34	70	34	87	35	99	49	100	67	105	66	....
Chico, Cal	106	62	102	68	106	56	86	36	78	28	62	32	58	30	60	30	86	36	94	46	105	50	106	60	78
Cisco, Cal	83	40	86	32	82	35	68	16	58	14	50	18	50	7	45	6	52	5	56	15	74	24	83	36	81
Colfax, Cal	101	60	93	52	100	46	70	40	68	33	68	33	60	28	60	28	78	33	76	32	101	45	99	49	73
Colton, Cal	106	60	112	60	112	57	82	40	65	38	78	36	70	30	65	30	90	37	90	40	96	50	100	40	82
Corinne, Utah	102	50	102	55	86	38	80	24	49	17	50	10	44	— 4	54	— 6	65	8	72	30	89	37	91	54	108
Davis, Cal	107	60	104	57	106	56	84	44	82	31	65	26	65	24	69	31	90	40	92	43	104	49	103	62	83
Delano, Cal	109	58	105	62	102	58	80	37	72	31	74	30	69	21	68	30	95	31	94	44	102	45	108	60	88
Dunnigan, Cal	105	67	98	59	108	46	90	45	78	29	62	21	63	27	72	30	92	36	91	40	106	50	106	60	87
Elko, Nev	98	55	99	45	90	25	84	3	63	Zero	47	— 2	47	—28	53	—29	67	— 7	78	29	85	37	95	50	128
Emigrant Gap, Cal	86	43	(a)	(a)	86	37	70	24	64	20	56	22	(a)	(a)	51	10	50	16	62	22	83	24	84	38	....
Farmington, Cal	103	60	103	54	102	53	85	47	75	32	60	30	63	22	67	25	82	30	86	42	102	49	100	58	81
Fresno City, Cal	110	68	106	66	106	52	92	32	(a)	(a)	69	30	60	24	69	30	83	38	92	47	102	51	102	58	....
Galt, Cal	100	59	103	60	100	58	89	43	77	31	67	33	63	25	64	28	84	36	89	44	102	49	100	51	78
Gilroy, Cal	95	54	92	51	100	50	81	38	76	24	68	27	63	14	65	22	80	31	86	44	87	45	90	51	86

Golconda, Nev	105	54	103	45	101	32	(a)	(a)	85	11	75	13	74	—10	62	—10	80	2	85	31	89	39	95	49	....
Goshen, Utah	110	65	108	60	104	58	90	40	75	33	68	25	65	19	65	25	90	32	(a)	(a)	105	55	106	64	....
Halleck, Nev	104	46	102	34	94	30	75	8	62	Zero	46	— 6	43	—34	50	—40	58	—20	84	26	88	34	90	48	144
Hollister, Cal	91	50	96	53	96	50	85	33	74	30	70	29	65	21	69	31	(a)	(a)	93	47	92	47	82	47	....
Hot Springs, Nev	105	58	102	47	98	34	82	19	70	1	(a)	(a)	50	— 5	60	— 2	76	24	87	23	90	36	96	45	....
Humboldt, Nev	100	50	102	43	95	30	77	20	80	7	60	9	62	— 2	57	— 8	82	11	89	27	92	35	99	50	110
Indio, Cal	113	85	113	77	110	70	98	51	85	32	82	30	78	30	77	30	94	30	104	58	101	70	108	70	83
Ione, Cal	106	64	108	65	106	58	91	39	81	29	68	28	67	24	64	29	84	30	86	40	102	51	99	56	84
Keene, Cal	98	62	93	54	93	47	78	32	74	28	71	29	71	21	68	9	77	32	83	35	95	38	93	47	89
Kelton, Utah	100	60	(a)	(a)	70	40	65	15	40	12	38	4	44	— 9	62	—23	62	10	74	32	82	44	90	62	....
Kingsburgh, Cal	107	60	105	55	104	45	90	30	75	28	68	32	62	10	70	31	89	34	95	46	106	46	106	55	97
Knight's Landing, Cal	97	60	94	52	100	51	85	36	74	30	65	30	62	30	63	29	86	36	89	40	96	51	93	56	71
Lathrop, Cal	97	58	94	53	97	48	79	34	70	30	64	32	68	25	68	27	79	35	84	41	98	48	94	50	73
Lemoore, Cal	108	70	(a)	(a)	105	60	90	40	68	29	(a)	(a)	66	28	64	36	70	36	99	40	100	50	100	56	....
Livermore, Cal	100	56	98	50	104	53	90	45	80	30	(a)	(a)	68	28	70	30	82	38	90	40	98	46	87	44	....
Los Angeles, Cal	100	58	102	58	104	57	88	48	82	42	81	36	74	34	81	41	92	40	78	51	84	58	90	60	70
Mammoth Tank, Cal	116	88	112	72	110	70	99	58	78	44	79	42	73	28	78	32	93	36	104	50	105	63	112	58	88
Maricopa, Ariz	115	78	112	72	105	55	(a)	(a)	96	34	(a)	(a)	92	24	92	32	101	30	107	48	104	61	110	70	....
Martinez, Cal	88	58	86	57	89	55	81	43	69	33	69	33	62	30	62	28	82	32	84	40	82	50	82	56	61
Marysville, Cal	98	61	97	64	100	60	87	42	73	32	62	26	64	30	65	30	(a)	(a)	91	38	102	47	100	60	....
Menlo Park, Cal	90	54	84	56	90	46	76	36	70	30	66	30	64	26	66	24	80	32	84	40	85	52	80	55	66
Merced, Cal	106	54	100	48	102	46	80	32	80	30	72	32	70	20	74	32	80	30	88	42	102	46	104	54	86
Modesto, Cal	100	60	95	58	95	58	85	38	78	30	(a)	(a)	68	22	65	27	85	32	90	45	98	55	105	59	....
Mojave, Cal	104	62	102	60	101	52	86	40	73	23	79	26	70	19	70	18	88	30	96	38	100	53	100	56	86
Monterey, Cal	89	53	73	48	82	44	78	35	70	23	70	33	66	26	68	28	72	30	63	37	75	48	80	53	63
Napa City, Cal	99	56	96	50	95	47	74	34	69	30	70	27	65	28	69	28	82	24	87	39	95	49	95	50	75
Newhall, Cal	99	58	108	58	106	56	80	40	70	30	76	22	68	18	72	21	85	30	90	40	92	46	98	49	90
Niles, Cal	94	60	92	54	94	50	75	38	72	35	71	35	64	30	62	33	82	35	83	41	90	50	99	53	69
Oakland, Cal	91	52	93	55	92	52	86	46	68	40	66	40	66	34	66	40	76	42	84	50	86	54	80	52	59
Ogden City, Utah	93	62	96.5	54.8	(a)	(a)	78	33	51	28	46	24	42	6	49	14	66	10	64	35	73	47	80	57	....
Otego, Nev	105	40	103	37	100	33	85	20	63	9	60	— 2	50	—18	40	—10	62	10	65	22	80	29	85	40	123
Pajaro, Cal	90	52	78	50	90	48	72	34	62	32	68	33	64	27	62	28	76	30	75	40	76	42	65	46	03
Palisade, Nev	105	41	102	38	93	22	64	10	54	4	53	Zero	46	—15	58	—16	62	4	74	26	84	40	(a)	(a)	....
Pantano, Ariz	105	63	(a)	(a)	101	62	98	40	74	34	73	32	72	24	70	30	90	31	92	39	99	58	106	70	....
Petaluma, Cal	96	54	88	54	97	49	90	30	80	30	64	30	62	24	(a)	(a)	84	29	80	38	86	44	80	50	....
Pleasanton, Cal	99	63	94	60	95	56	81	50	69	32	62	27	66	20	62	27	86	39	90	43	94	47	95	54	79
Promontory, Utah	106	52	102	45	87	38	82	15	55	8	46	Zero	38	—22	48	—12	62	10	85	26	90	22	108	49	130
Ravenna, Cal	104	58	108	52	108	47	90	51	86	23	(a)	(a)	79	20	70	21	85	22	95	45	98	40	98	40	....
Red Bluff, Cal	106	54	106	60	104	56	88	40	80	36	76	35	66	28	62	26	82	32	88	44	100	52	102	56	80
Redding, Cal	102	66	98	68	102	58	84	40	76	30	65	36	61	30	65	30	85	25	79	41	(a)	(a)	104	57	....
Reno, Nev	96	45	96	46	84	40	78	28	54	10	50	18	50	3	50	Zero	54	6	62	20	88	38	94	40	96
Rocklin, Cal	107	60	104	58	106	47	88	38	70	28	62	28	60	25	63	28	84	30	90	44	102	45	98	57	82
Sacramento, Cal	93	63	90	58	90	53	76	37	68	32	62	30	63	26	62	29	76	35	78	46	89	54	89	56	67
Salinas, Cal	76	51	68	52	78	48	58	32	64	30	58	36	58	24	61	30	72	39	78	44	80	52	70	52	56
San Fernando, Cal	98	58	106	53	106	57	86	49	78	40	75	31	76	28	76	29	85	44	85	50	86	42	91	56	78
San José, Cal	93	52	84	52	92	47	84	32	75	31	64	30	64	24	62	30	80	35	69	40	88	44	84	50	00
San Mateo, Cal	82	49	78	50	86	48	67	34	67	30	63	32	59	27	58	26	73	32	73	39	80	48	76	50	60
Santa Cruz, Cal	85	52	82	50	85	48	84	40	70	36	67	36	60	30	65	33	75	38	86	42	84	48	76	52	56
Soledad, Cal	98	54	94	52	100	50	82	30	76	26	78	28	60	18	72	22	90	30	82	32	(a)	(a)	84	52	....
South Vallejo, Cal	86	56	78	52	84	53	74	46	70	41	62	38	61	35	60	39	82	40	74	46	86	56	77	58	51

a No reports.

APPENDIX 30.—*Maximum and minimum temperatures and annual range of temperature, &c.*—Continued.

Stations.	1881. July. Max.	July. Min.	August. Max.	August. Min.	September. Max.	September. Min.	October. Max.	October. Min.	November. Max.	November. Min.	December. Max.	December. Min.	1882. January. Max.	January. Min.	February. Max.	February. Min.	March. Max.	March. Min.	April. Max.	April. Min.	May. Max.	May. Min.	June. Max.	June. Min.	Annual range.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
Spadra, Cal	94	64	101	53	105	53	79	52	88	40	(*a*)	(*a*)	75	35	68	32	87	38	78	45	86	50	98	53	....
Stockton, Cal	96	58	89	52	84	51	75	48	72	34	60	34	59	28	62	30	92	40	85	42	92	46	89	54	68
Suisun, Cal	100	58	96	56	105	57	98	34	80	32	74	30	69	29	70	32	92	39	98	48	102	45	95	56	76
Sumner, Cal	106	68	104	62	105	68	78	38	74	30	73	32	67	31	68	30	87	46	(*a*)	(*a*)	102	58	106	55	....
Summit, Cal	65	40	70	32	65	30	62	15	50	1	52	12	45	1	48	1	48	— 4	51	18	66	26	76	40	80
Tecoma, Nev	108	50	110	58	94	42	62	22	48	12	46	6	48	— 8	44	—18	55	5	64	24	76	36	90	44	128
Tehama, Cal	106	60	100	59	100	52	84	37	70	32	54	30	56	30	(*a*)	(*a*)	78	30	88	34	102	50	103	60	....
Tehichipa, Cal	98	60	98	46	86	42	78	18	66	20	64	18	63	14	56	4	74	28	80	28	90	38	92	40	94
Tennant, Cal	103	51	99	50	99	45	79	28	78	28	68	30	70	21	(*a*)	(*a*)	71	36	84	42	98	50	(*a*)	(*a*)	....
Terrace, Utah	97	60	100	49	80	40	78	30	52	15	40	10	35	— 5	36	—10	70	16	68	28	79	33	105	39	115
Texas Hill, Ariz	117	84	117	78	118	64	105	45	65	35	85	35	75	25	83	35	95	35	105	51	107	68	111	72	90
Toana, Nev	94	50	96	44	86	30	78	16	54	— 2	46	Zero	49	—10	46	— 8	56	4	72	26	85	30	92	40	116
Tracy, Cal	102	64	100	58	100	50	84	44	80	36	68	30	70	32	70	30	80	44	90	48	98	54	100	60	72
Truckee, Cal	89	42	88	32	87	32	70	20	60	—12	48	4	46	— 8	48	—18	56	— 4	68	10	80	28	(*a*)	(*a*)	....
Tucson, Ariz	102	70	100	73	97	60	91	42	78	33	78	37	77	32	71	30	85	43	93	38	96	59	104	54	74
Tulare, Cal	105	63	102	63	99	60	87	36	76	25	68	25	65	14	65	26	87	29	95	44	108	54	106	58	94
Tuohey's Ranche, Cal	(*a*)	(*a*)	(*a*)	(*a*)	100	52	(*a*)	(*a*)	(*a*)	(*a*)	69	28	62	22	66	29	84	32	(*a*)	(*a*)	102	36	101	57	....
Turlock, Cal	110	54	100	46	105	48	100	30	80	27	65	29	65	18	68	18	82	32	98	38	106	42	106	52	92
Wadsworth, Nev	98	54	100	52	93	36	78	26	68	9	52	14	55	— 3	61	13	75	15	88	31	88	40	95	49	103
Wells, Nev	94	54	98	58	82	44	78	28	56	14	56	12	54	—14	48	— 8	60	4	74	26	82	38	84	43	112
White Water, Cal	108	75	110	65	95	59	90	45	80	35	(*a*)	(*a*)	70	27	70	30	95	42	103	42	112	57	111	55	....
Willcox, Ariz	102	72	105	70	(*a*)	(*a*)	90	35	85	19	76	17	72	12	69	23	89	26	99	42	98	54	(*a*)	(*a*)	....
Williams, Cal	102	65	99	59	100	55	85	42	80	31	62	30	65	28	65	28	82	35	90	44	105	56	104	55	77
Willow, Cal	106	60	101	58	105	58	81	40	78	31	68	28	68	23	72	27	85	33	94	38	105	42	110	62	87
Winnemucca, Nev	100	48	104	44	94	42	76	20	62	8	52	14	54	— 2	52	— 10	70	10	86	28	82	38	98	42	114
Woodland, Cal	102	66	97	62	101	55	87	47	72	32	70	30	65	31	64	29	85	36	87	46	101	59	98	57	73
Yuma, Ariz	107	71	106	67	107	61	97	58	79	47	79	40	75	33	78	37	88	44	99	58	100	68	109	58	76

a No reports.

APPENDIX 31.

Monthly and annual maximum and minimum temperatures, and the precipitation, in inches and hundredths, at the stations of the third class on the United States military telegraph lines, for the year ending June 30, 1882, from observations taken daily at the hour of sunset.

Stations.	Observations commenced—	1881.																	
		July.			August.			September.			October.			November.			December.		
		Max.	Min.	Prec.	Max.	Min.	Prec.	Max.	Min.	Prec.	Max.	Min.	Prec.	Max.	Min.	Prec.	Max.	Min.	Prec.
		°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
Almota, Wash	Mar. 1, 1881	103	51	0.79	99	42	0.14	90	36	2.17	72	26	1.95	62	18	1.20	54	20	1.49
Brackettville, Tex	July 3, 1877	101	68	0.90	101	68	0.30	96	50	4.12	87	45	16.17	80	30	1.18	77	29	0.80
Colfax, Wash	Feb. 1, 1881	99	41	1.20	94	35	0.62	87	27	1.66	62	17	2.75	55	— 0.5	2.59	51.8	10	2.79
Deer Lodge, Mont.	March 1, 1881	93	(a)	0.77	95	(a)	0.24	80	(a)	0.92	58	(a)	0.75	45	(a)	0.57	54	(a)	0.58
Edinburg, Tex. *b*	Aug. 7, 1881	.....	.....	.....	102	70	2.52	98	65	4.17	94	56	10.54	89	37	2.01	83	39	1.70
Fort Bayard, N. Mex	Feb. 1, 1881	91	56	(c)	88	49	(c)	87	41	(c)	81	30	(c)	70	16	(c)	76	16	(c)
Fort Cœur d'Alene, Idaho	Sept. 1, 1881	.....	.....	.....	.....	.....	.....	81	32	1.95	64	17	2.41	50	Zero	3.55	45	8	3.18
Fort Lapwai, Idaho	Feb. 1, 1881	104	40	(c)	103	39	0.24	90	31	3.01	72	22	2.07	64	14	1.84	51	12	1.12
Fort Meade, Dak	April 1, 1881	107	50	1.50	105	50	1.17	90	30	1.20	66	17	0.55	64	— 1	0.15	58	11	0.00
Fort Sully, Dak	Aug. 1, 1881	.....	.....	.....	107	42	0.50	88	18	2.50	77	15	0.50	68	—11	(c)	61	Zero	(c)
Fort Supply, Ind. T	Jan. 1, 1881	106	59	9.34	107	57	1.35	102	33	3.38	90	24	0.86	73	12	0.88	76	16	0.23
Grierson Springs, Tex	Jan. 25, 1881	103.5	63	(c)	103	58	(c)	95	42	(c)	84	35	(c)	78	18	(c)	72	20	(c)
Graham, Tex	Jan. 1, 1881	106	67	0.93	106	71	1.66	102	50	3.83	91	44	2.40	82	22	1.21	77	27	2.31
Laredo, Tex	Sept. 23, 1876	108	74	0.12	104.5	74	2.02	(d)	(d)	(d)	91	51	5.49	85	37	1.74	79	32	1.01
New Chicago, Mont	Mar. 1, 1881	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	54	2	0.61	60	—16	1.69
Phœnix, Ariz	Aug. 28, 1876	106.2	65.4	2.03	104	59	2.19	97	48	1.04	93	34	0.25	76.8	25.5	0.36	77	25	0.16
Pomeroy, Wash	May 1, 1881	100	43	0.57	95	39	0.18	86	31	1.13	68	25	1.96	62	9	1.63	58	21	2.14
Rapid City, Dak	Jan. 24, 1881	100	37	2.64	104	50	0.20	92	30	1.45	71	15	0.71	67	2	0.12	60	3	0.00
Rock Creek, Mont. *e*	July 1, 1881	99	39	1.65	102	31	1.98	83	25	0.60	65	Zero	2.75	59	—10	0.60	54	— 1	0.34
San Carlos Agency, Ariz	June 1, 1881	112	64	4.13	106	59	5.93	100	44	1.94	98	29	0.93	80	17	0.06	73	18	0.52
Santa Maria, Tex *f*	Jan. 17, 1881	103	71	2.64	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Smithville, Dak	June 1, 1881	108	51	0.21	112	53	1.64	98	35	8.24	82	20	(d)	62	Zero	0.19	64	1	0.00
Terry's Landing, Mont	April 1, 1881	89	44	0.23	84	42	0.00	85	31	0.00	69	3	0.56	52	—15	0.28	51	—12	0.02

a No minimum thermometer on station.
b Observations discontinued January 27, 1882.
c No rain-gauge on station.
d Record incomplete.
e Observations discontinued March 31, 1882.
f Observations discontinued July 31, 1881.

APPENDIX 31.—*Monthly and annual maximum and minimum temperatures and precipitation, &c.*—Continued.

Stations.	Observations commenced—	1882.																		During year.		
		January.			February.			March.			April.			May.			June.			Highest.	Lowest.	Total precipitation.
		Max.	Min.	Prec.	Max.	Min.	Prec.	Max.	Min.	Prec.	Max.	Min.	Prec.	Max.	Min.	Prec.	Max.	Min.	Prec.			
		°	°		°	°		°	°		°	°		°	°		°	°		°	°	
Alnota, Wash	Mar. 1, 1881	55	10.2	0.45	56	5	2.88	71.4	25	0.92	78	33	2.71	89.5	34.5	0.94	99.5	50	0.01	103	5	15.65
Brackettville, Tex	July 3, 1877	77	26	1.20	79	34	1.09	86	27	0.90	95	32	(*e*)	95	52	3.61	102	66	1.22	102	26	31.49
Cartersville (Wolf Creek), Mont	April 1, 1882										76	17	1.83	91	26	1.60	100	38	0.56			
Colfax, Wash	Feb. 1, 1881	45.5	−8	2.84	44.2	−9	3.49	68.5	13.3	1.70	72.5	26.7	3.02	85	33	1.20	97	38	0.12	99	−9	23.98
Deer Lodge, Mont	Mar. 1, 1881	45	(*c*)	1.44	57	(*c*)	0.70	70	−5	0.47	74	14	1.67	89	21	1.92	95	32	1.73	95		11.76
Edinburg, Tex (*a*)	Aug. 7, 1881	84	35	1.15																		
Foley, Mont	Feb. 5, 1882				59	−37	0.14	79	−11	0.17	83	21	2.08	(*f*)								
Fort Bayard, N. Mex	Feb. 1, 1881	65	9	(*d*)	58	17	(*d*)	77	20	(*d*)	84	21	(*d*)	82	35	(*d*)	94	42	(*d*)	94	9	
Fort Coeur d'Alene, Idaho	Sept. 1, 1881	41	9	4.10	42	−18	3.27	64	3	0.14	67	20	2.10	82	27	1.69	91	42	0.16			
Fort Lapwai, Idaho	Feb. 1, 1881	49	4.5	1.53	55	1	1.38	80	18	1.50	80.5	25	3.70	93	33	2.24	99	38	0.51	104	1	
Fort Meade, Dak	April 1, 1881	50	−11	0.05	58	−14	0.01	71	4	0.33	76	8	1.89	70	24	1.13	86	41	5.19	107	−14	13.17
Fort Sully, Dak	Aug. 1, 1881	55	−21	(*d*)	67	−22	(*d*)	66	−12	(*d*)	81	22	(*d*)	85	15	(*d*)	95	50	3.19			
Fort Supply, Ind. T	Jan. 1, 1881	69.5	−6	0.44	75	12.5	0.93	85	17	0.53	92	26	3.03	94	34	2.00	103	38	5.21	107	−6	28.18
Grierson Springs, Tex	Jan. 25, 1881	76	15	(*d*)	78	22	(*d*)	88	17	(*d*)	99	20	(*d*)	98	40	(*d*)	110	50	(*d*)	110	15	
Graham, Tex	Jan. 1, 1881	78	15	2.16	77	28	3.27	86	27	1.13	94	34	0.37	97	45	2.76	110	54	1.87	110	15	23.90
Laredo, Tex	Sept. 23, 1876	80	31	1.74	91.8	44	0.86	92	44	(*e*)	101	49	1.80	101.5	62	1.59	105	65	2.57			
Life-Saving Station No. 6, N. C	April 3, 1882													82.9	47	1.56	96.8	55	2.05			
Little Egg Harbor, N. J	April 9, 1882										74	28.4	2.49	82.5	34.5	4.67	96	52.2	1.13			
Narragansett Pier, R. I	April 1, 1882										66	23	3.53	74	34	2.90	87	44	2.54			
New Chicago, Mont	Mar. 1, 1881	58	−32	2.75	57	−33	0.50	63	−16	1.38	68	20	1.53	84	25	0.92	(*g*)	34	1.67			
Phœnix, Ariz	Aug. 28, 1876	74.5	19	1.62	72	23	0.17	89.5	32	0.00	104.9	36.5	0.00	102.3	50.5	0.00	109.3	54.5	0.37	109.3	19	8.19
Pomeroy, Wash	May 1, 1881	51.2	8.1	1.19	54	−3	2.48	73.2	20.7	1.05	72.2	27.1	2.41	86	34.5	1.83	96	44	0.27	100	−3	16.84
Rapid City, Dak	Jan. 24, 1881	56	−16	0.20	65	−21	0.19	75	−2	0.07	82	13	3.47	89	27	4.71	90	36	5.07	106	−21	18.83
Rock Creek, Mont (*b*)	July 1, 1881	52	−26	1.30	56	−23	0.92	68	−5	0.52												
San Carlos Agency, Ariz	June 1, 1881	67	16	1.24	68	21	0.93	87	22	0.55	95	30	0.00	97	40	0.81	105	47	1.09	112	16	18.13
Smithville, Dak	June 1, 1881	54	−21	0.08	65	−23	0.03	72	−12	0.20	83	24	3.04	82	41	2.24	92	36	9.59	112	−23	
Terry's Landing, Mont	April 1, 1881	52	−36	0.45	59	−37	0.12	72	−11	0.35	86	19	1.80	85	22	3.78	93	39	3.34	93	−37	10.93
Tobacco Garden, Dak	Feb. 1, 1882				54	−35	(*d*)	66	−14	(*d*)	72	14	(*d*)	81	22	(*d*)	90	33	0.19			

a Observations discontinued January 27, 1882.
b Observations discontinued March 31, 1882.
c No minimum thermometer on station.
d No rain-gauge on station.
e Precipitation too small to measure.
f Station closed April 30, 1882.
g Maximum thermometer broken.

APPENDIX 32.

Monthly and annual maximum and minimum temperatures, and the precipitation, in inches and hundredths, at stations of the Signal Service, United States Army, in Alaska, July, 1881, to June, 1882.

Stations.	Observations commenced—	1881. July.			August.			September.			October.			November.			December.		
		Max.	Min.	Prec.	Max.	Min.	Prec.	Max.	Min.	Prec.	Max.	Min.	Prec.	Max.	Min.	Prec.	Max.	Min.	Prec.
		°	°		°	°		°	°		°	°		°	°		°	°	
Atka	Oct. 1, 1881	.....	.....	.....	.....	.....	.....	.....	.....	.....	54	30	6.30	47	28	10.91	45	12	13.56
Chernofsky, Unalashka Island *c*	Oct. 1, 1881	.....	.....	.....	.....	.....	.....	.....	.....	.....	62	31	7.24	51	26	6.76	56	12	6.50
Chilkaht, Portage Bay *b*	Sept. 18, 1881	.....	.....	.....	.....	.....	.....	.....	.....	.....	65	23	7.63	43	9	6.00	35	— 8	7.68
Fort Alexander *b*	Aug. 1, 1881	.....	.....	.....	69.5	46	2.86	63	34	3.75	65	27	1.91	47	2	3.38	40	—29	1.44
Fort Saint Michael's *b*	June 28, 1874	74	33	0.89	65	43	4.43	62	33	3.40	60	20	2.14	40	— 3	1.75	35	—35	0.23
Fort Wrangell *b*	Aug. 26, 1881	.....	.....	.....	.....	.....	.....	73	42	8.06	62	32	5.19	53	16	18.37	45	8	11.49
Harrisburg (or Juneau City) *c*	June 1, 1881	76	41	6.65	82	39	3.03	68	34	5.07	54	27	8.00	51	14	12.95	*(d)*	*(d)*	*(d)*
Hoochnahoo, Kilisnoo Island *c*	May 12, 1881	74	42	2.68	72	40	2.09	64	37	3.79	56	27	3.03	49	16	7.13	40	9	7.97
Marzovia	Nov. 2, 1881	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	50	24	8.38	46	10	2.31
Saint Paul's Island *c*	Aug. 18, 1872	57	35	2.10	56	43	4.43	53	38	7.94	50	32	5.88	43	24	7.81	42	12	3.04
Sitka *a*	Mar. 30, 1881	67	43	4.40	79	43.9	1.98	63.8	40.5	12.11	57.8	32.0	5.04	52.8	22.5	13.50	44.9	14	10.52
Unalashka Island *a*	Aug. 18, 1878	72	37	2.60	78	43	2.12	68	43	9.16	62	36	27.30	58	28	11.82	50	18	12.70

Stations.	Observations commenced—	1882. January.			February.			March.			April.			May.			June.			During year. Highest.	Lowest.	Total precipitation.
		Max.	Min.	Prec.	Max.	Min.	Prec.	Max.	Min.	Prec.	Max.	Min.	Prec.	Max.	Min.	Prec	Max.	Min.	Prec.			
		°	°		°	°		°	°		°	°		°	°		°	°		°	°	
Atka	Oct. 1, 1881	43	20	11.45	45	19	8.20	44	21	8.40	50	22	5.40	52	24	4.47	54	35	4.40	.....	.....	.....
Chernofsky, Unalashka Island *c*	Oct. 1, 1881	47	23	13.98	46	15	5.20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Chilkaht, Portage Bay *b*	Sept. 18, 1881	39	—13	8.77	33	—13	13.99	38	—13	1.34	55	14	3.04	70	30	1.55	75	37	2.45	.....	.....	.....
Fort Alexander *b*	Aug. 1, 1881	40	—18	4.80	36	—26	1.42	38	— 6	2.72	48	8	0.47	61	23	1.76	78	35	1.18	.....	.....	.....
Fort Saint Michael's *b*	June 28, 1874	38	—16	1.88	36	—38	0.40	41	—20	0.28	44	—18	0.04	52	12	0.18	66	32	0.25	74	—38	15.87
Fort Wrangell *b*	Aug. 26, 1881	*(d)*	*(d)*	*(d)*	40	3	9.14	50	7	3.90	*(d)*	*(d)*	*(d)*	72	35	1.49	76	44	3.40	.....	.....	.....
Harrisburg (or Juneau City) *c*	June 1, 1881	43	zero	9.50	*(d)*	— 4	4.55	*(d)*	14	4.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Hoochnahoo, Kilisnoo Island *c*	May 12, 1881	42	3	6.38	38	zero	7.01	42	zero	1.51	58	23	1.88	69	29	2.47	74	35	2.02	74	zero	47.96
Marzovia	Nov. 2, 1881	44	18	11.78	45	8	4.04	45	13	2.05	45	14	2.45	*(d)*	*(d)*	*(d)*	.....	.....	.....	.....	.....	.....
Saint Paul's Island *b*	Aug. 18, 1872	38	19	4.36	39	3	1.86	38	11	2.88	42	10	1.71	50	19	1.68	52	31	1.02	57	3	44.77
Sitka *a*	Mar. 30, 1881	50.8	8.5	14.20	42	4	16.35	44.9	5.5	3.53	61.8	25.5	4.21	69.2	32	2.89	69.6	38	3.71	79	4	92.44
Unalashka Island *b*	Aug. 18, 1878	52	25	14.30	51	14	7.97	50	20	5.84	51	21	2.19	60	24	4.51	60	36	3.84	78	14	104.35

a Stations of the first class. *b* Stations of the second class, taking two observations daily. *c* Stations of the third class taking observations daily at the hour of sunset. *d* No record.

APPENDIX 33.

Annual and mean annual precipitation, in inches and hundredths, at stations of observation of the Signal Service, United States Army, from the commencement of observations to December 31, 1881.

Stations.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	Years compiled from.	Mean annual precipitation.
Albany, N. Y	.....	.....	.....	37.03	38.25	38.19	36.09	40.37	38.66	32.54	36.34	8	38.42
Alpena, Mich	.....	.....	31.10	25.18	37.27	37.62	41.00	38.48	39.97	43.63	45.61	9	37.76
Atlanta, Ga	.....	.....	.....	.....	.....	.....	.....	.....	50.30	62.70	61.74	3	58.25
Atlantic City, N. J	.....	.....	.....	.....	33.98	39.85	35.95	36.38	42.00	47.43	46.25	40.08	8	40.24
Augusta, Ga	.....	55.17	48 50	57.19	54.68	46.16	53.97	46.34	40.99	47.91	54.77	10	50.57
Baltimore, Md	82.74	35.14	49.37	33.63	45.26	46.70	43.14	50.09	36.01	41.90	49.12	11	42.10
Barnegat, N. J	.....	.....	.....	55.93	46.73	47.17	48.24	52.06	49.35	48.81	53.28	8	50.20
Bismarck, Dak	.....	.....	.....	.....	27.52	30.92	17.68	20.23	22.61	19.75	15.76	7	22.07
Boisé City, Idaho	.....	.....	.....	.....	.....	.....	.....	10.21	17.63	10.66	13.56	4	13.02
Boston, Mass	46.97	50.62	54.53	43.52	50.15	48.96	51.49	65.53	45.67	37.30	52.63	11	49.76
Brackettville, Tex	.....	.....	.....	.....	.....	.....	.....	25.66	16.52	40.54	33.75	4	29.12
Brownsville, Tex	.....	.....	.....	.....	.....	25.81	25.86	36.35	34.73	38.07	31.74	6	32.09
Buffalo, N. Y	32.40	31.25	44.63	30.44	31.44	39.26	34.48	60.24	30.47	39.26	35.95	11	37.26
Burlington, Vt	.....	36.16	25.92	31.94	26.94	27.53	33.17	41.45	24.27	25.21	20.99	10	29.35
Cairo, Ill	.....	26.52	50.86	47.58	52.93	55.60	39.47	41.76	45 41	49.56	32.18	10	44.19
Campo, Cal	.....	.....	.....	.....	.....	.....	.....	19.72	11.34	19.63	11.39	4	15.52
Camp Thomas, Ariz	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11.41	1	11.41
Cape Henry, Va	.....	.....	.....	51.00	59.60	64.17	64.67	60.85	49.88	63.08	50.18	8	57.93
Cape May, N. J	.....	36.67	49.76	44.26	53.89	45.88	47.68	45.22	50.38	53.30	42.99	10	46.70
Castroville, Tex	.....	.....	.....	.....	.....	.....	.....	18.66	15.23	36.44	20.50	4	22.71
Cedar Keys, Fla	.....	.....	.....	.....	.....	.....	.....	.....	.....	82.30	53.03	2	67.66
Champaign, Ill	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	51.07	1	51.07
Charleston, S. C	63.87	57.06	62.15	62.51	50.07	78.42	78.11	77.44	50.29	49.69	43.20	11	60.91
Charlotte, N. C	.....	.....	.....	.....	.....	.....	.....	.....	44 34	59.60	41.62	3	48.52
Chattanooga, Tenn	.....	.....	.....	.....	.....	.....	.....	.....	52.03	52.03	60.97	3	60.32
Cheyenne, Wyo	9.23	13.48	10.01	9.71	12.10	5.03	11.71	12.64	7.34	8.38	11.88	11	10.14
Chicago, Ill	.....	29.07	36.41	28.63	38.08	36.48	41.01	41.95	30.71	37.10	44.18	10	36.36
Chincoteague, Va	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	35.34	1	35.34
Cincinnati, Ohio	.....	34.68	41.38	37.55	42.58	52.62	34.65	41.62	51.00	54.67	47.24	10	43.86
Cleveland, Ohio	80.03	34.38	41.33	33.33	36 91	41.20	33.49	53.51	41.51	37.38	34.96	11	38.00
Columbus, Ohio	.....	.....	.....	.....	.....	.....	.....	.....	31.26	44.68	46.99	3	40.98
Concho, Tex	.....	.....	.....	.....	.....	.....	.....	24.84	18.34	37.95	18.96	4	25.07
Corsicana, Tex	.....	.....	.....	.....	32.11	33.69	53.69	39.67	35.18	42.33	(a)	6	39.38
Davenport, Iowa	.....	34.44	28.08	36.79	31.99	46.82	35.10	31.21	33.89	42.73	37.28	10	36.03
Dayton, Wash	.....	.....	.....	.....	.....	.....	.....	.....	.....	29.78	27.70	2	28.74

Deadwood, Dak									28.50	19.20	21.13	3	22.94
Decatur, Tex								30.14	19.87	30.26	34.01	4	28.64
Delaware Breakwater, Del											25.50	1	25.50
Denison, Tex						42.10	52.64	41.15	20.45	46.31	36.98	6	39.94
Denver, Colo		18.05	11.81	13.46	17.25	20.12	16.38	15.51	10.86	9.58	12.78	10	14.58
Des Moines, Iowa									32.82	36.66	56.81	3	42.10
Detroit, Mich	22.69	25.63	34.32	26.43	35.71	40.40	35.23	43.39	37.17	47.68	45.44	11	35.83
Dodge City, Kans					10.78	15.40	27.89	17.96	15.43	18.12	33.55	7	19.88
Dubuque, Iowa				30.80	35.47	50.28	38.97	38.30	32.40	40.32	55.15	8	40.21
Duluth, Minn	31.20	30.12	38.73	36.43	26.93	32.27	34.31	28.09	45.28	38.11	37.56	11	34.46
Eagle Pass, Tex								25.67	18.65	31.89	28.04	4	26.06
Eagle Rock, Idaho											21.31	1	21.31
Eastport, Me				42.56	45.42	57.99	50.62	51.37	43.48	42.44	55.98	8	48.73
El Paso, Tex									6.81	14.37	18.17	3	13.12
Erie, Pa				37.83	41.20	44.65	38.96	55.23	36.25	40.94	37.62	8	41.58
Escanaba, Mich		32.60	27.06	31.12	43.54	42.44	34.61	32.73	30.76	30.17	48.49	10	35.35
Florence, Ariz						9.33	5.35	13.49	12.02	5.35	12.14	6	9.61
Fort Apache, Ariz									18.58	14.77	31.12	3	21.49
Fort Benton, Mont		12.32	11.95	10.45	12.75						16.51	5	12.80
Fort Buford, Dak									19.71	23.25	13.90	3	18.95
Fort Custer, Mont										19.65	11.88	2	15.76
Fort Davis, Tex									21.41	23.48	(a)	2	22.44
Fort Elliot, Tex										16.79	16.16	2	16.48
Fort Gibson, Ind. T				38.88	44.10	35.48	46.79	36.70	33.09	30.54	37.85	8	37.93
Fort Grant, Ariz								16.46	12.82	15.74	18.96	4	16.00
Fort Griffin, Tex								29.77	18.93	28.71	20.86	4	24.57
Fort Keogh, Mont									22.75	14.84	11.44	3	16.34
Fort Macon, N. C											62.35	1	62.35
Fort McKavett, Tex								21.88	16.65	28.61	21.72	4	22.22
Fort Missoula, Mont											20.56	1	20.56
Fort Saint Michael's, Alaska							9.37	16.18	7.26		16.61	4	12.36
Fort Shaw, Mont											14.77	1	14.77
Fort Sill, Ind. T							48.45	33.69	25.07	33.75	28.22	5	33.84
Fort Stevenson, Dak										12.23	19.83	2	16.03
Fort Verde, Ariz							10.56		9.00	7.21	15.37	4	10.54
Fredericksburg, Tex								22.78	18.27	47.23	24.11	4	28.10
Galveston, Tex		41.72	58.91	49.39	58.48	50.92	66.87	60.90	26.93	50.97	53.28	10	51.84
Grand Haven, Mich		32.50	28.14			46.29	36.03	33.75	35.48	44.65	47.89	8	38.09
Hatteras, N. C. b					68.26	65.78	102.04	77.18	70.72	92.64	58.81	7	76.49
Helena, Mont											19.94	1	19.94
Henrietta, Tex											22.73	1	22.73
Indianapolis, Ind		34.12	52.83	43.92	54.58	57.56	39.08	37.62	42.88	50.99	48.74	10	46.23
Indianola, Tex			43.30	44.51	35.39	32.57	42.67	39.74	26.78	45.17	37.70	9	38.65
Jacksborough, Tex								31.34	23.71	(a)	23.54	3	26.20
Jacksonville, Fla		57.17	60.65	48.31	57.60	55.28	50.58	60.42	47.18	65.51	54.69	10	55.74
Keokuk, Iowa		29.37	41.04	35.77	48.42	51.65	48.59	31.80	22.51	34.54	39.01	10	38.27
Key West, Fla	34.68	31.77	32.75	32.75	36.35	37.95	38.15	49.03	58.54	33.41	53.10	11	39.86
Kittyhawk, N. C						57.11	80.70	63.10	51.25	68.72	51.71	6	62.10
Knoxville, Tenn	48.22	44.22	59.38	58.38	73.87	41.21	54.36	47.76	48.95	52.54	45.67	11	52.23
La Crosse, Wis			23.27	31.88	38.72	39.41	36.58	31.40	34.94	34.34	44.74	9	35.03

a Data incomplete.

b Record from Cape Hatteras, N. C., prior to December 1, 1880.

APPENDIX 33.—*Annual and mean annual precipitation, in inches and hundredths, at stations of observation of the Signal Service, &c.*—Continued.

Stations.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	Years compiled from.	Mean annual precipitation.
La Mesilla, N. Mex								8.07	7.30	7.10	15.05	4	9.38
Laredo, Tex							21.39	27.49	21.51	26.73	23.67	5	24.16
Leavenworth, Kans		43.50	35.27	33.81	31.26	44.48	52.06	35.15	41.55	36.89	39.95	10	39.39
Lewiston, Idaho										17.41	20.56	2	18.98
Little Rock, Ark										56.35	43.03	2	49.69
Los Angeles, Cal								20.86	17.41	18.65	5.53	4	15.61
Louisville, Ky			45.77	43.69	53.21	53.62	44.58	47.06	50.69	53.85	36.59	9	47.67
Lynchburg, Va		30.55	52.61	44.35	41.89	40.04	43.75	45.04	36.81	38.78	35.57	10	40.94
Madison, Wis									35.21	46.72	52.93	3	44.95
Marquette, Mich		30.25	26.44	26.35	30.22	31.44	27.54	36.19	40.75	33.44	42.91	10	32.45
Mason, Tex								25.00	13.16	39.50	21.93	4	24.90
Memphis, Tenn		43.95	56.20	44.07	57.02	55.49	73.50	49.33	52.29	61.67	42.84	10	53.64
Milwaukee, Wis	30.41	26.26	30.57	30.83	35.56	50.34	46.15	38.29	24.92	29.96	39.07	11	34.76
Mobile, Ala	61.93	68.20	68.61	56.36	62.73	58.60	68.74	63.47	57.33	(a)	90.97	10	65.69
Montgomery, Ala			64.00	51.93	58.16	59.74	50.26	55.40	48.46	54.22	53.81	9	55.11
Moorhead, Minn. b			27.39	27.63	19.59	18.13	29.38	35.72	19.76	(a)	29.48	8	25.88
Morgantown, West Va				45.11	50.26	48.16	43.45	43.13	43.36	51.88	41.58	8	45.87
Mount Washington, N. H		56.51	78.56	70.72	55.78	77.56	86.41	114.48	91.11	79.93	121.13	10	82.22
Nashville, Tenn		40.20	51.69	58.24	53.48	46.91	49.64	48.56	57.69	67.24	47.87	10	52.15
New Haven, Conn			57.32	55.82	43.52	53.98	51.36	58.12	55.50	46.52	51.32	9	52.61
New London, Conn	42.50	47.01	42.26	50.59	44.79	43.20	51.31	39.35	51.05	43.23	51.64	11	47.81
New Orleans, La	64.62	60.68	65.55	62.74	85.73	67.25	63.09	66.16	51.27	69.83	64.01	11	65.63
Newport, R. I						50.32	48.46	60.10	44.28	47.76	48.94	6	59.98
New Shoreham, R. I											59.44	1	59.44
New York, N. Y	48.80	45.79	39.98	40.84	45.09	47.40	40.94	46.67	36.13	37.34	40.40	11	42.07
Norfolk, Va	56.65	56.95	55.43	50.41	50.97	46.54	69.13	51.87	35.88	51.84	40.06	11	51.43
North Platte, Nebr					15.35	11.84	25.47	18.62	20.06	17.48	22.93	7	18.82
Olympia, Wash								63.34	73.44	62.77	65.56	4	66.28
Omaha, Nebr	32.79	32.48	27.04	25.75	42.89	32.51	40.95	37.05	30.31	28.52	45.74	11	34.18
Oswego, N. Y	29.20	27.61	33.29	34.93	31.41	34.20	32.20	55.83	36.60	43.19	39.25	11	36.16
Pensacola, Fla										61.30	86.02	2	73.66
Philadelphia, Pa		48.36	55.28	46.25	40.22	47.39	37.26	34.53	36.75	33.58	30.21	10	40.98
Phœnix, Ariz								8.52	6.40	6.82	8.91	4	7.66
Pike's Peak, Colo				26.86	24.74	23.87	25.58	42.87	39.82	40.65	44.49	8	33.61
Pioche, Nev								8.36	6.94	4.67	5.25	4	6.30
Pittsburg, Pa		31.05	41.42	39.42	34.05	37.01	34.72	38.76	37.02	31.97	37.30	10	36.27
Port Huron, Mich					29.14	37.16	31.61	39.91	27.54	38.68	35.27	7	34.19
Portland, Me		37.02	36.90	36.24	36.14	39.04	43.51	38.60	41.61	37.59	46.68	10	39.33
Portland, Oreg		46.90	50.52	46.17	60.08	55.04	58.30	47.70	62.22	51.87	58.05	10	53.68
Portsmouth, N. C								65.26	40.55	54.55	58.25	4	54.15

Prescott, Ariz						*16.16*		*15.63*	*12.89*	*10.02*	*15.45*	*5*	*14.03*
Punta Rassa, Fla		*40.74*	*60.00*	*38.16*	*40.71*	*44.34*	*38.99*	*51.81*	*46.29*	*39.53*	*33.60*	*10*	*43.42*
Red Bluff, Cal								48.96	33.64	26.53	24 93	4	33.52
Rio Grande City, Tex								24.43	25.61	22.31	28.13	4	25.12
Rochester, N. Y	36.34	36.29	49.89	35.62	29.93	35.82	34.12	48.81	35.22	41.80	38.24	11	38.37
Roseburg, Oreg								36.92	45.03	31.44	43.68	4	39.27
Sacramento, Cal								23.45	22.37	31.99	20.71	4	24.63
Saint Louis, Mo	22.61	30.40	45.03	37.88	42.99	47.74	41.26	40.83	25.70	34.56	37.37	11	36.94
Saint Paul, Minn	30.63		34.75	35.51	30.66	23.67	28.80	22.78	32.39	29.76	39.16	10	30.81
Saint Vincent, Minn.c			13.19	12.64	(a)	25.75	21.67	33.83	19 31		15.51	7	20.27
Salt Lake City, Utah					23.64	21.28	16.35	19.75	13.11	10.94	16.88	7	17.42
San Antonio, Tex								39.60	22.80	41.91	26.78	4	32.77
San Diego, Cal		6.04	12.30	10.91	6.80	7.24	8.12	13.87	14.87	10.37	5.00	10	9.61
Sandusky, Ohio								42.91	37.71	39.44	46.31	4	41.59
Sandy Hook, N. J				51.20	48.31	57.26	53.65	61.70	56.50	41.06	46.74	8	52.05
San Francisco, Cal		22.45	18.55	22.52	22.63	23.54	11.93	33.26	30.76	30.07	23.73	10	23.94
Santa Fé, N. Mex		9.87	9.73	19.93	18.97	15.07	13.15	19.52	11.44	9.89	(a)	9	14.17
Savannah, Ga	61.66	63.87	48.39	57.43	49.00	64.85	59.60	52.58	45.81	50.26	38.00	11	53.77
Shreveport, La		51.03	52.37	54.80	50.98	54.49	47.71	55.83	41.59	66.60	53.72	10	52.91
Silver City, N. Mex									13.77	16.90	30.82	3	20.50
Smithville, N. C						56.23	65.01	56.88	49.08	50.13	50.64	6	54.66
Springfield, Ill										30.93	56.51	2	43.72
Springfield, Mass					47.89	47.15	41.51	54.74	48.02	40.48	49.33	7	47.02
Stockton, Tex								12.47	5.12	33.40	12.65	4	15.91
Thatcher's Island, Mass						47.52	42.53	58.38	45.93	46.11	64.21	6	50.78
Toledo, Ohio	31.42	27.56	35.52	25.83	28.03	34.55	35.17	32.67	30.27	35.72	45.91	11	32.97
Tucson, Ariz						14.02	12.77	16.66	12.01	6.61	14.92	6	12.83
Umatilla, Oreg								87.76	10.58	9.71	11.69	4	9 94
Uvalde, Tex								23.97	19.22	31.29	21.54	4	24.00
Vicksburg, Miss		58.27	41.45	66.10	70.05	51.79	52.96	60.86	52.31	84.19	51.94	10	58.99
Visalia, Cal								9.79	7.40	14.21	7.38	4	9.69
Washington, D. C	37.98	30.86	45.70	34.58	41.11	47.96	52.59	60.09	32.83	38.83	42.20	11	42.25
Wickenburg, Ariz							6.35	8.07	10.65	6.93	11.40	5	8.68
Wilmington, N. C	51.37	59.18	58.37	52.42	49.59	66.73	83.65	54.73	51.14	51.91	51.02	11	57.28
Winnemucca, Nev								6.77	9.36		11.91	3	9.35
Wood's Holl, Mass			52.10	41.23	42.58	48.26	50.90	50.29	36.88	31.32	38.13	9	43.52
Yankton, Dak				23.93	37.15	28.84	28.31	28.73	22.73	21.68	40.95	8	29.04
Yuma, Ariz						0.94	3.66	2.88	3.29	0.74	0.98	6	2.08

a Data incomplete. *b* Record from Breckenridge, Minn., prior to January 1, 1881. *c* Record from Pembina, Dak., used prior to September 4, 1880.

APPENDIX 34.

Monthly and annual precipitation, in inches and hundredths, at stations of observation of the Signal Service, United States Army, for the year ending June 30, 1882.

Station.	Height of rain-gauge above ground.	1881.						1882.						Annual amount.
		July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	Feet.													
Albany, N. Y.	70	2.22	2.07	2.38	3.19	3.44	4.88	2.64	3.31	1.79	1.27	4.15	3.98	35.32
Alpena, Mich.	52	2.09	3.02	6.16	10.25	3.01	2.28	3.70	2.56	4.62	2.65	4.49	6.66	51.49
Atlanta, Ga.	92	.56	4.10	3.76	3.44	4.30	7.53	6.40	10.29	4.16	5.25	3.02	3.22	56.03
Atlantic City, N. J.	37	1.01	2.79	2.20	3.03	3.64	2.14	6.74	4.37	3.43	3.21	5.27	1.72	39.55
Augusta, Ga.	40	3.46	4.82	7.01	2.33	3.81	4.96	3.39	3.95	6.80	4.77	3.70	4.12	53.12
Baltimore, Md.	69	1.40	2.15	2.98	4.06	2.41	5.90	5.38	3.73	3.43	2.14	3.42	2.30	39.30
Barnegat, N. J.	2	1.99	5.54	3.55	4.35	3.64	3.50	8.29	8.91	4.44	4.16	7.22	3.26	58.85
Behring's Island, Behring Sea	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(g) 2.03	.....
Bismarck, Dak.	31	1.28	2.98	1.26	.51	.35	.06	.23	.30	1.22	3.56	3.46	3.88	19.09
Block Island, R. I.	23	1.61	4.30	3.78	5.29	6.47	5.66	8.57	9.73	5.30	4.83	5.51	2.86	64.00
Boisé City, Idaho	32	.13	.00	.25	2.12	.94	.65	1.62	a1.73	1.54	2.33	.34	.29	11.94
Boston, Mass.	162	2.96	1.23	2.50	2.84	3.73	3.80	3.68	4.77	3.35	2.50	6.05	1.03	38.44
Brackettville, Tex.	22	.90	.30	4.12	16.17	1.18	*b* 80	1.20	1.09	.90	.00	3.61	.44	30.71
Brownsville, Tex.	40	1.49	3.01	5.02	8.72	3.74	1.92	2.05	1.24	3.54	1.63	7.07	1.69	42.02
Buffalo, N. Y.	98	2.17	.85	1.21	7.33	2.96	5.86	3.29	2.16	2.63	2.23	6.89	2.96	40.54
Burlington, Vt.	74	2.22	2.69	2.34	1.54	1.30	1.89	.44	1.10	2.34	1.23	2.00	3.17	22.26
Cairo, Ill.	78	.18	.11	2.74	2.74	4.98	3.70	6.35	10.14	4.22	4.14	10.22	3.34	52.86
Campo, Cal.	2	.07	1.27	*c*.02	.73	.11	.24	3.10	d4.57	1.01	1.10	*e* 18	.26	12.66
Camp Thomas, Ariz.	2	4.18	2.49	1.55	*f*.40	.32	.40	*g*.33	1.01	.70	.02	.47	1.26	13.13
Cape Henry, Va.	6	8.57	2.30	.93	3.48	8.96	1.89	6.92	4.17	3.73	3.92	5.18	2.87	52.92
Cape May, N. J.	6	*h*1.20	*i*2.26	1.22	4.52	*h*5.22	2.07	6.32	3.23	4.90	2.44	4.40	*d*2.62	40.41
Castroville, Tex.	8	1.98	.38	*i*2.14	4.85	1.39	*i*1.13	1.78	1.29	*j*2.38	.....	.....	.....	.....
Cedar Keys, Fla.	35	11.86	2.68	7.41	1.25	2.19	3.52	3.19	1.02	2.60	3.00	1.71	9.56	49.99
Champaign, Ill.	2	1.07	.64	4.89	5.77	7.78	8.54	1.99	5.49	4.54	3.86	8.55	9.93	63.05
Charleston, S. C.	57	4.99	7.25	5.49	1.59	2.15	4.76	1.69	1.09	5.96	2.72	1.82	9.12	48.63
Charlotte, N. C.	47	1.83	1.15	4.85	2.69	4.58	4.77	7.24	5.35	2.88	5.93	3.22	1 98	46.47
Chattanooga, Tenn.	59	2.09	2.95	5.74	5.07	4.29	8.83	14.74	7.24	4.56	4.61	4.46	4.97	69.55
Cheyenne, Wyo.	24	1.40	1.97	1.75	.88	.29	.01	.14	.05	.06	.46	2.73	1.85	11.59
Chicago, Ill.	93	4.31	.54	4.34	6.89	5.97	2.67	1.55	2.24	3.43	6.72	5.52	5.71	49.89
Chincoteague, Va.	26	1.53	.67	2.05	3.52	5.31	.88	5.41	3.82	3.11	.61	4.16	2.06	33.15
Cincinnati, Ohio	78	3.12	.76	2.10	6.01	4.06	5 67	6.02	7.04	6.17	2.71	8.47	4.34	56.47
Cleveland, Ohio	73	.90	.17	1.66	5.79	3.64	4.89	2.47	2.83	3.82	2.20	5.27	4.22	37.86
Columbus, Ohio	70	5.33	2.09	1.54	8 64	5.35	5.28	4.69	5.94	4.76	4.87	9.59	6.01	64.00

Concho, Tex	2	.51	.54	2.48	2.72	.64	2.10	1.48	4.14	1.25	.17	2.26	2.86	21.15
Corsicana, Tex		2.36	.21	4.03	*k*5.18									
Davenport, Iowa	77	.91	.83	5.59	6.85	2.19	1.71	.90	.62	2.90	3.15	5.49	8.43	39.57
Dayton, Wash	2	.65	.22	1.47	3.04	2.47	2.37	2.56	6.16	1.97	4.08	1.93	.77	27.69
Deadwood, Dak	24	1.56	.56	1.80	.58	.84	.05	.33	.21	1.29	7.31	7.05	5.78	27.36
Decatur, Tex	30	2.66	.04	7.57	4.16	1.78	2.47	*e*2.67	5.24	.78	1.99	4.61	2.91	37.08
Delaware Breakwater, Del	27	.67	1.48	.50	2.35	3.59	.91	4.46	2.14	3.15	2.07	2.36	1.13	24.81
Denison, Tex	28	1.14	.26	5.59	6.76	3.26	1.42	3.58	5.66	1.03	2.60	4.64	1.86	37.80
Denver, Col	86	2.50	2.33	.57	.32	1.68	.00	.57	.20	.20	1.47	2.98	4.96	17.78
Des Moines, Iowa	45	5.57	5.29	4.70	6.45	3.97	1.85	.63	1.21	2.28	3.47	8.53	12.16	58.11
Detroit, Mich	71	3.33	1.32	2.86	6.52	4.36	4.17	1.97	1.92	3.34	1.13	4.82	3.70	39.44
Dodge City, Kans	30	5.06	2.36	3.13	2.19	.95	.61	.52	.22	.24	.68	3.87	1.51	21.34
Dubuque, Iowa	43	10.53	2.46	10.26	6.70	3.19	1.55	.84	.59	1.49	4.47	4.16	6.29	52.53
Duluth, Minn	28	1.84	7.36	11.52	3.77	2.58	.20	.57	2.02	3.05	2.51	7.14	6.72	49.28
Eagle Pass, Tex	2	1.74	1.64	4.99	6.54	1.57	.72	1.39	1.60	.77	1.25	4.98	1.02	28.21
Eagle Rock, Idaho	1	1.21	.95	.60	1.71	1.91	.80	4.41	1.25	3.45	3.35	.30	.52	19.86
Eastport, Me	58	3.73	3.64	2.80	4.31	3.37	6.25	3.70	4.94	7.54	3.03	3.30	6.53	53.14
El Paso, Tex	14	8.18	3.15	1.44	1.45	.50	.78	.64	.78	.38	.00	.10	.43	17.83
Erie, Pa	59	1.39	1.02	1.35	5.75	5.46	6.44	4.00	3.12	4.27	3.31	5.63	3.43	45.17
Escanaba, Mich	38	1.10	6.87	9.48	6.13	3.72	1.53	2.60	2.30	2.73	1.30	4.94	6.15	48.85
Florence, Ariz	4	2.25	4.28	1.00	1.13	.34	.14	2.28	1.11	(*n*)	(*n*)	(*m*)		
Fort Alexander, Alaska	1	(*s*)	2.86	3.75	1.91	3.38	1.44	4.80	1.42	2.72	.47	1.76	1.18	
Fort Apache, Ariz	1	5.63	8.31	5.41	4.68	.85	.54	2.82	2.85	1.09	.91	.94	3.27	37.30
Fort Assininiboine, Mont	21	*b*3.45	1.45	1.64	.75	.60	.08	.20	.24	.55	2.68	1.35	1.06	14.05
Fort Bennett, Dak	17	*o*1.45	2.24	2.74	*h*1.00	.70	(*n*)	2.01	.83	1.63	3.04	1.35	4.06	21.05
Fort Benton, Mont	51	2.28	1.18	1.32	1.94	1.73	.07	.75	.38	1.09	1.22	.35	.13	12.44
Fort Buford, Dak	(*aa*)	1.32	1.10	.58	.39	.39	.09	.26	.29	.69	.94	1.61	1.87	9.53
Fort Custer, Mont	24	1.41	.03	1.09	.80	.66	.22	.40	.02	.07	1.12	4.45	2.43	12.70
Fort Davis, Tex	20	4.27	6.32	(*l*)	4.47	(*l*)	*e*1.15	.87	.36	.03	.26	.04	3.19	
Fort Elliott, Tex	(*aa*)	3.28	.49	3.18	.69	.42	.26	.33	.16	.53	.66	7.48	1.54	19.02
Fort Gibson, Ind. T	35	.76	(*n*)	2.79	6.67	3.13	2.92	2.23	3.45	2.99	1.24	*p*3.93		
Fort Grant, Ariz	1	5.53	5.47	3.84	1.02	.08	.65	.86	1.26	1.84	.07	.81	1.47	22.90
Fort Griffin, Tex	3	.81	.25	4.87	2.54	1.44	1.27	1.63	2.33	*q*.99	*r*.14			
Fort Keogh, Mont	33	.39	.93	.55	.46	.44	.10	.18	.18	.41	2.06	2.57	1.76	10.03
Fort McKavett, Tex	21	2.05	1.78	1.15	7.21	*b*.52	.59	1.42	2.19	.39	.70	3.96	1.90	23.86
Fort Macon, N. C	5	9.70	6.75	4.85	3.75	2.69	5.56	3.69	2.85	9.36	5.55	2.11	1.52	58.38
Fort Missoula, Mont	19	.71	.18	1.05	1.06	.80	1.25	1.18	.80	.71	.05	.96	1.51	10.86
Fort Shaw, Mont	24	1.67	1.23	.96	1.57	.59	04	.78	.23	.62	.97	1.45	1.69	11.80
Fort Sill, Ind. T	6	1.97	.84	4.46	1.74	1.38	2.30	.80	1.66	1.53	1.61	4.40	3.25	25.94
Fort Stevenson, Dak	4	2.01	3.12	2.10	1.26	1.00	.18	.43	.54	2.05	*q*5.36	2.49	5.61	28.15
Fort Saint Michael's, Alaska	1	.89	4.43	3.40	2.14	1.75	.23	1.88	.40	.28	.04	.18	.25	15 87
Fort Verde, Ariz	4	1.41	7.53	1.88	.20	.21	.27	2.72	.93	.01	.03	.19	1.35	16.73
Fort Washakie, Wyo	1								*o*.12	.15	1.81	5.77	1.51	
Fredericksburg, Tex	24	4.28	1.53	2.14	3.38	1.68	.72	*a*3.54	3.20	2.01	.78	5.57	.30	29.13
Galveston, Tex	94	4.92	5.98	3.66	10.38	2.85	3.50	8.15	5.57	1.58	.83	3.75	6 16	57.33
Grand Haven, Mich	74	4.78	1.91	6.71	7.87	4.19	3.77	3.59	3.09	5.85	2.17	4.04	6.05	54.02

a Amount for 23 days only.
b Amount for 16 days only.
c Amount for 22 days only.
d Amount for 24 days only.
e Amount for 26 days only.
f Amount for 17 days only.
g Amount for 21 days only.
h Amount for 25 days only.
i Amount for 27 days only.
j Observations discontinued March 29, 1882.
k Observations discontinued October 31, 1881.
l Record incomplete.
m Observations discontinued April 30, 1882.
n Precipitation too small to measure.
o Amount for 13 days only.
p Amount for 18 days only.
q Amount for 20 days only.
r Observations discontinued April 15, 1882.
s Observations commenced August 1, 1881.
aa On ground.

APPENDIX 34.—*Monthly and annual precipitation, in inches and hundredths, at stations of observation of the Signal Service, &c.*—Continued.

Station.	Height of rain-gauge above ground.	1881.						1882.						Annual amount.
		July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	Feet.													
Hatteras, N. C	1	6.16	1.06	4.45	6.26	4.77	3.93	3.89	5.26	9.67	4.07	1.02	.63	51.17
Helena, Mont	29	1.95	1.78	2.49	2.04	1.27	.38	1.08	.37	.31	.94	.54	1.18	14.33
Henrietta, Tex	22	1.86	.94	2.43	2.38	*a*2.13	1.41	2.73	1.91	1.84	.80	2.73	*d*2.13	23.29
Huron, Dak	36	3.58	6.31	3.11	2.10	.45	.06	.14	.25	.80	4.18	4.50	5.86	31.54
Indianapolis, Ind	74	.82	.97	3.25	6.11	9.35	5.40	3.74	7.28	6.11	3.68	7.65	9.35	63.71
Indianola, Tex	40	1.30	6.30	6.51	5.04	4.18	1.49	3.39	1.01	2.30	1.26	6.58	1.77	41.13
Jacksborough, Tex	17	.12	.58	6.32	3.17	.87	1.76	1.96	4.01	.79	*e*.54	2.72	2.08	24.95
Jacksonville, Fla	57	7.61	10.23	4.58	2.87	3.41	2.86	2.58	1.09	.89	5.23	2.20	5.14	48.69
Keokuk, Iowa	60	3.08	.86	4.10	8.01	2.59	1.70	1.07	1.54	3.30	3.22	7.11	9.45	46.03
Key West, Fla	41	5.97	6.91	10.71	1.99	4.62	1.97	1.33	.40	.01	3.93	7.46	3.48	48.78
Kittyhawk, N. C	1	5.00	3.83	.49	5.55	4.17	6.29	6.86	4.83	6.49	4.92	2.22	4.99	55.64
Knoxville, Tenn	77	4.05	1.77	2.31	5.14	5.31	5.32	16.98	6.10	4.35	3.88	6.77	3.56	65.54
La Crosse, Wis	67	8.86	5.01	10.87	7.56	1.17	.26	.75	1.11	2.37	1.96	2.49	4.78	47.19
La Mesilla, N. Mex	16	3.90	.13	1.96	2.14	.56	.91	.63	1.36	.41	.01	.10	.72	15.83
Laredo, Tex	5	.12	2.02	(*f*)	5.49	1.74	1.01	1.74	.86	(*g*)	1.80	1.59	2.57	.....
Leavenworth, Kans	48	1.72	2.74	6.89	5.73	3.42	1.18	.83	1.17	1.15	4.15	2.53	5.06	36.57
Lewiston, Idaho	36	.89	3.31	1.17	1.52	1.19	1.07	1.46	.78	.67	.80	.65	.36	10.87
Little Rock, Ark	57	1.95	1.42	1.87	4.69	6.50	2.34	8.17	12.74	6.25	5.59	15.91	1.96	69.39
Los Angeles, Cal	107	.00	(*g*)	(*g*)	.82	.27	.52	1.01	2.66	2.66	1.83	.63	(*g*)	10.40
Louisville, Ky	102	2.18	.15	2.70	3.44	2.79	6.00	6.29	9.69	5.85	2.17	7.46	5.23	53.95
Lynchburg, Va	50	3.88	.30	2.07	4.09	3.59	6.22	5.34	3.66	4.33	2.30	3.15	4.06	42.99
Madison, Wis	57	9.47	.56	8.17	9.12	2.56	1.32	1.33	1.74	4.73	4.21	2.89	7.76	53.86
Marquette, Mich	57	2.49	2.80	12.70	3.71	3.43	.98	1.10	3.41	2.75	2.48	2.88	2.69	41.42
Mason, Tex	2	1.98	.53	5.26	2.68	.48	.84	3.71	2.93	1.19	*h*.51	.....	.....	.....
Memphis, Tenn	51	.89	1.97	3.84	3.22	5.14	2.39	12.87	9.92	9.10	3.56	9.14	4.15	66.19
Milwaukee, Wis	135	5.34	.80	4.28	6.04	1.69	1.27	1.05	2.11	3.90	1.92	2.03	3.77	34.20
Mobile, Ala	51	2.77	15.22	11.71	3.23	7.36	9.15	6.77	4.54	5.13	9.92	6.78	2.40	84.98
Montgomery, Ala	58	2.18	5.06	4.49	2.72	4.56	9.75	4.54	9.27	6.92	5.03	2.94	3.98	61.44
Moorhead, Minn	41	1.97	5.89	4.75	2.75	1.41	.20	1.34	.80	2.83	1.69	5.32	5.43	34.38
Morgantown, W. Va	1	5.61	.41	2.78	4.55	3.19	5.93	6.78	5.41	7.18	3.36	4.51	3.39	53.10
Mount Washington, N. H	2	9.93	11.96	6.13	18.38	15.10	15.95	7.20	5.94	14.52	11.20	8.91	11.40	136.62
Nashville, Tenn	49	.86	1.81	6.49	4.74	4.84	4.83	14.49	8.58	9.36	3.55	7.34	2.51	69.40
New Haven, Conn	109	3.53	2.51	1.45	2.78	4.18	4.75	5.91	4.52	3.59	1.55	5.05	2.74	42.56
New London, Conn	57	2.72	2.08	1.37	3.56	5.16	4.03	6.90	5.26	3.56	3.40	4.13	4.85	47.02
New Orleans, La	77	6.97	4.21	4.47	4.84	7.24	6.62	4.54	4.04	.92	4.83	6.83	2.71	58.22
Newport, R. I	41	.87	.86	2.65	2.46	5.52	3.41	6.55	5.89	4.23	4.54	4.55	2.99	44.52
New York, N. Y	145	1.31	1.56	1.38	2.10	2.87	4.37	6.15	4.36	2.32	2.15	4.21	2.82	35.60

Norfolk, Va	*52*	*6.47*	*1.74*	*2.67*	*2.43*	*6.04*	*1.61*	*6.40*	*3.58*	*3.33*	*3.23*	*5.87*	*3.13*	*46.49*
North Platte, Nebr	*34*	*3.09*	*.75*	*2.36*	*2.22*	*.37*	*.13*	*.46*	*.13*	*.04*	*1.94*	*3.98*	*4.84*	*20.31*
Olympia, Wash	*39*	*.98*	*.71*	*2.47*	*8.18*	*6.75*	*8.86*	*6.11*	*9.60*	*2.24*	*4.57*	*2.30*	*1.00*	*53.77*
Omaha, Nebr	*78*	*5.89*	*1.65*	*8.36*	*4.84*	*1.29*	*1.56*	*0.74*	*.60*	*.79*	*4.31*	*4.91*	*12.05*	*46.99*
Ooglaamie (Pt. Barrow), Alaska t					*(s)*	*.73*	*.44*	*.45*	*.04*	*.51*	*.41*	*.44*	*.63*	
Oswego, N. Y	62	1.73	1.69	.76	4.61	3.13	6.78	4.46	3.33	3.28	2.08	4.83	3.72	40.40
Palestine, Tex	4						(n)	(n)	3.68	2.37	3.42	7.56	.83	
Pensacola, Fla	35	5.59	18.52	8.47	4.93	7.27	10.76	3.31	4.67	3.07	4.27	3.51	3.95	78.32
Philadelphia, Pa	106	.96	1.18	.94	3.04	2.02	2.63	4.57	4.22	3.57	2.12	5.06	1.90	32.21
Phœnix, Ariz	3	2.03	2.19	1.04	.25	.36	.16	1.62	.17	.00	.00	.00	.37	8.19
Pike's Peak, Colo	1	6.55	11.29	1.85	1.77	4.76	.56	1.78	.36	2.65	1.79	12.34	3.10	48.80
Pioche, Nev	23	.23	1.73	.00	.56	.10	.08	.38	.55	.30	.98	.29	3.23	8.43
Pittsburg, Pa	86	3.86	.88	.76	3.75	2.66	3.94	4.58	3.14	3.78	1.39	5.80	4.14	38.68
Port Eads, La	2	10.44	14.16	7.24	4.93	3.16	11.28	3.50	5.14	1.81	3.50	6.37	3.70	75.23
Port Huron, Mich	63	1.30	1.61	2.86	4.14	2.70	3.41	2.81	2.23	5.25	2.33	4.99	6.34	39.97
Portland, Me	77	3.94	1.42	2.75	2.90	3.13	6.79	4.39	4.58	3.97	1.97	3.95	3.20	42.99
Portland, Oreg	60	1.16	2.11	2.64	6.60	6.91	6.64	5.06	10.49	2.53	4.60	1.84	1.91	52.49
Portsmouth, N. C	29	6.33	4.96	3.29	3.62	5.19	5.81	4.44	2.69	6.35	5.57	.58	(n)	
Prescott, Ariz	5	3.27	5.25	1.69	.33	.30	.33	2.53	2.04	.00	.28	.45	.47	16.94
Provincetown, Mass	35								11.67	4.55	4.70	5.96	2.73	
Punta Rassa, Fla	35	3.60	7.28	7.20	1.58	.80	1.22	.30	.20	.15	3.59	2.51	8.46	36.89
Red Bluff, Cal	36	(g)	.00	1.07	1.61	.73	5.60	2.81	3.94	2.67	2.12	.33	.15	21.12
Rio Grande City, Tex	2	1.34	4.03	3.71	6.98	1.15	1.26	.95	.11	1.91	1.50	4.11	.46	27.51
Rochester, N. Y	145	2.20	1.44	1.82	3.63	1.96	4.11	2.04	1.25	1.74	2.18	5.57	2.50	30.44
Roseburg, Oreg	33	.79	.46	.72	5.96	4.15	5.14	4.21	6.21	2.83	5.14	.85	.61	37.07
Sacramento, Cal	58	(g)	.00	.30	.55	1.88	3.27	1.89	2.40	3.78	1.99	.35	.10	16.51
Saint Louis, Mo	100	2.13	.31	3.14	7.21	6.74	1.40	2.80	8.94	3.49	3.58	4.55	4.53	48.82
Saint Paul, Minn	58	2.60	4.55	9.95	4.44	1.36	.53	.67	2.35	3.25	1.61	2.44	2.68	36.43
Saint Paul's Island, Alaska	(t)	2.10	4.49	7.94	5.88	7.81	3.04	4.36	1.86	2.88	1.71	1.68	1.02	44.77
Saint Vincent, Minn	14	.48	1.96	1.99	1.30	.48	.25	.74	.83	1.66	.90	2.94	3.35	16.88
Salt Lake City, Utah	78	.21	1.61	.43	2.19	1.44	1.24	1.50	.42	1.12	3.81	.26	2.24	16.47
San Antonio, Tex	37	1.37	.95	5.86	4.19	2.07	1.51	1.91	2.18	4.24	.92	6.79	.11	32.10
San Diego, Cal	30	.00	.01	.04	.24	.12	.30	4.53	2.55	1.02	.45	.18	0.7	9.51
Sandusky, Ohio	64	3.88	.96	3.78	5.58	4.99	6.27	2.46	3.79	4.02	2.75	7.11	3.71	49.30
Sandy Hook, N. J	1	2.43	.63	3.57	2.71	3.54	5.00	6.47	4.85	4.00	3.19	7.21	2.60	46.20
San Francisco, Cal	75	.00	.00	.25	.54	1.94	3.85	1.68	2.96	3.45	1.22	.21	.04	16.14
Santa Fé, N. Mex	68	4.72	6.28	.91	4.19	m1.11	(n)	.47	.06	.23	.26	1.06	1.36	
Savannah, Ga	58	1.25	9.63	3.09	2.72	2.45	3.08	1.90	.78	4.19	2.94	1.60	7.95	41.58
Shreveport, La	44	3.17	.45	5.90	8.28	5.96	7.59	9.08	8.71	3.16	5.44	4.50	.65	62.98
Silver City, N. Mex	9	9.62	8.69	3.89	3.21	1.55	.28	1.83	2.06	1.17	.08	1.37	1.92	35.67
Sitka, Alaska	43	4.40	1.98	12.11	5.04	13.50	10.52	14.20	16.35	3.53	4.21	2.89	3.71	92.44
Smithville, N. C	35	10.65	3.49	4.42	2.83	4.25	5.19	3.36	1.64	7.81	1.63	1.17	2.76	49.20
Spokane Falls, Wash	32	2.25	.45	2.55	2.41	2.23	2.44	4.54	2.25	1.04	2.84	1.54	1.17	25.71
Springfield, Ill	61	3.37	4.63	6.43	10.02	6.93	4.81	2.48	7.92	4.92	3.85	10.59	12.71	78.06
Springfield, Mass	64	3.23	3.23	.99	3.43	4.84	5.14	4.70	5.29	2.98	1.36	6.11	4.44	45.73
Springfield, Mo	49							r2.65	7.29	3.19	3.71	8.07	2.70	

a Amount for 26 days only.
b Amount for 23 days only.
c Amount for 27 days only.
d Amount for 28 days only.
e Amount for 19 days only.
f Record incomplete; observer sick.
g Precipitation too small to measure.
h Observation discontinued April 15, 1882.
i Amount for 18 days only.
j Amount for 7 days only.
k Amount for 16 days only.
l Amount for 14 days only.
m Amount for 20 days only.
n No record on station.
o Amount for 24 days only.
p Amount for 27 days only.
q Amount for 28 days only.
r Observations commenced January 3, 1882.
s Observations commenced October 15, 1881.
t Not determined.

APPENDIX 34.—*Monthly and annual precipitation, in inches and hundredths, at stations of observation of the Signal Service, &c.*—Continued.

Station.	Height of rain-gauge above ground.	1881.						1882.						Annual amount.
		July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
	Feet.													
Stockton, Tex	2	1.64	1.10	1.71	2.67	.07	1.30	.68	1.21	.16	.12	.99	3.50	15.24
Thatcher's Island, Mass	4	2.89	.85	3.76	3.19	11.18	6.80	5.00	4.69	3.60	2.73	8.72	1.33	54.74
Toledo, Ohio	106	5.45	.88	5.33	8.49	4.74	4.73	1.57	2.40	3.02	1.66	4.99	4.51	47.77
Tucson, Ariz	1	5.69	3.92	2.37	.62	.00	.19	1.75	1.64	.72	.05	.01	.99	17.95
Umatilla, Oreg	5	.53	.73	.74	1.54	.98	.45	.71	.73	.32	.76	.26	.17	7.92
Unalashka, Alaska	.....	2.60	2.12	9.16	27.30	11.82	12.70	14.30	7.97	5.84	2.19	4.51	3.84	104.35
Uvalde, Tex	(*a*)	1.22	1.91	1.44	3.15	2.24	.91	c07	d71	1.41	.33	4.73	.36	18.48
Vicksburg, Miss	53	2.45	2.53	6.11	9.69	6.07	3.18	13.83	7.15	7.41	5.44	8.30	.40	72.56
Visalia, Cal	45	(*e*)	.03	.09	.31	.52	.27	.87	1.86	1.47	.95	.37	.02	6.76
Washington, D. C	51	1.67	1.07	2.19	3.29	2.45	6.12	7.09	5.09	3.75	2.55	5.00	2.33	42.60
West Las Animas, Colo	1	.....	.....	.....	*h*.21	d63	i04	l08	.02	.10	.98	5.06	2.49	.....
Wickenburg, Ariz	2	1.82	5.02	1.16	.09	.41	.36	1.82	.69	.00	.04	(*m*)	(*m*)	.....
Williamsport, Pa	58	.....	.....	.....	.....	.....	.....	*f*3.01	3.74	3.48	2.24	6.66	3.25	.....
Wilmington, N. C	45	12.40	4.99	3.50	1.48	2.95	3.64	1.96	1.92	7.09	2.27	1.40	2.96	46.56
Winnemucca, Nev	6	.00	.07	.12	1.37	.32	1.81	1.03	1.50	1.22	.85	.63	1.17	10.09
Wood's Holl, Mass	32	1.71	.65	2.50	2.68	5.52	2.06	*k*4.22	.....	.....	.....	.....	.....	.....
Yankton, Dak	28	4.54	1.77	8.61	3.47	.90	.11	.04	.09	.06	2.93	5.25	4.87	32.64
Yuma, Ariz	21	.20	.08	.05	(*e*)	.00	.10	1.35	.01	.00	.00	.00	.05	1.84

a On ground.
b Amount for 27 days only.
c Amount for 7 days only.
d Amount for 17 days only.
e Precipitation too small to measure.
f Amount for 25 days only.
g Amount for 21 days only.
h Amount for 23 days only.
i Amount for 12 days only.
j Amount for 15 days only.
k Observations discontinued January 31, 1882.
l Record incomplete.
m No report received.

APPENDIX 35.

Table showing the precipitation, in inches and hundredths, at the military post hospitals named below, for each month of the year ending June 30, 1882.

Stations.	1881.						1882.						Annual amount.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Alcatraz Island, Cal	.00	.00	.25	.54	2.04	3.39	1.51	3.14	4.07	1.32	.02	.10	16.38
Angel Island, Cal	.00	.00	.44	.56	2.13	3.84	1.72	3.00	3.55	1.22	.19	(a)	.....
Benicia Barracks, Cal	.00	.00	.60	.19	1.45	2.70	1.64	1.61	3.24	.90	.12	.02	12.47
Fort Adams, R. I	.57	.84	2.14	2.56	3.29	1.92	(a)	2.20	1.02	1.56	2.71	1.56	.....
Fort Abraham Lincoln, Dak	1.00	2.00	2.25	.10	.50	(b)	(c)	.10	1.30	3.20	2.80	3.30	.....
Fort Apache, Ariz	3.93	6.66	4.52	4.18	.33	.34	1.94	3.04	.84	.54	1.12	2.40	29.84
Fort Assinniboine, Mont	3.11	1.26	1.58	.70	.35	.00	.28	.35	.75	2.99	1.75	1.30	14.42
Fort Barrancas, Fla	6.21	16.71	8.82	4.55	8.09	10.89	3.72	9.16	4.47	7.08	3.97	4.79	88.46
Fort Bidwell, Cal	.32	.10	.24	3.55	2.87	3.40	3.44	2.82	1.46	1.72	.64	.38	20.94
Fort Bowie, Ariz	5.33	5.16	2.27	1.15	.58	.03	.90	1.15	1.51	.26	.71	1.39	20.44
Fort Brady, Mich	1.03	.41	8.53	3.04	2.38	.93	.83	2.91	1.66	1.60	1.67	(a)	.....
Fort Bridger, Wyo	.65	.42	.18	.46	.44	.36	.93	.18	.35	1.58	.45	1.36	7.36
Fort Brown, Tex	1.20	2.35	4.04	7.04	3.14	1.50	1.83	.65	3.30	1.14	6.30	1.69	34.18
Fort Buford, Dak	1.22	.72	.47	.05	.36	.07	.26	.29	.62	.80	2.88	3.22	10.96
Fort Canby, Wash	2.46	.90	2.50	9.34	7.29	11.55	7.16	10.48	5.40	6.80	2.18	(a)	.....
Fort Columbus, New York Harbor	1.77	2.38	1.22	1.80	2.77	3.90	5.23	3.93	2.14	1.82	4.03	2.33	33.37
Fort Concho, Tex	.04	.20	1.70	2.30	.50	1.80	.84	3.38	.35	.09	1.23	2.09	14.52
Fort Davis, Tex	2.42	2.76	2.70	3.40	(a)	1.15	.87	.36	.03	.26	.04	3.19	.....
Fort Douglas, Utah	.40	1.38	.50	2.40	2.12	1.24	1.40	1.20	1.76	2.64	1.28	1.40	17.72
Fort Ellis, Mont	1.24	.84	1.12	1.89	2.43	.07	1.03	1.01	2.50	2.62	2.94	(a)	.....
Fort Fetterman, Wyo	4.70	1.80	4.20	2.50	1.60	2.00	.40	(a)	(a)	(a)	(a)	(a)	.....
Fort Garland, Colo	1.88	2.42	.95	.58	.56	.10	.92	.22	.16	.60	1.64	.90	10.93
Fort Gaston, Cal	.06	.27	.30	6.51	4.83	9.24	7.72	10.46	3.46	6.11	1.69	.28	50.93
Fort Grant, Ariz	4.38	4.73	2.90	.66	.18	.50	.62	1.01	.90	.14	.33	1.47	17.82
Fort Hale, Dak	2.28	2.78	1.30	3.20	.68	.00	.60	.48	.86	2.04	2.54	3.22	19.98
Fort Hamilton, New York Harbor	1.22	1.94	.80	2.00	2.76	3.92	4.94	3.69	2.02	2.00	4.75	1.70	31.74
Fort Keogh, Mont	.36	.96	.35	.38	.44	.10	.18	.18	.39	2.06	2.57	1.76	9.73
Fort Klamath, Oreg	1.24	.30	.68	3.04	2.78	3.00	2.40	4.38	1.48	2.72	1.38	(a)	.....
Fort Lapwai, Idaho	.52	.24	2.66	1.96	1.21	.67	1.02	1.00	1.03	3.00	1.66	.30	15.27
Fort Leavenworth, Kans	1.99	1.92	5.23	4.46	1.40	.96	1.07	.88	.88	3.84	2.61	2.82	28.06
Fort Lewis, Colo	1.50	3.80	1.40	1.70	3.00	.50	.70	1.30	.50	1.20	.60	2.00	18.20
Fort Lowell, Ariz	3.62	(a)	2.04	1.26	.00	.30	2.30	1.90	.94	.30	.32	1.54	.....
Fort Lyon, Col	0.61	1.58	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.80	3.40	1.20	.....
Fort McDermit, Nev	.00	.00	(b)	1.18	.76	.32	.54	.20	.44	.14	.34	.28	4.20
Fort McDowell, Ariz	1.16	3.38	.10	(b)	.80	(b)	3.22	.58	.00	.00	.10	.56	9.90
Fort McHenry, Md	1.19	2.01	2.65	2.96	2.04	4.19	5.11	3.88	2.55	1.99	3.41	2.39	34.37
Fort Meade, Dak	1.50	1.57	1.09	.63	.46	(a)	.10	.10	.60	4.77	3.87	5.47	.....

Table showing the precipitation, in inches and hundredths, at the military post hospitals named below, &c.—Continued.

Stations.	1881.						1882.						Annual amount.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Fort Mojave, Ariz	1.80	.30	.14	(b)	.00	.00	.66	.66	.00	.26	.00	.08	3.90
Fort Monroe, Va	4.69	.86	2.16	2.02	3.70	1.16	5.88	3.24	2.08	3.14	3.04	4.60	36.57
Fort Niagara, N. Y	1.69	.42	1.25	3.63	2.98	2.60	2.05	1.87	2.41	1.16	5.23	1.29	26.58
Fort Niobrara, Nebr	(a)	1.00	2.56	(a)	(a)	(a)	(a)	(a)	.68	2.68	1.86	3.60	.....
Fort Pembina, Dak	.40	2.50	2.52	2.66	.70	.50	1.08	.62	1.78	.50	2.50	3.34	19.10
Fort Porter, N. Y	2.10	.57	1.08	6.28	3.14	4.10	3.36	2.17	2.57	1.79	7.14	2.82	37.12
Fort Preble, Me	1.50	.94	.84	(a)	(a)	5.26	4.10	2.74	1.52	1.64	4.28	4.14	.....
Fort Randall, Dak	1.36	1.85	3.95	1.90	.60	.10	.20	2.00	1.50	3.40	(a)	4.40	.....
Fort Ringgold, Tex	1.50	2.18	3.68	5.74	(a)	1.08	.50	(a)	(a)	(a)	(a)	(a)	.....
Fort Shaw, Mont	1.67	1.23	.96	1.54	.59	.03	.70	.55	.47	.30	1.12	1.69	10.86
Fort Sisseton, Dak	1.30	3.96	1.64	1.62	.26	.12	.36	.32	(a)	2.46	2.20	7.42	.....
Fort Snelling, Minn	1.64	4.36	10.54	3.32	1.34	.15	.22	.28	1.36	1.95	3.05	2.75	30.96
Fort Stanton, N. Mex	(a)	(a)	2.65	(a)	.76	.35	.95	(a)	.26	.88	(a)	(a)	.....
Fort Stevens, Oreg	1.20	2.89	1.71	11.59	7.88	13.47	6.95	13.27	5.00	5.03	1.09	1.87	71.95
Fort Stevenson, Dak	2.27	4.43	2.03	1.13	.54	.20	.21	.43	3.33	3.25	2.71	6.07	26.60
Fort Sully, Dak	1.83	1.97	2.45	.75	.31	(a)	.23	.09	.42	2.56	1.81	3.13	.....
Fort Totten, Dak	.10	2.24	2.46	.24	.50	(b)	.48	.30	2.04	2.40	1.30	4.30	16.36
Fort Townsend, Wash	.78	1.40	(a)	1.68	3.95	2.22	2.76	2.74	2.68	2.88	.63	1.60	.....
Fort Union, N. Mex	4.74	4.59	2.50	3.94	.56	.10	.32	(a)	(a)	(a)	1.20	2.24	.....
Fort Verde, Ariz	1.41	6.69	1.16	.20	.21	.27	2.72	.93	.01	.03	.19	1.35	15.17
Fort Wallace, Kans	1.19	1.50	2.50	.35	(a)	.01	.20	1.00	.00	1.11	(a)	(a)	.....
Fort Warren, Mass	1.54	1.18	2.18	1.62	2.16	2.38	3.80	2.98	3.47	1.30	3.94	1.04	27.59
Fort Washakie, Wyo	(a)	.06	.05	1.08	.07	.01	.06	.04	.01	.92	4.97	1.12	.....
Fort Wingate, N. Mex	1.74	3.18	2.55	1.19	.19	.35	.62	1.02	.40	.40	.14	2.06	13.84
Fort Yates, Dak	(a)	(a)	(a)	(a)	(a)	(a)	.50	.10	1.00	2.00	2.04	2.59	.....
Fort Yuma, Cal	.75	.00	.00	(b)	.00	.10	1.53	.00	.00	.00	(a)	.05	2.43
Jefferson Barracks, Mo	(a)	(a)	(a)	(a)	(a)	(a)	2.80	6.96	2.14	3.17	4.89	3.80	.....
Madison Barracks, N. Y	.38	.47	1.21	2.94	2.03	2.90	1.40	1.94	2.72	1.26	4.97	2.88	25.10
McPherson Barracks, Ga	.43	2.91	2.66	2.50	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Pagosa Springs, Colo	(a)	(a)	(a)	(a)	(a)	.40	2.20	1.00	1.56	1.15	.50	(a)	.....
Plattsburg, N. Y	2.35	2.54	1.99	1.84	1.50	1.76	1.06	1.96	2.70	.86	1.70	4.78	25.04
Point San José, Cal	.00	.00	.09	.36	1.54	2.72	1.17	1.99	2.47	.97	.16	(b)	11.47
Presidio, Cal	.00	.00	.17	.48	2.06	3.17	1.41	2.70	2.78	.86	.12	.00	13.75
Saint Augustine, Fla	6.38	5.55	1.60	1.66	3.26	3.80	2.60	.02	.45	7.27	1.86	3.35	37.80
Fort Brooke, Fla	3.10	5.32	4.24	.28	.54	2.24	3.72	.82	1.18	3.88	2.40	5.28	33.00
West Point, N. Y	3.50	3.00	(a)	5.20	3.50	(a)	5.40	(a)	4.90	1.94	6.00	3.60	.....

a No reports received.

b Precipitation too small to measure.

APPENDIX 36.

Table showing the precipitation, in inches and hundredths, at the voluntary stations of observation of the Signal Service, United States Army, for each month of the year ending June 30, 1882.

Stations.	1881.						1882.						Annual mean.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Accotink, Va.	2.41	1.76	1.53	3.30	2.10	1.85	6.75	4.19	2.77	3.01	3.69	1.01	34.37
Adrian, Mich.	3.96	(a)	.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Aiken, S. C.	5.30	(a)	3.10	1.22	3.52	4.09	2.35	.95	(a)	(a)	(a)	(a)	.....
Albany, Oreg.	1.39	1.62	2.24	7.00	4.64	6.78	.....	10.07	3.47	4.32	1.29	.41	.....
Ames, Iowa	16.31	3.25	7.63	6.24	2.07	.89	.57	1.14	3.09	2.44	5.21	7.43	56.27
Amherst, Mass.	1.50	2.76	2.37	4.24	4.58	6.15	5.44	4.23	5.20	1.52	6.50	2.25	46.74
Anna, Ill.	.00	.38	1.91	6.51	6.10	2.17	4.39	8.17	4.52	4.09	9.77	3.04	51.05
Antrim, N. H.	6.23	2.45	4.55	3.45	4.25	6.60	4.50	5.18	3.90	1.65	6.20	3.85	52.81
Ardenia, N. Y.	2.73	2.23	.92	2.68	4.92	5.77	2.99	.77	7.05	(a)	5.86	2.34	.....
Argyle, Kans.	(a)	(a)	7.10	2.50	.89	(a)	(a)	3.30	1.25	2.90	11.02	3.00	.....
Argyle, N. Y.	2.66	.35	3.29	3.58	2.62	6.25	2.86	(a)	(a)	(a)	(a)	(a)	.....
Ashland, N. H.	5.23	1.55	2.83	3.93	3.74	6.30	3.48	4.13	3.29	1.77	5.52	3.67	45.44
Ashland, Wis.	(a)	1.30	3.50	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Ashwood, Tenn.	.02	.50	5.60	5.50	8.10	4.20	18.10	7.30	8.15	3.80	9.80	1.55	72.62
Atco, N. J.	4.69	1.23	2.25	2.32	2.67	2.83	6.32	5.08	3.17	1.95	5.36	2.93	40.80
Auburn, Ala.	2.50	6.03	4.11	4.91	5.12	6.30	4.47	11.31	9.28	4.34	2.45	2.11	62.93
Auburn, N. H.	7.92	4.62	7.02	6.10	6.95	5.21	3.71	4.97	7.25	(a)	11.50	5.00	.....
Austin, Nebr.	(a)	.71	2.16	1.22	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Austin, Tenn.	.20	.50	5.80	4.62	5.16	5.50	18.11	7.95	8.90	4.81	8.40	2.40	72.35
Austin, Tex.	2.19	2.05	1.99	3.14	2.42	1.32	3.46	5.05	3.90	(a)	(a)	(a)	.....
Avon, Nebr.	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.40	(a)	(a)	(a)	(a)	.....
Bainbridge Island, Wash.	1.74	2.45	.75	5.60	5.07	8.00	4.31	(a)	3.42	4.24	1.82	1.52	.....
Battle Creek, Mich.	1.20	(a)	(a)	7.17	(a)	(a)	(a)	2.10	3.25	1 93	4.72	8.00	.....
Bellefontaine, Ohio.	3.65	1.77	1.37	5.46	4.44	2.97	2.80	4.78	4.23	3.45	7.87	3.45	46.24
Belle Plain, Kans.	(a)	.20	9.90	2.10	1.40	(a)	1.15	2.80	1.10	1.60	8.10	3.60	.....
Belmont, N. H.	5.30	1.24	3.53	3.86	3.19	5.25	3.92	4.14	3.21	.96	4.62	4.07	43.29
Beloit, Wis.	6.20	.84	4.93	5.95	2.44	2.69	.90	2.51	4.10	3.38	3.55	6.51	44.00
Bethel, Ohio.	1.75	2.25	2.25	4.00	3.50	5.38	5.62	7.00	5.00	2.50	9.00	4.38	52.63
Blackfeet Agency, Mont.	(a)	(a)	(a)	(a)	(a)	.21	.78	(a)	1.52	1.76	(a)	(a)	.....
Blooming Grove, Pa.	1.30	1.40	.90	3.50	1.90	3.10	(a)	1.33	3.70	1.60	3.70	4.10	.....
Bowling Green, Ky.	(a)	(a)	(a)	(a)	5.90	3.43	6.39	6.11	9.99	5.25	8.65	2.96	.....
Bristol, N. H.	5.96	1.39	2.06	3.93	3.05	6.08	3.05	4.66	3.02	1.46	5.59	4.38	44.63
Brook Haven, N. Y.	.61	.41	.24	1.68	2.35	.98	3.11	3.28	.28	1.50	1.85	(a)	.....

a No report.

APPENDIX 36.—*Table showing the precipitation, in inches and hundredths, at the voluntary stations of observation of the Signal Service, &c.*—Continued.

Stations.	1881.						1882.						Annual mean.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Caldwell, Kans	(a)	(a)	12.15	(a)	1.40	(a)	1.11	.68	.99	2.85	7.00	3.00	.....
Carson City, Nev	.34	.08	.31	.17	1.21	2.53	1.16	1.03	4.22	.51	.29	.59	12.44
Catawissa, Pa	1.17	1.07	.45	2.06	2.80	4.85	4.32	3.96	3.95	2.65	5.69	4.15	37.12
Cedar Bend, Nebr	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.76	(a)	7.19	(a)	.63	.....
Cedar Rapids, Iowa	(a)	(a)	(a)	(a)	(a)	(a)	.59	1.15	2.92	4.86	9.13	3.78	.....
Centralia, Ill	.20	(a)	(a)	(a)	5.50	(a)	3.00	6.05	(a)	(a)	(a)	(a)	.....
Chambersburg, Pa	4.28	1.33	1.35	2.80	1.36	5.06	4.56	3.97	(a)	(a)	(a)	(a)	.....
Charleston, Ill	1.12	(b)	3.95	7.30	8.20	3.50	2.88	8.01	5.10	3.80	5.80	7.70	57.36
Charlotte, Vt	2.70	2.80	2.30	1.40	1.00	2.00	.90	1.70	2.40	1.00	2.25	3.68	24.13
Cincinnati, Ohio	1.47	.64	2.44	4.89	3.26	4.58	5.56	5.70	5.69	2.10	7.47	3.49	47.29
Clarksville, Tex	.12	.00	1.25	4.75	2.50	3.50	8.50	8.25	2.25	4.25	6.75	1.25	.....
Clay Centre, Kans	1.50	1.14	7.00	5.02	1.08	2.00	(a)	(a)	.50	4.03	9.37	4.07	.....
Clear Creek, Nebr	6.58	.41	2.38	5.45	1.50	1.57	.65	.60	.42	3.36	3.33	8.17	.....
Cleveland, Ohio	1.01	.28	2.17	4.77	3.93	4.69	2.56	3.14	3.64	2.19	4.98	3.81	37.17
Clinton, Iowa	2.27	1.38	4.01	5.55	2.28	2.44	.48	1.10	4.16	7.40	4.16	9.05	44.28
Coalville, Utah	1.00	1.90	.55	.50	(a)	(a)	.50	5.11	.13	(a)	(a)	2.40	.....
Coldwater, Mich	6.75	.95	4.95	7.40	7.42	5.63	2.26	2.55	4.25	4.85	8.12	(a)	.....
College Hill, Ohio	4.50	1.50	2.25	4.00	4.75	7.00	7.25	9.50	7.50	1.25	8.50	9.75	67.75
Columbia, S. C	2.23	3.91	3.92	2.11	2.89	3.93	3.56	2.07	5.88	(a)	2.83	2.42	.....
Contoocookville, N. H	4.50	.95	4.15	2.65	4.50	5.80	3.00	3.05	2.10	1.00	4.25	(a)	.....
Cooperstown, N. Y	3.07	.72	1.43	4.89	3.24	6.02	2.67	3.17	2.48	1.30	3.98	4.88	37.85
Corning, Mo	1.40	2.97	6.73	6.91	1.81	.73	.23	(a)	2.15	4.80	(a)	(a)	.....
Cornish, Me	4.91	1.54	3.17	2.57	3.47	5.70	4.10	5.02	3.06	(a)	3.65	3.86	.....
Council Grove, Kans	(a)	(a)	(a)	5.22	(a)	(a)	1.20	(a)	1.14	3.23	(a)	(a)	.....
Cresco, Iowa	7.59	4.01	10.03	8.06	1.64	.58	1.09	1.32	2.79	2.78	3.47	6.10	49.46
Creswell, Kans	2.97	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	2.30	6.65	5.61	.....
Crete, Nebr	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.56	.15	6.17	(a)	3.80	.....
Cumberland, Md	3.82	.31	2.09	2.05	1.43	4.50	3.95	4.93	4.50	2.53	3.83	2.08	36.02
Dana, Iowa	(a)	(a)	(a)	(a)	2.06	1.23	.84	.75	1.60	2.72	4.12	5.10	.....
De Soto, Nebr	6.35	1.03	2.58	5.14	.99	1.06	.79	.80	.13	2.98	3.48	7.31	32.64
Dexter, Me	(a)	(a)	2.55	2.43	3.20	6.40	3.50	3.20	5.15	2.15	4.82	(a)	.....
Distributing Reservoir, D. C	1.97	1.61	2.24	3.20	2.57	5.71	5.81	5.17	3.77	2.72	6.20	3.41	44.38
Dyberry, Pa	4.36	2.57	1.06	4.08	3.41	4.05	4.67	4.12	2.09	.80	5.19	3.39	39.79
East Harbor, British West Indies	.39	1.39	2.31	6.66	4.98	1.91	1.01	.00	.68	(a)	3.17	.17	.....
Elmira, Ill	3.95	.62	4.16	5.93	2.77	1.44	.74	1.04	2.52	2.93	4.96	6.23	37.29
Elsworth, N. C	7.37	7.63	26.50	6.75	8.50	(a)	4.71	3.15	(a)	(a)	(a)	(a)	.....
Embarrass, Wis	2.55	7.85	11.60	8.75	3.71	.70	1.70	3.05	3.80	2.95	4.40	6.40	57.46
Emmettsburg, Md	2.09	.86	2.34	8.77	11.00	5.90	5.61	4.52	4.57	2.39	6.39	2.73	57.17

Emporia, Kans	2.90	4.07	5.40	4.51	2.48	.94	.76	.75	1.12	(a)	6.55	3.72	.....
Eola, Oreg	1.37	1.24	1.83	5.92	3.16	3.40	5.65	9.06	2.72	2.57	1.51	.91	39.34
Fall River, Mass	2.68	.74	3.22	2.65	5.59	2.41	5.32	4.75	4.02	4.08	4.06	3.81	43.33
Fallsington, Pa	1.13	1.44	.64	2.00	2.85	3.32	5.02	4.99	2.31	2.37	5.14	2.30	33.51
Fallston, Md	1.67	(a)	1.21	2.73	2.78	3.75	6.63	4.79	3.28	2.82	3.76	2.32	.....
Fayette, Miss	2.20	1.90	4.50	8.80	6.10	2.70	12.70	5.50	5.60	6.50	7.20	1.60	65.60
Federalsburg, Md	(a)	(a)	(a)	2.86	5.30	3.17	7.01	3.47	5.03	3.51	3.39	(a)	.....
Flemington, W. Va	7.60	.90	1.44	2.26	2.67	6.33	6.33	4.94	(a)	(a)	(a)	(a)	.....
Flushing, N. Y	2.45	.90	.65	2.38	3.25	4.66	5.64	3.87	3.57	1.90	4.35	2.77	36.39
Forest Hill, N. C	(a)	(a)	(a)	(a)	(a)	(a)	8.90	3.80	(a)	(a)	(a)	(a)	.....
Forsyth, Ga	2.05	4.10	(a)	2.54	4.39	6.85	4.34	7.90	10.46	4.38	3.02	5.98	.....
Fort Madison, Iowa	2.30	(a)	2.98	6.96	2.53	1.40	(a)	80	1.82	3.30	10.50	8.75	.....
Fort Scott, Kans	.38	2.57	9.41	3.93	3.48	2.80	1.05	4.67	(a)	(a)	(a)	(a)	.....
Fort Wayne, Ind	(a)	(a)	2.39	5.15	4.16	5.90	1.00	3.32	2.33	3.76	3.83	(a)	.....
Franklin, Ark	(a)	(a)	4.90	6.21	.....	.....	.....	.....	.....	.....	.....	.....	.....
Franklin, N. C	2.25	5.50	11.35	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Franklin, Pa	1.05	.34	2.16	3.08	3.60	5.60	3.96	3.02	3.10	1.60	5.02	7.88	40.41
Franklin, Wis	(a)	(a)	(a)	(a)	3.15	.66	2.36	2.38	3.57	2.66	1.55	4.88	.....
Freehold, N. J	.70	3.13	2.65	3.45	3.55	3.87	5.42	5.17	2.82	2.40	4.51	3.44	41.11
Fremont, Nebr	5.01	.32	(a)	(a)	1.98	(a)	(a)	.25	.17	4.43	3.43	7.61	.....
Friendship, N. Y	1.65	1.48	1.50	3.88	4.00	5.75	2.15	3.10	3.55	1.13	5.61	5.04	38.84
Gardiner, Me	3.76	2.42	3.00	2.65	3.26	6.56	3.56	4.96	5.04	2.65	4.74	4.25	46.85
Geneseo, Ill	1.50	.10	5.60	7.90	.50	1.40	(a)	2.40	5.80	3.50	(a)	(a)	.....
Genoa, Nebr	4.00	.45	5.30	2.45	1.00	.50	.45	.85	(a)	3.40	6.45	4.10	.....
Golconda, Ill	.61	(a)	4.30	3.69	5.83	(a)	6.05	10.19	(a)	(a)	(a)	(a)	.....
Grafton, N. H	5.08	2.13	2.27	3.97	3.03	6.22	3.41	3.92	(a)	(a)	5.45	4.38	.....
Grand Turk's Island, West Indies	.86	2.68	1.60	3.48	(a)	1.81	0.62	2.02	1.08	(a)	2.93	.39	.....
Grayville, Ill	.00	(a)	(a)	3.50	4.50	(a)	(a)	6.00	(a)	(a)	(a)	(a)	.....
Great Falls, Md	2.97	2.21	2.63	3.71	2.50	6.90	6.44	3.75	4.91	2.80	5.72	2.95	47.49
Greensborough, N. C	.45	.40	1.00	1.00	2.20	2.70	3.95	2.90	2.70	3.10	2.30	.75	23.45
Green Springs, Ala	1.73	11.00	2.98	3.90	5.53	4.75	7.36	5.35	7.15	8.18	2.01	(a)	.....
Guttenberg, Iowa	5.52	1.41	7.50	6.31	1.49	.67	.64	1.01	2.29	3.80	3.51	5.91	40.06
Harper, Kans	(a)	.95	5.40	(a)	3.45	(a)	(a)	(a)	(a)	(a)	(a)	2.45	.....
Hector, N. Y	2.40	2.10	1.05	2.95	1.85	4.10	1.05	.60	1.00	.60	3.50	2.00	23.20
Helvetia, W. Va	9.48	1.45	1.37	4.51	3.23	8.81	9.50	6.95	6.65	4.26	7.15	8.27	71.63
Hermosa, Colo	1.78	5.51	.80	(a)	(a)	(a)	(a)	(a)	(a)	.85	.39	.67	.....
Highlands, N. C	3.28	4.85	13.40	10.83	9.69	14.29	11.32	11.00	5.51	4.26	6.80	(a)	.....
Holton, Kans	2.12	.50	4.50	6.50	1.50	.88	.63	1.13	2.25	3.13	4.87	2.63	30.64
Howard, Nebr	1.00	1.50	12.36	5.23	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Hudson, Ohio	3.98	(a)	3.89	5.65	3.64	5.20	3.29	3.18	2.20	1.87	5.22	(a)	.....
Inavale, Nebr	1.00	(a)	(a)	(a)	(a)	(a)	(a)	.25	.00	6.80	(a)	6.75	.....
Independence, Iowa	7.10	1.77	10.20	6.50	2.25	.95	.70	1.60	2.50	4.10	4.87	(a)	.....
Independence, Kans	2.46	.85	9.11	6.34	2.89	1.91	1.53	3.99	1.56	2.08	6.21	4.92	43.85
Ithaca, N. Y	2.92	.39	1.67	3.24	2.32	4.76	2.21	2.45	3.21	1.06	6.84	2.64	33.71
Jacksonburg, Ohio	3.05	1.05	2.00	6.15	6.05	5.70	6.30	6.25	5.10	2.55	5.90	2.70	52.80
Johnsontown, Va	7.00	2.40	.95	2.50	4.50	4.74	6.75	4.80	3.95	2.35	3.80	1.00	44.74
Johnstown, N. Y	3.84	1.14	4.16	4.34	4.83	6.71	2.54	4.77	3.10	1.60	5.15	(a)	.....
Kalamazoo, Mich	3.94	.47	5.22	6.57	2.63	3.44	1.55	3.09	3.52	2.45	5.32	5.37	43.57
Laconia, Ind	1.81	.71	3.97	4.03	2.48	4.69	6.88	9.13	4.52	1.99	7.86	5.75	53.82
Lafayette, Ind	(a)	(a)	(a)	(a)	(a)	(a)	1.44	4.41	3.88	2.85	7.80	9.10	.....

a No report.

b Too small to measure.

APPENDIX 36.—*Table showing the precipitation, in inches and hundredths, at the voluntary stations of observation of the Signal Service, &c.*—Continued.

Stations.	1881.						1882.						Annual mean.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Lake Village, N. H	4.33	4.48	2.81	3.53	3.26	5.62	3.72	4.52	3.27	1.33	4.87	4.22	45.96
Lambertville, N. J	(a)	(a)	.33	(a)	2.92	4.33	(a)	(a)	(a)	(a)	(a)	(a)	.....
Lansing, Mich	1.63	2.05	3.24	5.60	4.39	1.76	1.13	2.59	3.66	1.85	4.33	5.51	37.74
Lawrence, Kans	2.28	1.57	5.72	4.35	2.55	.90	.70	1.66	1.62	(a)	3.53	4.72	.....
Lenoir, N. C	1.90	(a)	5.10	4.80	6.10	3.30	6.00	4.40	5.90	2.70	3.10	2.30	.....
Levy, Kans	(a)	.35	4.05	1.77	1.80	(a)	(a)	(a)	1.40	4.25	6.75	1.75	.....
Lincoln, Nebr	1.33	.25	3.25	(a)	4.25	(a)	.55	.85	.45	4.20	11.33	(a)	.....
Litchfield, Mich	4.27	.70	5.90	7.45	3.65	3.14	1.70	3.50	3.02	3.51	5.50	4.61	46.95
Little Mountain, Ohio	1.45	.30	5.01	7.21	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Logan, Iowa	9.50	(a)	5.30	6.60	1.50	1.90	1.20	1.30	.60	3.50	3.80	9.60	.....
Logansport, Ind	1.54	.67	4.55	5.47	5.76	5.99	1.94	4.83	3.52	4.45	5.49	8.99	53.20
Lunenburgh, Vt	3.09	2.75	2.45	4.75	3.34	4.12	3.75	(a)	.40	.70	3.20	4.93	.....
Manhattan, Kans	1.32	.43	4.92	4.27	1.86	.53	.42	.42	.80	3.47	(a)	3.08	.....
Manitowoc, Wis	2.25	3.12	7.85	8.81	1.89	.87	1.24	1.94	2.79	3.16	7.99	4.30	46.21
Marysville, Nebr	4.00	.40	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Margaretta Township, Ohio	4.00	.71	4.07	5.25	3.00	4.77	1.40	3.17	2.45	1.88	5.35	3.61	39.66
Mayport, Fla	3.47	5.49	4.01	4.51	2.53	1.74	2.71	1.20	1.33	3.68	1.61	4.04	36.32
Mazatlan, Mexico	9.46	17.99	22.49	2.40	1.34	.63	2.95	(a)	(b)	(a)	(a)	(a)	.....
Meadville, Pa	2.25	(a)	(a)	(a)	4.37	5.64	3.22	1.97	3.12	2.77	5.70	4.22	.....
Mendon, Mass	3.20	2.10	1.30	1.85	3.90	(a)	(a)	(a)	(a)	1.70	(a)	1.60	.....
Milan, Kans	(a)	(a)	8.90	2.25	2.76	(a)	(a)	1.01	.75	1.12	3.80	6.76	3.25
Milford, Nebr	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.51	.01	6.88	(a)	4.00	.....
Milton, Pa	1.15	4.25	.35	3.71	5.69	2.74	4.97	5.33	4.55	3.03	8.05	(a)	.....
Milton, Mass	2.00	(a)	(a)	1.72	4.05	2.75	(a)	(a)	(a)	(a)	6.24	1.40	.....
Minden, Nebr	(a)	1.72	(a)	(a)	(a)	(a)	(a)	.60	.05	4.53	(a)	2.35	.....
Mission Creek, Nebr	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.66	(a)	(a)	(a)	(a)	.....
Minneapolis, Minn	1.48	4.00	9.90	3.04	2.20	.35	.50	1.43	1.10	2.69	3.99	2.69	33.37
Monticello, Iowa	5.67	2.23	10.15	7.21	2.90	.94	.62	1.25	2.32	4.97	5.45	3.61	47.32
Montreal, Canada	3.31	2.08	1.93	(a)	2.19	3.63	3.90	2.87	4.41	1.85	1.55	4.74	.....
Moorestown, N. J	1.53	.81	.93	3.39	2.82	3.07	5.82	4.29	2.65	2.33	5.03	(a)	.....
Morrison, Ill	2.39	.75	3.90	5.76	2.31	2.27	1.08	.73	3.25	(a)	(a)	10.06	.....
Morriston, Dak	2.40	8.60	3.80	3.80	.50	.15	(a)	1.00	1.40	4.30	2.10	4.50	.....
Mount Forest (Ontario), Canada	(a)	(a)	(a)	3.81	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Mount Ida, Ark	.75	.30	.45	7.45	4.55	3.80	8.40	10.80	2.55	2.05	12.45	2.90	56.45
Murfreesborough, Tenn	(a)	(a)	(a)	(a)	(a)	(a)	16.30	7.62	6.77	2.83	(a)	1.88	.....
Murphy, N. C	3.55	1.35	4.90	6.40	2.70	6.55	13.25	7.40	6.40	5.30	4.12	6.05	68.67
Muscatine, Iowa	3.77	1.36	6.59	7.03	2.83	1.75	.84	1.10	2.98	4.00	8.36	8.25	48.86
Nebraska City, Nebr	(a)	.40	(a)	(a)	0.62	(a)	(a)	.92	(a)	4.60	(a)	3.82	.....

Neillsville, Wis	2.00	7.30	14.01	8.60	.85	5.20	1.30	.80	(a)	(a)	(a)	3.80	.....
New Athens, Ohio	(a)	(a)	(a)	(a)	(a)	4.20	5.20	4.69	4.94	1.96	10.61	5.44	.....
New Bedford, Mass	1.79	.87	3.60	1.66	5.78	2.05	4.14	.....	2.51	4.11	4.70	1.74	.....
New Brunswick, N. J	(a)	1.58	.50	2.31	2.05	3.21	3.94	(a)	2.08	(a)	(a)	(a)	.....
New Castle, Pa	2.50	.20	1.50	3.40	2.70	3.00	2.70	2.90	2.00	.70	6.00	4.00	31.60
New Corydon, Ind	3.34	1.58	4.20	7.31	7.42	4.56	4.10	6.68	5.14	6.01	11.34	6.17	67.85
New Harmony, Ind	.11	2.12	2.24	4.05	4.58	3.70	2.88	8.56	3.74	1.84	6.70	3.42	43.94
New Market, N. H	(a)	(a)	(a)	(a)	(a)	(a)	(a)	4.45	2.94	1.07	3.57	2.23	.....
Newport, Vt	3.09	3.25	2.89	3.52	2.80	4.33	2.58	4.35	2.20	2.08	2.54	6.49	40.12
New Ulm, Tex	5.69	(a)	3.41	12.44	3.75	3.56	10.55	10.94	4.81	2.94	12.25	(a)	.....
Niles, Mich	8.48	.65	7.36	7.41	6.81	6.59	2.91	4.26	3.70	4.77	(a)	3.23	.....
Nora Springs, Iowa	4.90	4.60	13.05	11.70	2.13	(a)	.50	.70	2.10	2.80	2.25	5.20	.....
Northfield, Minn	(a)	4.10	10.27	6.07	2.13	.45	.47	2.50	2.21	2.84	2.10	4.30	.....
North Lewisburg, Ohio	4.85	1.70	3.10	5.45	4.00	4.60	4.85	4.35	4.05	2.75	7.95	4.40	52.05
Northport, Mich	(a)	(a)	(a)	10.19	6.30	6.90	4.85	6.15	1.73	4.80	7.50	13.50	.....
North Volney, N. Y	2.90	(a)	1.42	4.15	2.80	5.80	2.70	2.70	3.12	1.80	3.55	3.33	.....
Oakland, Cal	(a)	.00	.40	.82	1.49	5.09	2.42	2.05	4.20	1.51	.15	(a)	.....
Olivet, Dak	1.30	3.95	6.34	2.75	.38	.15	.34	.75	.34	3.64	3.17	6.69	29.80
Oregon, Mo	1.22	(a)	4.59	6.27	2.73	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Orono, Me	2.72	5.89	2.35	3.57	2.81	6.88	4.19	3.96	5.20	2.05	4.52	4.44	48.58
Owing's Mills, Md	1.99	1.35	2.67	2.66	1.95	(a)	(a)	3.32	3.03	1.94	3.54	1.81	.....
Oxford, Kans	(a)	(a)	(a)	(a)	1.50	(a)	1.30	1.57	.99	4.60	8.16	2.61	.....
Palermo, N. Y	2.00	1.99	1.34	3.81	1.82	5.40	2.95	2.50	4.22	1.67	2.53	2.92	33.15
Paramaribo, (Colony of Surinam,) S. Am.	4.96	4.88	.92	2.33	4.18	9.99	22.07	11.64	9.65	10.36	11.36	(a)	.....
Paterson, N. J	2.48	1.13	1.46	2.76	4.86	7.87	4.59	5.39	5.80	3.39	13.46	9.00	62.19
Pawnee City, Nebr	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.50	(a)	6.50	(a)	(a)	.....
Penn Yan, N. Y	2.22	.52	2.77	3.77	1.94	4.25	2.03	1.76	1.89	.92	3.67	3.84	29.58
Peoria, Ill	2.43	1.38	4.05	5.56	4.26	3.50	1.27	3.21	3.12	2.41	6.34	11.18	48.71
Philadelphia, Pa	1.20	1.74	1.35	3.12	2.91	3.79	(a)	(a)	(a)	(a)	(a)	(a)	.....
Phillipsburg, N. J	(a)	(a)	(a)	2.63	2.39	4.27	4.07	3.55	3.92	2.32	5.94	2.23	.....
Pierce City, Mo	2.00	2.60	5.40	8.10	3.70	1.70	2.30	5.20	4.00	3.80	5.30	3.40	47.50
Point Pleasant, La	.31	.12	4.71	(a)	8.60	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Port Angeles, Wash	.30	.30	.35	3.20	4.00	2.40	(a)	(a)	(a)	(a)	(a)	(a)	.....
Port Jervis, N. Y	3.52	(a)	2.45	2.87	3.08	4.42	5.49	3.87	3.37	1.94	7.00	3.33	.....
Portsmouth, Ohio	3.80	2.06	2.45	4.47	3.70	5.17	8.82	6.28	4.19	3.09	8.49	(a)	.....
Poway, Cal	.00	.04	.03	1.17	.20	.73	6.40	2.69	1.13	.90	.04	.09	13.42
Princeton, Cal	.02	(a)	.60	.60	.22	2.51	1.21	2.54	1.73	1.08	.28	.52	.....
Princeton, Mass	2.65	2.86	3.69	3.43	4.04	6.83	5.65	7.78	5.83	2.12	(a)	(a)	.....
Princeton, N. J	(a)	(a)	(a)	2.67	3.28	4.59	5.36	5.34	3.23	(a)	(a)	(a)	.....
Prospect Park (Brooklyn), N. Y	2.00	1.99	1.28	1.54	3.97	3.67	(a)	(a)	(a)	(a)	(a)	(a)	.....
Protem, Mo	(a)	(a)	(a)	(a)	3.91	2.82	3.31	8.98	4.00	6.61	10.56	7.14	.....
Quitman, Ga	1.40	4.70	5.00	(a)	4.10	3.80	2.00	.....	1.30	4.00	1.60	8.30	.....
Receiving Reservoir, D. C	1.71	1.80	2.72	3.37	2.37	5.48	6.49	4.43	3.66	2.55	5.02	2.49	42.09
Riley, Ill	5.88	1.01	5.47	6.81	2.36	2.69	1.57	2.15	4.58	3.29	3.59	4.42	43.82
Rio Magna, San Domingo, West Indies	(a)	6.31	8.96	(a)	2.31	.85	.03	.91	.20	3.49	(a)	(a)	.....
Rio Vista, Cal	.00	(a)	.20	.41	1.15	2.89	1.53	1.48	3.31	1.43	.10	(a)	.....
Rising Sun, Ind	(a)	.80	2.30	6.15	4.65	6.05	6.80	5.10	4.35	2.55	6.25	5.55	.....
Rockford, Ill	7.72	.33	3.72	5.37	2.17	2.99	1.19	2.01	3.54	5.15	3.42	5.69	43.30
Rolling Green, Kans	(a)	(a)	(a)	(a)	(a)	(a)	.80	1.80	1.35	4.00	8.01	1.85	.....
Rowe, Mass	5.00	1.58	3.80	2.20	5.00	5.60	3.80	4.07	3.00	1.80	4.75	2.70	43.30

a No report.

APPENDIX 36.—*Table showing the precipitation, in inches and hundredths, at the voluntary stations of observation of the Signal Service, &c.*—Continued.

Stations.	1881.						1882.						Annual mean.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Ruggles, Ohio	3.95	.10	3.50	2.50	2.60	2.90	2.15	2.55	2.20	1.05	4.55	2.25	30.30
Saint Helena Mount, Cal	(a)	(a)	1.09	(a)	2.12	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Saint Louis, Mo	2.35	.27	2.36	(a)	6.32	(a)	(a)	7.34	3.39	(a)	(a)	4.44	.....
Saint Louis, Mo	(a)	(a)	(a)	(a)	6.10	1.56	3.04	(a)	(a)	(a)	(a)	(a)	.....
Saint Marie, Ill	1.70	(a)	3.17	6.99	5.91	(a)	3.27	5.41	(a)	(a)	(a)	(a)	.....
Saint Meinrad, Ind	.10	2.03	6.00	4.63	4.78	4.50	5.93	9.20	8.51	2.64	9.23	6.75	64.30
Salinas City, Cal	.00	.00	.10	.28	.67	1.24	1.78	2.31	(a)	1.01	.49	.19	.....
Salt Cay, British West Indies	.46	2.06	3.52	6.00	5.48	2.23	0.80	1.01	1.18	(a)	2.30	.72	.....
Salt City, Kans	(a)	(a)	(a)	2.14	1.50	(a)	.97	1.90	1.42	2.64	8.16	2.50	.....
San Buenaventura, Cal	(a)	(a)	.10	(a)	(a)	.81	.63	2.79	4.14	(a)	(a)	.00	.....
Sandy Springs, Md	2.81	2.11	3.31	3.62	2.22	6.01	5.97	4.65	4.06	1.90	4.73	3.35	44.74
San Gorgonio, Cal	.94	.00	.00	(a)	(a)	.42	3.30	7.29	4.38	4.21	.35	1.30	.....
Santa Barbara, Cal	.00	(a)	.60	1.69	.40	.96	(a)	2.85	(a)	(a)	(a)	(a)	.....
Snowville, Va	2.30	(a)	2.80	(a)	(a)	3.60	(a)	(a)	2.60	1.20	3.80	(a)	.....
Somerset, Mass	2.91	.76	3.75	2.78	5.92	2.56	4.83	4.56	3.73	3.44	4.43	2.19	41.86
Somerville, N. J	.92	2.76	.30	2.19	2.47	3.61	4.77	3.71	3.87	1.93	5.77	(a)	.....
South Haven, Kans	(a)	.35	6.85	1.00	1.35	(a)	1.00	1.10	1.02	2.55	7.15	2.62	.....
Southington, Conn	3.51	2.80	.38	1.74	4.61	4.18	3.99	3.62	2.87	.85	2.33	1.28	32.16
South Lee, Mass	3.77	2.80	1.19	3.85	5.10	6.41	4.55	6.00	3.64	(a)	4.23	5.57	.....
South Orange, N. J	1.03	.12	.74	2.18	3.07	4.62	5.48	4.08	3.32	2.05	6.00	2.95	35.64
Spiceland, Ind	.50	2.60	4.00	(a)	5.76	5.00	3.50	6.53	5.40	3.47	6.22	(a)	.....
Springfield, Mass	3.10	3.10	.79	3.62	4.98	5.23	5.38	(a)	(a)	(a)	(a)	(a)	.....
Stateburg, S. C	1.91	3.73	2.81	1.23	2.68	3.95	2.92	2.05	5.67	3.05	1.24	2.73	33.97
Stockham, Nebr	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.50	.32	7.20	(a)	4.30	.....
Stratford, Vt	2.00	3.60	4.60	3.80	4.70	5.60	2.52	2.91	1.81	1.21	4.30	1.90	38.95
Superior, Nebr	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.35	(a)	3.62	(a)	3.62	.....
Sutton, Nebr	(a)	(a)	(a)	(a)	3.25	(a)	(a)	1.95	.00	10.95	(a)	4.35	.....
Swanwick, Ill	1.00	.06	3.16	6.40	(a)	(a)	2.21	7.17	3.96	1 29	6.68	3.22	.....
Table Rock, Nebr	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.80	.45	4.23	(a)	3.50	.....
Thomasville, Ga	(a)	(a)	(a)	(a)	3.68	(a)	2.16	3.73	(a)	(a)	(a)	(a)	.....
Thornville, Mich	.47	1.04	3.82	4.10	4.43	(a)	1.56	2.15	3.29	2.22	4.45	6.22	.....
Topeka, Kans	.85	.63	2.74	4.65	1.70	.40	.57	.62	1.19	3.53	4.49	3.88	25.30
Upper Alton, Ill	1.70	(a)	5.40	6.97	8.05	(a)	2.12	8.26	(a)	(a)	(a)	(a)	.....
Vevay, Ind	2.90	1.22	5.05	7.20	3.85	5.30	6.40	6.70	6.30	.98	8.65	6.53	61.08
Vineland, N. J	2.96	.65	2.35	3.13	3.05	3.24	6.45	5.41	4.31	2.19	5.50	1.36	40.60
Wabash, Ind	2.69	.48	3.79	6.96	4.73	5.87	1.70	3.98	2.94	4.32	4.63	5.25	47.34
Walla Walla, Wash	0.37	.34	.66	3.93	2.32	1.67	.78	2.27	1.30	3.22	1.57	.78	19.21
Waterburg, N. Y	3.50	1.73	1.64	4.42	2.72	5.04	2.66	2.39	2.60	1.90	4.70	3.70	37.06

Waterloo, South America	5.51	7.79	(a)	(a)	4.03	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Waynesville, N. C	(a)	(a)	(a)	(a)	3.25	2.62	12.12	2.82	2.33	(a)	(a)	(a)	.....
Weeping Water, Nebr	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.50	1.63	5.21	(a)	3.63	.....
Weirs Bridge, N. H	5.59	3.39	3.13	4.08	3.61	5.76	3.74	2.85	3.20	1.34	4.77	4.72	46.18
Weldon, N. C	1.05	1.07	3.77	3.44	4.27	2.70	6.64	3.61	2.88	4.25	6.00	1.39	41.07
Wellington, Kans	3.21	1.60	11.19	3.10	1.98	.67	1.05	1.18	.96	3.10	7.20	3.62	38.86
Wellsborough, Pa	3.57	1.45	1.80	3.23	3.74	9.57	5.62	7.86	4.71	2.50	9.12	9.80	62.97
Wellsburg, W. Va	3.20	2.38	1.78	3.48	4.00	5.96	5.54	4.10	4.23	1.87	8.05	3.65	48.24
Westborough, Mass	2.07	1.45	2.47	3.12	3.85	4.10	4.43	7.32	2.36	1.84	5.10	1.46	39.57
West Chester, Pa	1.77	.94	1.53	3.00	3.08	4.39	6.38	4.95	4.61	2.36	6.94	1.50	41.45
Westerville, Ohio	3.52	3.50	2.43	4.59	4.55	3.67	2.98	5.11	4.46	2.76	8.43	4.66	50.66
White Plains, N. Y	1.59	1.75	.50	2.83	2.85	8.65	11.50	7.80	5.40	1.20	6.85	5.35	56.27
Wichita, Kans	(a)	.41	4.21	1.82	1.00	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Wier's Bridge, N. H	5.59	3.39	3.13	4.08	3.61	5.76	3.74	2.85	3.20	1.34	4.77	4.72	46.18
Williamstown, Mass	5.16	1.02	2.26	2.28	3.33	5.04	2.23	(a)	2.35	1.72	4.26	3.85	.....
Windsor, Vt	2.63	1.26	2.68	3.98	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	.....
Wolfborough, N. H	5.07	1.22	3.21	3.35	2.59	5.30	4.16	5.19	3.11	1.16	3.89	3.90	42.05
Woodstock, Md	2.95	.90	3.70	3.40	2.00	4.60	4.00	4.11	3.27	2.76	2.05	1.65	35.39
Woodstock, N. H	5.70	2.97	3.44	4.61	4.61	6.65	3.83	3.80	4.36	1.91	4.29	4.96	51.13
Woodstock, Vt	3.74	1.47	2.76	3.19	3.09	4.51	2.18	3.86	(a)	1.28	4 43	2.33	.....
Wooster, Ohio	5.01	.97	4.12	3.87	3.54	4.41	2.40	4.09	3.10	.60	6.26	(a)	.....
Worcester, Mass	3.06	1.79	3.00	3.15	3.95	6.04	5.40	4.55	3.32	(a)	5.77	2.10	.....
Wytheville, Va	4.10	2.00	5.73	3.43	2.67	4.15	7.08	5.09	3.16	2.81	4.45	5.56	50.23
Yates Centre, Kans	3.29	.85	8.31	8.52	3.18	.90	1.20	2.80	2.04	1.95	6.42	8.24	47.79
York Factory, H. B. T., Canada	6.05	11.50	1.18	.31	1.52	.93	1.70	.28	.37	.16	.52	4.15	29.57
Ypsilanti, Mich	(a)	(a)	(a)	(a)	4.85	3.13	(a)	(a)	(a)	(a)	(a)	(a)	.....

a No report.

b Too small to measure.

APPENDIX 37.

Table showing the comparative precipitation, in inches and hundredths, at the principal stations of the Signal Service, United States Army, for each month of the year ending December 31, 1822.

Stations.	Station established.	January.			February.			March.			April.			May.			June.		
		Average to include 1880.	Amount for 1881.	Excess or deficiency +or−.	Average to include 1880.	Amount for 1881.	Excess or deficiency +or−.	Average to include 1880.	Amount for 1881.	Excess or deficiency +or−.	Average to include 1880.	Amount for 1881.	Excess or deficiency +or−.	Average to include 1880.	Amount for 1881.	Excess or deficiency +or−.	Average to include 1880.	Amount for 1881.	Excess or deficiency +or−.
Albany, N. Y	Dec. 22, 1873	2.75	2.86	+ .11	2.66	2.50	− .16	3.00	3.80	+ .80	3.35	1.34	−2.01	2.64	3.90	+1.26	4.15	3.76	− .39
Alpena, Mich	Sept. 10, 1872	1.86	1.59	− .27	1.68	5.04	+3.36	1.81	3.04	+1.23	1.98	0.88	−1.10	3.74	5.02	+1.28	3.81	3.23	− .58
Atlanta, Ga	Sept. 25, 1878	3.57	8.35	+4.78	3.10	10.41	+7.31	7.18	10.98	+3.80	5.52	4.58	− .94	4.34	1.27	−3.07	3.38	2.46	− .92
Atlantic City, N. J.	Dec. 10, 1873	2.46	7.18	+4.72	2.29	5.03	+2.74	4.06	4.71	+ .65	3.65	2.85	− .80	2.11	1.68	− .43	3.45	3.82	+ .37
Augusta, Ga	Nov. 2, 1870	4.07	8.69	+4.62	4.12	3.98	− .14	5.86	7.54	+1.68	4.43	4.71	+ .28	3.29	1.35	−1.94	4.28	2.11	−2.17
Baltimore, Md	Jan. 1, 1871	2.75	4.84	+2.09	2.65	5.68	+3.03	3.71	7.59	+3.88	3.66	2.00	−1.66	3.08	2.30	− .78	3.35	7.81	+4.46
Barnegat, N. J	Dec. 10, 1873	4.14	8.43	+4.29	2.77	5.39	+2.62	5.43	7.58	+2.15	4.50	1.36	−3.14	2.46	1.77	− .69	3.67	6.18	+2.51
Bismarck, Dak	Sept. 15, 1874	0.67	0.69	+ .02	0.70	0.78	+ .08	1.47	0.45	−1.02	3.38	1.02	−2.36	3.81	2.27	−1.54	3.49	4.11	+ .62
Boisé City, Idaho	July 1, 1877	2.08	3.62	+1.54	1.51	3.51	+2.00	1.72	0.64	−1.08	1.10	1.34	+ .24	1.22	0.07	−1.15	0.80	0.29	− .51
Boston, Mass	Nov. 1, 1870	3.78	7.21	+3.43	3.34	4.89	+1.55	4.90	9.86	+4.96	4.50	1.66	−2.84	2.99	4.16	+1.17	3.62	7.79	+4.17
Brackettville, Tex	Sept. 1, 1875	2.22	0.35	−1.87	0.86	0.39	− .47	1.91	0.81	−1.10	3.36	3.43	+ .07	5.85	5.29	− .56	3.12	0.01	−3.11
Brownsville, Tex	Aug. 25, 1875	2.46	2.73	+ .27	2.68	1.18	−1.50	1.39	0.20	−1.19	0.74	0.30	− .44	1.40	3.43	+2.03	1.32		−1.32
Buffalo, N. Y	Nov. 1, 1870	2.66	2.31	− .35	2.28	2.43	+ .15	3.14	3.74	+ .60	2.62	0.76	−1.86	2.24	2.18	− .06	2.86	4.15	+1.29
Burlington, Vt	May 24, 1871	2.28	0.88	−1.40	0.70	1.79	+1.09	1.54	1.56	+ .02	1.93	0.62	−1.31	2.33	2.27	− .06	2.91	1.89	−1.02
Cairo, Ill	June 1, 1871	4.47	3.56	− .91	3.33	4.97	+1.64	4.73	1.33	−3.40	4.34	3.62	− .72	3.84	2.44	−1.40	4.95	1.81	−3.14
Campo, Cal	Jan. —, 1874	2.32	1.74	− .58	2.97	0.53	−2.44	2.07	5.00	+2.93	3.21	1.52	−1.69	0.33	0.12	− .21	0.00	0.04	+ .04
Cape Henry, Va	Dec. 15, 1873	4.49	4.03	− .46	3.45	4.06	+ .61	6.81	4.66	−2.15	5.41	6.03	+ .62	3.51	1.34	−2.17	3.84	3.93	+ .09
Cape May, N. J	May 24, 1871	3.55	7.36	+3.81	3.34	4.23	+ .89	5.25	4.94	− .31	3.51	1.34	−2.17	2.49	3.51	+1.02	3.51	5.11	+1.60
Castroville, Tex	Sept. 29, 1875	1.53	0.45	−1.08	1.69	0.85	− .84	1.23	0.58	− .65	2.06	3.06	+1.00	2.87	3.69	+.82	1.75		−1.75
Charleston, S. C	Jan. 5, 1871	4.00	5.98	+1.98	4.35	1.56	−2.79	4.27	4.11	− .16	5.58	3.37	−2.21	4.70	0.48	−4.22	5.54	1.47	−4.07
Charlotte, N. C	Oct. 6, 1878	3.02	6.81	+3.79	3.36	3.95	+ .59	5.80	3.77	−2.03	4.02	3.61	− .41	2.56	2.26	− .30	3.51	1.35	−2.16
Chattanooga, Tenn	Jan. 8, 1879	6.48	4.70	−1.78	4.30	6.19	+1.89	7.71	6.85	− .86	6.69	4.56	−2.13	3.86	4.46	+ .60	2.03	5.24	+3.21
Cheyenne, Wyo	Nov. 1, 1870	0.16	0.36	+ .20	0.12	0.22	+ .10	0.55	0.32	− .23	0.78	2.32	+1.54	2.00	1.14	− .86	1.05	1.22	+ .17
Chicago, Ill	Nov. 1, 1870	2.23	0.87	−1.36	1.66	5.98	+4.32	2.94	2.99	+ .05	3.50	1.84	−1.66	3.73	1.85	−1.88	4.06	5.93	+1.87
Cincinnati, Ohio	Nov. 1, 1870	3.59	3.76	+ .17	2.87	4.95	+2.08	3.91	3.51	− .40	3.42	3.25	− .17	3.22	2.23	− .99	5.20	7.82	+2.62
Cleveland, Ohio	Nov. 1, 1870	2.65	1.96	− .69	2.18	2.57	+ .39	3.32	2.82	− .50	2.64	1.75	− .89	2.89	0.74	−2.15	4.02	8.07	+4.05
Columbus, Ohio	July 1, 1878	3.07	2.25	− .82	1.56	4.44	+2.88	3.09	4.01	+ .92	3.00	2.04	− .96	2.65	2.00	− .65	2.99	4.02	+1.03
Concho, Tex	Oct. 10, 1875	1.56	0.22	−1.34	0.78	0.51	− .27	0.81	0.28	− .53	2.00	1.87	− .13	2.04	6.82	+4.78	3.19	0.27	−2.92
Corsicana, Tex	Sept. 15, 1874	3.49	2.20	−1.29	2.68	3.37	+ .69	2.90	2.71	+ .19	5.42	.73	−1.69	4.19	14.33	+10.14	3.28	0.00	−3.28
Davenport, Iowa	May 24, 1871	1.95	1.34	− .61	1.14	4.14	+3.00	2.27	3.33	+1.06	3.51	1.11	−2.40	4.65	1.34	−3.31	4.71	7.94	+3.23
Denison, Tex	Dec. 16, 1874	2.24	0.74	−1.50	2.84	4.85	+2.01	2.74	1.62	−1.12	4.35	3.31	−1.04	3.98	8.03	+4.05	6.47	0.00	−6.47
Denver, Colo	Nov. 19, 1871	0.54	0.49	− .05	0.37	1.22	+ .85	1.00	0.87	− .13	1.71	0.50	−1.21	3.01	2.21	− .80	1.48	0.09	−1.39

Des Moines, Iowa	*Aug. 1, 1878*	*0.69*	*1.55*	*+ .86*	*1.03*	*2.68*	*+1.65*	*1.19*	*1.78*	*+ .59*	*1.29*	*3.36*	*+2.07*	*5.29*	*3.82*	*−1.47*	*5.40*	*15.79*	*+10.39*
Detroit, Mich	*Nov. 1, 1870*	*2.26*	*2.39*	*+ .13*	*2.01*	*6.41*	*+4.40*	*2.90*	*3.36*	*+ .46*	*2.54*	*2.37*	*− .17*	*3.60*	*2.45*	*−1.15*	*3.74*	*5.90*	*+2.16*
Dodge City, Kans	*Sept. 15, 1874*	*0.23*	*0.15*	*− .08*	*0.32*	*1.63*	*+1.31*	*0.85*	*0.50*	*− .35*	*0.97*	*2.38*	*+1.41*	*2.82*	*12.82*	*+10.00*	*2.56*	*1.77*	*− .79*
Dubuque, Iowa	July 10, 1873	1.50	1.87	+ .37	1.17	3.75	+2.58	2.49	3.78	+1.29	3.07	1.30	−1.77	3.68	2.20	−1.48	5.43	7.56	+2.13
Duluth, Minn	Nov. 1, 1870	0.85	1.65	+ .80	0.88	1.79	+ .91	1.70	1.46	− .24	2.18	1.10	−1.08	4.03	1.77	−2.26	6.31	2.52	−3.79
Eagle Pass, Tex	Jan. 19, 1875	1.39	1.15	− .24	1.18	0.34	− .84	1.37	0.32	−1.05	1.31	0.87	− .44	2.52	8.16	+5.64	3.18	0.00	−3.18
Eastport, Me	Apr. 1, 1873	3.28	1.64	−1.64	3.51	4.11	+ .60	5.22	6.78	+1.56	3.79	1.66	−2.13	3.03	13.22	+10.19	3.85	4.47	+ .62
Erie, Pa	May 25, 1873	3.50	2.10	−1.40	2.88	1.93	− .95	3.33	2.39	− .94	2.60	1.26	−1.34	3.08	2.16	− .92	3.93	6.37	+2.44
Escanaba, Mich	May 24, 1871	1.13	1.91	+ .78	1.08	2.10	+1.02	1.88	1.09	− .79	1.99	0.44	−1.55	3.73	7.91	+4.18	4.81	6.21	+1.40
Florence, Ariz	Nov. 12, 1874	0.60	0.00	− .60	0.90	0.03	− .87	0.65	1.98	+1.33	0.52	0.86	+ .34	0.08	0.13	+ .05	0.01	0.00	− .01
Fort Apache, Ariz	Oct. 9, 1877	1.60	0.20	−1.40	1.06	1.17	+ .11	0.41	2.45	+2.04	0.29	1.53	+1.24	0.00	0.35	+ .35	0.26		− .26
Fort Gibson, Ind. T	Apr. 1, 1873	2.24	1.76	− .48	1.72	4.14	+2.42	2.84	2.28	− .56	4.87	2.64	−2.23	4.39	6.96	+2.57	4.65	3.80	− .85
Fort Grant, Ariz	Nov. 1, 1875	0.74	0.05	− .69	0.48	0.33	− .15	0.69	0.89	+ .20	0.11	0.84	+ .73	0.00	0.26	+ .26	0.57		− .57
Fort Griffin, Tex	July 1, 1875	1.34	0.62	− .72	0.59	1.39	+ .80	0.49	0.17	− .32	2.19	3.71	+1.52	3.00	3.70	+ .70	7.10	0.09	−7.01
Fort Keogh, Mont	Nov. 18, 1878	0.29	2.35	+2.06	0.43	0.36	− .07	0.39	0.31	− .08	1.34	0.35	− .99	3.13	0.76	−2.37	4.14	4.44	+ .30
Fort McKavett, Tex	Oct. 19, 1875	1.37	0.12	−1.25	1.38	0.19	−1.19	0.70	0.51	− .19	1.22	2.27	+1.05	1.55	5.26	+3.71	2.41	0.07	−2.34
Fort Sill, Ind. T	June 23, 1875	1.33	1.92	+ .59	1.42	3.45	+2.03	1.24	1.28	+ .04	2.81	2.63	− .18	5.83	6.04	+ .21	6.54	0.21	−6.33
Fort Verde, Ariz	Nov. 9, 1874	0.54	0.07	− .47	0.47	0.12	− .35	0.76	2.64	+1.88	0.74	0.97	+ .23	0.56	0.07	− .49	0.05		− .05
Fredericksburg, Tex	Mar. 14, 1876	0.61	0.23	+ .38	1.75	0.59	−1.16	1.38	1.13	− .25	3.99	2.13	−1.86	3.35	6.30	+2.95	2.86	0.00	−2.86
Galveston, Tex	Apr. 19, 1871	2.99	3.94	+ .95	2.45	8.29	+5.84	3.10	1.47	−1.63	3.66	4.76	+1.10	4.09	3.50	− .59	3.97	0.03	−3.94
Grand Haven, Mich	May 24, 1871	1.94	2.24	+ .30	1.37	6.13	+4.76	2.18	3.77	+1.59	2.88	1.89	− .99	3.50	1.19	−2.31	3.92	3.44	+ .48
Indianapolis, Ind	Feb. 10, 1871	3.12	2.10	−1.02	2.60	6.43	+3.83	4.12	4.01	− .11	3.79	2.60	−1.19	4.26	3.78	− .48	5.44	3.92	−1.52
Indianola, Tex	May 1, 1872	1.92	3.07	+1.15	1.99	4.21	+2.22	2.67	0.29	−2.38	1.31	3.29	+1.98	2.61	2.02	− .59	2.69		−2.69
Jacksonville, Fla	Sept. 11, 1871	2.53	9.12	+6.59	4.29	1.12	−3.17	3.32	2.89	− .43	3.14	4.57	+1.43	4.16	2.61	−1.55	5.51	2.82	−2.69
Keokuk, Iowa	July 16, 1871	1.86	0.50	−1.36	1.19	2.58	+1.39	2.30	2.42	+ .12	3.27	3.12	− .15	4.22	1.35	−2.87	4.84	8.70	+3.86
Key West, Fla	Nov. 1, 1870	2.43	3.65	+1.22	2.44	0.35	−2.09	0.80	0.46	− .34	1.00	4.99	+3.99	3.62	4.01	+ .39	3.98	7.47	+3.49
Kittyhawk, N. C	Jan. 15, 1875	5.26	7.34	+2.08	3.59	3.97	+ .38	6.15	4.24	−1.91	5.68	4.97	− .71	2.77	0.80	−1.97	4.35	5.06	+ .71
Knoxville, Tenn	Jan. 1, 1871	5.00	4.41	− .59	5.00	4.20	− .80	5.85	3.90	−1.95	6.23	2.99	−3.24	3.01	1.14	−1.87	4.64	5.13	+ .49
La Crosse, Wis	Oct. 15, 1872	1.21	1.51	+ .30	1.14	1.26	+ .12	2.12	1.01	−1.11	2.08	1.35	− .73	3.68	3.13	− .55	5.30	2.75	−2.55
La Mesilla, N. Mex	June 16, 1876	0.47	0.04	− .43	0.49		− .49	0.51	0.14	− .37	0.21	0.09	− .12	0.46	1.75	+1.29	0 35	0.43	+ .08
Laredo, Tex	Dec. 16, 1875	0.85	3.15	+2.30	3.15	0.31	−2.84	2.54	0.27	−2.27	0.88	2.53	+1.65	1.43	7.75	+6.32	1.78	0.00	−1.78
Leavenworth, Kans	May 21, 1871	1.57	0.44	−1.13	1.12	4.84	+3.72	2.70	2.21	− .49	3.90	1.86	−2.04	5.24	3.65	−1.59	5.48	5.27	− .21
Los Angeles, Cal	July 1, 1877	2.75	1.43	−1.32	3.40	0.36	−3.04	1.50	1.66	+ .16	2.65	0.46	−2.19	0.31	0.01	− .30	0.03	0.00	− .03
Louisville, Ky	Sept. 11, 1871	4.21	3.24	− .97	3.25	4.05	+ .80	4.64	2.46	−2.18	4.85	3.45	−1.40	3.63	2.35	−1.28	4.86	3.78	−1.08
Lynchburg, Va	May 24, 1871	3.32	4.47	+1.15	2.97	2.37	− .60	3.84	2.57	−1.27	3.84	2.14	−1.70	3.12	2.20	− .92	3.75	1.67	−2.08
Madison, Wis	Sept. 29, 1878	1.77	2.05	+ .28	2.14	5.42	+3.28	1.72	4.36	+2.64	4.40	1.50	−2.90	4.18	4.25	+ .07	6.05	4.15	−1.90
Marquette, Mich	May 1, 1871	0.99	1.69	+ .70	0.94	2.80	+1.86	1.05	3.84	+2.79	1.45	0.52	− .93	3.10	4.47	+1.37	4.65	3.47	−1.18
Mason, Tex	Feb. 7, 1876	0.92	0.37	− .55	1.26	0.70	− .56	1.03	0.85	− .18	2.64	2.95	+ .31	3.31	5.29	+1.98	2.04	0.00	−2.04
Memphis, Tenn	Feb. 28, 1871	5.44	4.38	−1.06	4.59	6.41	+1.82	6.08	3.23	−2.85	7.25	5.74	−1.51	4.13	2.80	−1.33	5.58	2.83	−2.75
Milwaukee, Wis	Nov. 1, 1870	2.12	1.86	− .26	1.49	5.39	+3.90	2.74	5.30	+2.56	3.54	0.78	−2.76	3.90	2.55	−1.35	4.23	3.77	− .46
Mobile, Ala	Nov. 7, 1870	3.57	7.62	+4.05	4.21	8.00	+3.79	7.69	10.41	+2.72	5.49	9.21	+3.72	4.22	1.44	−2.78	5.42	4.85	− .57
Montgomery, Ala	Nov. 9, 1870	4.35	3 58	− .77	5.37	7.05	+1.68	6.98	5.45	−1.53	7.09	4.52	−2.57	4.54	1.41	−3.13	4.39	3.04	−1.35
Morgantown, W. Va	Jan. 25, 1873	3.99	3.08	− .91	2.92	3.56	+ .64	4.41	2.12	−2.29	3.26	2.30	− .96	2.38	3.28	+ .90	4.96	4.77	− .19
Mount Washington, N. H	Dec. 1, 1870	4.01	3.94	− .07	3.14	6.62	+3.48	6.26	8.51	+2.25	5.64	5.08	− .56	5.44	12.50	+7.06	9.49	7.03	−2.46
Nashville, Tenn	Nov. 1, 1870	4.37	3.54	− .83	4.46	5.48	+1.02	5.21	2.79	−2.42	5.79	5.12	− .67	2.75	3.67	+ .92	4.22	3.70	− .52
New Haven, Conn	Dec. 10, 1872	3.99	4.79	+ .80	3.85	6.17	+2.32	5.32	10.42	+5.10	5.36	1.71	−3.65	3.42	3.89	+ .47	3.17	5.14	+1.97
New London, Conn	Jan. 10, 1871	3.56	6.76	+3.20	2.79	7.06	+4.27	4.81	8.07	+3.26	4.30	2.23	−2.07	2.81	4.85	+2.04	3.14	3.75	+ .61
New Orleans, La	Nov. 1, 1870	4.30	11.15	+6.85	4.85	5.80	+ .95	6.84	2.75	−4.09	6.35	3.92	−2.43	5.83	3.20	−2.63	5.81	2.84	−2.97
Newport, R. I	Aug. 1, 1875	3.40	5.70	+2.30	3.35	8.28	+4.93	7.27	8.24	+ .97	5.41	2.11	−3.30	2.36	2.90	+ .54	2.81	5.94	+3.13
New York, N. Y	Nov. 1, 1870	2.91	5.41	+2.50	2.80	5.06	+2.26	4.21	6.78	+2.57	3.53	1.00	−2.53	2.61	2.33	− .28	3.01	6.23	+3.22

NOTE.—The dash indicates precipitation too small to measure.

APPENDIX 37.—*Table showing the comparative precipitation, in inches and hundredths, at the principal stations of the Signal Service, &c.*—Continued.

Stations.	Station established.	January.			February.			March.			April.			May.			June.		
		Average to include 1880.	Amount for 1881.	Excess or deficiency +or—.	Average to include 1880.	Amount for 1881.	Excess or deficiency +or—.	Average to include 1880.	Amount for 1881.	Excess or deficiency +or—.	Average to include 1880.	Amount for 1881.	Excess or deficiency +or—.	Average to include 1880.	Amount for 1881.	Excess or deficiency +or—.	Average to include 1880.	Amount for 1881.	Excess or deficiency +or—.
Norfolk, Va	Jan. 1, 1871	3.50	3.55	+ .05	3.74	2.88	— .86	4.30	3.38	— .92	3.97	4.06	+ .09	3.69	1.49	—2.20	4.05	3.74	— .31
North Platte, Nebr	Sept. 18, 1874	0.68	0.16	— .52	0.23	0.76	+ .53	0.46	1.26	+ .80	1.72	0.87	— .85	2.61	4.84	+2.23	2.90	6 12	+3.22
Olympia, Wash	July 1, 1877	11.82	8.90	—2.92	11.65	16.28	+4.63	9.30	4.03	—5.27	1.93	4.93	+3.00	3.39	1.54	—1.85	0.71	1.93	+1.22
Omaha, Nebr	Nov. 1, 1870	0.46	0.61	+ .15	0.44	3.09	+2.65	1.66	0.72	— .94	3.10	4.23	+1.13	4.76	7.94	+3.18	6.13	5.56	— .57
Oswego, N. Y	Nov. 1, 1870	2.80	4.15	+1.35	2.23	4.74	+2.51	3.23	5.08	+1.85	2.24	1.19	—1.05	2.23	2.41	+ .18	3.40	2.98	— .42
Philadelphia, Pa	Jan. 1, 1871	2.94	3.66	+ .72	2.51	4.76	+2.25	3.31	3.83	+ .52	3.63	0.61	—3.02	2.63	2.71	+ .08	3.44	3.87	+ .43
Phœnix, Ariz	May 9, 1877	0.47	0.00	— .47	0.96	0.20	— .76	0.46	1.46	+1.00	0.37	1.10	+ .73	0.01	0.12	+ .11	0.12	0.00	— .12
Pike's Peak, Colo	Nov. 1, 1873	1.81	2.58	+ .77	1.57	1.47	— .10	1.96	4.44	+2.48	4.00	4.64	+ .64	3.19	3.71	+ .52	1.93	0.87	—1.06
Pioche, Nev	July 29, 1877	0.60	0.47	— .13	0.73	0.29	— .44	6.32	0.47	+ .15	1.15	1.08	— .07	0.44	0.21	— .23	0.16	0.03	— .13
Pittsburg, Pa	Nov. 1, 1870	2.64	3.55	+ .91	2.06	3.45	+1.39	3.21	3.35	+ .14	2.75	1.81	— .94	2.24	2.34	+ .10	3.05	6.95	+3.90
Port Huron, Mich	July 25, 1874	1.61	3.50	+1.89	1.62	4.91	+3.29	4.00	4.60	+ .60	2.59	0.76	—1.83	2.82	1.66	—1.16	3.35	3.82	+ .47
Portland, Me	Jan. 15, 1871	3.05	4.30	+1.25	2.48	5.30	+2.82	3.15	5.09	+1.94	3.15	1.43	—1.72	2.54	5.64	+3.10	3.88	3.99	+ .11
Portland, Oreg	Nov. 1, 1871	6.75	8.57	+1.82	7.90	13.36	+5.46	8.38	2.83	—5.55	2.87	3.51	+ .64	2.71	1.38	—1.33	1.95	2.34	+ .39
Portsmouth, N. C	Apr. 23, 1876	5.00	2.72	—2.28	4.06	5.98	+1.92	3.79	6.57	+2.78	3.26	4.70	+1.44	2.89	2.13	— .76	3.66	4.95	+1.29
Prescott, Ariz	Nov. 19, 1873	0.47	0.16	— .31	0.92	0.10	— .82	0.28	2.91	+2.63	0.85	0.67	— .18	0.54	0.44	— .10	0.10		— .10
Punta Rassa, Fla	Aug. 15, 1871	2.39	4.02	+1.63	2.21	0.52	—1.69	0.85	1.18	+ .33	1.92	0.54	—1.38	3.80	3.13	— .67	4.85	2.53	—2.32
Red Bluff, Cal	July 1, 1877	8.63	9.40	+ .77	7.33	2.79	—4.54	3.75	0.51	—3.24	3.79	1.83	—1.96	1.37	0.79	— .58	0.10	0.51	+ .41
Rio Grande City, Tex	May 28, 1875	0.63	3.48	+2.85	1.13	1.06	— .07	1.97	0.07	—1.90	0.35	2.12	+1.77	2.28	2.93	+ .65	0.87	0.00	— .87
Rochester, N. Y	Nov. 1, 1870	3.57	4.68	+1.11	2.84	2.86	+ .02	3.58	5.33	+1.75	3.02	1.15	—1.87	2.50	5.86	+3.36	3.23	3.20	— .03
Roseburg, Oreg	July 15, 1877	7.60	11.60	+4.00	4.67	8.19	+3.52	5.92	1.95	—3.97	2.81	1.07	—1.74	2.55	0.73	—1.82	0.54	2.92	+2.38
Sacramento, Cal	July 1, 1877	4.69	6.14	+1.45	4.58	5.06	+ .48	3.22	1.37	—1.85	5.98	1.64	—4.34	0.74		— .74	0.04	0.50	+ .46
Saint Louis, Mo	Nov. 1, 1870	2.40	0.49	—1.91	2.05	4.16	+2.11	3.39	1.95	—1.44	3.72	3.14	— .58	3.96	3.96	Normal	5.31	2.74	—2.57
Saint Paul, Minn	Nov. 1, 1870	0.83	4.34	+3.51	0.86	2.65	+1.79	1.70	1.06	— .64	2.04	0.47	—1.57	3.86	4.34	+ .48	5.11	2.87	—2.24
Saint Vincent, Minn	Sept. 5, 1880	0.24	0.13	— .11	0.35	0.56	+ .21	1.21	0.08	—1.13	1.09	0.81	— .28	3.54	4.00	+ .46	4.49	3.47	—1.02
Salt Lake City, Utah	Mar. 22, 1874	1.40	1.24	— .16	1.32	2.44	+1.12	2.23	0.88	—1.35	2.13	2.37	+ .24	2.57	2.55	— .02	0.60	0.28	— .32
San Antonio, Tex	Sept. 22, 1875	2.05	0.58	—1.47	2.47	1.24	—1.23	1.21	1.06	— .15	3.52	3.25	— .27	2.74	4.70	+1.96	3.06		—3.06
San Diego, Cal	Nov. 1, 1871	1.78	0.52	—1.26	2.21	0.45	—1.76	0.93	1.88	+ .95	0.67	1.35	+ .68	0.20	0.04	— .16	0.04	0.05	+ .01
Sandusky, Ohio	Aug. 2, 1877	2.78	1.31	—1.47	2.54	3.25	+ .71	3.31	2.75	— .56	2.91	2.47	— .44	2.87	0.98	—1.89	3.83	10.09	+6.26
Sandy Hook, N. J	Dec. 10, 1873	3.67	5.03	+1.36	2.78	5.37	+2.59	6.08	6.92	+ .84	5.22	1.41	—3.81	3.50	3.33	— .17	4.17	6.80	+2.63
San Francisco, Cal	Mar. 8, 1871	5.43	8.69	+3.26	4.31	4.65	+ .34	3.22	0.90	—2.32	1.87	2.00	+ .13	0.57	0.22	— .35	0.15	0.69	+ .54
Santa Fé, N. Mex	Nov. 20, 1871	0.56	0.38	— .18	0.69	0.22	— .47	0.55	0.57	+ .02	0.61	0.98	+ .37	0.67	2.31	+1.64	1.24	0.08	—1.16
Savannah, Ga	Jan. 1, 1871	3.12	5.77	+2.65	3.47	1.16	—2.31	3.93	3.79	— .14	5.41	3.32	—2.09	3.26	0.83	—2.43	7.29	0.91	—6.38
Shreveport, La	Sept. 3, 1871	4.70	2.24	—2.46	4.41	6.51	+2.10	5.52	1.80	—3.72	6.53	2.81	—3.72	4.32	8.63	+4.31	3.43	0.38	—3.05
Silver City, N. Mex	May 15, 1878	1.78	0.02	—1.76	0.98	0.73	— .25	0.42	0.91	+ .49	0.15	0.48	+ .33	0.00	1.01	+1.01	0.37	0.43	+ .06
Smithville, N. C	Oct. 15, 1875	3.50	6.05	+2.55	3.71	2.31	—1.40	3.35	3.92	+ .57	3.42	4.76	+1.34	3.20	2.25	— .95	3.58	0.52	—3.06
Springfield, Mass	July 19, 1873	2.92	3.16	+ .24	3.62	4.50	+ .88	5.46	4.40	—1.06	4.41	2.49	—1.92	2.29	4.85	+2.56	4.06	9.07	+4.41

Stockton, Tex	*Feb. 26, 1876*	*0.31*	*0.20*	*— .11*	*0.41*	*0.13*	*— .28*	*0.85*	*0.06*	*— .79*	*0.30*	*0.46*	*+ .16*	*0.94*	*2.26*	*+1.32*	*1.98*	*1.05*	*— .93*
Thatcher's Island, Mass	*Dec. 26, 1875*	*3.28*	*4.56*	*+1.28*	*3.20*	*4.73*	*+1.53*	*6.10*	*9.96*	*+3.86*	*5.81*	*1.56*	*—4.25*	*1.72*	*7.22*	*+5.50*	*2.39*	*7.51*	*+5.12*
Toledo, Ohio	*Nov. 1, 1870*	*2.27*	*0.54*	*—1.73*	*1.42*	*4.28*	*+2.86*	*2.39*	*1.90*	*— .49*	*2.52*	*1.76*	*— .76*	*2.89*	*0.45*	*—2.44*	*3.52*	*7.36*	*+3.84*
Tucson, Ariz	Dec. 2, 1875	0.67	0.05	— .62	0.90	0.25	— .65	0.86	1.17	+ .31	0.23	0.62	+ .39	0.08	0.04	— .04	0.19	0.00	— .19
Umatilla, Oreg	July 15, 1877	0.88	2.45	+1.57	1.20	1.92	+ .72	1.12	0.44	— .68	0.82	0.89	+ .07	0.96	0.06	— .90	0.23	0.96	+ .73
Uvalde, Tex	Sept. 6, 1875	1.17	0.43	— .74	1.44	0.82	— .62	1.84	0.59	—1.25	2.66	2.39	— .27	2.74	6.44	+3.70	1.26	0.00	—1.26
Vicksburg, Miss	Sept. 10, 1871	4.27	3.37	— .90	4.60	7.20	+2.60	7.51	3.53	—3.98	7.90	1.48	— 6.42	5.26	4.39	— .87	4.32	1.94	—2.38
Visalia, Cal	July 1, 1877	1.64	2.71	+1.07	2.47	1.10	—1.37	0.71	1.20	+ .49	1.91	0.86	—1.05	0.28	0.29	+ .01	0.02	0.00	— .02
Washington, D. C	Nov. 1, 1870	2.57	5.14	+2.57	2.29	4.01	+1.72	3.89	6.61	+2.72	3.12	2.08	—1.04	2.94	1.86	—1.08	3.84	5.71	+1.87
Wickenburg, Ariz	Jan. 6, 1874	0.79	0.07	— .72	1.03	0.00	—1.03	0.27	1.70	+1.43	0.41	0.70	+ .29	0.20	0.07	— .13	0.01	———	— .01
Wilmington, N. C	Jan. 1, 1871	3.81	5.06	+1.25	3.84	2.80	—1.04	3.53	5.14	+1 61	3.36	3.47	+ .11	4.33	2.11	—2.22	6.16	3.48	—2.68
Winnemucca, Nev	July 1, 1877	0.78	3.08	+2.30	0.81	1.59	+ .78	0.76	0.87	+ .11	1.04	1.04	Normal	0.64	1.02	+ .38	0.61	0.62	+ .01
Wood's Holl, Mass	Jan. 1, 1873	3.54	2.57	— .97	3.37	5.46	+2.09	4.98	4.22	— .76	4.99	2.12	—2.87	2.83	2.39	— .44	2.19	6.25	+4.06
Yankton, Dak	Apr. 1, 1873	0.54	1.23	+ .69	0.63	2.70	+2.07	1.29	1.74	+ .45	2.55	2.49	— .06	3.70	9.88	+6.18	5.86	3.51	—2.35
Yuma, Ariz	Nov. 18, 1873	0.17	0.00	— .17	0.77	0.00	— .77	0.15	———	— .15	0.04	0.55	+ .51	0.01	00.0	— .01	0.00	———	Trace

NOTE.—The dash indicates precipitation too small to measure.

APPENDIX 37.—*Table showing the comparative precipitation, in inches and hundredths, at the principal stations of the Signal Service, &c.*—Continued.

Stations.	Station established.	July.			August.			September.			October.			November.			December.		
		Average to include 1880.	Amount for 1881.	Excess or deficiency +or—.	Average to include 1880.	Amount for 1881.	Excess or deficiency +or—.	Average to include 1880.	Amount for 1881.	Excess or deficiency +or—.	Average to include 1880.	Amount for 1881.	Excess or deficiency +or—.	Average to include 1880.	Amount for 1881.	Excess or deficiency +or—.	Average to include 1880.	Amount for 1881.	Excess or deficiency +or—.
Albany, N. Y	Dec. 22, 1873	4.66	2.22	—2.44	3.49	2.07	—1.42	3.31	2.38	— .93	3.47	3.19	— .28	2.76	3.44	+ .68	2.49	4.88	+2.39
Alpena, Mich	Sept. 10, 1872	3.84	2.09	—1.75	3.46	3.02	— .44	4.99	6.16	+1.17	4.48	10.25	+5.77	2.72	3.01	+ .29	1.98	2.28	+ .30
Atlanta, Ga	Sept. 25, 1878	4.45	0.56	—3.89	4.18	4.10	— .08	3.82	3.76	— .06	3.41	3.44	+ .03	5.54	4.30	—1.24	6.45	7.53	+1.08
Atlantic City, N. J	Dec. 10, 1873	3.36	1.01	—2.35	4.49	2.79	—1.70	3.55	2.20	—1.35	2.36	3.03	+ .67	3.89	3.64	— .25	4.60	2.14	—2.46
Augusta, Ga	Nov. 2, 1870	4.93	3.46	—1.47	5.07	4.82	— .25	4.01	7.01	+3.00	2.20	2.33	+ .13	4.45	3.81	— .64	4.08	4.96	+ .88
Baltimore, Md	Jan. 1, 1871	4.23	1.40	—2.83	4.95	2.15	—2.80	4.05	2.98	—1.07	3.08	4.06	+ .98	3.51	2.41	—1.10	2.99	5.90	+2.91
Barnegat, N. J	Dec. 10, 1873	4.62	1.99	—2.63	4.66	5.54	+ .88	4.50	3.55	— .95	2.97	4.35	+1.38	5.26	3.64	—1.62	4.78	3.50	—1.28
Bismarck, Dak	Sept. 15, 1874	2.17	1.28	— .89	3.35	2.98	— .37	1.50	1.26	— .24	1.07	0.51	— .56	0.86	0.35	— .51	0.76	0.06	— .70
Boisé City, Idaho	July 1, 1877	0.17	0.13	— .04	0.16	0.00	— .16	0.20	0.25	+ .05	0.60	2.12	+1.52	1.06	0.94	— .12	2.00	0.65	—1.35
Boston, Mass	Nov. 1, 1870	4.11	2.96	—1.15	5.31	1.23	—4.08	2.75	2.50	— .25	4.38	2.84	—1.54	6.16	3.73	—2.43	3.56	3.80	+ .24
Brackettville, Tex	Sept. 1, 1875	2.77	0.90	—1.87	2.82	0.30	—2.52	2.04	4.12	+2.08	0.40	16.17	+15.77	0.66	1.18	+ .52	1.42	0.80	— .62
Brownsville, Tex	Aug. 25, 1875	3.18	1.49	—1.69	8.69	3.01	—5.68	4.86	5.02	+ .16	3.18	8.72	+5.54	1.64	3.74	+2.10	2.21	1.92	— .29
Buffalo, N. Y	Nov. 1, 1870	3.96	2.17	—1.79	3.11	0.85	—2.26	3.52	1.21	—2.31	3.97	7.33	+3.36	3.71	2.96	— .75	3.29	5.86	+2.57
Burlington, Vt	May 24, 1871	4.30	2.22	—2.08	3.67	2.69	— .98	3.14	2.34	— .80	3.60	1.54	—2.06	2.05	1.30	— .75	1.37	1.89	+ .52
Cairo, Ill	June 1, 1871	3.68	0.18	—3.50	3.19	0.11	—3.08	2.46	2.74	+ .28	3.22	2.74	— .48	3.86	4.98	+1.12	3.47	3.70	+ .23
Campo, Cal	Jan. —, 1874	0.21	0.07	— .14	0.10	1.27	+1.17	0.00	0.02	+ .02	0.33	0.73	+ .40	1.47	0.11	—1.36	2.70	0.24	—2.46
Cape Henry, Va	Dec. 15, 1873	5.81	8.57	+2.76	6.24	2.30	—3.94	6.54	0.93	—5.61	3.41	3.48	+ .07	4.62	8.96	+4.34	5.04	1.89	—3.15
Cape May, N. J	May 24, 1871	3.42	1.20	—2.22	6.33	2.26	—4.07	4.51	1.22	—3.29	3.13	4.53	+1.40	3.80	5.22	+1.42	4.41	2.07	—2.34
Castroville, Tex	Sept. 29, 1875	3.48	1.98	—1.50	3.28	0.38	—2.90	1.87	2.14	+ .27	0.93	4.85	+3.92	1.18	1.39	+ .21	1.43	1.13	— .30
Charleston, S. C	Jan. 5, 1871	7.91	4.99	—2.92	6.15	7.25	+1.10	6.94	5.49	—1.45	5.59	1.59	—4.00	3.88	2.15	—1.73	3.58	4.76	+1.18
Charlotte, N. C	Oct. 6, 1878	7.13	1.83	—5.30	9.23	1.15	—8.08	1.18	4.85	+3.67	2.66	2.69	+ .03	4.29	4.58	+ .29	6.08	4.77	—1.31
Chattanooga, Tenn	Jan. 8, 1879	5.15	2.09	—3.06	4.05	2.95	—1.10	3.87	5.74	+1.87	3.02	5.07	+2.05	5.85	4.29	—1.56	6.96	8.83	+1.87
Cheyenne, Wyo	Nov. 1, 1870	1.88	1.40	— .48	1.53	1.97	+ .44	0.82	1.75	+ .93	0.72	0.88	+ .16	0.28	0.29	+ .01	0.14	0.01	— .13
Chicago, Ill	Nov. 1, 1870	3.82	4.31	+ .49	2.79	0.54	—2.25	2.90	4.34	+1.44	3.18	6.89	+3.71	2.58	5.97	+3.39	2.06	2.67	+ .61
Cincinnati, Ohio	Nov. 1, 1870	4.97	3.12	—1.85	4.40	0.76	—3.64	2.11	2.10	— .01	2.44	6.01	+3.57	3.46	4.06	+ .60	3.80	5.67	+1.87
Cleveland, Ohio	Nov. 1, 1870	4.48	0.90	—3.58	3.83	0.17	—3.66	4.03	1.66	—2.37	2.97	5.79	+2.82	2.59	3.64	+1.05	2.70	4.89	+2.19
Columbus, Ohio	July 1, 1878	4.04	5.33	+1.29	5.53	2.09	—3.44	2.32	1.54	— .78	1.93	8.64	+6.71	3.71	5.35	+1.64	4.05	5.28	+1.23
Concho, Tex	Oct. 10, 1875	4.36	0.51	—3.85	2.80	0.54	—2.26	5.14	2.48	—2.66	1.23	2.72	+1.49	1.20	0.64	— .56	1.08	2.10	+1.02
Corsicana, Tex	Sept. 15, 1874	3.13	2.36	— .77	2.13	0.21	—1.92	2.90	4.03	+1.13	2.21	5.18	+2.97	3.79			3.73		
Davenport, Iowa	May 24, 1871	4.36	0.91	—3.45	4.18	0.83	—3.35	3.36	5.59	+2.23	2.07	6.85	+4.78	2.08	2.19	+ .11	1.55	1.71	+ .16
Denison, Tex	Dec. 16, 1874	5.43	1.14	—4.29	3.85	0.26	—3.59	2.63	5.59	+2.96	2.71	6.76	+4.05	2.80	3.26	+ .46	2.58	1.42	—1.16
Denver, Colo	Nov. 19, 1871	1.92	2.50	+ .58	1.57	2.33	+ .76	1.09	0.57	— .52	0.77	0.32	— .45	0.68	1.68	+1.00	0.62	0.00	— .62
Des Moines, Iowa	Aug. 1, 1878	2.05	5.57	+3.52	3.63	5.29	+1.66	3.38	4.70	+1.32	3.63	6.45	+2.82	2.93	3.97	+1.04	1.13	1.85	+ .72
Detroit, Mich	Nov. 1, 1870	4.36	3.33	—1.03	3.16	1.32	—1.84	2.87	2.86	— .01	2.58	6.52	+3.94	2.57	4.36	+1.79	2.52	4.17	+1.65
Dodge City, Kans	Sept. 15, 1874	2.81	5.06	+2.25	3.43	2.36	—1.07	0.97	3.13	+2.16	0.88	2.19	+1.31	0.74	0.95	+ .21	0.71	0.61	— .10
Dubuque, Iowa	July 10, 1873	4.80	10.53	+5.73	3.78	2.46	—1.32	4.96	10.26	+5.30	2.23	6.70	+4.47	2.44	3.19	+ .75	1.54	1.55	+ .01

Duluth, Minn	*Nov. 1, 1870*	*4.25*	*1.84*	*−2.41*	*3.11*	*7.36*	*+4.25*	*4.43*	*11.52*	*+7.09*	*2.95*	*3.77*	*+.82*	*1.83*	*2.58*	*+.75*	*1.51*	*0.20*	*−1.31*
Eagle Pass, Tex	*Jan. 19, 1875*	*3.70*	*1.74*	*−1.96*	*3.38*	*1.64*	*−1.74*	*3.95*	*4.99*	*+1.04*	*1.04*	*6.54*	*+5.50*	*0.32*	*1.57*	*+1.25*	*1.58*	*0.72*	*−.86*
Eastport, Me	*Apr. 1, 1873*	*4.43*	*3.73*	*−.70*	*3.65*	*3.64*	*−.01*	*3.97*	*2.80*	*−1.17*	*4.65*	*4.31*	*−.34*	*5.26*	*3.37*	*−1.89*	*3.00*	*6.25*	*+3.25*
Erie, Pa	*May 25, 1873*	*3.40*	*1.39*	*−2.01*	*3.31*	*1.02*	*−2.29*	*4.66*	*1.35*	*−3.31*	*4.35*	*5.75*	*+1.40*	*4.54*	*5.46*	*+.92*	*3.00*	*6.44*	*+3.44*
Escanaba, Mich	*May 24, 1871*	*3.65*	*1.10*	*−2.55*	*4.26*	*6.87*	*+2.61*	*3.63*	*9.48*	*+5.85*	*3.32*	*6.13*	*+2.81*	*2.50*	*3.72*	*+1.22*	*1.51*	*1.53*	*+.02*
Florence, Ariz	*Nov. 12, 1874*	*0.69*	*2.25*	*+1.56*	*1.69*	*4.28*	*+2.59*	*1.28*	*1.00*	*−.28*	*0.48*	*1.13*	*+.65*	*0.54*	*0.34*	*−.20*	*1.62*	*0.14*	*−1.48*
Fort Apache, Ariz	*Oct. 9, 1877*	*4.87*	*5.63*	*+.76*	*2.25*	*8.31*	*+6.06*	*1.03*	*5.41*	*+4.38*	*1.60*	*4.68*	*+3.08*	*0.90*	*0.85*	*−.05*	*1.62*	*0.54*	*−1.08*
Fort Gibson, Ind. T	Apr. 1, 1873	4.27	0.76	−3.51	2.67	———	−2.67	2.84	2.79	−.05	2.31	6.67	+4.36	2.79	3.13	+.34	2.40	2.92	+.52
Fort Grant, Ariz	Nov. 1, 1875	4.89	5.53	+.64	3.18	5.47	+2.29	1.05	3.84	+2.79	0.75	1.02	+.27	0.70	0.08	−.62	1.63	0.65	−.98
Fort Griffin, Tex	July 1, 1875	3.59	0.81	−2.78	1.50	0.25	−1.25	2.19	4.87	+2.68	2.72	2.54	−.18	2.46	1.44	−1.02	1.95	1.27	−.68
Fort Keogh, Mont	Nov. 18, 1878	4.28	0.39	−3.89	1.97	0.93	−1.04	0.25	0.55	+.30	1.38	0.46	−.92	0.33	0.44	+.11	0.85	0.10	−.75
Fort McKavett, Tex	Oct. 19, 1875	2.92	2.05	−.87	2.75	1.78	−.97	3.40	1.15	−2.25	2.04	7.21	+5.17	1.63	0.52	−1.11	1.31	0.59	−.72
Fort Sill, Ind. T	June 23, 1875	4.18	1.97	−2.21	2.71	0.84	−1.87	2.22	4.46	+2.24	2.10	1.74	−.36	2.05	1.38	−.67	2.79	2.30	−.49
Fort Verde, Ariz	Nov. 9, 1874	1.40	1.41	+.01	1.63	7.53	+5.90	1.15	1.88	+.73	0.31	0.20	−.11	0.73	0.21	−.52	2.01	0.27	−1.74
Fredericksburg, Tex	Mar. 14, 1876	2.28	4.28	+2.00	2.24	1.53	−.71	3.79	2.14	−1.65	2.15	3.38	+1.23	2.22	1.68	−.54	1.73	0.72	−1.01
Galveston, Tex	Apr. 19, 1871	4.00	4.92	+.92	5.76	5.98	+.22	6.79	3.66	−3.13	4.92	10.38	+5.46	5.86	2.85	−3.01	4.98	3.50	−1.48
Grand Haven, Mich	May 24, 1871	2.86	4.78	+1.92	3.23	1.91	−1.32	4.09	6.71	+2.62	3.39	7.87	+4.48	3.18	4.19	+1.01	2.33	3.77	+1.44
Indianapolis, Ind	Feb. 10, 1871	6.63	0.82	−5.81	3.48	0.97	−2.51	3.09	3.25	+.16	2.82	6.11	+3.29	3.18	9.35	+6.17	3.10	5.40	+2.30
Indianola, Tex	May 1, 1872	2.96	1.30	−1.66	4.09	6.30	+2.21	6.19	6.51	+.32	3.79	5.04	+1.25	3.11	4.18	+1.07	3.80	1.49	−2.31
Jacksonville, Fla	Sept. 11, 1871	4.66	7.61	+2.95	6.98	10.23	+3.25	8.48	4.58	−3.90	6.54	2.87	−3.67	2.91	3.41	+.50	3.00	2.86	−.14
Keokuk, Iowa	July 16, 1871	5.91	3.08	−2.83	3.38	0.86	−2.52	3.94	4.10	+.16	2.88	8.01	+5.13	2.07	2.59	+.52	2.29	1.70	−.59
Key West, Fla	Nov. 1, 1870	4.20	5.97	+1.77	5.44	6.91	+1.47	6.33	10.71	+4.38	4.98	1.99	−2.99	2.02	4.62	+2.60	1.70	1.97	+.27
Kittyhawk, N. C	Jan. 15, 1875	6.13	5.00	−1.13	8.12	3.83	−4.29	7.43	0.49	−6.94	5.02	5.55	+.53	5.79	4.17	−1.62	5.48	6.29	+.81
Knoxville, Tenn	Jan. 1, 1871	4.26	4.05	−.21	4.52	1.77	−2.75	3.12	2.31	−.81	2.71	5.14	+2.43	4.43	5.31	+.88	4.59	5.32	+.73
La Crosse, Wis	Oct. 15, 1872	4.10	8.86	+4.76	3.75	5.01	+1.26	4.25	10.87	+6.62	2.25	7.56	+5.31	2.51	1.17	−1.34	1.49	0.26	−1.23
La Mesilla, N. Mex	June 16, 1876	1.95	3.90	+1.95	0.67	3.13	+2.46	0.58	1.96	+1.38	0.55	2.14	+1.59	0.37	0.56	+.19	0.71	0.91	+.20
Laredo, Tex	Dec. 16, 1875	3.35	0.12	−3.23	6.25	2.02	−4.23	1.28	(a)	———	0.38	5.49	+5.11	0.93	1.74	+.81	1.45	1.01	−.44
Leavenworth, Kans	May 21, 1871	5.37	1.72	−3.65	3.47	2.74	−.73	3.08	6.89	+3.81	2.68	5.73	+3.05	2.61	3.42	+.81	1.96	1.18	−.78
Los Angeles, Cal	July 1, 1877	0.00	0.00	Normal	0.00	———	+———	0.00	———	+———	0.52	0.82	+.30	1.14	0.27	−.87	5.89	0.52	−5.37
Louisville, Ky	Sept. 11, 1871	4.61	2.18	−2.43	3.88	0.15	−3.73	2.80	2.70	−.10	3.28	3.44	+.16	3.69	2.79	−.90	4.53	6.00	+1.47
Lynchburg, Va	May 24, 1871	3.02	3.88	+.86	4.94	0.30	−4.64	3.10	2.07	−1.03	2.91	4.09	+1.18	3.76	3.59	−.17	2.76	6.22	+3.46
Madison, Wis	Sept. 29, 1878	5.95	9.47	+3.52	3.44	0.56	−2.88	3.61	8.17	+4.56	2.65	9.12	+6.47	2.82	2.56	−.26	1.42	1.32	−.10
Marquette, Mich	May 1, 1871	3.51	2.49	−1.02	2.99	2.80	−.19	4.50	12.71	+8.21	3.61	3.71	+.10	2.19	3.43	+1.24	1.50	0.98	−.52
Mason, Tex	Feb. 7, 1876	2.57	1.98	−.59	2.47	0.53	−1.94	3.61	5.26	+1.62	1.90	2.68	+.78	1.76	0.48	−1.28	2.09	0.84	−1.25
Memphis, Tenn	Feb. 28, 1871	3.11	0.89	−2.22	3.64	1.97	−1.67	3.00	3.84	+.84	3.39	3.22	−.17	4.48	5.14	+.66	3.77	2.39	−1.38
Milwaukee, Wis	Nov. 1, 1870	2.96	5.34	+2.38	3.18	0.80	−2.38	3.31	4.28	+.97	2.62	6.04	+3.42	2.39	1.69	−.70	1.79	1.27	−.52
Mobile, Ala	Nov. 7, 1870	7.17	2.77	−4.40	7.15	15.22	+8.07	5.19	11.71	+6.52	3.61	3.23	−.38	4.86	7.36	+2.50	4.31	9.15	+4.84
Montgomery, Ala	Nov. 9, 1870	3.96	2.18	−1.78	3.34	5.06	+1.72	2.88	4.49	+1.61	2.72	2.72	Normal	3.94	4.56	+.62	5.39	9.75	+4.36
Morgantown, W. Va	Jan. 25, 1873	6.38	5.61	−.77	4.65	0.41	−4.24	3.88	2.78	−1.10	2.91	4.55	+1.64	3.66	3.19	−.47	3.92	5.93	+2.01
Mount Washington, N. H	Dec. 1, 1870	0.64	9.93	+.29	7.74	11.96	+4.22	8.97	6.13	−2.84	5.98	18.38	+12.40	6.27	15.10	+8.83	4.94	15.95	+11.01
Nashville, Tenn	Nov. 1, 1870	5.59	0.86	−4.73	3.33	1.81	−1.52	3.39	6.49	+3.10	2.86	4.74	+1.88	4.13	4.84	+.71	4.05	4.83	+.78
New Haven, Conn	Dec. 10, 1872	5.15	3.53	−1.62	7.23	2.51	−4.72	3.54	1.45	−2.09	3.90	2.78	−1.12	4.83	4.18	−.65	3.24	4.75	+1.51
New London, Conn	Jan. 10, 1871	4.70	2.72	−1.98	6.06	2.08	−3.98	3.24	1.37	−1.87	4.60	3.56	−.44	4.48	5.16	+.68	3.25	4.03	+.78
New Orleans, La	Nov. 1, 1870	7.53	6.97	−.56	5.87	4.21	−1.66	5.07	4.47	−.60	3.39	4.84	+1.45	5.70	7.24	+1.54	4.95	6.62	+1.67
Newport, R. I	Aug. 1, 1875	4.52	0.87	−3.65	4.44	0.86	−3.58	2.60	2.65	+.05	3.82	2.46	−1.36	6.15	5.52	−3.63	3.93	3.41	−.52
New York, N. Y	Nov. 1, 1870	5.05	1.31	−3.74	5.46	1.56	−3.90	3.13	1.38	−1.75	3.25	2.10	−1.15	3.82	2.87	−.95	2.94	4.37	+1.43
Norfolk, Va	Jan. 1, 1871	5.24	6.47	+1.23	6.88	1.74	−5.14	5.06	2.67	−2.39	3.86	2.43	−1.43	3.80	6.04	+2.24	3.92	1.61	−2.31
North Platte, Nebr	Sept. 18, 1874	3.37	3.09	−.28	2.30	0.75	−1.55	1.70	2.36	+.66	0.99	2.22	+1.23	0.38	0.37	−.01	0.82	0.13	−.69
Olympia, Wash	July 1, 1877	1.09	0.98	−.11	1.07	0.71	−.36	3.73	2.47	−1.26	5.08	8.18	+3.10	9.88	6.75	−3.13	11.71	8.86	−2.85

NOTE.—The dash indicates precipitation too small to measure.
(a) No record.

APPENDIX 37.—*Table showing the comparative precipitation, in inches and hundredths, at the principal stations of the Signal Service, &c.*—Continued.

Stations.	Station established.	July.			August.			September.			October.			November.			December.		
		Average to include 1880.	Amount for 1881.	Excess or deficiency + or −.	Average to include 1880.	Amount for 1881.	Excess or deficiency + or −.	Average to include 1880.	Amount for 1881.	Excess or deficiency + or −.	Average to include 1880.	Amount for 1881.	Excess or deficiency + or −.	Average to include 1880.	Amount for 1881.	Excess or deficiency + or −.	Average to include 1880.	Amount for 1881.	Excess or deficiency + or −.
Omaha, Nebr	Nov. 1, 1870	5.07	5.89	+ .82	3.75	1.65	−2.10	3.21	8.36	+5.15	2.47	4.84	+2.37	1.42	1.29	− .13	0.81	1.56	+ .75
Oswego, N. Y	Nov. 1, 1870	3.79	1.73	−2.06	2.56	1.69	− .87	2.73	0.76	−1.97	3.83	4.61	+ .78	3.50	3.13	− .37	3.28	6.78	+3.50
Philadelphia, Pa	Jan 1, 1871	5.32	0.96	−4.36	5.46	1.18	−4.28	3.11	0.94	−2.17	2.94	3.04	+ .10	3.81	2.02	−1.79	2.57	2.63	+ .06
Phœnix, Ariz	May 9, 1877	1.03	2.03	+1.00	0.76	2.19	+1.43	0.66	1.04	+ .38	0.13	0.25	+ .12	0.49	0.36	− .13	1.01	0.16	− .85
Pike's Peak, Colo	Nov. 1, 1873	5.06	6.55	+1.49	4.11	11.29	+7.18	2.40	1.85	− .55	1.86	1.77	− .09	2.26	4.76	+2.50	1.49	0.56	− .93
Pioche, Nev	July 29, 1877	0.21	0.23	+ .02	0.52	1.73	+1.21	0.14	0.00	− .14	0.50	0.56	+ .06	0.32	0.10	− .22	1.24	0.08	−1.16
Pittsburg, Pa	Nov. 1, 1870	5.45	3.86	−1.59	3.05	0.88	−2.17	3.01	0.76	−2.25	2.57	3.75	+1.18	2.80	2.66	− .14	2.95	3.94	+ .99
Port Huron, Mich	July 25, 1874	3.08	1.30	−1.78	2.82	1.61	−1.21	2.78	2.86	+ .08	3.05	4.14	+1.09	2.78	2.70	− .08	2.28	3.41	+1.13
Portland, Me	Jan. 15, 1871	3.45	3.94	+ .49	3.89	1.42	−2.47	2.81	2.75	− .06	3.83	2.90	− .93	4.22	3.13	−1.09	2.55	6.79	+4.24
Portland, Oreg	Nov. 1, 1871	0.71	1.16	+ .45	0.82	2.11	+1.29	1.69	2.64	+ .95	4.14	6.60	+2.46	7.84	6.91	− .93	6.96	6.64	− .32
Portsmouth, N. C	Apr. 23, 1876	5.29	6.33	+1.04	8.50	4.96	−3.54	7.00	3.29	−3.71	5.07	3.62	−1.45	3.90	5.19	+1.29	4.94	5.81	+ .87
Prescott, Ariz	Nov. 19, 1873	1.60	3.27	+1.67	2.89	5.25	+2.36	1.24	1.69	+ .45	0.48	0.33	− .15	0.61	0.30	− .31	2.32	0.33	−1.99
Punta Rassa, Fla	Aug. 15, 1871	7.33	3.60	−3.73	7.80	7.28	− .52	7.54	7.20	− .34	3.14	1.58	−1.56	1.59	0.80	− .79	1.31	1.22	− .09
Red Bluff, Cal	July 1, 1877	0.02		− .02	0.08	0.00	− .08	0.10	1.07	+ .97	0.87	1.61	+ .74	2.74	0.73	−2.01	6.87	5.69	−1.18
Rio Grande City, Tex	May 28, 1875	2.09	1.34	− .75	6.71	4.03	−2.68	2.08	3.71	+1.63	1.37	6.98	+5.61	0.79	1.15	+ .36	1.75	1.26	− .49
Rochester, N. Y	Nov. 1, 1870	3.88	2.20	−1.68	3.24	1.44	−1.80	2.57	1.82	− .75	3.81	3.63	− .18	3.25	1.96	−1.29	3.03	4.11	+1.08
Roseburg, Oreg	July 15, 1877	0.52	0.79	+ .27	0.65	0.46	− .19	1.08	0.72	− .36	2.02	5.96	+3.94	4.72	4.15	− .57	5.96	5.14	− .82
Sacramento, Cal	July 1, 1877	0.00		...	0.00	0.00	Normal	0.07	0.30	+ .23	0.54	0.55	+ .01	0.92	1.88	+ .96	4.28	3.27	−1.01
Saint Louis, Mo	Nov. 1, 1870	5.05	2.13	−2.92	2.72	0.31	−2.41	2.83	3.14	+ .31	2.08	7.21	+5.13	2.25	6.74	+4.49	2.35	1.40	− .95
Saint Paul, Minn	Nov. 1, 1870	3.35	2.60	− .75	4.16	4.55	+ .39	2.99	9.95	+6.96	2.12	4.44	+2.32	1.40	1.36	− .04	1.30	0.53	− .77
Saint Vincent, Minn	Sept. 5, 1880	2.92	0.48	−2.44	2.97	1.96	−1.01	1.48	1.99	+ .51	1.95	1.30	− .65	0.44	0.48	+ .04	0.83	0.25	− .58
Salt Lake City, Utah	Mar. 22, 1874	0.80	0.21	− .59	0.58	1.61	+1.03	0.92	0.43	− .49	1.74	2.19	+ .45	1.70	1.44	− .26	1.54	1.24	− .30
San Antonio, Tex	Sept. 22, 1875	3.84	1.37	−2.47	4.31	0.95	−3.36	3.87	5.86	+1.99	2.46	4.19	+1.73	2.10	2.07	− .03	2.51	1.51	−1.00
San Diego, Cal	Nov. 1, 1871	0.15	0.00	− .15	0.30	0.01	− .29	0.05	0.04	− .01	0.37	0.24	− .13	0.82	0.12	− .70	2.53	0.30	−2.23
Sandusky, Ohio	Aug. 2, 1877	4.97	3.88	−1.09	4.04	0.96	−3.08	3.82	3.78	− .04	2.77	5.58	+2.81	3.47	4.99	+1.52	2.58	6.27	+3.69
Sandy Hook, N. J	Dec. 10, 1873	4.96	2.43	−2.53	5.66	0.63	−5.03	4.57	3.57	−1.00	3.21	2.71	− .50	4.95	3.54	−1.41	3.84	5.00	+1.16
San Francisco, Cal	Mar. 8, 1871	0.01	0.00	− .01	0.01	0.00	− .01	0.10	0.25	+ .15	1.00	0.54	− .46	2.82	1.94	− .88	5.45	3.85	+1.60
Santa Fé, N. Mex	Nov. 20, 1871	3.52	4.72	+1.20	2.46	6.28	+3.82	1.34	6.91	− .43	0.78	4.19	+3.41	0.99	1.11	+ .12	0.73	(a)	
Savannah, Ga	Jan. 1, 1871	5.68	1.25	−4.43	6.30	0.63	+3.33	5.57	3.09	−2.48	4.08	2.72	−1.36	2.91	2.45	− .46	3.32	3.08	− .24
Shreveport, La	Sept. 3, 1871	4.05	3.17	− .88	2.11	0.45	−1.66	4.93	5.90	+ .97	3.52	8.28	+4.76	4.02	5.96	+1.94	4.79	7.59	+2.80
Silver City, N. Mex	May 15, 1878	2.78	9.62	+6.84	5.75	8.69	+2.94	2.08	3.89	+1.81	0.91	3.21	+2.30	1.36	1.55	+ .19	0.97	0.28	− .69
Smithville, N. C	Oct. 15, 1875	6.45	10.65	+4.20	5.96	3.49	−2.47	7.94	4.42	−3.52	6.73	2.83	−3.90	3.54	4.25	+ .71	3.68	5.19	+1.51
Springfield, Mass	July 19, 1873	4.43	3.23	−1.20	4.71	3.23	+1.48	2.63	0.99	−1.64	3.72	3.43	− .29	4.47	4.84	+ .37	2.98	5.14	+2.16
Stockton, Tex	Feb. 26, 1876	2.31	1.64	− .67	2.57	1.10	−1.47	4.22	1.71	−2.51	0.66	2.67	+2.01	0.67	0.07	− .60	0.49	1.30	+ .81
Thatcher's Island, Mass	Dec. 26, 1875	4.64	2.89	−1.75	4.11	0.85	−3.26	2.07	3.76	+1.69	4.04	3.19	− .85	7.51	11.18	+3.67	3.22	6.80	+3.58
Toledo, Ohio	Nov. 1, 1870	3.63	5.45	+1.82	3.29	0.88	−2.41	2.31	5.33	+3.02	2.21	8.49	+6.28	2.49	4.74	+2.25	2.48	4.73	+2.25

a. Record incomplete.

Tucson, Ariz	*Dec. 2, 1875*	*2.99*	*5.69*	*+2.70*	*2.38*	*3.92*	*+1.54*	*1.49*	*2.37*	*+ .88*	*0.51*	*0.62*	*+ .11*	*0.53*	*0.00*	*− .53*	*1.49*	*0.19*	*−1.30*
Umatilla, Oreg	*July 15, 1877*	*0.34*	*0.53*	*+ .19*	*0.33*	*0.73*	*+ .40*	*0.68*	*0.74*	*+ .06*	*0.48*	*1.54*	*+1.06*	*0.95*	*0.98*	*+ .03*	*1.36*	*0.45*	*− .91*
Uvalde, Tex	*Sept. 6, 1875*	*2.71*	*1.22*	*−1.49*	*3.50*	*1.01*	*−1.59*	*2.74*	*1.44*	*−1.30*	*0.79*	*3.15*	*+2.36*	*1.15*	*2.24*	*+1.09*	*2.19*	*0.91*	*−1.28*
Vicksburg, Miss	*Sept. 10, 1871*	*3.54*	*2.45*	*−1.09*	*3.73*	*2.53*	*−1.20*	*4.44*	*6.11*	*+1.67*	*3.00*	*9.69*	*+6.19*	*5.68*	*6.07*	*+ .39*	*5.13*	*3.18*	*−1.95*
Visalia, Cal	*July 1, 1877*	*0.00*	———	*− ——*	*0.00*	*0.03*	*+ .03*	*0.00*	*0.09*	*+ .09*	*0.35*	*0.31*	*− .04*	*0.50*	*0.52*	*+ .02*	*2.05*	*0.27*	*−1.78*
Washington, D. C	Nov. 1, 1870	4.22	1.67	−2.55	5.58	1.07	−4.51	4.31	2.19	−2.12	3.25	3.29	+ .04	3.17	2.45	−1.72	2.75	6.12	+3.37
Wickenburg, Ariz	Jan. 6, 1874	0.80	1.82	+1.02	1.42	5.02	+3.60	0.77	1.16	+ .39	0.15	0.09	− .06	0.65	0.41	− .24	1.68	0.36	−1.32
Wilmington, N. C	Jan. 1, 1871	5.80	12.40	+6.60	8.51	4.99	−3.52	7.62	3.50	−4.12	4.19	1.48	−2.71	3.04	2.95	− .09	3.85	3.64	− .21
Winnemucca, Nev	July 1, 1877	0.19	0.00	− .19	0.14	0.07	− .07	0.24	0.12	− .12	0.16	1.37	+1.21	0.52	0.32	− .20	0.66	1.81	+1.15
Wood's Holl, Mass	Jan. 1, 1873	3.46	1.71	−1.75	4.06	0.65	−3.41	2.48	2.50	+ .02	3.38	2.68	− .70	5.60	5.52	− .08	3.31	2.06	−1.25
Yankton, Dak	Apr. 1, 1873	4.43	4.54	+ .11	2.91	1.77	−1.14	2.46	8.61	+6.15	1.29	3.47	+2.18	0.36	0.90	+ .54	0.82	0.11	− .71
Yuma, Ariz	Nov. 18, 1873	0.26	0.20	− .06	0.41	0.08	− .33	0.12	0.05	− .07	0.08	———	− .08	0.04	0.00	− .04	0.59	0.10	− .49

NOTE.—The dash indicates precipitation too small to measure.

APPENDIX 38.

Table showing the average precipitation, in inches and hundredths, for the several States and Territories of the United States. Compiled from observations taken during a period of from one to eleven years, and including 1881.

State or Territory.	1870 to 1881.												Mean annual precipitation.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
Alabama	3.96	4.79	7.33	6.29	4.38	4.90	5.56	5.24	4.03	3.16	4.40	4.85	58.89
Arizona	0.67	0.83	0.50	0.40	0.16	0.15	2.06	1.85	0.98	0.50	0.58	1.55	10.23
Arkansas	3.35	7.14	4.99	3.31	3.97	4.62	2.63	4.79	2.42	2.59	5.76	2.96	48.53
California	3.89	3.90	2.20	2.87	0.54	0.05	0.06	0.07	0.05	0.57	1.49	4.25	19.94
Colorado	0.54	0.37	1.00	1.71	3.01	1.48	1.92	1.57	1.09	0.77	0.68	0.62	14.76
Connecticut	3.77	3.32	5.06	4.83	3.11	3.15	4.92	6.64	3.39	3.95	4.65	3.24	50.03
Dakota	0.78	0.65	1.01	2.39	3.44	4.18	2.67	2.24	1.23	1.19	0.67	0.80	21.25
Delaware	3.97	2.61	4.53	2.19	1.89	3.06	3.20	4.80	2.68	3.16	3.45	3.25	38.79
District of Columbia	2.57	2.29	3.89	3.12	2.94	3.84	4.22	5.58	4.31	3.25	3.17	2.75	41.93
Florida	2.45	2.98	1.66	2.02	3.86	4.78	5.56	6.74	7.45	4.89	2.17	2.00	46.56
Georgia	3.59	3.56	5.66	5.12	3.63	4.98	5.02	5.18	4.47	3.23	4.30	4.62	53.36
Idaho	2.71	2.97	1.03	1.94	0.96	1.19	0.90	0.61	0.29	1.28	1.58	2.78	18.24
Illinois	2.34	3.96	4.09	2.95	3.88	4.36	2.70	2.46	3.43	4.15	3.94	3.37	41.63
Indiana	3.12	2.60	4.12	3.79	4.26	5.44	6.64	3.48	3.09	2.82	3.18	3.10	45.64
Indian Territory	1.78	1.57	2.04	3.84	5.11	5.59	4.22	2.69	2.53	2.20	2.42	2.59	36.58
Iowa	1.50	1.13	2.06	2.78	4.46	5.09	4.28	3.74	3.91	2.70	2.38	1.63	35.66
Kansas	0.90	0.72	1.77	2.43	4.03	4.02	4.09	3.45	2.02	1.78	1.67	1.33	28.21
Kentucky	4.29	3.85	4.92	5.32	3.19	4.54	5.10	3.60	3.09	3.07	3.91	4.29	49.17
Louisiana	4.50	4.63	6.18	6.44	5.07	4.62	5.79	3.99	5.00	3.45	4.86	4.87	59.40
Maine	3.16	2.99	4.18	3.47	2.78	3.86	3.94	3.77	3.39	4.24	4.74	2.77	43.29
Maryland	2.75	2.65	3.71	3.66	3.08	3.35	4.23	4.95	4.05	3.08	3.51	2.99	42.01
Massachusetts	3.38	3.38	5.37	4.93	2.46	3.21	4.16	4.55	2.48	3.88	5.93	3.27	47.00
Michigan	1.63	1.45	2.30	2.24	3.41	4.05	3.55	3.32	3.81	3.40	2.66	2.02	33.84
Minnesota	0.73	0.82	1.67	2.13	3.70	5.64	3.59	3.90	3.10	2.29	1.30	1.11	29.98
Mississippi	4.31	4.98	7.24	7.49	4.90	4.35	3.75	3.53	3.66	2.86	4.81	5.26	57.14
Missouri	1.31	1.18	2.12	2.34	3.39	3.93	3.93	3.07	1.99	1.48	1.49	1.53	27.67
Montana	1.68	0.53	0.31	0.98	2.49	2.67	2.43	1.53	0.70	1.02	0.65	1.04	16.03
Nebraska	0.57	0.33	1.06	2.41	3.68	4.51	4.22	3.02	2.45	1.73	0.90	0.81	25.69
Nevada	0.69	0.77	0.54	1.09	0.54	0.38	0.20	0.33	0.19	0.33	0.42	0.95	6.43
New Hampshire	2.66	1.59	2.34	2.54	2.43	3.39	3.87	3.78	2.97	3.71	3.13	1.96	34.37
New Jersey	3.45	2.79	5.20	4.22	2.64	3.70	4.09	5.28	4.28	2.92	4.47	4.41	47.45
New Mexico	0.94	0.72	0.49	0.32	0.38	0.65	2.75	2.96	1.33	0.75	0.91	0.80	13.00
New York	2.94	2.56	3.43	2.95	2.44	3.33	4.27	3.57	3.05	3.67	3.41	3.01	38.63
North Carolina	4.12	3.71	4.52	3.95	3.15	4.25	6.16	8.06	6.23	4.73	4.11	4.81	57.80
Ohio	2.87	2.11	3.20	2.90	2.90	3.91	4.42	4.22	2.92	2.46	3.14	3.12	38.17
Oregon	5.08	4.59	5.14	2.17	2.07	0.91	0.52	0.60	1.15	2.21	4.50	4.76	33.70

Pennsylvania	3.03	2.48	3.28	2.99	2.65	3.47	4.72	3.94	3.59	3.29	3.72	2.84	40.00
Rhode Island	2.78	4.04	6.17	3.66	3.93	2.81	3.06	4.37	3.25	4.38	5.69	4.48	48.62
South Carolina	4.03	4.23	5.06	5.09	3.99	4.91	6.42	5.61	5.47	3.89	4.16	3.83	56.60
Tennessee	5.32	4.59	6.21	6.49	3.44	4.12	4.53	3.88	3.34	2.99	4.72	4.84	54.47
Texas	1.54	1.58	1.54	2.13	2.77	2.71	3.42	3.73	3.49	1.93	1.71	1.90	28.45
Utah	1.40	1.32	2.23	2.13	2.57	0.60	0.80	0.58	0.92	1.74	1.70	1.54	17.53
Vermont	2.28	0.70	1.54	1.93	2.33	2.91	4.30	3.67	3.14	3.60	2.05	1.37	29.82
Virginia	3.77	3.39	4.98	4.41	3.44	3.88	4.69	6.02	4.90	3.39	4.06	3.91	50.84
Washington Territory	8.01	6.37	4.08	2.26	1.83	1.08	1.50	0.76	2.37	3.28	4.78	6.37	42.69
West Virginia	3.99	2.92	4.41	3.26	2.38	4.96	6.38	4.65	3.88	2.91	3.66	3.92	47.32
Wisconsin	1.70	1.59	2.19	3.34	3.92	5.19	4.34	3.46	3.72	2.51	2.57	1.57	36.10
Wyoming	0.87	0.33	0.40	0.91	2.85	1.71	1.92	1.41	0.63	1.03	0.37	0.57	13.00

APPENDIX 39.

Table showing the average precipitation, in inches and hundredths, in the several geographical districts of the United States, during each month of the year. Computed from observations covering a period of from one to eleven years.

Geographical district.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Eastern Gulf States	4.05	4.99	7.14	5.99	4.57	4.50	5.19	5.00	4.03	3.01	4.83	5.26
Florida Peninsula	2.74	2.78	3.22	3.09	3.58	5.37	5.44	6.74	6.84	5.93	2.79	2.80
Lower Lake region	1.48	2.07	2.83	2.37	2.57	3.14	3.74	2.97	3.11	3.18	3.09	2.57
Middle Atlantic States	3.12	2.75	4.39	3 90	2.95	3.66	4.40	5.34	3.82	3.09	4.04	3.50
Middle Pacific Coast region	5.92	4.79	3.39	3.75	.88	.10	.01	.03	.10	.80	2.04	5.53
Missouri valley	.99	2.02	1.81	2.77	3.77	4.49	3.92	2.95	2.18	1.64	1.50	1.21
New England States	3.16	3.51	4.57	4.07	2.77	3.44	4.28	4.79	3.05	3.87	4.59	2.99
North Pacific Coast region	7.08	8.18	7.87	2.53	2.88	1.06	.75	.85	2.34	3.76	7.48	8.23
Ohio Valley	3.66	2.85	3.98	3.77	3.26	4.74	5.27	3.78	2.82	2.87	3.44	3.60
South Atlantic States	4.06	4.15	5.10	4.67	3.91	5.27	5.59	6.54	6.57	4.69	3.95	4.23
South Pacific Coast region	2.42	2.35	.73	.94	.18	.02	.05	.19	.02	.22	0.78	2.13
Upper Lake region	1.56	1.33	2.35	2.47	3.56	4.39	3.52	3.35	3.79	3.19	2.47	1.84
Upper Mississippi valley	1.62	1.26	2.36	2.94	3.99	5.13	4.58	3.66	3.73	2.27	2.08	1.72
Western Gulf States	3.61	3.50	4.64	5.25	4.37	3.92	4.21	3.95	5.05	3.72	4.85	4.72

NOTES.

Eastern Gulf States.—Eastern Mississippi, Alabama, and northwestern Florida.
Lower Lake region.—Lakes Erie and Ontario, with adjacent territory.
Middle Atlantic States.—New York, New Jersey, Pennsylvania, Delaware, Maryland, District of Columbia, and Virginia as the Middle States, and that part of those States lying east of the Alleghanies as the Middle Atlantic States.
Middle Pacific coast region.—Those portions of California west of the Sierra Nevadas and north of the 37th parallel of latitude.
Missouri valley.—A belt of country two hundred miles broad, from Fort Sully, Dak., to Jefferson City, Mo.
New England States.—Maine, New Hampshire, Vermont, Massachusetts, Connecticut, and Rhode Island.
North Pacific region.—Those portions of Oregon and Washington Territory lying west of the Cascade range.
Ohio Valley.—The belt of country, about two hundred miles broad, from Pittsburg, Pa., to Cairo, Ill.
South Atlantic States.—North Carolina, South Carolina, Georgia, and northern and eastern Florida.
South Pacific coast region.—Those portions of California west of the Sierra Nevadas and south of the 37th parallel of latitude.
Upper Lake region.—Lakes Superior, Huron, and Michigan, with adjacent country.
Upper Mississippi valley.—The belt of country, about two hundred miles broad, from Saint Paul, Minn., to Cairo, Ill.
Western Gulf States.—Western Louisiana, western Arkansas, eastern Texas, southern Missouri, and southeastern portion of Indian Territory.

APPENDIX 40.

Monthly and annual amounts of precipitation, in inches and hundredths, at stations on the Central Pacific and Southern Pacific Railroads and connecting branches, July, 1881, to June, 1882, inclusive.

Stations.	1881.						1882.						Annual amount.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Alta, Cal	.00	.00	1.12	4.50	5.60	13.60	5.93	6 40	15.40	3.20	1.15	.80	57.70
Anaheim, Cal	.00	.00	.00	.81	.34	.37	.40	1.90	2.42	.48	.40	.00	7.12
Antioch, Cal	.00	.00	(a)	(a)	.95	1.89	.95	1.29	2.35	.25	(a)	(a)	7.68
Auburn, Cal	.00	.00	.92	2.72	3.01	5.87	4.60	4.99	6.05	(b)	.53	.28	.....
Battle Mountain, Nev	.00	.15	.16	.60	.56	1.03	1.50	.70	2.10	1.27	.55	.83	9.45
Benson, Ariz	(b)	4.33	.99	.34	.00	(b)	.40	1.20	.00	.00	.00	.86	.....
Beowawe, Nev	.05	.13	.00	.61	.33	.40	.65	.22	1.65	1.10	.07	.10	5.31
Blue Creek, Utah	.40	1.47	.29	1.62	.05	.40	.45	.92	.75	2.54	.65	.70	10.24
Boca, Cal	.00	.00	(a)	.10	1.20	1.00	3.90	3.60	10.20	1.00	.00	.00	21.00
Borden, Cal	(a)	(a)	.05	.34	.31	.32	.68	1.25	1.40	1.18	.31	.00	5.84
Brentwood, Cal	.00	.00	.00	.07	.81	1.79	.71	.82	2.18	.49	(a)	(a)	6.87
Brighton, Cal	.00	.00	.00	.45	1.09	1.38	1.17	1.42	2.20	1.20	.00	.31	9.22
Brown's, Nev	.00	.00	.04	.00	.00	.45	.39	.00	1.05	.25	.20	.20	2.58
Byron, Cal	.00	.00	.00	.04	1.00	1.80	1.15	1.02	3.11	.72	.00	.00	8.84
Caliente, Cal	.00	.00	.13	.81	.30	.51	1.51	3.30	.73	1.59	.69	.56	10.13
Calistoga, Cal	.00	.00	.48	2.19	(b)	5.18	3.81	5.53	3.84	1.65	.17	.00	.....
Carlin, Nev	.70	.62	.10	.48	.22	.95	2.04	.57	1.93	.30	.00	.20	8.11
Casa Grande, Ariz	.00	(b)	.00	(a)	.00	(b)	(b)	.00	.00	.00	.00	.00	.....
Chico, Cal	.00	.00	1.13	.00	1.55	2.55	1.61	4.54	4.54	1.01	.00	.00	16.93
Cisco, Cal	.00	.00	2.16	2.93	3.60	8.76	11.71	8.50	25.30	5.60	.91	.48	69.95
Colfax, Cal	.00	.00	1.63	1.38	3.40	8.01	9.09	7.11	6.97	3.98	1.13	.13	42.83
Colton, Cal	.00	.00	.00	.28	.38	.00	2.23	1.28	1.51	1.08	.00	.50	7.26
Corinne, Utah	.02	.95	.37	1.80	.70	.25	1.20	2.40	.30	1.45	.05	.75	10.24
Davis, Cal	.00	.00	.23	.28	1.65	2.38	1.28	1.92	2.76	1.13	.00	.00	11.63
Delano, Cal	.00	.00	.02	.30	.42	(a)	.51	1.10	.83	.83	.50	.00	4.51
Dunnigan, Cal	.00	.00	.77	.38	.52	3.22	1.00	2.04	2.33	1.23	.00	.12	11.61
Elko, Nev	.01	.36	.00	.36	.30	.69	1.45	.50	1.20	.86	.05	.00	5.78
Emigrant Gap, Cal	.00	(b)	1.70	6.68	2.90	5.64	(b)	9.40	16.60	2.60	1.55	.40	.....
Farmington, Cal	.00	.00	.17	.44	.55	1.62	2.10	2.35	3.05	2.55	.13	.13	13.09
Fresno City, Cal	(a)	(a)	.46	.36	(b)	.16	.42	1.04	1.26	1.23	.10	.00	.....
Galt, Cal	.00	.00	.24	.39	.93	2.39	1.35	1.83	3.77	1.87	.15	.00	12.92
Gilroy, Cal	.00	.00	.34	.46	.81	2.18	1.28	2.17	3.46	.72	.25	.10	11.77

a Precipitation too small to measure. *b* No report.

APPENDIX 40.—*Monthly and annual amounts of precipitation, in inches and hundredths, at stations on the Central Pacific and Southern Pacific Railroads, &c.*—Continued.

Stations.	1881.						1882.						Annual amount.
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Golconda, Nev.	.00	.10	.10	(b)	.11	.41	.20	.64	1.35	.40	.16	.72	.....
Goshen, Utah	.00	.00	.03	.19	.47	.19	1.02	1.27	1.26	(b)	.23	.00	.....
Halleck, Nev.	.00	.00	.00	.65	.30	.60	1.40	1.00	2.06	.90	.51	.27	7.69
Hollister, Cal.	.00	.00	.24	.20	.64	1.08	1.78	1.50	(b)	1.20	.10	.24	.....
Hot Springs, Nev	.20	.02	.08	.07	.00	(b)	.39	.00	.65	.55	.50	.69	.....
Humboldt, Nev.	.00	.00	.15	.18	.18	2.30	1.14	.33	2.27	.67	.40	.49	8.11
Indio, Cal	.00	.00	.00	.00	.00	.00	1.50	.00	.00	.00	.00	.00	1.50
Ione, Cal	.00	.00	.10	.50	1.41	3.54	2.87	2.28	5.10	3.00	.27	.04	19.11
Keene, Cal.	.00	.00	.58	.21	.95	.30	.85	2.57	1.42	1.44	.60	.10	9.02
Kelton, Utah	.00	(b)	.00	.00	.00	.90	1.00	1.80	.05	.05	.00	.00	.....
Kingsburgh, Cal	.00	.00	.00	.00	.25	.00	.56	1.27	1.31	1.23	.08	.00	4.70
Knight's Landing, Cal	.00	.00	.42	.33	2.04	2.17	1.30	1.75	2.19	1.33	.16	.16	11.85
Lathrop, Cal.	.00	.00	.18	.00	.62	1.80	.92	.95	2.05	1.71	.00	.00	8.23
Lemoore, Cal.	.00	(b)	.20	.45	.35	(b)	.32	1.20	.60	.96	.08	(a)	.....
Livermore, Cal.	.00	.00	(a)	.08	.78	(b)	1.07	1.72	4.85	1.03	.20	.00	.....
Los Angeles, Cal	.00	.06	.00	.91	.19	.62	.66	2.47	2.22	1.77	.65	.00	9.49
Mammoth Tank, Cal.	.28	.88	.00	.26	.00	.00	1.29	.00	.00	.00	.00	.00	2.71
Maricopa, Ariz	.00	1.47	.50	(b)	.00	(b)	(b)	.00	.00	.00	.00	.00	.....
Martinez, Cal	.00	.00	.00	.67	1.28	3.30	2.05	1.38	3.08	.97	.17	.00	12.90
Marysville, Cal.	.00	.00	.60	1.80	.93	2.68	1.84	2.51	(b)	1.09	.00	.98	.....
Menlo Park, Cal	.00	.00	.00	.36	.71	1.97	.65	1.17	3.71	.67	.18	.00	9.42
Merced, Cal.	.00	.00	.14	.35	.47	.70	.92	1.37	3.19	1.12	.32	.00	8.58
Modesto, Cal.	.00	.00	.00	.25	.63	(b)	.99	.62	1.85	.79	.50	.19	.....
Mojave, Cal.	.00	.00	.00	(a)	(a)	(a)	.05	.58	.00	.00	.00	.00	.63
Monterey, Cal.	.00	.00	.00	.60	1.20	2.13	1.50	2.52	5.64	1.57	.00	.00	15.16
Napa City, Cal	.00	.00	.13	1.01	1.62	4.21	3.40	2.19	2.85	1.67	.00	.00	17.08
Newhall, Cal.	.00	.00	.00	1.23	.12	.20	.43	2.36	4.71	.93	.00	.00	9.98
Niles, Cal.	.00	.00	.08	.38	.87	2.59	1.52	1.74	4.75	1.17	.45	(a)	13.55
Oakland, Cal.	.00	.00	.10	.25	1.61	2.30	.49	1.52	2.21	.82	.00	.00	9.30
Ogden City, Utah	.14	.02	(b)	1.74	.53	.25	(b)	2.13	.20	(b)	.20	.68	.....
Otego, Nev.	.34	.41	.12	.90	.50	1.12	.90	1.37	1.41	1.24	.37	.37	9.05
Pajaro, Cal.	.00	.00	.31	.00	1.09	3.44	1.41	1.62	5.43	1.12	.28	.00	14.70
Palisade, Nev	.85	.67	.13	.94	.55	1.65	1.57	.70	1.60	.25	.35	(b)	.....
Pantano, Ariz.	4.52	(b)	3.30	2.48	.60	.00	2.02	2.80	.65	.00	.60	.90	.....
Petaluma, Cal.	.00	.00	.30	.54	1.81	4.12	3.04	(b)	2.58	1.29	.31	.00	.....
Pleasanton, Cal.	.00	.00	.13	.53	.86	2.95	1.17	1.38	5.49	1.47	.48	.00	14.46
Promontory, Utah	.40	1.20	.00	.85	.20	.40	1.05	1.15	.57	.32	.75	1.15	8.04

Ravenna, Cal	.00	.33	.00	.76	.08	(b)	1.50	1.50	3.32	.50	.05	.25	.....
Red Bluff, Cal	.00	.00	1.20	1.38	.72	5.74	3.67	4.46	3.18	1.76	.12	.14	22.37
Redding, Cal	.00	.05	1.12	4.05	1.50	6.07	3.02	3.36	4.23	1.67	(b)	.00	.....
Reno, Nev	.10	.00	.00	.00	.95	.80	.80	.00	2.50	.38	.60	.20	6.33
Rocklin, Cal	.00	.00	.30	.92	1.55	3.54	2.89	2.66	3.63	2.78	.00	.25	18.52
Sacramento, Cal	.00	.00	.20	.30	1.80	2.58	1.23	1.53	2.81	1.61	.35	.16	12.57
Salinas, Cal	.00	.00	.19	.21	.66	1.27	1.83	2.31	4.42	1.27	.46	.06	12.68
San Fernando, Cal	.00	.00	.00	.95	.16	.32	.61	1.70	3.21	1.56	.10	.00	8.61
San José, Cal	.00	.00	.02	.45	.91	1.83	1.17	1.49	4.26	1.10	.55	.00	11.78
San Mateo, Cal	.00	.00	.16	.69	1.16	3.01	.79	1.72	3.98	1.11	.08	.00	12.70
Santa Cruz, Cal	.00	.00	.39	1.64	.96	5.58	3.07	3.04	5.57	2.26	.24	.07	22.82
Soledad, Cal	.00	.00	.04	.07	.56	.79	.96	1.92	4.65	.26	(b)	.00	.....
South Vallejo, Cal	.00	.00	.30	.40	1.57	3.26	1.56	2.60	2.71	1.63	.25	.00	14.28
Spadra, Cal	.00	.00	.00	.35	.08	(b)	.60	2.35	2.82	.60	.00	.00	.....
Stockton, Cal	.00	.00	.00	.05	1.06	1.94	1.03	1.20	3.40	1.94	.00	.00	10.62
Suisun, Cal	.79	.00	.31	.73	1.27	4.28	1.78	2.53	2.57	1.53	.14	.00	15.93
Sumner, Cal	.00	.00	.00	.10	.28	.16	.95	.44	.65	(b)	.25	.05	.....
Summit, Cal	.00	.00	.60	3.10	3.05	9.05	7.40	9.00	19.30	3.25	.60	.00	55.35
Tecoma, Nev	.22	.15	.00	.57	.00	.10	.40	.00	.40	.50	.15	.15	2.04
Tehama, Cal	(a)	.00	.35	1.25	.35	3.09	1.05	(b)	2.17	1.32	.05	.28	.....
Tehichipa, Cal	.00	.00	.32	.10	.60	.12	.65	2.91	1.40	.63	.20	.15	7.08
Tennant, Cal	.00	.00	.08	.30	.76	2.37	1.42	(b)	6.57	1.02	.37	(b)	.....
Terrace, Utah	.29	.34	.00	.48	.00	.45	.35	.85	.30	.00	.00	.00	3.06
Texas Hill, Ariz	.03	.24	.12	2.50	.00	.18	(b)	.00	.00	.00	.00	.00	.....
Toana, Nev	.00	.00	.00	.40	.10	.40	.65	.50	.50	.22	.50	.10	3.37
Tracy, Cal	.00	.00	.00	.15	.70	.85	.70	.50	2.43	1.48	.40	.00	7.21
Truckee, Cal	.18	.00	.25	2.50	2.70	3.80	6.40	4.95	12.05	1.98	.85	(b)	.....
Tucson, Ariz	5.69	3.90	.00	.62	.00	.00	1.75	1.18	.50	.05	.00	.75	14.44
Tulare, Cal	(a)	.00	.00	.22	.30	.06	.60	.90	.66	1.57	.40	.00	4.71
Tuohey's Ranche, Cal	(b)	(b)	.05	(b)	(b)	.00	.83	1.70	.81	(b)	.08	.10	.....
Turlock, Cal	.00	.00	.00	.45	1.10	.95	.93	1.24	2.55	1.88	.00	.00	9.10
Wadsworth, Nev	.63	.10	.00	.68	.10	1.10	.85	.05	1.10	.70	.25	.00	5.56
Wells, Nev	.60	.96	.00	.00	.20	.85	2.55	.97	2.65	1.85	.58	.25	11.46
White Water, Cal	.00	.46	.00	(a)	.00	(b)	(b)	.48	.20	.16	.00	.00	.....
Willcox, Ariz	3.97	5.17	(b)	.00	.00	.00	(b)	1.15	.00	.00	.00	(b)	.....
Williams, Cal	.03	.00	.37	.58	.08	1.95	1.32	1.37	1.21	1.15	.05	.17	8.28
Willow, Cal	.00	.00	.44	.47	.10	2.23	.67	2.00	1.47	.63	.00	.27	8.28
Winnemucca, Nev	.00	.10	.12	.98	.25	1.80	1.37	1.66	2.07	.98	.60	1.35	11.28
Woodland, Cal	.00	.00	.00	.37	2.08	2.25	.89	1.88	1.89	1.37	.00	.00	10.73
Yuma, Ariz	.20	.08	.05	.00	.00	.10	1.35	.01	.00	.00	.00	.05	1.84

a Precipitation too small to measure.

b No report.

APPENDIX 41.

Monthly and annual mean relative humidity at stations of observation of the Signal Service, United States Army, for the year ending June 30, 1882.

Stations.	Station established.	1881.						1882.						Annual mean.
		July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Albany, N. Y	Dec. 22, 1873	63.4	67.3	67.7	64.8	68.0	73.9	69.5	65.9	64.6	53.4	55.0	58.6	64.3
Alpena, Mich	Sept. 10, 1872	68.4	74.7	77.9	77.9	76.0	75.8	78.7	75.5	79.6	68.4	(a)64.6	72.5	74.2
Atlanta, Ga	Sept. 25, 1878	60.0	68.8	73.6	71.9	71.1	69.6	78.2	68.5	62.7	63.6	64.3	68.0	68.4
Atlantic City, N. J	Dec. 10, 1873	78.8	82.7	85.6	79.5	78.1	79.4	75.5	78.5	73.5	74.5	80.4	77.2	78.6
Augusta, Ga	Nov. 2, 1870	62.0	70.4	71.6	69.8	71.5	68.0	74.4	65.4	64.1	68.0	67.8	70.7	68.6
Baltimore, Md	Jan. 1, 1871	61.3	61.1	69.3	67.1	67.8	70.6	72.6	66.8	64.0	60.9	69.1	60.3	65.9
Barnegat, N. J	Dec. 10, 1873	80.1	81.3	85.1	79.0	76.8	81.0	79.9	81.6	74.2	71.8	79.4	76.8	78.9
Bismarck, Dak	Sept. 15, 1874	62.5	61.7	66.5	67.3	72.7	70.9	74.5	69.7	77.3	73.8	63.4	68.0	69.0
Block Island, R. I	Sept. 1, 1880	82.5	82.7	83.7	74.3	73.0	74.5	72.7	74.6	73.1	70.8	79.9	76.9	76.6
Boisé City, Idaho	July 1, 1877	41.6	41.5	49.4	66.5	74.5	81.2	85.5	(b)81.0	72.6	62.4	53.1	46.9	63.0
Boston, Mass	Nov. 1, 1870	73.1	74.0	78.8	70.6	74.5	73.3	72.1	71.0	68.1	62.4	66.6	63.8	70.7
Brackettville, Tex	Sept. 1, 1875	56.1	56.2	64.7	82.3	70.7	(c)75.6							
Brownsville, Tex	Aug. 25, 1875	74.4	77.7	80.0	(d)85.6	82.6	84.8	(d)91.2	81.3	84.1	81.8	83.2	81.1	82.3
Buffalo, N. Y	Nov. 1, 1870	70.7	64.2	69.3	71.8	75.0	80.3	85.6	79.1	78.0	71.4	68.4	(d)70.6	73.7
Burlington, Vt	May 24, 1871	67.7	74.2	74.2	70.8	70.6	73.1	75.4	70.6	66.8	63.3	58.2	63.9	69.1
Cairo, Ill	June 1, 1871	65.6	62.3	70.7	77.1	74.3	74.1	82.5	75.6	69.8	65.9	71.9	73.8	72.0
Campo, Cal	Jan. —, 1874	48.8	57.8	(e)53.3	63.5	46.7	54.4	(f)70.6	(g)68.7	64.6	(h)68.7	(i)61.1	63.2	60.1
Camp Thomas, Ariz	Sept. 22, 1877	60.5	67.8	59.6	(j)58.8	59.6	62.6	(k)68.5	70.0	50.6	36.3	36.3	40.8	56.0
Cape Henry, Va	Dec. 15, 1873	71.6	76.2	77.4	70.9	72.7	72.5	79.7	71.3	70.2	71.2	72.9	70.7	73.1
Cape May, N. J	May 24, 1871	(l)73.6	(i)77.5	79.8	(d)76.0	(l)77.0	(f)75.6	77.2	(b)73.6	(k)70.7	(l)74.4	(g)78.6	(g)76.4	75.9
Castroville, Tex	Sept. 29, 1875	(a)58.1	(a)57.8	(i)72.2	(d)73.6	71.4	(h)71.4	78.5	72.6	(d)73.9				
Cedar Keys, Fla	Nov. 7, 1879	73.5	73.2	76.0	74.0	74.4	78.0	78.8	71.2	71.9	72.1	67.2	75.3	73.8
Champaign, Ill	Oct. 13, 1880	63.7	56.0	70.8	79.8	74.1	75.6	72.5	72.4	70.6	66.3	72.4	70.8	70.4
Charleston, S. C	Jan. 5, 1871	71.6	76.3	77.4	78.4	77.2	76.1	(d)78.7	74.3	70.9	77.9	74.2	75.0	75.7
Charlotte, N. C	Oct. 6, 1876	53.5	55.6	67.7	69.2	73.2	69.8	79.4	69.6	63.1	65.9	66.5	60.6	66.2
Chattanooga, Tenn	Jan. 8, 1879	65.2	67.8	73.4	75.7	76.8	71.7	79.8	69.6	64.2	63.4	69.5	70.3	70.6
Cheyenne, Wyo	Nov. 1, 1870	55.8	55.8	46.0	53.7	58.2	48.0	54.5	46.9	41.9	49.6	60.7	60.5	52.6
Chicago, Ill	Nov. 1, 1870	70.4	63.6	69.5	79.0	77.7	81.8	83.2	77.0	80.1	72.3	71.4	77.3	75.3
Chincoteague, Va	Mar. 16, 1880	80.7	84.3	87.1	81.5	79.9	(f)83.4	82.7	77.6	75.5	74.5	81.4	80.6	80.8
Cincinnati, Ohio	Nov. 1, 1870	58.3	55.2	64.7	75.4	70.5	76.9	73.0	67.3	59.8	60.6	67.2	67.3	66.4
Cleveland, Ohio	Nov. 1, 1870	68.1	62.8	69.1	72.8	69.9	76.6	80.5	72.7	72.8	65.5	70.2	65.2	70.5
Columbus, Ohio	July 1, 1878	57.8	57.7	64.9	73.2	68.4	73.0	74.1	67.7	62.0	62.9	68.7	69.6	66.7
Concho, Tex	Oct. 10, 1875	60.7	59.4	68.0	78.3	70.5	75.2	80.7	81.5	73.4	58.5	55.3	64.3	68.8
Corsicana, Tex	Sept. 15, 1874	60.4	54.6	61.8	(n)72.4									
Davenport, Iowa	May 24, 1871	66.5	59.4	64.9	73.7	66.5	65.0	62.9	61.3	63.6	63.5	67.1	74.9	65.8

Dayton, Wash	July 1, 1879	55.9	51.9	62.0	77.0	83.4	79.9	80.7	72.9	69.4	67.5	63.5	63.8	69.0
Deadwood, Dak	Nov. 1, 1878	(*o*)		48.0	65.4	69.0	61.0	71.4	62.2	69.1	73.8	72.8	75.9	
Decatur, Tex	Feb. 1, 1876	(*d*)56.4	(*i*)49.7	(*f*)54.3	(*c*)72.3	68.5	(*g*)67.6	(*i*)74.1	(*l*)63.9	(*l*)57.3	(*l*)54.3	(*p*)56.0	(*q*)47.9	60.2
Delaware Breakwater, Del	Jan. 28, 1880	79.1	79.7	82.5	78.2	77.7	80.3	87.0	81.3	79.2	79.3	81.8	77.6	80.3
Denison, Tex	Dec. 16, 1874	64.0	(*a*)53.2	65.5	79.8	72.5	69.4	78.4	76 7	68.0	(*i*)68.6	(*a*)69.9	67.1	69.4
Denver, Colo	Nov. 19, 1871	47.6	54.4	44.6	(*a*)49.8	60.2	50.8	56.8	47.8	(*a*)39.8	48.8	59.4	58.3	51.5
Des Moines, Iowa	Aug. 1, 1878	74.1	66.3	72.8	76.8	72.9	75.4	73.4	69.0	67.6	64.7	70.5	74.2	71.5
Detroit, Mich	Nov. 1, 1870	63.8	63.9	69.0	72.5	68.2	77.0	77.9	71.7	(*a*)73.0	64.5	66.3	(*d*)66.1	69.5
Dodge City, Kans	Sept. 15, 1874	66.1	62.1	56.9	76.1	67.1	69.6	73.6	62.0	56.1	59.8	(*f*)71.8	65.3	65.5
Dubuque, Iowa	July 10, 1873	70.2	67.0	70.2	75.7	66.6	69.2	67.6	63.4	66.5	59.9	64.0	69.3	67.5
Duluth, Minn	Nov. 1, 1870	63.6	79.3	79.8	73.4	79.6	73.5	75.9	72.4	74.1	67.1	64.4	66.0	72.4
Eagle Pass, Tex	Jan. 19, 1875	51.1	55.6	61.1	78.9	72.9	75.8	79.5	71.3	71.3	56.5	62.5	60.6	66.4
Eagle Rock, Idaho	Dec. 3, 1880	36.6	31.9	36.9	59.2	72.0	73.2	72.6	73.3	74.0	67.2	49.9	45.1	57.7
Eastport, Me	April 1, 1873	78.5	85.0	81.3	75.0	72.5	76.3	73.8	73.2	72.7	69.6	(*a*)68.0	70.8	74.7
El Paso, Tex	Nov. 5, 1877	56.3	63.3	55.3	57.9	51.5	56.1	54.2	60.5	40.9	33.1	32.7	37.0	49.9
Erie, Pa	May 25, 1873	71.8	65.4	71.7	72.6	73.7	78.2	79.6	77.6	76.9	71.8	71.7	69.9	73.4
Escanaba, Mich	May 24, 1871	67.7	78.7	82.1	79.0	82.3	82.3	80.0	80.1	78.4	69.0	65.6	68.7	76.2
Florence, Ariz	Nov. 12, 1874	43.1	60.7	50.0	51.8	49.7	50.0	64.2	66.4	39.5	(*r*)35.8			
Fort Apache, Ariz	Oct. 9, 1877	64.1	77.9	(*b*)64.9	69.6	58.7	60.2	66.7	63.7	55.3	51.1	47.6	49.8	60.8
Fort Assininiboine, Mont	Oct. 6, 1879	(*l*)53.7	47.8	60.1	77.2	68.0	52.5	56.1	53.6	55.2	61.0	60.5	57.1	58.6
Fort Bennett, Dak	Dec. 22, 1879	(*s*)67 1	64.4	(*f*)69.3	(*l*)73.3	74.7	71.7	71.5	62.7	71.2	69.9	70.1	73.3	69.9
Fort Benton, Mont	Oct. 11, 1879	47.4	46.9	59.0	70.6	64.8	54.6	64.9	60.1	65.4	60.8	56.7	(*p*)62.4	59.5
Fort Buford, Dak	Oct. 23, 1878	69.4	61.6	69.8	71.6	72.1	72.1	66.2	61.4	69.4	70.4	67.6	67.3	68.2
Fort Custer, Mont	Dec. 5, 1878	45.3	34.3	50.0	58.4	73.4	70.8	75.3	67.9	65.8	66.3	69.2	74.8	62.6
Fort Davis, Tex	Dec. 24, 1877	57.7	67.2	(*o*)	69.9	(*o*)	(*i*)57.7	62.2	57.1	46.4	39.2	42.3	49.8	
Fort Elliott, Tex	Nov. 29, 1879	62.1	57.2	60.8	67.6	49.3	47.2	46.5	46.8	45.6	44.4	59 5	59.2	53.8
Fort Gibson, Ind. T	Apr. 1, 1873	64.0	50.8	52.5	77.5	71.6	70.3	76.6	71.8	63.7	63.4	(*t*)76.6		
Fort Grant, Ariz	Nov. 1, 1875	60.9	71.2	57.2	52.0	45.4	43.9	51.3	61.0	38.1	31.1	29.5	37.8	48.3
Fort Griffin, Tex	July 1, 1875	51.6	(*d*)48.2	(*i*)57.5	74.0	61.8	61.6	(*f*)71.6	69.3	(*p*)64.1	(*u*)59.4			
Fort Keogh, Mont	Nov. 18, 1878	53.7	42.6	55.0	64.9	69.5	61.6	64.1	63.2	58.0	60.8	(*a*)60.1	60.7	59.5
Fort McKavett, Tex	Oct. 19, 1875	(*s*)59.5	(*g*)57.8	(*h*)62.0	(*l*)77.7	(*c*)65.4	64.5	73.3	68.0	65.2	59.5	63.4	59.8	64.7
Fort Macon, N. C	May 23, 1878	81.9	81.8	81.0	79.9	80.7	81.6	86.2	79.3	76.2	83.7	80.2	80.1	81.0
Fort Missoula, Mont	Dec. 15, 1879	56 5	49.3	66.5	79.9	85.0	86.3	83.9	85.2	78.8	75.0	65.7	62.0	72.8
Fort Shaw, Mont	Apr. 1, 1880	57.3	48.4	63.3	76.6	66.2	53.4	65.8	64.0	63.2	63.4	62.1	62.0	62.1
Fort Sill, Ind. T	June 23, 1875	53.7	48.4	58.0	78.9	68.8	64.3	71.8	70.0	67.4	60.5	66.7	65.1	64.5
Fort Stevenson, Dak	Sept. 19, 1878	71 5	68.6	70.6	74.5	78.9	74.7	74.3	77.9	(*g*)79.0	(*p*)79.9	74.6	73.5	74.8
Fort Saint Michael's, Alaska	June 28, 1874	76.4	88.0	86.7	84.6	85.2	87.5	94.3	99.5	94.7	93.4	93.8	88.1	89.4
Fort Verde, Ariz	Nov. 9, 1874	43.1	56.8	47.9	(*d*)45.8	43.1	49.8	61.8	57.6	36.4	33.6	31.5	35.4	45.2
Fort Washakie, Wyo	Feb. 15, 1882								(*v*)64.4	57.3	(*d*)70.8	68.5	88.1	89.4
Fredericksburg, Tex	Mar. 14, 1876	(*h*)67.1	(*a*)64.3	(*d*)70.0	81.5	76.3	(*f*)76.2	(*b*)84.1	76.2	77.8	76.7	(*i*)78.0	70.7	74.9
Galveston, Tex	Apr. 19, 1871	71.8	72.1	71.1	77.4	79.1	78.5	90.2	81.8	79.1	79.4	73.9	78.8	77.8
Grand Haven, Mich	May 24, 1871	73.6	73.5	76.5	82.1	76.3	78.7	82.1	79.1	79.2	67.4	65.2	72.9	75.6
Hatteras, N. C	Dec. 1, 1880	79.2	78.2	79.4	76.2	79.8	83.0	86.6	77.8	78.5	80.8	79.1	79.1	79.8

a Mean for 30 days only.
b Mean for 23 days only.
c Mean for 16 days only.
d Mean for 29 days only.
e Mean for 22 days only.
f Mean for 28 days only.
g Mean for 24 days only.
h Mean for 27 days only.
i Mean for 26 days only.
j Mean for 17 days only.
k Mean for 21 days only.
l Mean for 25 days only.
m Station closed March 29, 1882.
n Observations discontinued October 31, 1881.
o Record incomplete.
p Mean for 20 days only.
q Mean for 19 days only.
r Station closed April 30, 1882.
s Mean for 13 days only.
t Mean for 12 days only.
u Observations discontinued and station closed April 15, 1882.
v Mean for 14 days only.

APPENDIX 41.—*Monthly and annual mean relative humidity at stations of observation of the Signal Service, United States Army, &c.*—Continued.

Stations.	Station established.	1881.						1882.						Annual mean.
		July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Helena, Mont	Oct. 15, 1879	52.6	41.9	58.5	78.7	70.1	62.7	64.6	61.8	54.2	61.4	55.7	54.2	59.7
Henrietta, Tex	Feb. 1, 1877	(a)55.7	52.4	(b)53.8	68.8	(b)68.0	68.7	76.8	(c)75.0	(d)69.2	66.4	(a)64.4	(a)61.7	65.1
Huron, Dak	July 1, 1881	79.1	78.3	77.5	73.1	74.0	64.6	64.1	64.6	69.6	69.8	72.0	74.6	71.8
Indianapolis, Ind	Feb. 10, 1871	59.9	51.6	65.1	77.4	74.2	76.0	76.7	71.9	67.0	63.4	66.0	69.4	68.2
Indianola, Tex	May 1, 1872	74.9	77.8	77.3	80.3	80.5	81.7	89.9	80.7	82.3	81.7	78.2	79.6	80.4
Jacksborough, Tex	May 8, 1875	57.2	49.5	60.8	77.2	68.0	68.3	74.5	73.2	68.7	(e)62.9	68.3	61.3	65.8
Jacksonville, Fla	Sept 11, 1871	72.2	73.6	76.4	74.9	75.3	75.2	74.8	70.2	65.8	75.6	69.2	70.4	72.8
Keokuk, Iowa	July 16, 1871	67.8	57.6	63.0	79.7	73.5	78.6	78.2	69.5	68.2	66.1	72.5	74.1	70.7
Key West, Fla	Nov. 1, 1870	68.9	72.6	77.5	75.5	78.5	76.5	75.9	72.9	68.7	71.5	69.3	68.3	73.0
Kittyhawk, N. C	Jan. 15, 1875	75.0	80.2	80.5	75.5	76.8	79.2	81.7	77.7	75.6	78.1	78.6	76.1	77.9
Knoxville, Tenn	Jan. 1, 1871	66.3	69.2	70.4	75.2	75.6	75.0	82.5	70.4	66.4	62.1	70.7	74.1	71.5
La Crosse, Wis	Oct. 15, 1872	70.4	69.2	73.3	69.4	64.0	67.0	70.3	63.3	68.1	54.3	52.7	(f)58.8	65.1
La Mesilla, N. Mex	June 16, 1876	53.7	62.2	56.7	62.3	53.8	52.5	54.4	55.4	39.3	30.2	30.2	(a)37.4	49.0
Laredo, Tex	Dec. 16, 1875	55.6	62.6	(g)	(h)75.6	75.0	(i)78.7							
Leavenworth, Kans	May 21, 1871	64.5	55.7	61.9	74.6	66.4	66.5	70.5	64.3	60.2	61.6	67.3	67.1	65.0
Lewiston, Idaho	July 1, 1879	48.4	46.1	56.3	67.8	75.0	72.7	66.2	61.1	60.3	62.0	54.6	47.3	59.8
Little Rock, Ark	July 1, 1879	70.5	64.0	68.6	79.9	74.3	70.9	80.0	78.3	70.0	72.9	77.0	73.7	73.3
Los Angeles, Cal	July 1, 1877	67.4	68.6	66.8	70.4	51.3	64.1	69.6	63.2	65.1	71.9	65.8	68.5	66.1
Louisville, Ky	Sept. 11, 1871	60.2	55.4	65.6	74.4	66.6	72.0	76.5	68.8	62.8	58.8	(j)66.7	71.2	66.6
Lynchburg, Va	May 24, 1871	55.7	53.8	64.3	65.5	66.0	67.0	69.3	61.3	57.8	(f)59.7	62.9	61.4	62.1
Madison, Wis	Sept. 29, 1878	74.7	69.5	77.2	80.0	75.6	74.4	73.4	72.7	75.1	70.9	71.6	73.5	74.0
Marquette, Mich	May 1, 1871	62.9	74.4	80.3	70.2	77.6	66.0	70.3	71.9	73.2	67.0	58.2	62.7	69.6
Mason, Tex	Feb. 7, 1876	6[illegible]3	59.2	65.1	73.9	68.6	67.5	(f)74.8	(d)68.6	(f)67.7	(k)68.6			
Memphis, Tenn	Feb. 28, 1871	61.7	61.8	66.0	73.2	70.9	69.4	81.4	72.9	65.1	66.5	67.8	67.6	68.7
Milwaukee, Wis	Nov. 1, 1870	71.7	72.8	78.2	81.2	77.5	77.5	79.3	74.5	79.3	72.0	68.6	73.4	75.5
Mobile, Ala	Nov. 7, 1870	71.9	73.9	73.7	76.7	76.7	77.7	82.3	75.6	75.0	73.0	69.2	72.5	74.8
Montgomery, Ala	Nov. 9, 1870	61.9	69.4	71.7	72.2	75.8	72.1	75.3	68.6	66.6	67.4	64.7	68.2	69.5
Moorhead, Minn	Jan. 1, 1881	59.1	76.0	77.4	75.1	83.6	77.3	82.4	75.3	81.7	75.6	67.5	69.0	75.0
Morgantown, W. Va	Jan. 25, 1873	76.0	68.6	72.8	77.0	67.7	70.2	74.8	67.8	65.2	64.2	70.1	75.2	70.8
Mount Washington, N. H	Dec. 1, 1870	81.8	82.6	78.7	87.5	86.0	84.4	86.1	81.3	84.6	86.6	86.9	82.2	84.1
Nashville, Tenn	Nov. 1, 1870	57.5	56.2	68.3	72.6	70.0	71.2	79.3	68.2	63.1	62.1	68.4	68.7	67.1
New London, Conn	Jan. 10, 1871	76.5	79.4	89.5	71.8	73.2	79.1	72.7	71.4	69.4	67.1	70.7	71.7	73.6
New Haven, Conn	Dec. 10, 1872	74.4	76.0	75.7	70.0	70.8	74.4	73.9	71.4	67.9	62.5	67.3	66.7	70.9
New Orleans, La	Nov. 1, 1870	70.0	70.3	70.8	76.9	73.9	73.1	77.8	73.8	71.2	71.8	68.6	71.8	72.5
Newport, R. I	Aug. 1, 1875	78.8	81.8	83.5	72.6	82.0	74.5	73.5	(d)73.6	70.6	67.5	73.6	76.9	75.2
New York, N. Y	Nov. 1, 1870	73.8	72.4	78.0	72.1	73.9	79.6	78.4	75.3	72.1	67.9	72.4	(f)66.8	73.6
Norfolk, Va	Jan. 1, 1871	68.7	73.1	75.9	73.9	73.5	70.7	74.6	65.4	63.3	69.5	71.6	68.1	70.7
North Platte, Nebr	Sept. 18, 1874	71.0	57.0	62.2	73.9	66.5	66.2	72.4	62.3	54.3	64.5	69.7	71.8	66.0

Olympia, Wash	*July 1, 1877*	*71.4*	*74.6*	*81.2*	*83.0*	*86.0*	*85.7*	*85.4*	*82.8*	*78.4*	*75.8*	*69.3*	*71.7*	*78.8*
Omaha, Nebr	*Nov. 1, 1870*	*67.5*	*60.8*	*66.5*	*74.5*	*66.9*	*69.7*	*72.3*	*63.4*	*60.4*	(*f*)62.7	*67.1*	*69.6*	*66.8*
Ooglaamie (Point Barrow) Alaska	*Oct. 17, 1881*				(*r*)95.4	*93.3*	*86.4*	*83.7*	*76.8*	*82.6*	*90.5*	*98.6*	*96.0*	
Oswego, N. Y	Nov. 1, 1870	72.3	71.4	76.2	73.4	64.8	65.6	70.6	69.5	69.3	63.9	64.7	69.8	68.8
Palestine, Tex	Dec. 3, 1881						(*l*)60.5	(*m*)77.3	(*i*)66.2	(*c*)64.5	73.3	73.6	70.2	
Pensacola, Fla	Oct. 27, 1879	75.6	78.0	78.2	79.7	78.2	79.0	84.1	78.2	77.7	77.9	73.0	78.6	78.2
Philadelphia, Pa	Jan. 1, 1871	66.8	66.1	71.2	70.2	72.4	77.5	79.3	70.7	63.6	60.5	68.2	60.2	68.9
Phœnix, Ariz	May 9, 1877	43.4	55.0	47.7	41.3	42.0	(*n*)46.5							
Pike's Peak, Colo	Nov. 1, 1873	69.0	76.3	65.8	75.1	76.2	66.4	77.4	73.0	80.7	83.2	85.6	81.7	75.9
Pioche, Nev	July 29, 1877	41.8	37.3	24.9	41.4	40.3	42.0	58.0	58.5	47.7	43.0	30.0	40.3	42.1
Pittsburg, Pa	Nov. 1, 1870	68.6	69.7	65.2	71.0	67.6	73.4	76.1	70.9	63.5	57.3	67.0	65.0	67.2
Port Eads, La	Apr. 10, 1881	77.9	79.9	77.4	80.1	81.2	85.2	88.6	83.3	83.2	82.6	76.0	81.0	81.4
Port Huron, Mich	July 25, 1874	72.3	69.5	74.5	80.6	83.1	86.6	86.7	81.6	80.4	76.7	73.4	73.9	78.3
Portland, Me	Jan. 15, 1871	71.6	74.7	77.3	69.9	71.4	73.6	74.7	68.5	64.4	58.3	58.7	62.1	68.8
Portland, Oreg	Nov. 1, 1871	63.4	69.5	72.3	80.5	82.1	85.1	82.9	82.5	75.7	70.3	62.0	67.1	74.4
Portsmouth, N. C	Apr. 23, 1876	75.3	76.1	76.4	74.1	72.6	65.7	70.2	69.2	70.5	71.2	72.8	75.5	72.5
Prescott, Ariz	Nov. 19, 1873	54.8	68.8	54.7	50.1	52.3	53.4	54.0	62.6	43.0	36.2	32.9	38.5	50.1
Provincetown, Mass	Feb. 15, 1882								(*o*)78.9	78.6	75.9	79.0	71.8	
Punta Rassa, Fla	Aug. 15, 1871	73.1	(*f*)76.9	78.2	73.9	75.4	76.2	76.3	72.9	69.4	(*f*)73.8	70.5	73.7	74.2
Red Bluff, Cal	July 1, 1877	32.8	35.1	40.4	59.4	56.2	84.1	68.2	75.0	62.3	59.0	41.2	41.0	54.6
Rio Grande City, Tex	May 28, 1875	61.1	64.9	(*p*)	77.2	70.3	73.2	81.3	66.8	71.9	67.5	72.4	64.9	
Rochester, N. Y	Nov. 1, 1870	68.1	64.5	67.1	73.2	74.4	79.1	80.6	77.4	78.4	69.7	65.9	68.8	72.3
Roseburg, Oreg	July 15, 1877	63.7	63.3	68.9	80.1	83.9	84.0	85.2	81.2	74.4	70.6	(*j*)61.2	62.1	73.2
Sacramento, Cal	July 1, 1877	51.2	56.9	52.8	62.6	61.8	85.5	69.7	74.1	64.2	64.2	57.2	(*f*)59.3	63.3
Saint Louis, Mo	Nov. 1, 1870	61.0	53.0	62.2	79.3	70.1	75.6	79.1	73.9	69.1	69.4	83.5	82.0	71.5
Saint Paul, Minn	Nov. 1, 1870	73.6	79.5	79.6	75.6	73.8	74.6	72.3	71.1	75.0	66.2	59.1	65.1	72.1
Saint Paul's Island, Alaska	Aug. 18, 1872	94.1	96.4	96.4	95.5	(*s*)	(*s*)	(*s*)	(*s*)	(*s*)	(*s*)	(*s*)	(*s*)	
Saint Vincent, Minn	Sept. 5, 1880	72.9	77.4	78.8	(*j*)76.8	87.4	87.1	95.1	87.6	90.2	77.5	69.5	68.8	80.8
Salt Lake City, Utah	Mar. 22, 1874	30.2	33.1	28.4	38.2	47.2	52.4	53.4	49.7	50.0	53.2	37.7	39.1	42.7
San Antonio, Tex	Sept. 22, 1875	63.6	66.0	70.9	79.0	73.3	71.2	79.2	73.8	73.6	71.2	71.0	68.4	71.8
San Diego, Cal	Nov. 1, 1871	73.2	73.0	72.6	69.8	69.8	65.5	70.2	(*d*)69.7	72.0	74.1	71.3	71.0	69.4
Sandusky, Ohio	Aug. 2, 1877	67.8	65.4	69.9	75.5	72.0	76.9	78.1	73.1	72.6	66.6	70.9	68.3	71.4
Sandy Hook, N. J	Dec. 10, 1873	74.9	72.3	77.3	68.5	67.1	77.1	79.5	77.7	75.3	73.0	74.9	73.7	74.3
San Francisco, Cal	Mar. 8, 1871	76.7	78.8	77.4	73.7	63.9	85.0	67.6	69.4	66.8	(*f*)72.6	72.2	78.5	73.6
Santa Fé, N. Mex	Nov. 20, 1871	55.0	65.5	50.9	(i)65.2	66.8	(*p*)	67.9	52.9	37.3	36.6	35.1	39.0	
Savannah, Ga	Jan. 1, 1871	67.7	77.2	78.4	77.4	72.1	70.3	75.0	66.1	60.7	71.8	68.0	69.7	71.2
Shreveport, La	Sept. 3, 1871	65.2	61.1	68.1	79.1	77.7	74.8	84.0	76.8	68.6	71.1	70.8	67.7	72.1
Silver City, N. Mex	May 15, 1878	69.9	67.8	57.5	64.8	60.8	59.7	61.4	64.8	46.1	35.9	36.5	44.4	55.8
Sitka, Alaska	Mar. 30, 1881	(*q*)>1.0	(*a*)75.8	83.3	(*j*)73.8	(*d*)83.6	(*d*)80.4	77.0	78.5	68.2	65.0	70.1	75.5	76.0
Smithville, N. C	Oct. 15, 1875	77.8	78.8	82.5	80.8	80.8	80.0	83.7	78.7	76.4	80.8	76.8	76.1	79.4
Spokane Falls, Wash	Feb. 5, 1881	55.2	57.1	66.8	76.7	76.8	72.3	80.9	79.2	73.8	69.1	61.2	60.8	69.2
Springfield, Ill	July 1, 1879	66.3	56.9	67.9	81.2	72.5	72.1	73.1	66.7	61.9	60.1	68.6	72.6	68.3
Springfield, Mass	July 19, 1873	72.2	75.4	77.1	71.8	71.2	75.2	68.2	71.9	63.8	56.8	62.6	62.6	69.1
Springfield, Mo	Jan. 3, 1882							(*f*)78.9	73.7	71.6	62.8	73.5	70.5	
Stockton, Tex	Feb. 26, 1876	62.5	65.0	71.9	80.4	62.1	72.0	79.8	73.5	63.5	49.1	61.4	63.6	67.1
Thatcher's Island, Mass	Dec. 26, 1875	88.0	90.2	89.0	80.6	74.1	76.7	77.3	80.8	79.3	73.3	78.9	79.1	80.6

a Mean for 28 days only.
b Mean for 26 days only.
c Mean for 23 days only.
d Mean for 27 days only.
e Mean for 19 days only.
f Mean for 29 days only.
g Record complete, and observer sick.
h Mean for 25 days only.
i Mean for 16 days only.
j Mean for 30 days only.
k Observations discontinued and station closed Apr. 15, '82.
l Mean for 18 days only.
m Mean for 7 days only.
n Observations discontinued December 31, 1881.
o Mean for 14 days only.
p No record.
q Mean for 24 days only.
r Mean for 15 days only.

No report received.

APPENDIX 41.—*Monthly and annual mean relative humidity of stations of observation of the Signal Service, United States Army, &c.*—Continued.

Stations.	Station established.	1881.						1882.						Annual mean.
		July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	
Toledo, Ohio	Nov. 1, 1870	67.8	67.0	72.1	78.1	75.7	78.2	72.5	69.8	70.2	64.9	67.0	65.1	70.7
Tucson, Ariz	Dec. 2, 1875	54.6	63.3	53.3	51.8	44.7	50.0	62.0	65.4	46.6	37.5	30.6	37.6	49.8
Umatilla, Oreg	July 15, 1877	45.6	48.3	51.9	68.4	73.8	80.6	75.7	68.5	59.4	53.2	46.5	46.3	59.8
Unalashka, Alaska	Aug. 18, 1878	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	74.4	.....
Uvalde, Tex	Sept. 6, 1875	(a)65.0	(a)61.2	(b)65.7	(b)74.5	(b)71.2	(c)73.6	(d)79.4	(c)71.4	(b)73.6	62.2	64.5	64.2	68.9
Vicksburg, Miss	Sept. 10, 1871	68.2	65.6	67.4	76.2	71.7	68.3	79.2	68.9	65.7	68.3	67.2	69.2	69.7
Visalia, Cal	July 1, 1877	47.4	50.3	52.9	62.7	61.2	79.9	66.0	67.6	60.8	(f)57.1	(g)48.7	(c)45.7	58.4
Washington, D. C	Nov. 1, 1870	67.8	70.0	74.0	73.4	74.4	76.6	80.8	72.6	69.3	68.1	70.9	64.5	71.9
West Las Animas, Colo	Oct. 1, 1881	.....	.....	.....	(h)49.6	(e)68.7	(i)68.8	(i)73.0	(j)51.8	41.8	44.7	58.9	55.0	.....
Wickenburg, Ariz	Jan. 6, 1874	50.9	(c)64.4	(c)59.6	54.1	52.6	59.3	(k)71.5	(f)74.3	(c)44.6	(c)58.4	.....	.....	.....
Williamsport, Pa	Jan. 1, 1882	.....	.....	.....	.....	.....	.....	(b)74.9	74.7	65.0	61.9	64.2	61.5	.....
Wilmington, N. C	Jan. 1, 1871	74.3	75.8	76.4	74.5	75.7	72.7	73.5	67.1	66.2	71.0	70.3	72.0	72.5
Winnemucca, Nev	July 1, 1877	28.9	24.2	32.8	56.6	60.1	73.3	66.6	66.2	(a)64.5	53.5	37.8	42.2	50.6
Wood's Holl, Mass	Jan. 1, 1873	83.9	86.4	87.9	76.1	74.1	76.9	(l)74.4	.....	.....	.....	.....	.....	.....
Yankton, Dak	Apr. 1, 1873	73.8	66.7	73.1	76.0	71.1	70.2	64.9	66.2	68.1	69.3	67.9	69.3	69.7
Yuma, Ariz	Nov. 18, 1873	46.0	54.2	48.8	50.7	37.9	46.5	56.6	46.1	36.9	36.3	36.4	37.5	44.5

a Mean for 30 days only.
b Mean for 28 days only.
c Mean for 27 days only.
d Mean for 7 days only.
e Mean for 17 days only.
f Mean for 25 days only.
g Mean for 21 days only.
h Mean for 23 days only.
i Mean for 12 days only.
j Mean for 26 days only.
k Mean for 24 days only.
l Observations discontinued January 31, 1882.
m No reports received.

APPENDIX 42.

Monthly and annual mean dew-point at stations of observation of the Signal Service, United States Army, for the year ending June 30, 1882.

Stations.	Station established.	1881.						1882.					
		July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.
Albany, N. Y.	Dec. 22, 1873	.....	61.0	58.9	42.7	33.0	30.7	18.5	22.2	27.4	29.8	38.6	52.6
Alpena, Mich	Sept. 10, 1872	.....	57.2	54.6	38.8	26.7	23.3	14.5	21.3	21.6	26.5	32.1	47.9
Atlanta, Ga	Sept. 25, 1878	.....	.....	65.0	56.5	42.1	39.1	41.0	41.1	42.6	50.3	52.5	64.0
Atlantic City, N. J	Dec. 10, 1873	.....	65.8	67.6	54.1	41.7	35.9	26.3	31.4	32.8	38.5	46.8	58.9
Augusta, Ga	Nov. 2, 1870	.....	.....	68.2	59.1	46.3	42.1	43.8	42.8	47.1	54.1	57.3	67.3
Baltimore, Md	Jan. 1, 1871	.....	61.5	65.0	50.8	38.2	34.4	26.1	30.4	32.2	37.5	48.2	58.3
Barnegat, N. J	Dec. 10, 1873	.....	64.7	66.8	52.6	39.9	35.0	26.8	30.9	31.8	36.5	46.4	58.2
Bismarck, Dak	Sept. 15, 1874	.....	.....	39.8	29.0	16.7	17.3	4.9	12.7	15.6	30.9	37.6	51.2
Block Island, R. I	Sept. 1, 1880	.....	.....	61.2	48.5	38.9	34.3	24.4	27.3	29.7	33.7	42.6	55.1
Boise City, Idaho	July 1, 1877	.....	.....	35.3	33.9	28.3	27.5	21.1	(k)24.7	27.8	34.1	38.5	43.3
Boston, Mass	Nov. 1, 1870	.....	60.0	58.2	43.1	34.4	29.5	18.2	21.5	25.1	28.9	37.4	51.9
Brackettville, Tex	Sept. 1, 1875	.....	65.5	64.1	64.7	46.2	(a)47.9	.....	.....	.....	.....	.....	.....
Brownsville, Tex	Aug. 25, 1875	.....	.....	72.4	(b)73.0	58.5	57.4	(b)59.8	62.0	64.8	68.3	72.1	74.9
Buffalo, N. Y	Nov. 1, 1870	.....	58.0	60.1	44.6	33.4	31.0	22.4	26.5	27.1	31.6	38.3	(b)51.9
Burlington, Vt	May 24, 1871	.....	.....	.....	38.9	28.5	25.3	13.0	16.3	19.8	26.6	35.7	51.2
Cairo, Ill	June 1, 1871	.....	.....	63.8	57.2	39.0	36.8	33.4	41.0	41.8	48.2	53.8	66.8
Campo, Cal	Jan. —, 1874	.....	.....	(c)40.0	35.7	20.7	25.1	(g)26.6	(i)28.6	32.6	(h)38.6	(e)40.0	44.2
Camp Thomas, Ariz	Sept. 22, 1877	64.5	65.3	53.5	(d)38.5	29.0	29.9	(n)31.1	34.7	32.6	28.9	35.1	45.9
Cape Henry, Va	Dec. 15, 1873	.....	67.6	69.5	57.2	46.3	39.9	35.7	37.1	38.8	44.1	51.6	62.3
Cape May, N. J	May 24, 1871	.....	(e)65.8	67.4	(b)54.2	(f)44.2	(g)35.9	29.3	(k)32.1	(n)35.8	(f)41.5	(i)48.2	(i)60.7
Castroville, Tex	Sept. 29, 1875	.....	.....	.....	(b)63.7	47.1	(h)45.2	47.6	50.3	(b)54.4	.....	.....	.....
Cedar Keys, Fla	Nov. 7, 1879	.....	72.1	72.1	66.2	58.1	54.4	55.3	52.0	56.8	63.2	62.8	71.0
Champaign, Ill	Oct. 13, 1880	.....	58.1	59.5	50.6	31.3	30.3	20.7	30.8	32.5	39.9	46.1	58.7
Charleston, S. C	Jan. 5, 1871	79.2	(l)	72.5	64.4	52.6	47.4	(b)47.9	48.3	51.4	58.8	62.3	70.0
Charlotte, N. C	Oct. 6, 1878	.....	62.2	64.4	54.4	41.5	36.3	36.0	38.3	39.2	47.6	52.5	61.9
Chattanooga, Tenn	Jan. 8, 1879	.....	.....	64.2	56.5	42.3	36.9	38.7	39.5	41.8	48.5	53.3	64.7
Cheyenne, Wyo	Nov. 1, 1870	.....	.....	29.0	25.0	16.6	14.0	9.0	11.2	9.5	19.5	30.6	42.8
Chicago, Ill	Nov. 1, 1870	.....	.....	58.1	49.1	32.9	31.8	23.9	31.3	32.4	36.8	42.0	55.7
Chincoteague, Va	Mar. 16, 1880	.....	67.4	69.8	57.2	45.5	(g)39.7	32.0	34.9	36.5	40.3	50.2	63.1
Cincinnati, Ohio	Nov. 1, 1870	.....	.....	.....	54.7	38.0	36.5	29.4	35.8	34.9	41.0	49.0	60.8
Cleveland, Ohio	Nov. 1, 1870	.....	.....	60.0	47.8	32.1	30.7	22.9	28.3	29.7	32.7	41.6	53.4

a Mean for 16 days only.
b Mean for 29 days only.
c Mean for 22 days only.
d Mean for 17 days only.
e Mean for 26 days only.
f Mean for 25 days only.
g Mean for 28 days only.
h Mean for 27 days only.
i Mean for 24 days only.
k Mean for 23 days only.
l Record incomplete.
n Mean for 21 days only.

APPENDIX 42.—*Monthly and annual mean dew-point at stations of observation of the Signal Service, United States Army, &c.*—Continued.

Stations.	Station established.	1881.						1882.					
		July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.
Columbus, Ohio	July 1, 1878	.....	.....	....	50.6	33.5	31.5	24.6	31.0	31.3	37.1	45.9	57.8
Concho, Tex	Oct. 10, 1875	.....	.....	62.0	59.6	40.9	40.7	39.9	48.3	49.4	46.5	51.5	64.8
Corsicana, Tex	Sept. 15, 1874	.....	66.8	63.2	(t)61.9	.....	.....	.....	.....	.....	.....	.....	.....
Davenport, Iowa	May 24, 1871	.....	.....	.....	47.6	29.2	27.2	17.7	27.6	28.6	38.3	44.4	59.7
Dayton, Wash	July 1, 1879	.....	.....	43.1	39.1	31.2	31.0	26.4	24.6	30.4	34.5	40.5	49.8
Deadwood, Dak	Nov. 1, 1878	.....	.....	.....	28.0	21.9	19.9	14.4	17.2	21.5	28.7	37.9	49.6
Decatur, Tex	Feb. 1, 1876	.....	.....	(g)58.4	(a)59.3	41.1	(i)39.8	(e)35.0	(f)39.9	(f)42.2	(f)46.2	(p)48.9	(y)58.0
Delaware Breakwater, Del	Jan. 28, 1880	.....	65.6	68.0	56.1	44.4	38.4	32.6	34.5	36.6	41.2	49.1	60.1
Denison, Tex	Dec. 16, 1874	.....	.....	62.7	62.0	41.1	39.2	37.1	45.8	48.2	(e)53.2	(j)56.9	66.5
Denver, Colo	Nov. 19, 1871	.....	52.7	34.4	(j)28.7	22.6	20.1	14.9	17.0	(j)16.7	25.4	36.5	47.9
Des Moines, Iowa	Aug. 1, 1878	.....	.....	56.5	46.6	27.6	27.8	19.3	26.2	27.6	38.6	44.4	58.6
Detroit, Mich	Nov. 1, 1870	.....	60.1	60.8	48.4	34.3	33.2	24.8	31.1	(j)31.7	33.7	40.9	(b)54.5
Dodge City, Kans	Sept. 15, 1874	.....	62.5	48.8	47.6	26.1	26.4	22.7	23.5	28.7	36.1	(g)45.9	58.5
Dubuque, Iowa	July 10, 1873	.....	.....	55.6	44.9	25.7	25.2	14.6	23.6	26.1	33.7	41.1	55.7
Duluth, Minn	Nov. 1, 1870	.....	.....	49.4	36.5	21.4	18.4	9.2	17.7	20.4	27.1	33.8	45.4
Eagle Pass, Tex	Jan. 19, 1875	65.6	67.2	64.9	65.5	48.2	45.6	47.3	50.2	53.9	53.4	60.9	67.6
Eagle Rock, Idaho	Dec. 3, 1880	.....	.....	.....	24.5	17.0	14.5	2.7	7.7	16.8	29.2	30.1	36.8
Eastport, Me	April 1, 1873	.....	.....	.....	38.0	28.7	25.3	13.2	16.0	21.3	25.4	(j)34.4	45.9
El Paso, Tex	Nov. 5, 1877	.....	.....	52.1	48.7	26.9	28.4	26.8	32.4	28.1	27.9	32.8	45.7
Erie, Pa	May 25, 1873	.....	59.8	61.5	48.3	34.8	32.6	23.9	29.8	30.7	34.8	41.8	54.4
Escanaba, Mich	May 24, 1871	.....	59.8	53.4	38.8	27.0	24.1	13.7	21.2	22.0	26.7	34.6	48.1
Florence, Ariz	Nov. 12, 1874	.....	.....	57.7	45.8	30.6	30.9	32.5	36.4	29.2	(w)31.3	.....	.....
Fort Apache, Ariz	Oct. 9, 1877	.....	.....	(k)47.1	42.1	23.0	24.7	24.0	25.4	27.0	27.8	33.3	42.6
Fort Assinniboine, Mont	Oct. 6, 1879	.....	41.1	35.3	23.8	18.7	15.1	4.5	10.0	12.0	27.0	36.1	45.1
Fort Bennett, Dak	Dec. 22, 1879	.....	59.7	(g)45.6	(f)34.9	(b)22.9	22.8	10.6	16.8	23.0	34.4	43.2	55.9
Fort Benton, Mont	Oct. 11, 1879	.....	.....	36.6	22.9	19.1	19.0	9.7	13.8	18.4	28.2	36.9	(p)49.3
Fort Buford, Dak	Oct. 23, 1878	.....	.....	.....	29.3	15.4	16.3	4.4	10.6	14.4	30.5	40.1	50.4
Fort Custer, Mont	Dec. 5, 1878	.....	.....	32.9	27.6	22.9	22.1	10.6	17.0	22.0	31.7	41.7	53.7
Fort Davis, Tex	Dec. 24, 1877	.....	.....	(l)	51.9	(l)	(e)29.2	30.9	32.0	29.5	27.1	38.2	50.5
Fort Elliott, Tex	Nov. 29, 1879	.....	60.1	51.5	48.8	21.8	19.4	14.9	21.7	27.7	31.6	43.9	56.3
Fort Gibson, Ind. T	April 1, 1873	.....	.....	55.8	57.6	37.2	35.6	33.1	40.4	43.0	48.4	(z)57.4	.....
Fort Grant, Ariz	Nov. 1, 1875	.....	.....	50.1	(b)41.6	23.3	24.7	23.6	29.7	24.1	24.3	29.4	41.1
Fort Griffin, Tex	July 1, 1875	.....	.....	(e)60.0	59.5	38.1	35.4	(g)34.7	41.7	(p)42.0	(x)47.8	.....	.....
Fort Keogh, Mont	Nov. 18, 1878	.....	.....	36.4	30.2	22.6	17.6	8.9	14.4	18.5	29.4	(j)38.1	48.9
Fort McKavett, Tex	Oct. 19, 1875	.....	.....	(h)60.0	(f)60.7	(a)49.7	37.0	38.8	43.7	46.3	49.5	56.1	61.9
Fort Macon, N. C	May 23, 1878	.....	.....	71.7	62.7	52.4	45.5	43.7	44.6	46.3	54.1	60.0	68.3
Fort Missoula, Mont	Dec. 15, 1879	.....	.....	.....	32.4	24.1	19.2	15.1	20.0	23.2	34.4	38.4	47.7

Fort Shaw, Mont	*April 1, 1880*		*38.1*	*35.8*	*26.2*	*19.1*	*18.6*	*9.8*	*14.8*	*16.0*	*25.5*	*34.9*	*44.4*
Fort Sill, Ind. T	*June 23, 1875*			*57.9*	*57.6*	*35.6*	*33.4*	*30.6*	*37.7*	*(b)42.2*	*44.4*	*52.2*	*63.5*
Fort Stevenson, Dak	*Sept. 19, 1878*			*40.8*	*29.8*	*16.0*	*13.9*	*1.7*	*11.6*	*(i)14.8*	*(p)32.4*	*40.6*	*52.4*
Fort Verde, Ariz	*Nov. 9, 1874*		*60.6*	*46.2*	*(b)36.1*	*20.6*	*23.9*	*22.3*	*27.2*	*23.0*	*25.4*	*31.7*	*43.1*
Fort Washakie, Wyo	Feb. 15, 1882								*(o)7.0*	*17.7*	*(b)30.0*	*35.6*	*42.4*
Fredericksburg, Tex	Mar. 11, 1876				*63.0*	*48.1*	*(g)45.9*	*(k)47.5*	*50.2*	*53.7*	*58.1*	*(e)61.5*	*66.0*
Galveston, Tex	Apr. 19, 1871			*70.6*	*69.3*	*54.4*	*51.4*	*55.3*	*56.7*	*60.3*	*65.3*	*65.7*	*73.9*
Grand Haven, Mich	May 24, 1871		*61.5*	*59.2*	*46.9*	*32.7*	*30.8*	*23.2*	*29.9*	*29.3*	*32.7*	*39.7*	*53.4*
Hatteras, N. C	Dec. 1, 1880				*62.2*	*53.3*	*46.8*	*44.1*	*43.8*	*44.6*	*50.7*	*57.4*	*67.2*
Helena, Mont	Oct. 15, 1879			*39.2*	*31.4*	*20.1*	*19.3*	*10.3*	*13.2*	*15.9*	*27.5*	*33.7*	*42.6*
Henrietta, Tex	Feb. 1, 1877			*(e)59.4*	*56.5*	*38.0*	*37.7*	*34.2*	*(k)42.6*	*(h)45.6*	*51.1*	*(g)54.4*	*(g)65.0*
Huron, Dak	July 1, 1881	*64.0*	*64.0*	*47.7*	*35.6*	*20.7*	*17.1*	*7.5*	*14.0*	*21.0*	*34.0*	*42.1*	*55.7*
Indianapolis, Ind	Feb. 10, 1871		*58.2*	*60.2*	*52.5*	*34.9*	*33.0*	*25.1*	*33.3*	*34.0*	*40.4*	*46.3*	*60.4*
Indianola, Tex	May 1, 1872			*72.1*	*69.9*	*55.7*	*53.4*	*55.4*	*58.3*	*61.4*	*66.6*	*68.1*	*73.7*
Jacksborough, Tex	May 8, 1875				*60.1*	*39.9*	*39.9*	*36.0*	*43.9*	*47.0*	*(y)53.7*	*56.5*	*64.0*
Jacksonville, Fla	Sept. 11, 1871	*73.4*	*71.8*	*71.3*	*65.5*	*57.0*	*52.6*	*53.4*	*50.3*	*53.4*	*62.0*	*62.9*	*69.9*
Keokuk, Iowa	July 16, 1871			*57.4*	*50.1*	*31.2*	*31.1*	*22.0*	*28.1*	*31.0*	*41.4*	*47.0*	*61.9*
Key West, Fla	Nov. 1, 1870	*74.4*	*74.6*	*74.9*	*71.6*	*69.6*	*65.0*	*64.8*	*64.3*	*63.8*	*68.3*	*68.7*	*72.5*
Kittyhawk, N. C	Jan. 15, 1875			*70.5*	*59.7*	*49.5*	*43.4*	*39.0*	*41.1*	*41.5*	*45.8*	*53.8*	*64.3*
Knoxville, Tenn	Jan. 1, 1871		*64.6*	*62.0*	*54.4*	*39.4*	*35.6*	*37.1*	*38.0*	*39.0*	*45.3*	*51.9*	*63.0*
La Crosse, Wis	Oct. 15, 1872		*62.9*	*55.6*	*42.4*	*24.8*	*24.3*	*14.6*	*22.9*	*25.5*	*32.1*	*37.3*	*(b)52.5*
La Mesilla, N. Mex	June 16, 1876			*49.7*	*47.8*	*24.6*	*24.5*	*24.0*	*27.9*	*22.6*	*18.8*	*25.6*	*(g)40.3*
Laredo, Tex	Dec. 16, 1875			*(m)*	*(f)64.9*	*53.1*	*(a)54.3*						
Leavenworth, Kans	May 21, 1871			*54.7*	*49.7*	*29.2*	*29.4*	*23.8*	*30.0*	*31.7*	*41.7*	*46.8*	*61.0*
Lewiston, Idaho	July 1, 1879			*41.3*	*36.2*	*31.4*	*28.8*	*21.7*	*21.0*	*29.3*	*35.6*	*39.1*	*46.7*
Little Rock, Ark	July 1, 1879			*63.8*	*60.8*	*42.5*	*39.5*	*38.4*	*46.7*	*48.3*	*54.2*	*58.0*	*69.0*
Los Angeles, Cal	July 1, 1877			*55.1*	*50.3*	*35.6*	*40.6*	*38.9*	*36.6*	*41.9*	*46.1*	*48.2*	*52.5*
Louisville, Ky	Sept. 11, 1871	*64.5*	*61.9*	*61.9*	*54.7*	*36.3*	*35.7*	*31.4*	*37.2*	*36.6*	*41.4*	*(j)49.9*	*62.8*
Lynchburg, Va	May 24, 1871				*52.1*	*38.1*	*34.1*	*29.1*	*31.8*	*33.1*	*(b)40.3*	*48.4*	*60.1*
Madison, Wis	Sept. 29, 1878			*56.7*	*45.0*	*27.6*	*25.7*	*15.2*	*25.5*	*27.0*	*35.2*	*41.9*	*55.1*
Marquette, Mich	May 1, 1871			*51.0*	*35.0*	*24.4*	*20.3*	*12.2*	*19.7*	*19.9*	*25.9*	*31.0*	*42.7*
Mason, Tex	Feb. 7, 1876			*62.7*	*61.2*	*41.2*	*40.0*	*(b)40.5*	*(h)45.6*	*(b)49.9*	*(x)54.7*		
Memphis, Tenn	Feb. 28, 1871		*68.0*	*63.2*	*58.7*	*40.8*	*37.6*	*37.8*	*43.6*	*44.2*	*50.8*	*55.0*	*66.7*
Milwaukee, Wis	Nov. 1, 1870			*56.7*	*45.9*	*30.0*	*28.3*	*19.5*	*27.7*	*29.1*	*33.6*	*37.8*	*52.5*
Mobile, Ala	Nov. 7, 1870			*69.4*	*64.9*	*50.9*	*48.8*	*52.2*	*50.3*	*55.7*	*60.3*	*60.6*	*70.6*
Montgomery, Ala	Nov. 9, 1870	*68.1*	*68.8*	*66.6*	*60.7*	*47.8*	*44.2*	*46.5*	*45.8*	*49.0*	*55.2*	*56.4*	*67.0*
Moorhead, Minn	Jan. 1, 1881			*45.3*	*31.8*	*15.7*	*14.5*	*1.0*	*10.2*	*14.5*	*31.6*	*39.2*	*50.9*
Morgantown, W. Va	Jan. 25, 1873		*58.6*	*62.1*	*50.9*	*36.3*	*33.5*	*29.5*	*32.4*	*33.7*	*39.1*	*47.2*	*59.7*
Mount Washington, N. H	Dec. 1, 1870			*41.8*	*25.8*	*15.1*	*12.4*	*0.4*	*5.1*	*7.7*	*13.3*	*23.5*	*36.0*
Nashville, Tenn	Nov. 1, 1870			*62.7*	*56.1*	*39.4*	*37.0*	*36.5*	*40.7*	*41.1*	*47.0*	*53.1*	*64.8*
New Haven, Conn	Dec. 10, 1872			*60.7*	*44.9*	*33.5*	*29.8*	*19.2*	*22.7*	*26.5*	*30.3*	*39.6*	*53.6*
New London, Conn	Jan. 10, 1871		*63.1*	*62.3*	*47.2*	*36.7*	*33.1*	*21.4*	*24.8*	*28.7*	*33.9*	*41.5*	*55.6*
New Orleans, La	Nov. 1, 1870	*72.6*	*71.4*	*(l)*	*67.0*	*51.9*	*49.5*	*54.8*	*52.9*	*57.0*	*61.6*	*62.4*	*70.8*
Newport, R. I	Aug. 1, 1875	*61.2*	*62.5*	*61.2*	*46.6*	*40.7*	*32.8*	*23.2*	*(h)25.7*	*28.4*	*32.4*	*41.0*	*53.8*
New York, N. Y	Nov. 1, 1870			*64.1*	*48.9*	*37.5*	*34.5*	*24.0*	*27.9*	*30.9*	*35.1*	*43.8*	*(b)55.7*

t Observation discontinued after October 31, 1881.
g Mean for 28 days only.
a Mean for 16 days only.
i Mean for 24 days only.
e Mean for 26 days only.
f Mean for 25 days only.
p Mean for 20 days only.
y Mean for 19 days only.
j Mean for 30 days only.
b Mean for 29 days only.
w Observation discontinued after April 30, 1881.
k Mean for 23 days only.
l Record incomplete.
z Mean for 12 days only.
x Observation discontinued after April 15, 1882.
h Mean for 28 days only.
o Mean for 14 days only.
m Record incomplete, observer sick.

APPENDIX 42.—*Monthly and annual mean dew-point at stations of observation of the Signal Service, United States Army, &c.*—Continued.

Stations.	Station established.	1881.						1882.					
		July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.
Norfolk, Va	Jan. 1, 1871	.....	.....	68.3	57.3	45.9	39.2	34.7	36.7	37.8	44.7	52.6	63.0
North Platte, Nebr	Sept. 18, 1874	.....	.....	44.4	38.4	21.7	20.9	16.9	20.2	23.1	34.1	43.1	56.9
Olympia, Wash	July 1, 1877	.....	51.1	49.1	42.0	39.5	38.0	33.9	31.8	35.4	37.7	42.3	50.2
Omaha, Nebr	Nov. 1, 1870	.....	64.1	52.8	45.7	26.1	26.6	19.4	23.9	26.3	(b)37.9	44.4	59.7
Oswego, N. Y	Nov. 1, 1870	.....	60.8	59.6	43.7	30.1	26.4	18.1	23.4	25.5	29.7	38.2	52.3
Palestine, Tex	Dec. 3, 1881	.....	.....	.....	.....	.....	38.4	(r)44.5	(a)47.7	(k)51.2	57.7	59.9	67.7
Pensacola, Fla	Oct. 27, 1879	.....	.....	70.8	66.6	53.5	51.1	54.5	51.6	56.6	62.4	62.6	72.0
Philadelphia, Pa	Jan. 1, 1871	.....	61.4	63.3	49.8	38.4	34.8	25.3	30.2	31.5	35.7	45.7	57.2
Phœnix, Ariz	May 9, 1877	.....	.....	53.1	40.5	27.8	30.0	(u)	.....	.....	.....	.....	.....
Pike's Peak, Col	Nov. 1, 1873	.....	33.7	21.0	16.0	0.5	-1.1	-3.8	-1.6	3.2	9.1	16.1	25.0
Pioche, Nev	July 29, 1877	.....	.....	22.7	23.0	12.5	17.9	13.0	15.4	17.0	19.2	19.8	32.7
Pittsburg, Pa	Nov. 1, 1870	.....	58.0	61.3	49.8	34.5	32.8	26.0	30.5	30.5	35.0	45.0	56.3
Port Eads, La	Apr. 10, 1881	.....	.....	72.9	70.3	58.9	54.7	57.9	55.9	61.5	66.7	65.6	78.5
Port Huron, Mich	July 25, 1874	.....	58.5	58.5	45.7	32.5	30.2	20.6	27.1	27.1	32.0	38.4	52.0
Portland, Me	Jan. 15, 1871	.....	.....	56.4	40.9	32.3	29.1	17.6	20.1	24.5	28.8	36.4	50.3
Portland, Oreg	Nov. 1, 1871	.....	.....	49.4	43.8	38.1	38.5	34.3	32.7	35.7	37.3	41.2	50.7
Portsmouth, N. C	Apr. 23, 1876	71.6	70.1	70.7	61.6	51.0	40.5	38.9	40.4	42.6	48.4	57.0	63.6
Prescott, Ariz	Nov. 19, 1873	.....	.....	42.1	31.8	18.8	21.8	14.8	21.9	19.6	19.5	24.8	36.2
Provincetown, Mass	Feb. 15, 1882	.....	.....	.....	.....	.....	.....	.....	(o)26.2	29.5	34.2	41.2	53.8
Punta Rassa, Fla	Aug. 15, 1871	.....	.....	72.1	67.6	63.4	59.4	59.6	58.4	59.4	(b)65.9	65.7	71.0
Red Bluff, Cal	July 1, 1877	.....	.....	43.0	41.4	34.1	41.0	32.6	36.1	37.7	40.7	39.2	47.3
Rio Grande City, Tex	May 28, 1875	.....	.....	68.7	67.7	54.3	50.6	54.8	54.5	59.9	62.0	68.5	70.7
Rochester, N. Y	Nov. 1, 1870	59.8	(s)	58.6	43.3	32.0	29.9	20.0	25.8	27.3	31.2	38.0	52.0
Roseburg, Oreg	July 15, 1877	49.1	48.6	47.6	41.3	37.8	37.6	34.3	33.7	35.7	38.7	(j)40.6	48.7
Sacramento, Cal	July 1, 1877	.....	.....	48.5	42.7	36.6	41.7	34.7	37.9	39.8	42.4	46.7	(b)52.1
Saint Louis, Mo	Nov. 1, 1870	.....	61.7	59.2	53.8	33.9	33.1	26.2	35.4	36.6	46.3	53.9	66.9
Saint Paul, Minn	Nov. 1, 1870	.....	.....	52.2	40.4	23.1	21.9	11.0	20.3	24.0	33.9	38.6	52.7
Saint Vincent, Minn	Sept. 5, 1880	.....	.....	43.5	(j)29.1	13.4	10.5	-1.5	3.7	9.7	26.6	37.5	47.3
Salt Lake City, Utah	Mar. 22, 1874	39.8	40.1	24.8	23.5	15.4	18.0	9.7	11.1	19.5	28.2	29.5	39.2
San Antonio, Tex	Sept. 22, 1875	.....	.....	67.1	64.9	48.0	45.8	47.5	50.8	54.9	59.5	62.1	68.6
San Diego, Cal	Nov. 1, 1871	.....	.....	57.2	51.0	35.0	42.0	40.2	(h)40.9	45.2	47.9	52.0	54.4
Sandusky, Ohio	Aug. 2, 1877	.....	.....	61.3	49.6	33.5	31.2	23.7	30.0	31.0	34.8	42.8	55.5
Sandy Hook, N. J	Dec. 10, 1873	.....	.....	67.9	50.3	38.0	35.1	25.9	29.8	32.7	37.9	45.8	59.4
San Francisco, Cal	Mar. 8, 1871	.....	.....	51.0	46.9	40.9	46.0	37.3	37.7	41.0	(b)43.3	46.7	50.0
Santa Fé, N. Mex	Nov. 20, 1871	.....	.....	37.7	37.2	(p)22.8	(s)	19.4	15.4	14.4	17.2	23.0	34.6
Savannah, Ga	Jan. 1, 1871	.....	.....	72.1	64.3	51.2	46.5	49.0	45.9	48.4	57.8	(b)60.7	68.7
Shreveport, La	Sept. 3, 1871	.....	.....	65.0	63.0	45.9	43.8	45.2	49.1	51.6	56.9	59.4	67.6

Silver City, N. Mex	*May 15, 1878*			*46.8*	*43.9*	*25.7*	*25.3*	*23.6*	*27.2*	*24.4*	*22.2*	*28.3*	*41.2*
Sitka, Alaska	*Mar. 30, 1881*					*(h)36.9*	*(h)29.2*	*28.0*	*24.9*	*21.3*	*27.9*	*37.4*	*(g)43.9*
Smithville, N. C	Oct. 15, 1875		71.4	72.3	62.8	51.7	44.8	43.7	45.0	47.9	55.7	60.0	68.3
Spokane Falls, Wash	Feb. 5, 1881			41.2	35.5	26.5	23.3	17.9	20.6	28.6	33.7	39.7	49.1
Springfield, Ill	July 1, 1879			59.4	52.3	33.4	31.1	24.0	31.5	31.5	40.5	46.7	61.5
Springfield, Mass	July 19, 1873			60.3	43.7	32.7	29.5	16.5	22.6	25.7	29.9	39.2	54.1
Springfield, Mo	Jan. 3, 1882							(b)31.0	38.0	41.3	44.6	50.5	63.6
Stockton, Tex	Feb. 26, 1876			62.7	58.1	35.4	36.6	38.6	41.4	42.2	38.6	52.4	61.6
Thatcher's Island, Mass	Dec. 26, 1875			60.1	45.6	33.7	31.2	21.8	26.4	29.8	34.3	41.1	54.5
Toledo, Ohio	Nov. 1, 1870		61.7	61.8	49.9	35.2	32.7	23.1	29.7	31.1	34.6	41.7	55.3
Tucson, Ariz	Dec. 2, 1875			56.2	47.2	30.1	32.5	34.1	37.4	34.9	33.8	36.5	47.9
Umatilla, Oreg	July 15, 1877	45.1	45.1	41.6	38.1	32.3	30.4	26.5	25.9	30.1	32.2	35.9	45.3
Uvalde, Tex	Sept. 6, 1875			(g)66.2	(g)63.6	(g)48.0	(h)46.9	(r)53.2	(d)52.4	(g)56.5	55.7	60.5	67.6
Vicksburg, Miss	Sept. 10, 1871			64.5	62.3	45.9	43.2	46.9	48.0	51.6	56.5	58.9	68.5
Visalia, Cal	July 1, 1877		52.6	48.4	41.5	33.4	40.8	31.1	34.3	39.8	(f)40.3	(n)44.5	(h)48.4
Washington, D. C	Nov. 1, 1870		64.7	66.8	53.3	39.0	34.6	27.2	31.5	33.5	39.3	48.3	60.0
West Las Animas, Colo	Oct. 1, 1881				(k)33.7	(d)22.9	(z)24.2	(z)19.3	13.5	15.9	23.6	38.9	49.7
Wickenburg, Ariz	Jan. 6, 1874				41.0	28.8	31.0	(i)28.4	(e)31.1	(h)28.5	(h)31.3		
Williamsport, Pa	Jan. 1, 1882							(f)21.8	27.3	28.2	32.4	42.0	53.9
Wilmington, N. C	Jan. 1, 1871		70.2	70.3	60.7	50.4	43.6	42.6	42.7	45.7	52.6	57.7	66.6
Winnemucca, Nev	July 1, 1877			23.5	25.6	19.2	24.1	15.7	14.3	(j)22.9	26.3	24.4	36.9
Wood's Holl, Mass	Jan. 1, 1873			61.3	48.2	38.5	34.5	(v)24.0					
Yankton, Dak	Apr. 1, 1873			49.8	40.5	23.4	23.6	13.1	18.9	24.2	36.7	43.0	56.7
Yuma, Ariz	Nov. 18, 1873	66.1	68.2	58.9	49.0	30.3	34.6	33.3	32.3	31.8	35.6	44.9	51.0

b Mean for 29 days only.
r Mean for 7 days only.
a Mean for 16 days only.
k Mean for 23 days only.
u Observations discontinued after December 31, 1881.
o Mean for 14 days only.
s No record on station.
j Mean for 30 days only.
h Mean for 27 days only.
p Mean for 20 days only.
g Mean for 28 days only.
d Mean for 17 days only.
f Mean for 25 days only.
n Mean for 21 days only.
z Mean for 12 days only.
i Mean for 24 days only.
e Mean for 26 days only.
v Observations discontinued after January 31, 1882.

APPENDIX 43.

Table showing the dates on which the first frosts occurred at the several stations of observation of the Signal Service, U. S. Army, during the fall and winter months of 1880–'81, *and* 1881–'82.

Stations.	Latitude.	Longitude.	First frost during fall and winter of—		
			1880–'81.	1881–1882.	
				Light.	Killing.
	° ′	° ′			
Albany, N. Y	42 39	73 45	Sept. 24	Oct. 5	Nov. 21
Alpena, Mich	45 5	83 30	Sept. 22	Oct. 1	Oct. 6
Apache Pass, Ariz	32 8	109 30	Nov. 1	Nov. 10	Nov. 11
Atlanta, Ga	33 45	84 23	Oct. 24	Nov. 14	Nov. 4
Atlantic City, N. J	39 22	74 25	Oct. 19	Nov. 17	Nov. 16
Augusta, Ga	33 28	81 54	Oct. 24	Nov. 4	Nov. 26
Baltimore, Md	39 18	76 37	Oct. 19	Oct. 6	Nov. 27
Bangor, Me	44 49	68 46	Aug. 25	(a)	Sept. 22
Barnegat, N. J	39 46	74 6	Oct. 19	Nov. 20	Nov. 27
Bismarck, Dak	46 47	100 38	Sept. 13	Sept. 7	Sept. 15
Block Island, R. I	41 10	71 36	Nov. 20	Dec. 6	Dec. 18
Boisé City, Idaho	43 37	116 8	Aug. 25	Aug. 29	Sept. 7
Boston, Mass	42 21	71 4	Aug. 16	Oct. 6	Oct. 5
Brackettville, Tex	29 17	100 25	Oct. 17	Nov. 25	Dec. 22
Brownsville, Tex	25 53	97 26	Dec. 20	(b)	(b)
Buffalo, N. Y	42 53	78 53	Oct. 13	Oct. 10	Oct. 5
Burlington, Iowa	40 49	91 7	Sept. 7	Oct. 4	Oct. 19
Burlington, Vt	44 29	73 13	Oct. 1	Sept. 29	Oct. 28
Cairo, Ill	37 0	89 10	Oct. 5	Oct. 20	Nov. 15
Camp Thomas, Ariz	33 4	110 2	Oct. 12	(a)	Oct. 16
Campo, Cal	32 37	116 25	(c)	Aug. 26	Aug. 27
Cape Henry, Va	36 56	76 0	Oct. 24	Nov. 2	Nov. 25
Cape May, N. J	38 56	74 58	Nov. 1	Sept. 11	Oct. 16
Cedar Keys, Fla	29 8	83 2	Oct. 24	Nov. 25	(b)
Champaign, Ill	40 8	88 14	(a)	Oct. 19	Oct. 20
Charleston, S. C	32 47	79 56	Nov. 16	(a)	Nov. 26
Charlotte, N. C	35 13	80 51	Oct. 1	Nov. 5	Nov. 4
Chattanooga, Tenn	35 4	85 15	Oct. 18	Nov. 4	Nov. 16
Cheyenne, Wyo	41 8	104 48	Sept. 12	Sept. 10	Sept. 15
Chicago, Ill	41 52	87 38	Sept. 29	Oct. 21	Oct. 19
Chincoteague, Va	37 55	75 23	Nov. 8	Nov. 21	Nov. 25
Cincinnati, Ohio	39 6	84 30	Oct. 17	Oct. 19	Nov. 4
Cleveland, Ohio	41 30	81 42	Sept. 23	Oct. 6	Nov. 16
Coleman City, Tex	31 53	99 18	Nov. 6	Nov. 14	Dec. 26
Colfax, Wash	46 52	117 17	(a)	Sept. 6	Oct. 13
Columbus, Ohio	39 58	83 0	Sept. 30	Oct. 11	Nov. 4
Concho, Tex	31 25	100 24	Oct. 17	Nov. 9	Nov. 25
Davenport, Iowa	41 30	90 38	Oct. 4	Oct. 5	Nov. 10
Dayton, Wash	46 19	117 56	Sept. 11	Aug. 25	Sept. 28
Deadwood, Dak	44 23	103 43	Sept. 13	Oct. 2	Oct. 8
Decatur, Tex	33 12	97 35	Oct. 20	Dec. 21	Nov. 23
Delaware Breakwater, Del	38 48	75 10	Nov. 14	Dec. 25	Nov. 25
Denison, Tex	33 48	96 32	Oct. 15	Nov. 3	Nov. 20
Denver, Colo	39 45	105 0	Oct. 13	Sept. 30	Sept. 10
Des Moines, Iowa	41 35	93 37	Sept. 9	Oct. 18	Nov. 9
Detroit, Mich	42 20	83 3	Sept. 30	Oct. 5	Dec. 10
Dodge City, Kans	37 45	100 0	Oct. 4	(a)	Oct. 18
Dubuque, Iowa	42 30	90 44	Sept. 8	Oct. 5	Oct. 19
Duluth, Minn	46 48	92 6	Sept. 8	Sept. 28	Oct. 10
Eagle Pass, Tex	28 44	100 29	Nov. 6	Nov. 25	Dec. 15
Eastport, Me	44 54	66 59	Sept. 24	Oct. 7	Oct. 20
El Paso, Tex	31 47	106 30	Nov. 4	Sept. 7	Nov. 11
Erie, Penn	42 7	80 5	Oct. 28	Oct. 6	Oct. 11
Escanaba, Mich	45 48	87 5	Sept. 8	Aug. 15	Oct. 5
Florence, Ariz	33 3	111 19	Oct. 12	Oct. 16	Nov. 11
Fort Assiniboine, Mont	48 37	109 43	Sept. 12	Sept. 5	Sept. 6
Fort Apache, Ariz	33 48	109 57	Sept. 26	Sept. 24	Oct. 15
Fort Bennett, Dak	44 43	100 39	Sept. 13	Sept. 30	Oct. 13
Fort Benton, Mont	47 50	110 40	Sept. 12	Sept. 12	Sept. 6
Fort Buford, Dak	48 0	103 56	Sept. 18	Sept. 16	Sept. 17
Fort Cummings, N. Mex	32 18	107 32	Oct. 16	Nov. 2	Nov. 9
Fort Cœur d'Alene, Idaho	47 42	116 45	(a)	Sept. 2	Sept. 28

APPENDIX 43.—*Table showing the dates on which the first frosts occurred, &c.*—Continued.

Stations.	Latitude.	Longitude.	First frost during fall and winter of—		
			1880-'81.	1881-1882.	
				Light.	Killing.
	° ′	° ′			
Fort Custer, Mont	45 42	107 34	Sept. 12	Sept. 7	Oct. 8
Fort Davis, Tex	30 38	103 56	Oct. 4	Nov. 2	Nov. 3
Fort Elliott, Tex	35 30	100 21	Oct. 17	Nov. 2	Nov. 12
Fort Ellis, Mont	45 40	110 51	July 1	Sept. 2	Aug. 27
Fort Gibson, Ind. T	35 50	95 20	Oct. 4	Nov. 14	Sept. 16
Fort Grant, Ariz	32 39	109 57	(a)	Oct. 28	Nov. 8
Fort Keogh, Mont	46 22	105 56	Sept. 12	Sept. 5	Sept. 17
Fort Lapwai, Idaho	46 25	116 48	Sept. 9	Sept. 27	Oct. 7
Fort McKavett, Tex	30 48	100 7	Oct. 5	Nov. 23	Dec. 15
Fort Missoula, Mont	46 50	114 7	Sept. 12	Nov. 7	Sept. 21
Fort Shaw, Mont	47 31	111 48	Aug. 27	Sept. 14	Sept. 6
Fort Sill, Ind. T	34 40	98 23	Oct. 17	Nov. 13	Nov. 3
Fort Stevenson, Dak	47 35	101 28	Sept. 13	Sept. 15	Sept. 7
Fort Verde, Ariz	34 33	111 52	Nov. 25	Sept. 24	Nov. 12
Fort Yates, Dak	46 11	100 34	Sept. 30	(a)	Oct. 8
Fredericksburg, Tex	30 17	98 52	Nov. 2	Sept. 17	Nov. 25
Galveston, Tex	29 18	94 47	Dec. 29	(b)	(b)
Grand Haven, Mich	43 5	86 18	Sept. 8	Oct. 5	Oct. 10
Helena, Mont	46 34	112 4	Sept. 20	Oct. 13	Sept. 6
Hatteras, N. C	35 15	75 40	(b)	Jan. 4	Jan. 15
Henriette, Tex	33 46	98 12	Oct. 29	Nov. 24	Nov. 23
Huron, Dak	44 21	98 9	(a)	Sept. 15	Oct. 9
Indianapolis, Ind	39 46	86 10	Oct. 17	Oct. 20	Nov. 14
Indianola, Tex	28 32	96 31	Nov. 15	Nov. 4	Nov. 25
Jacksborough, Tex	33 12	98 10	Dec. 6	Nov. 3	Nov. 20
Jacksonville, Fla	30 20	81 39	Nov. 16	Nov. 4	Nov. 25
Keokuk, Iowa	40 22	91 26	Sept. 9	Oct. 19	Nov. 3
Key West, Fla	24 34	81 49	(b)	(b)	(b)
Kittyhawk, N. C	36 0	75 42	Nov. 16	Nov. 27	Nov. 5
Knoxville, Tenn	35 56	83 58	Sept. 30	Oct. 26	Nov. 4
La Crosse, Wis	43 49	91 15	Sept. 8	Sept. 28	Oct. 5
La Mesilla, N. Mex	32 17	106 48	Oct. 16	Oct. 28	Nov. 11
Laredo, Tex	27 32	99 30	Nov. 6	(a)	Dec. 10
Leavenworth, Kans	39 19	94 58	Oct. 4	Nov. 3	Nov. 9
Lewiston, Idaho	46 28	117 5	Aug. 25	Sept. 28	Oct. 12
Life-saving Station No. 6, N. C	36 32	75 52	(a)	Nov. 24	Dec. 8
Little Rock, Ark	34 45	92 12	Oct. 16	Sept. 16	Nov. 13
Los Angeles, Cal	34 3	118 16	Nov. 18	Nov. 18	(b)
Louisville, Ky	38 15	85 45	Sept. 30	Nov. 13	Nov. 4
Logansport, Ind	40 46	86 20	Oct. 2	Oct. 17	Nov. 15
Lynchburg, Va	37 30	79 2	Sept. 16	Oct. 6	Nov. 16
Madison, Wis	43 3	89 24	Sept. 14	Oct. 15	Nov. 10
Marquette, Mich	46 33	87 24	Sept. 8	Sept. 28	Oct. 14
Memphis, Tenn	35 7	90 0	Sept. 13	Oct. 21	Oct. 20
Milwaukee, Wis	43 3	87 54	Sept. 14	Oct. 19	Nov. 4
Miners' Camp, Idaho	47 31	116 0	(a)	Sept. 22	Sept. 6
Mission, Idaho	Not determined.		(a)	Sept. 11	Aug. 24
Mobile, Ala	30 42	88 2	Nov. 7	Dec. 23	Nov. 25
Montgomery, Ala	32 22	86 18	Oct. 24	Nov. 4	Nov. 26
Moorhead, Minn	46 51	96 44	Sept. 8	Sept. 7	Sept. 15
Morgantown, W. Va	39 40	79 52	Sept. 30	Oct. 6	Oct. 5
Mount Washington, N. H	44 16	71 8	(c)	Sept. 12	Oct. 5
Narragansett Pier, R. I	41 29	71 17	Oct. 7	Sept. 7	Sept. 15
Nashville, Tenn	36 11	86 53	Oct. 18	Oct. 21	Oct. 20
New Haven, Conn	41 17	72 57	Sept. 24	Oct. 6	Nov. 5
New London, Conn	41 22	72 5	Sept. 24	Oct. 6	Oct. 6
New Orleans, La	29 58	90 4	Nov. 16	Dec. 16	Nov. 25
Newport, R. I	41 29	71 19	Oct. 25	Oct. 6	Oct. 5
New York, N. Y	40 43	74 0	Nov. 3	Oct. 6	Oct. 27
Norfolk, Va	36 51	76 19	Nov. 16	Nov. 16	Nov. 17
North Platte, Nebr	41 8	100 45	Sept. 13	Oct. 13	Sept. 16
Olympia, Wash	47 2	122 53	Sept. 8	Oct. 3	Oct. 13
Omaha, Nebr	41 16	95 56	Sept. 29	Oct. 13	Nov. 10
Oswego, N. Y	43 29	76 35	Oct. 1	Oct. 5	Oct. 27
Palestine, Tex	31 45	95 40	Nov. 7	Dec. 22	Dec. 15
Pensacola, Fla	30 25	87 12	Nov. 7	Nov. 4	Nov. 25
Philadelphia, Pa	39 57	75 10	Nov. 8	(a)	Oct. 6
Phoenix, Ariz	33 28	112 0	Dec. 6	Nov. 2	Jan. 17
Pike's Peak, Colo	38 50	105 2	(c)	(c)	(c)
Ploche, Nev	37 57	114 26	Nov. 28	Oct. 27	Oct. 25
Pittsburg, Pa	40 32	80 2	Oct. 13	Oct. 5	Nov. 4
Point Judith, R. I	41 22	71 29	Oct. 13	Oct. 5	Oct. 6
Port Huron, Mich	43 0	82 26	Oct. 19	Oct. 6	Oct. 11

APPENDIX 43.—*Table showing the dates on which the first frosts occurred, &c.*—Continued.

Stations.	Latitude.	Longitude.	First frost during fall and winter of—		
			1880–'81.	1881–1882.	
				Light.	Killing.
	° ′	° ′			
Portland, Me	43 40	70 16	Aug. 27	Oct. 5	Oct. 27
Portland, Oreg	45 30	122 43	Oct. 30	Oct. 13	Nov. 23
Portsmouth, N. C	35 2	76 4	Nov. 23	(a)	Nov. 26
Prescott, Ariz	34 33	112 30	Oct. 11	Sept. 24	Sept. 29
Punta Rassa, Fla	26 36	82 10	(b)	(b)	(b)
Rapid City, Dak	44 0	103 0	Sept. 10	Sept. 7	(a)
Red Bluff, Cal	40 10	122 16	Nov. 15	Oct. 14	Dec. 13
Rio Grande City, Tex	26 22	98 48	Dec. 20	(b)	(b)
Rochester, N. Y	43 8	77 42	Oct. 14	Oct. 11	Oct. 26
Roseburg, Oreg	43 13	123 20	Sept. 18	Sept. 30	Oct. 13
Sacramento, Cal	38 35	121 31	Nov. 14	Oct. 14	Nov. 18
Saint Louis, Mo	38 37	90 12	Sept. 30	Oct. 20	Nov. 3
Saint Paul, Minn	44 58	93 5	Sept. 13	Sept. 28	Oct. 5
Saint Vincent, Minn	48 56	97 14	Sept. 7	Aug. 6	Sept. 6
Salt Lake City, Utah	40 46	111 54	Sept. 12	Sept. 6	Oct. 15
San Antonio, Tex	29 25	98 25	Nov. 6	Nov. 26	Nov. 25
San Diego, Cal	32 45	117 8	Sept. 30	Nov. 18	(b)
Sandusky, Ohio	41 27	82 40	Sept. 30	Oct. 5	Nov. 15
Sandy Hook, N. J	40 28	74 1	Oct. 19	Nov. 29	Nov. 21
San Francisco, Cal	37 48	122 26	Nov. 11	Oct. 14	Nov. 18
Santa Fé, N. Mex	35 41	105 57	Sept. 27	Oct. 17	(a)
Savannah, Ga	32 5	81 5	Oct 25	Nov. 26	Jan. 4
Shreveport, La	32 30	93 40	Oct. 17	Nov. 21	Nov. 20
Silver City, N. Mex	32 48	108 16	Nov. 1	Nov. 4	Oct. 30
Sloop Point, N. C	34 19	77 48	Oct. 25	Nov. 25	Nov. 26
Smithville, Dak	44 28	102 18	(a)	Sept. 10	Sept. 18
Smithville, N. C	33 55	78 1	Oct. 24	Nov. 26	Nov. 25
Springfield, Ill	39 48	89 39	Sept. 10	Oct. 22	Oct. 19
Springfield, Mass	42 6	72 36	Aug. 15	Oct. 6	Oct. 5
Spangle, Wash	47 26	117 18	(a)	Sept. 1	Sept. 28
Spokane Falls, Wash	47 39	117 25	(a)	Sept. 27	Sept. 26
Stockton, Tex	30 53	102 53	Sept. 10	Dec. 14	Nov. 24
Thatcher's Island, Mass	42 36	70 34	Oct. 25	Oct. 5	Oct. 6
Toledo, Ohio	41 40	83 32	Sept. 30	Oct. 19	Oct. 5
Tucson, Ariz	32 14	110 53	Dec. 5	Nov. 11	Nov. 12
Umatilla, Oreg	45 55	119 21	Oct. 10	Sept. 10	Oct. 13
Uvalde, Tex	29 13	99 40	Oct. 15	Nov. 3	Nov. 25
Vicksburg, Miss	32 23	90 54	Oct. 17	Nov. 26	Nov. 4
Visalia, Cal	36 20	119 16	Sept. 25	Oct. 14	Nov. 18
Washington, D. C	38 54	77 2	Oct. 1	Oct. 6	Nov. 16
Wickenburg, Ariz	33 58	112 42	Dec. 5	Oct. 14	Nov. 2
Wilmington, N. C	34 14	77 57	Nov. 16	Nov. 5	Nov. 24
Winnemucca, Nev	41 0	117 41	(c)	Aug. 26	Aug. 28
Wood's Holl, Mass	41 33	70 40	Oct. 26	Nov. 16	Nov. 23
Yankton, Dak	42 54	97 30	Sept. 8	Sept. 28	Oct. 16
Yuma, Ariz	32 44	114 36	Nov. 18	Dec. 13	(b)

a No record. *b* No frost. *c* Frost every month in the year.

APPENDIX 44

Directions from which the prevailing winds have been observed to blow, during each month of the year, at stations of the Signal Service, United States Army.

[Compiled from observations taken from the establishment of the several stations up to and including June 30, 1882.]

Stations.	Established.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Albany, N. Y	Dec. 22, 1873	NW.	NW.	NW.	NW.	S.	S.	S.	S.	S.	S.	NW.	NW.
Alpena, Mich	Sept. 10, 1872	W.	NW.	NW.	NW.	SE.	SE.	SE.	NW.	NW.	NW.	W.	NW.
Atlanta, Ga	Sept. 25, 1878	NW.	NW.	NW.	NW.	E.	E.	W.	E.	NW.	NW.	NW.	NW.
Atlantic City, N. J	Dec. 10, 1873	NW.	NW.	NW.	NW.	S.	S.	S.	S.	S.	W.	W.	NW.
Augusta, Ga	Nov. 2, 1870	NW.	NW.	NW.	NW.	SE.	S.	S.	SE.	NE.	NW.	NW.	NW.
Baltimore, Md	Jan. 1, 1871	NW.	NW.	NW.	NW.	SE.	SW.	S.	SE.	SE.	NW.	NW.	NW.
Barnegat, N. J	Dec. 10, 1873	NW.	NW.	NW.	NW.	S.	S.	S.	S.	E.	SE.	NW.	NW.
Bismarck, Dak	Sept. 15, 1874	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.
Block Island, R. I	Sept. 1, 1880	NW.	N.	NW.	NW.	SW.	SW.	NW.	SW.	SW.	SW.	NW.	NW.
Boisé City, Idaho	July 1, 1877	S.	SE.	SE.	W.	NW.	NW.	NW.	NW.	NW.	NW.	SE.	SE.
Boston, Mass	Nov. 1, 1870	NW.	NW.	NW.	NW.	SW.	W.	W.	E.	SW.	W.	NW.	NW.
Brackettville, Tex	Sept. 1, 1875	E.	E.	E.	SE.	E.	E.	SE.	E.	SE.	E.	E.	E.
Brownsville, Tex	Aug. 25, 1875	S.	S.	SE.	SE.	SE.	SE.	SE.	SE.	SE.	SE.	N.	S.
Buffalo, N. Y	Nov. 1, 1870	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	W.	W.
Burlington, Vt	May 24, 1871	S.	S.	S.	N.	S.	S.	S.	S.	S.	S.	S.	S.
Cairo, Ill	June 1, 1871	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.
Campo, Cal	Jan. —, 1874	E.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	E.	E.	E.
Camp Thomas, Ariz	Sept. 22, 1877	NW.	NW.	N.	W.	W.	W.	NW.	N.	SE.	SE.	NW.	NW.
Castroville, Tex	Sept. 20, 1875	SE.	NW.	S.	SE.	SE.	SE.	SE.	SE.	SE.	SE.	NW.	SE.
Cape Henry, Va	Dec. 15, 1873	NW.	N.	NW.	NW.	SE.	SE.	SW.	SW.	NE.	NW.	NW.	NW.
Cape May, N. J	May 24, 1871	NW.	NW.	NW.	NW.	S.	S.	S.	S.	E.	NW.	NW.	NW.
Cedar Keys, Fla	Nov. 7, 1879	NE.	E.	SW.	W.	NE.	W.	W.	NE.	NE.	NE.	NE.	NW.
Champaign, Ill	Oct. 13, 1880	S.	SE.	NW.	NW.	NE.	SW.	N.	S.	S.	NW.	NW.	NW.
Charleston, S. C	Jan. 5, 1871	N.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	NE.	NE.	N.	W.
Charlotte, N. C	Oct. 6, 1878	SW.	NE.	SW.	SW.	NE.	SW.	S.	NE.	SW.	NE.	NE.	SW.
Chattanooga, Tenn	Jan. 8, 1879	NE.	S.	NW.	NW.	NE.	SW.	SW.	NE.	NE.	NE.	NE.	NW.
Cheyenne, Wyo	Nov. 1, 1870	W.	W.	NW.	NW.	NW.	W.	S.	W.	NW.	NW.	W.	NW.
Chicago, Ill	Nov. 1, 1870	SW.	SW.	SW.	N.	NE.	SW.	SW.	NE.	SW.	SW.	SW.	SW.
Chincoteague, Va	Mar. 16, 1880	NW.	NW.	NW.	NW.	NE.	SW.	SE.	NE.	SW.	NW.	NW.	NW.
Cincinnati, Ohio	Nov. 1, 1870	NW.	NW.	NW.	NW.	SE.	SW.	SW.	NE.	E.	SE.	SE.	SW.
Cleveland, Ohio	Nov. 1, 1870	SW.	W.	W.	NE.	SE.	N.	N.	N.	SE.	S.	SW.	SW.
Columbus, Ohio	July 1, 1878	W.	W.	W.	NW.	S.	SW.	SW.	N.	S.	S.	SW.	W.
Corsicana, Tex	Sept. 15, 1874	N.	S.	S.	S.	S.	S.	S.	SE.	S.	S.	S.	S.

APPENDIX 44.—*Directions from which the prevailing winds have been observed to blow, during each month of the year, &c.*—Continued.

Stations.	Established.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Davenport, Iowa	May 24, 1871	W.	NW.	NW.	NE.	E.	SW.	SW.	SW.	SW.	SW.	NW.	NW.
Dayton, Wash	July 1, 1879	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.
Deadwood, Dak	Nov. 1, 1878	SW.	SW.	SW.	SW.	SW.	NE.	NE.	NE.	SW.	SW.	S.	SW.
Decatur, Tex	Feb. 1, 1876	SE.	SE.	SE.	SE.	S.	S.	S.	SE.	S.	S.	N.	NW.
Delaware Breakwater, Del	Jan. 28, 1880	N.	NW.	NW.	NW.	SW.	SE.	SE.	NE.	NW.	NW.	NW.	NW.
Denison, Tex	Dec. 16, 1874	NW.	NW.	S.	SE.	SE.	SE.	SE.	SE.	SE.	S.	NW.	NW.
Denver, Colo	Nov. 19, 1871	S.	S.	S.	S.	S.	S.	S.	S.	SE.	S.	S.	S.
Des Moines, Iowa	Aug. 1, 1878	NW.	NW.	N.	N.	SW.	SW.	SW.	NW.	SW.	SW.	NW.	NW.
Detroit, Mich	Nov. 1, 1870	SW.	W.	NW.	NE.	SW.	SW.	SW.	SW.	SW.	SW.	W.	SW.
Dodge City, Kans	Sept. 15, 1874	N.	N.	N.	N.	S.	S.	S.	S.	S.	N.	N.	N.
Dubuque, Iowa	July 10, 1873	NW.	NW.	NW.	NW.	SE.	SE.	S.	NW.	S.	NW.	NW.	NW.
Duluth, Minn	Nov. 1, 1870	SW.	NE.	NE.	NE.	NE.	NE.	NE.	NE.	NE.	SW.	NW.	SW.
Eagle Pass, Tex	Jan. 19, 1875	SE.	SE.	SE.	SE.	SE.	SE.	SE.	SE.	SE.	SE.	N.	SE.
Eagle Rock, Idaho	Dec. 3, 1880	N.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	N.
Eastport, Me	Apr. 1, 1873	NW.	NW.	NW.	N.	S.	S.	S.	S.	S.	S.	NW.	NW.
El Paso, Tex	Nov. 5, 1877	W.	W.	W.	W.	W.	W.	W.	W.	W.	W.	W.	W.
Erie, Pa	May 25, 1873	SW.	W.	W.	W.	W.	S.	W.	S.	S.	S.	S.	SW.
Escanaba, Mich	May 24, 1871	NW.	N.	N.	N.	S.	S.	S.	S.	S.	NW.	W.	W.
Florence, Ariz	Nov. 12, 1874	E.	W.	W.	W.	W.	W.	W.	W.	W.	W.	E.	E.
Fort Apache, Ariz	Oct. 9, 1877	E.	E.	E.	NE.	E.	E.	E.	E.	E.	E.	E.	E.
Fort Assininiboine, Mont	Oct. 6, 1879	SW.	SW.	SW.	SW.	SW.	SW.	NE.	SW.	SW.	SW.	NW.	NE.
Fort Bennett, Dak	Dec. 22, 1879	N.	NW.	SE.	SE.	SW.	SE.	SE.	SE.	SE.	N.	NW.	NW.
Fort Benton, Mont	Oct. 11, 1879	W.	SW.	W.	SW.	SW.	SW.	SW.	SW.	NW.	SW.	SW.	W.
Fort Buford, Dak	Oct. 23, 1878	NW.	NW.	NW.	NW.	NW.	NW.	E.	E.	NW.	NW.	NW.	NW.
Fort Concho, Tex	Oct. 10, 1875	SW.	SW.	NE.	SW.	S.	S.	S.	S.	S.	S.	N.	SW.
Fort Custer, Mont	Dec. 5, 1878	SW.	SW.	SW.	SW.	SW.	SW.	SE.	SE.	NW.	SE.	SE.	N.
Fort Davis, Tex	Dec. 24, 1877	SW.	SW.	SW.	SW.	SW.	SW.	E.	E.	SW.	SW.	SW.	SW.
Fort Elliott, Tex	Nov. 29, 1879	N.	N.	SE.	NE.	SE.	SE.	SE.	SE.	S.	S.	NE.	N.
Fort Gibson, Ind. T	Apr. 1, 1873	N.	N.	N.	SE.	SE.	S.	SE.	SE.	SE.	SE.	N.	N.
Fort Grant, Ariz	Nov. 1, 1875	N.	N.	N.	N.	N.	N.	W.	E.	N.	N.	N.	N.
Fort Griffin, Tex	July 1, 1875	N.	S.	SE.	SE.	SE.	SE.	S.	S.	S.	S.	N.	N.
Fort Keogh, Mont	Nov. 18, 1878	SW.	NW.	NW.	N.	NW.	NW.	NW.	NE.	NW.	W.	NW.	NE.
Fort Macon, N. C	May 23, 1878	N.	N.	SW.	SW.	N.	SW.	SW.	SW.	SE.	N.	N.	N.
Fort McKavett, Tex	Oct. 19, 1875	SW.	SW.	S.	S.	S.	S.	S.	SE.	S.	S.	SW.	S.
Fort Missoula, Mont	Dec. 15, 1879	N.	S.	NW.	NW.	NE.	N.	N.	NW.	NW.	N.	N.	N.
Fort Shaw, Mont	Apr. 1, 1880	W.	W.	W.	W.	W.	W.	W.	W.	W.	W.	W.	W.
Fort Sill, Ind. T	June 23, 1875	N.	N.	N.	S.	S.	SE.	S.	SE.	SE.	S.	N.	N.
Fort Stevenson, Dak	Sept. 19, 1878	W.	W.	NW.	NW.	W.	W.	W.	SE.	W.	NW.	W.	W.
Fort Sully, Dak	Dec. 1, 1879	NW.	NW.	NW.	NW.	SE.	SE.	SE.	SE.	SE.	NW.	NW.	NW.
Fort Verde, Ariz	Nov. 9, 1874	N.	NW.	S.	S.	S.	S.	S.	S.	S.	NW.	NW.	NW.

Fredericksburg, Tex	Mar. 14, 1876	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.
Galveston, Tex	Apr. 19, 1871	N.	SE.	SE.	SE.	SE.	S.	S.	S.	SE.	SE.	N.	E.
Grand Haven, Mich	May 24, 1871	W.	E.	NW.	E.	SW.	SW.	SW.	SW.	S.	NW.	W.	NW.
Hatteras, N. C	Dec. 1, 1880	N.	NE.	SW.	SW.	NE.	S.	SW.	NE.	SW.	NE.	SW.	NE.
Helena, Mont	Oct. 15, 1879	SW.	S.	S.	N.	S.	S.	S.	S.	S.	S.	NW.	SW.
Henrietta, Tex	Feb. 1, 1877	SE.	SE.	SE.	SE.	SE.	SE.	SE.	SE.	SE.	SE.	SE.	N.
Huron, Dak	July 1, 1881	NW.	NW.	SE.	SE.	SE.	SE.	SE.	SE.	NW.	NW.	NW.	NW.
Indianapolis, Ind	Feb. 10, 1871	W.	NW.	NW.	NW.	S.	SW.	SW.	NW.	S.	S.	NW.	W.
Indianola, Tex	May 1, 1872	N.	N.	SE.	SE.	SE.	S.	S.	S.	SE.	S.	N.	N.
Jacksborough, Tex	May 8, 1875	N.	SW.	S.	SE.	SE.	SE.	S.	SE.	S.	SE.	N.	N.
Jacksonville, Fla	Sept. 11, 1871	NE.	NE.	SW.	SW.	NE.	SW.	SW.	NE.	NE.	NE.	NE.	NE.
Keokuk, Iowa	July 16, 1871	NW.	NW.	NW.	NW.	S.	S.	SW.	SE.	S.	S.	NW.	NW.
Key West, Fla	Nov. 1, 1870	NE.	E.	E.	E.	E.	E.	E.	E.	E.	NE.	NE.	NE.
Kittyhawk, N. C	Jan. 15, 1875	NE.	NE.	NE.	NE.	NE.	SW.	SW.	SW.	NE.	NE.	NE.	NE.
Knoxville, Tenn	Jan. 1, 1871	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	NE.	SW.	NE.	SW.
La Crosse, Wis	Oct. 15, 1872	S.	S.	N.	N.	S.	S.	S.	S.	S.	S.	SE.	S.
La Mesilla, N. Mex	June 16, 1876	NW.	NW.	NW.	W.	W.	W.	S.	SE.	SE.	SE.	W.	W.
Laredo, Tex	Dec. 16, 1875	SE.	SE.	SE.	SE.	SE.	SE.	SE.	SE.	SE.	SE.	SE.	SE.
Leavenworth, Kans	May 21, 1871	S.	N.	N.	N.	S.	S.	S.	S.	S.	S.	N.	N.
Lewiston, Idaho	July 1, 1879	E.	W.	W.	W.	W.	NE.	E.	NE.	W.	W.	E.	E.
Little Rock, Ark	July 1, 1879	S.	S.	NW.	S.	S.	S.	S.	S.	NE.	N.	N.	NE.
Los Angeles, Cal	July 1, 1871	NE.	NE.	NE.	SW.	SW.	W.	W.	W.	W.	W.	N.	NE.
Louisville, Ky	Sept. 11, 1871	S.	W.	W.	S.	S.	S.	SW.	N.	N.	S.	W.	SW.
Lynchburg, Va	May 24, 1871	W.	W.	NW.	NE.	S.	SW.	SW.	NE.	NE.	S.	W.	W.
Madison, Wis	Sept. 29, 1878	NW.	NW.	NW.	NW.	S.	SE.	SW.	E.	W.	NW.	NW.	W.
Marquette, Mich	May 1, 1871	W.	NW.	NW.	NW.	NW.	NW.	NW.	NW.	W.	W.	W.	W.
Mason, Tex	Feb. 7, 1876	SW.	SE.	SE.	SE.	S.	SE.	SE.	SE.	SE.	SE.	SE.	N.
Memphis, Tenn	Feb. 28, 1871	NW.	NW.	SE.	SW.	SE.	SW.	SW.	NW.	NE.	NW.	NW.	NW.
Milwaukee, Wis	Nov. 1, 1870	NW.	NW.	NW.	NE.	NE.	SE.	SE.	SE.	SW.	SW.	NW.	NW.
Mobile, Ala	Nov. 7, 1870	N.	N.	S.	S.	S.	S.	S.	S.	N.	N.	N.	N.
Montgomery, Ala	Nov. 9, 1870	NW.	N.	NW.	S.	SE.	SW.	SW.	E.	E.	NW.	NW.	NW.
Moorhead, Minn	Jan. 1, 1881	NW.	SE.	N.	N.	SE.	SE.	SE.	SE.	NW.	NW.	NW.	NE.
Morgantown, W. Va	Jan. 25, 1873	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.
Mount Washington, N. H	Dec. 1, 1870	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.
Nashville, Tenn	Nov. 1, 1870	NW.	NW.	NW.	NW.	S.	W.	W.	E.	NW.	NW.	NW.	NW.
New Haven, Conn	Dec. 10, 1872	NW.	NW.	NW.	NW.	S.	S.	S.	S.	SW.	SW.	NW.	N.
New London, Conn	Jan. 10, 1871	NW.	NW.	NW.	NW.	SW.	SW.	SW.	SW.	N.	NW.	NW.	NW.
New Orleans, La	Nov. 1, 1870	N.	N.	SE.	SE.	SE.	SE.	SE.	SE.	E.	N.	N.	E.
Newport, R. I	Aug. 1, 1875	W.	NW.	NW.	NW.	SW.	SW.	SW.	SW.	SW.	SW.	W.	W.
New York, N. Y	Nov. 1, 1870	W.	NW.	NW.	NW.	NW.	SW.	SW.	SW.	SW.	NW.	W.	NW.
Norfolk, Va	Jan. 1, 1871	SW.	N.	S.	SW.	SW.	SW.	SW.	SW.	NE.	N.	NE.	SW.
North Platte, Nebr	Sept. 18, 1874	NW.	NW.	NW.	NW.	SE.	SE.	SE.	SE.	SE.	NW.	NW.	NW.
Olympia, Wash	July 1, 1877	S.	S.	S.	S.	SW.	SW.	N.	N.	S.	S.	S.	S.
Omaha, Nebr	Nov. 1, 1870	S.	N.	N.	N.	SE.	S.	S.	S.	S.	S.	NW.	NW.
Oswego, N. Y	Nov. 1, 1870	SE.	NW.	NW.	W.	W.	W.	W.	S.	S.	S.	S.	S
Pensacola, Fla	Oct. 27, 1879	E.	SE.	NW.	SW.	SE.	S.	S.	SW.	S.	NE.	NE.	N.
Philadelphia, Pa	Jan. 1, 1871	NW.	NW.	NW.	NW.	SW.	SW.	SW.	SW.	SW.	SW.	NW.	NW.
Phœnix, Ariz	May 9, 1877	E.	E.	E.	W.	W.	W.	W.	SW.	E.	E.	E.	E.
Pike's Peak, Colo	Nov. 1, 1873	W.	W.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	W.	W.	NW.
Pioche, Nev	July 29, 1877	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.

APPENDIX 44.—*Directions from which the prevailing winds have been observed to blow during each month, &c.*—Continued.

Stations.	Established.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Pittsburg, Pa	Nov. 1, 1870	W.	NW.	NW.	NW.	NW.	SW.	NW.	NW.	NW.	NW.	W.	W.
Port Eads, La	Apr. 10, 1881	.....	.....	.....	SE.	E.	S.	E.	W.	E.	E.	NE.	N.
Port Huron, Mich	July 25, 1874	S.	S.	N.	N.	N.	S.	S.	NE.	S.	S.	SW.	SW.
Portland, Me	Jan. 15, 1871	NW.	NW.	NW.	NW.	S.	SW.	SW.	SW.	SW.	SW.	NW.	W.
Portland, Oreg	Nov. 1, 1871	S.	S.	S.	NW.	NW.	NW.	NW.	NW.	S.	S.	S.	S.
Prescott, Ariz	Nov. 19, 1873	S.	S.	S.	S.	S.	SW.	SW.	S.	SW.	S.	S.	S.
Punta Rassa, Fla	Aug. 15, 1871	NE.	NE.	S.	S.	E.	E.	E.	E.	E.	NE.	NE.	NE.
Red Bluff, Cal	July 1, 1877	N.	N.	SE.	S.	N.	N.	S.	S.	NW.	N.	N.	N.
Rio Grande City, Tex	May 28, 1875	SE.	SE.	SE.	SE.	SE.	SE.	S.	E.	SE.	SE.	SE.	SE.
Rochester, N. Y	Nov. 1, 1870	W.	W.	W.	W.	W.	W.	W.	W.	W.	W.	W.	W.
Roseburg, Oreg	July 15, 1877	SW.	SW.	S.	NW.	NW.	N.	N.	N.	S.	N.	N.	N.
Sacramento, Cal	July 1, 1877	N.	SE.	S.	S.	SW.	S.	S.	S.	S.	N.	N.	N.
Saint Louis, Mo	Nov. 1, 1870	S.	NW.	N.	N.	S.	S.	S.	S.	S.	S.	S.	S.
Saint Paul, Minn	Nov. 1, 1870	NW.	NW.	NW.	NW.	SE.	SE.	SE.	SE.	SE.	NW.	NW.	NW.
Saint Vincent, Minn	Sept. 5, 1880	NW.	NW.	NW.	NW.	NW.	SE.	NW.	SE.	NW.	NW.	NW.	NW.
Salt Lake City, Utah	Mar. 22, 1874	SE.	SE.	SE.	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.
San Antonio, Tex	Sept. 22, 1875	SE.	N.	SE.	SE.	SE.	SE.	SE.	SE.	SE.	N.	N.	N.
San Diego, Cal	Nov. 1, 1871	NE.	NW.	W.	W.	W.	W.	W.	W.	NW.	NW.	NW.	NE.
Sandusky, Ohio	Aug. 2, 1877	SW.	SW.	SW.	NE.	SW.	SW.	SW.	SW.	S.	SW.	SW.	SW.
Sandy Hook, N. J	Dec. 10, 1873	W.	NW.	NW.	NW.	SE.	SE.	SW.	SE.	W.	W.	NW.	W.
San Francisco, Cal	Mar. 8, 1871	N.	W.	W.	W.	W.	SW.	SW.	SW.	SW.	SW.	NW.	N.
Santa Fé, N. Mex	Nov. 20, 1871	N.	N.	N.	E.	SW.	SW.	E.	E.	E.	E.	N.	N.
Savannah, Ga	Jan. 1, 1871	NW.	NE.	W.	SW.	E.	SW.	SW.	SW.	NE.	NW.	NW.	NW.
Shreveport, La	Sept. 3, 1871	S.	S.	S.	S.	S.	S.	S.	SE.	NE.	S.	N.	S.
Silver City, N. Mex	May 15, 1878	NW.	NW.	NW.	NW.	S.	S.	NW.	NW.	NW.	NW.	NW.	NW.
Sitka, Alaska	Mar. 30, 1881	.....	.....	.....	SE.	E.	W.	W.	SW.	SW.	NE.	E.	.....
Smithville, N. C	Oct. 15, 1875	N.	N.	SW.	SW.	S.	SW.	SW.	SW.	N.	N.	N.	N.
Spokane Falls, Wash	Feb. 5, 1881	.....	E.	SW.	SW.	SW.	S.	S.	SW.	SW.	NE.	SW.	SW.
Springfield, Ill	July 1, 1879	S.	S.	NW.	S.	S.	S.	SW.	S.	S.	S.	S.	NW.
Springfield, Mass	July 19, 1873	NW.	NW.	N.	N.	S.	S.	S.	S.	S.	S.	NW.	N.
Stockton, Tex	Feb. 26, 1876	SW.	SW.	SE.	SE.	SE.	SE.	SE.	SE.	SE.	SE.	NE.	NE.
Thatcher's Island, Mass	Dec. 26, 1875	NW.	NW.	NW.	NW.	S.	SW.	SW.	SW.	SW.	W.	NW.	NW.
Toledo, Ohio	Nov. 1, 1870	SW.	SW.	W.	NE.	NE.	SW.	SW.	SW.	S.	SW.	SW.	SW.
Tucson, Ariz	Dec. 2, 1875	S.	S.	S.	W.	SW.	SW.	S.	S.	S.	S.	S	S.
Umatilla, Oreg	July 15, 1877	SE.	S.	W.	W.	W.	SW.	W.	W.	W.	SE.	SE.	SE.
Uvalde, Tex	Sept. 6, 1875	S.	NE.	E.	E.	S.	S.	E.	E.	E.	E.	E.	E.

Vicksburg, Miss	Sept.	*10, 1871*	*N.*	*NE.*	*S.*	*S.*	*S.*	*SW.*	*SW.*	*SE.*	*N.*	*N.*	*SE.*	*N.*
Visalia, Cal	*July*	*1, 1877*	*SE.*	*NW.*	*NW.*	*NW.*	*NW.*	*NW.*	*NW.*	*W.*	*NW.*	*NW.*	*NW.*	*NW.*
Washington, D. C	Nov.	1, 1870	NW.	NW.	NW.	NW.	S.	S.	S.	S.	S.	S.	NW.	NW.
Wickenburg, Ariz	*Jan.*	*6, 1874*	NW.	NW.	NW.	W.	W.	S.	S.	E.	*N.*	*N.*	NW.	NW.
Wilmington, N. C	Jan.	1, 1871	SW.	NE.	SW.	SW.	SW.	SW.	SW.	SW.	NE.	NE.	NE.	SW.
Winnemucca, Nev	July	1, 1877	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	NE.
Wood's Holl, Mass	Jan.	1, 1873	NW.	NW.	NW.	NW.	SW.	SW.	SW.	SW.	NW.	NW.	NW.	NW.
Yankton, Dak	Apr.	1, 1873	NW.	NW.	NW.	NW.	SE.	SE.	S.	SE.	NW.	NW.	NW.	NW.
Yuma, Ariz	Nov.	18, 1873	N.	W.	W.	SW.	S.	SW.	S.	SE.	SW.	N.	NE.	N.

APPENDIX 45.

Table showing the quadrants from which the winds most likely to be followed by rain or snow are observed to blow during each month of the year at the principal stations of the Signal Service, United States Army.

[Computed from the commencement of observations to December 31, 1881.]

Stations.	Station established.	January.	February.	March.	April.	May.	June.
Albany, N. Y	Dec. 22, 1873	SW. to SE.	W. to S.	SW. to SE.	N. to W.	SW. to SE.	W. to S.
Alpena, Mich	Sept. 10, 1872	SW. to SE.	SW. to SE.	SE. to NE.	SE. to NE.	S. to E.	S. to E.
Atlanta, Ga	Sept. 25, 1878	SE. to NE.	S. to E.	SW. to SE.	S. to E.	S. to E.	W. to S.
Atlantic City, N. J	Dec. 10, 1873	E. to N.	S. to E.	S. to E.	S. to E.	SW. to SE.	W. to S.
Augusta, Ga	Nov. 2, 1870	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SE. to NE.	SW. to SE.
Baltimore, Md	Jan. 1, 1871	SE. to NE.	SE. to NE.	SE. to NE.	S. to E.	SW. to SE.	SW. to SE.
Barnegat, N. J	Dec. 10, 1873	W. to S.	SW. to SE.	S. to E.	SW. to SE.	SW. to SE.	SW. to SE.
Bismarck, Dak	Sept. 15, 1874	NE. to NW.	NE. to NW.	E. to N.	SE. to NE.	S. to E.	SE. to NE.
Block Island, R. I	Sept. 1, 1880	SE. to NE.	SW. to SE.	NE. to NW.	NE. to NW.	W. to S.	SW. to SE.
Boisé City, Idaho	July 1, 1877	S. to E.	S. to E.	S. to E.	N. to W.	N. to W.	NW. to SW.
Boston, Mass	Nov. 1, 1870	NW. to SW.	SW. to SE.	SE. to NE.	S. to E.	SW. to SE.	W. to S.
Brackettville, Tex	Sept. 1, 1875	SE. to NE.	SE. to NE.	E. to N.	E. to N.	S. to E.	SE. to NE.
Brownsville, Tex	Aug. 25, 1875	NE. to NW.	S. to E.	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.
Buffalo, N. Y	Nov. 1, 1870	W. to S.	W. to S.	SW. to SE.	SE. to NE.	W. to S.	W. to S.
Burlington, Vt	May 24, 1871	S. to E.	SW. to SE.	SW. to SE.	S. to E.	W. to S.	W. to S.
Cairo, Ill	June 1, 1871	S. to E.	S. to E.	SW. to SE.	S. to E.	S. to E.	SW. to SE.
Campo, Cal	Jan. —, 1874	W. to S.	W. to S.	W. to S.	W. to S.	W. to S.	W. to S.
Camp Thomas, Ariz	Sept. 22, 1877	NE. to NW.	N. to W.	N. to W.	N. to W.	S. to E.	(a)
Cape Henry, Va	Dec. 15, 1873	SW. to SE.	SW. to SE.	S. to E.	SW. to SE.	SW. to SE.	SW. to SE.
Cape May, N. J	May 24, 1871	E. to N.	S. to E.	S. to E.	S. to E.	S. to E.	SW. to SE.
Castroville, Tex	Sept. 29, 1875	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.
Cedar Keys, Fla	Nov. 7, 1879	S. to E.	SE. to NE.	SW. to SE.	W. to S.	SE. to NE.	W. to S.
Champaign, Ill	Oct. 13, 1880	SE. to NE.	S. to E.	SE. to NE.	SW. to SE.	SW. to SE.	SW. to SE.
Charleston, S. C	Jan. 5, 1871	NE. to NW.	E. to N.	W. to S.	SW. to SE.	SW. to SE.	SW. to SE.
Charlotte, N. C	Oct. 6, 1878	SE. to NE.	SE. to NE.	SW. to SE.	SW. to SE.	S. to E.	W. to S.
Chattanooga, Tenn	Jan. 8, 1879	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.
Cheyenne, Wyo	Nov. 1, 1870	N. to W.	N. to W.	NE. to NW.	NE. to NW.	NE. to NW.	S. to E.
Chicago, Ill	Nov. 1, 1870	W. to S.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.
Chincoteague, Va	Mar. 16, 1880	NE. to NW.	N. to W.	S. to E.	SW. to SE.	SW. to SE.	SW. to SE.
Cincinnati, Ohio	Nov. 1, 1870	SW. to SE.	SW. to SE.	S. to E.	SW. to SE.	SW. to SE.	SW. to SE.
Cleveland, Ohio	Nov. 1, 1870	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.
Columbus, Ohio	July 1, 1878	SW. to SE.	SW. to SE.	W. to S.	W. to S.	W. to S.	W. to S.
Concho, Tex	Oct. 10, 1875	E. to N.	SE. to NE.	SE. to NE.	NW. to SW.	SE. to NE.	S. to E.
Corsicana, Tex	Sept. 15, 1874	S. to E.	SW. to SE.	SW. to SE.	S. to E.	S. to E.	S. to E.
Davenport, Iowa	May 24, 1871	W. to S.	SE. to NE.	SE. to NE.	SE. to NE.	S. to E.	SW. to SE.
Dayton, Wash	July 1, 1879	W. to S.	W. to S.	W. to S.	SW. to SE.	W. to S.	SW. to SE.
Deadwood, Dak	Nov. 1, 1878	W. to S.	N. to W.	W. to S.	W. to S.	NE. to NW.	SE. to NE.
Decatur, Tex	Feb. 1, 1876	NE. to NW.	S. to E.	S. to E.	SW. to SE.	SE. to NE.	SW. to SE.
Delaware Breakwater, Del	Jan. 28, 1880	E. to N.	N. to W.	NE. to NW.	SE. to NE.	SW. to SE.	SE. to NE.

Denison, Tex	*Dec. 16, 1874*	*E. to N.*	*SW. to SE.*	*S. to E.*	*S. to E.*	*S. to E.*	*S. to E.*
Denver, Colo	*Nov. 19, 1871*	*NE. to NW.*	*NE. to NW.*	*E. to N.*	*NE. to NW.*	*E. to N.*	*NE. to NW.*
Des Moines, Iowa	*Aug. 1, 1878*	E. to N.	NE. to NW.	SE. to NE.	SE. to NE.	SW. to SE.	S. to E.
Detroit, Mich	Nov. 1, 1870	W. to S.	SW. to SE.	S. to E.	SW. to SE.	W. to S.	SW. to SE.
Dodge City, Kans	Sept. 15, 1874	NE. to NW.	SE. to NE.	SE. to NE.	E. to N.	SW. to SE.	S. to E.
Dubuque, Iowa	July 10, 1873	S. to E.	S. to E.	S. to E.	SE. to NE.	SW. to SE.	SW. to SE.
Duluth, Minn	Nov. 1, 1870	NW. to SW.	NE. to NW.	NE. to NW.	NE. to NW.	NE. to NW.	NE. to NW.
Eagle Pass, Tex	Jan. 19, 1875	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.	S. to E.
Eagle Rock, Idaho	Dec. 3, 1880	NE. to NW.	NW. to SW.	W. to S.	W. to S.	W. to S.	NW. to SW.
Eastport, Me	Apr. 1, 1873	S. to E.	W. to S.	S. to E.	E. to N.	W. to S.	W. to S.
El Paso, Tex	Nov. 5, 1877	SE. to NE.	NW. to SW.	N. to W.	N. to W.	SE. to NE.	SE. to NE.
Erie, Pa	May 25, 1873	SW. to SE.	SW. to SE.	SW. to SE.	W. to S.	W. to S.	W. to S.
Escanaba, Mich	May 24, 1871	N. to W.	S. to E.	E. to N.	S. to E.	S. to E.	SW. to SE.
Florence, Ariz	Nov. 12, 1874	NW. to SW.	W. to S.	S. to E.	NW. to SW.	NW. to SW.	(*a*)
Fort Apache, Ariz	Oct. 9, 1877	W. to S.	W. to S.	W. to S.	W. to S.	S. to E.	NW. to SW.
Fort Assinniboine, Mont	Oct. 6, 1879	NW. to SW.	NE. to NW.	NW. to SW.	E. to N.	E. to N.	(*b*)
Fort Bennett, Dak	Dec. 22, 1879	NE. to NW.	E. to N.	SE. to NE.	SW. to SE	SE. to NE.	S. to E.
Fort Benton, Mont	Oct. 11, 1879	N. to W.	W. to S.	SE. to NE.	NW. to SW.	E. to N.	E. to N.
Fort Buford, Dak	Oct. 23, 1878	NW. to SW.	SE. to NE.	NW. to SW.	SE. to NE.	SE. to NE.	SE. to NE.
Fort Custer, Mont	Dec. 5, 1878	SW. to SE.	E. to N.	N. to W.	N. to W.	NE. to NW.	NE. to NW.
Fort Davis, Tex	Dec. 24, 1877	SE. to NE.	NW. to SW.	W. to S.	E. to N.	SE. to NE.	W. to S.
Fort Elliott, Tex	Nov. 29, 1879	N. to W.	NE. to NW.	E. to N.	SE. to NE.	SE. to NE.	S. to E.
Fort Gibson, Ind. Ter	Apr. 1, 1873	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.
Fort Grant, Ariz	Nov. 1, 1875	N. to W.	N. to W.	W. to S.	NW. to SW.	W. to S.	E. to N.
Fort Griffin, Tex	July 1, 1875	E. to N.	SE. to NE.	SE. to NE.	S. to E.	S. to E.	SE. to NE.
Fort Keogh, Mont	Nov. 18, 1878	N. to W.	N. to W.	NW. to SW.	NE. to NW.	NE. to NW.	NE. to NW.
Fort McKavett, Tex	Oct. 19, 1875	SE. to NE.	SW. to SE.	S. to E.	S. to E.	SE. to NE.	S. to E.
Fort Macon, N. C	May 23, 1878	E. to N.	SW. to SE.	S. to E.	SW. to SE.	SW. to SE.	NW. to SW.
Fort Missoula, Mont	Dec. 15, 1879	SW. to SE.	SW. to SE.	NW. to SW.	NW. to SW.	W. to S.	NE. to NW.
Fort Shaw, Mont	Apr. 1, 1880	W. to S.	N. to W.	NW. to SW.	N. to W.	NE. to NW.	NE. to NW.
Fort Sill, Ind. Ter	June 23, 1875	S. to E.	S. to E.	E. to N.	S. to E.	SE. to NE.	SW. to SE.
Fort Stevenson, Dak	Sept. 19, 1878	S. to E.	NW. to SW.	SW. to SE.	SE. to NE.	SE. to NE.	SE. to NE.
Fort Verde, Ariz	Nov. 9, 1874	NW. to SW.	S. to E.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.
Fredericksburg, Tex	Mar. 14, 1876	W. to S.	N. to W.	S. to E.	W. to S.	SW. to SE.	S. to E.
Galveston, Tex	Apr. 19, 1871	SE. to NE.	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.
Grand Haven, Mich	May 24, 1871	S. to E.	S. to E.	S. to E.	S. to E.	SW. to SE.	SW. to SE.
Hatteras, N. C	Dec. 1, 1880	SE. to NE.	SE. to NE.	SW. to SE.	SW. to SE.	SE. to NE.	SW. to SE.
Helena, Mont	Oct. 15, 1879	W. to S.	NW. to SW.	NE. to NW.	W. to S.	SW. to SE.	SW. to SE.
Henrietta, Tex	Feb. 1, 1877	E. to N.	SE. to NE.	SE. to NE.	S. to E.	S. to E.	S. to E.
Indianapolis, Ind	Feb. 10, 1871	SW. to SE.	S. to E.	S. to E.	SW. to SE.	SW. to SE.	SW. to SE.
Indianola, Tex	May 1, 1872	E. to N.	SE. to NE.	S. to E.	S. to E.	S. to E.	S. to E.
Jacksborough, Tex	May 8, 1875	NE. to NW.	N. to W.	S. to E.	SW. to SE.	S. to E.	S. to E.
Jacksonville, Fla	Sept. 11, 1871	NE. to NW.	SE. to NE.	SW. to SE.	SW. to SE.	SE. to NE.	SW. to SE.
Keokuk, Iowa	July 16, 1871	SW. to SE.	SW. to SE.	S. to E.	S. to E.	S. to E.	SW. to SE.
Key West, Fla	Nov. 1, 1870	SE. to NE.	SE. to NE.	E. to N.	SE. to NE.	SE. to NE.	SE. to NE.
Kittyhawk, N. C	Jan. 15, 1875	E. to N.	W. to S.	SW. to SE.	W. to S.	SE. to NE.	W. to S.
Knoxville, Tenn	Jan. 1, 1871	E. to N.	W. to S.	W. to S.	W. to S.	W. to S.	SW. to SE.
La Crosse, Wis	Oct. 15, 1872	SW. to SE.	S. to E.	S. to E.	S. to E.	S. to E.	SW. to SE.
La Mesilla, N. Mex	June 16, 1876	NE. to NW.	SE. to NE.	NW. to SW.	W. to S.	S. to E.	SW. to SE.
Laredo, Tex	Dec. 16, 1875	E. to N.	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.

a No rainfall during June of any year.

b Data incomplete.

APPENDIX 45.—*Table showing the quadrants from which the winds most likely to be followed by rain or snow are observed, &c.*—Continued.

Stations.	Station established.	January.	February.	March.	April.	May.	June.
Leavenworth, Kans	May 21, 1871	NE. to NW.	NE. to NW.	S. to E.	S. to E.	S. to E.	SW. to SE.
Lewiston, Idaho	July 1, 1879	W. to S.	W. to S.	E. to N.	SE. to NE.	NW. to SW.	N. to W.
Little Rock, Ark	July 1, 1879	NE. to NW.	S. to E.	SE. to NE.	S. to E.	S. to E.	SW. to SE.
Los Angeles, Cal	July 1, 1877	SE. to NE.	SE. to NE.	SE. to NE.	SW. to SE.	SW. to SE.	SW. to SE.
Louisville, Ky	Sept. 11, 1871	SW. to SE.	S. to E.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.
Lynchburg, Va	May 24, 1871	E. to N.	W. to S.	S. to E.	W. to S.	W. to S.	W. to S.
Madison, Wis	Sept. 29, 1878	S. to E.	S. to E.	S. to E.	S. to E.	SW. to SE.	SW. to SE.
Marquette, Mich	May 1, 1871	NW. to SW.	N. to W.	NW. to SW.	NE. to NW.	S. to E.	W. to S.
Mason, Tex	Feb. 7, 1876	SE. to NE.	S. to E.	S. to E.	S. to E.	SW. to SE.	S. to E.
Memphis, Tenn	Feb. 28, 1871	S. to E.	S. to E.	SE. to NE.	SW. to SE.	SW. to SE.	SW. to SE.
Milwaukee, Wis	Nov. 1, 1870	NW. to SW.	SW. to SE.	SE. to NE.	SE. to NE	SE. to NE.	SW. to SE.
Mobile, Ala	Nov. 7, 1870	S. to E.	S. to E.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.
Montgomery, Ala	Nov. 9, 1870	S. to E	S. to E.	SW. to SE.	SW. to SE.	S. to E.	SW. to SE.
Moorhead, Minn	Jan. 1, 1881	N. to W.	SE. to NE.	SE. to NE.	S. to E.	SW. to SE.	SW. to SE.
Morgantown, W. Va	Jan. 25, 1873	W. to S.	W. to S.	W. to S.	W. to S.	W. to S.	SW. to SE.
Nashville, Tenn	Nov. 1, 1870	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.	W. to S.
New Haven, Conn	Dec. 10, 1872	NE. to NW.	NE. to NW.	SE. to NE.	SW. to SE.	SW. to SE.	S. to E.
New London, Conn	Jan. 10, 1871	E. to N.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.
New Orleans, La	Nov. 1, 1870	S. to E.	S. to E.	S. to E.	SW. to SE.	S. to E.	S. to E.
Newport, R. I	Aug. 1, 1875	W. to S.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.
New York, N. Y	Nov. 1, 1870	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.	SW. to SE.	SW. to SE.
Norfolk, Va	Jan. 1, 1871	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.
North Platte, Nebr	Sept. 18, 1874	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.	S. to E.
Olympia, Wash	July 1, 1877	SW. to SE.	SW. to SE.	W. to S.	W. to S.	W. to S.	W. to S.
Omaha, Nebr	Nov. 1, 1870	E. to N.	NE. to NW.	S. to E.	SE. to NE.	S. to E.	S. to E.
Oswego, N. Y	Nov. 1, 1870	SW. to SE.	SW. to SE.	S. to E.	S. to E.	SW. to SE.	W. to S.
Pensacola, Fla	Oct. 27, 1879	SE. to NE.	S. to E.	SW. to SE.	SW. to SE.	SE. to NE.	S. to E.
Philadelphia, Pa	Jan. 1, 1871	E. to N.	N. to W.	SW. to SE.	SW. to SE.	SW. to SE.	W. to S.
Phœnix, Ariz	May 9, 1877	SW. to SE.	S. to E.	W. to S.	W. to S.	E. to N.	N. to W.
Pioche, Nev	July 29, 1877	SW. to SE.	SW. to SE.	SW. to SE.	W. to S.	W. to S.	N. to W.
Pittsburgh, Pa	Nov. 1, 1870	W. to S.	NW. to SW.	SE. to NE.	W. to S.	W. to S.	W. to S.
Port Huron, Mich	July 25, 1874	SW. to SE.	SW. to SE.	S. to E.	S. to E.	SW. to SE.	SW. to SE.
Portland, Me	Jan. 15, 1871	NE. to NW.	NE. to NW.	SW. to SE.	S. to E.	S. to E.	SW. to SE.
Portland, Oreg	Nov. 1, 1871	S. to E.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	N. to W.
Prescott, Ariz	Nov. 19, 1873	W. to S.	W. to S.	S. to E.	SW. to SE.	SW. to SE.	SW. to SE.
Punta Rassa, Fla	Aug. 15, 1871	S. to E.	S. to E.	SW. to SE.	W. to S.	W. to S.	S. to E.
Red Bluff, Cal	July 1, 1877	SW. to SE.	SW. to SE.	SW. to SE.	S. to E.	S. to E.	SW. to SE.
Rio Grande City, Tex	May 28, 1875	SE. to NE.	NE. to NW.	SE. to NE.	SE. to NE.	SE. to NE.	S. to E.
Rochester, N. Y	Nov. 1, 1870	W. to S.	W. to S.	SW. to SE.	S. to E.	NW. to SW.	NW. to SW.
Roseburg, Oreg	July 15, 1877	SW. to SE.	SW. to SE.	W. to S.	NW. to SW.	N. to W.	NW. to SW.
Sacramento, Cal	July 1, 1877	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.
Saint Louis, Mo	Nov. 1, 1870	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.	SW. to SE.
Saint Paul, Minn	Nov. 1, 1870	SE. to NE.	SE. to NE.	S. to E.	SW. to SE.	S. to E.	S. to E.
Saint Vincent, Minn	Sept. 5, 1880	S. to E.	S. to E.	S. to E.	SE. to NE.	S. to E.	S. to E.

Salt Lake City, Utah	*Mar. 22, 1874*	*S. to E.*	*S. to E.*	*S. to E.*	*SE. to NE.*	*NW. to SW.*	*SE. to NE.*
San Antonio, Tex	*Sept. 22, 1875*	*SE. to NE.*	*E. to N.*	*SE. to NE.*	*SE. to NE.*	*SE. to NE.*	*SE. to NE.*
San Diego, Cal	Nov. 1, 1871	SW. to SE.	W. to S.	W. to S.	W. to S.	W. to S.	NW. to SW.
Sandusky, Ohio	Aug. 2, 1877	W. to S.	SW. to SE.	S. to E.	W. to S.	W. to S.	SW. to SE.
Sandy Hook, N. J	Dec. 10, 1873	E. to N.	N. to W.	SE. to NE.	S. to E.	SW. to SE.	SW. to SE.
San Francisco, Cal	Mar. 8, 1871	SW. to SE.	SW. to SE.	W. to S.	W. to S.	W. to S.	W. to S.
Santa Fé, N. Mex	Nov. 20, 1871	SE. to NE.	W. to S.	SW. to SE.	NW. to SW.	SW. to SE.	S. to E.
Savannah, Ga	Jan. 1, 1871	NE. to NW.	S. to E.	SW. to SE.	SW. to SE.	E. to N.	SW. to SE.
Shreveport, La	Sept. 3, 1871	S. to E.	S. to E.	S. to E.	S. to E.	SW. to SE.	SW. to SE.
Silver City, N. Mex	May 15, 1878	SW. to SE.	W. to S.	W. to S.	W. to S.	W. to S.	SE. to NE.
Smithville, N. C	Oct. 15, 1875	E. to N.	E. to N.	SW. to SE.	SW. to SE.	SE. to NE.	SW. to SE.
Springfield, Ill	July 1, 1879	SW. to SE.	SW. to SE.	SE. to NE.	S. to E.	SW. to SE.	W. to S.
Springfield, Mass	July 10, 1873	NE. to NW.	NE. to NW.	NE. to NW.	W. to S.	W. to S.	W. to S.
Stockton, Tex	Feb. 26, 1876	NE. to NW.	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.	SW. to SE.
Thatcher's Island, Mass	Dec. 26, 1875	NW. to SW.	SW. to SE.	SE. to NE.	SW. to SE.	SW. to SE.	W. to S.
Toledo, Ohio	Nov. 1, 1870	W. to S.	W. to S.	W. to S.	W. to S.	W. to S.	W. to S.
Tucson, Ariz	Dec. 2, 1875	SW. to SE.	W. to S.	SW. to SE.	SW. to SE.	W. to S.	SW. to SE.
Umatilla, Oreg	July 15, 1877	SE. to NE.	SW. to SE.	NW. to SW.	E. to N.	W. to S.	W. to S.
Uvalde, Tex	Sept. 6, 1875	SE. to NE.	E. to N.	SE. to NE.	S. to E.	S. to E.	S. to E.
Vicksburg, Miss	Sept. 10, 1871	SW. to SE.	SW. to SE.	S. to E.	S. to E.	SW. to SE.	W. to S.
Visalia, Cal	July 1, 1877	S. to E.	W. to S.	SW. to SE.	S. to E.	S. to E.	NW. to SW.
Washington, D. C	Nov. 1, 1870	S. to E.	NW. to SW.	S. to E.	S. to E.	S. to E.	SW. to SE.
Wickenburg, Ariz	Jan. 6, 1874	SW. to SE.	W. to S.	SW. to SE.	S. to E.	W. to S.	SE. to NE.
Wilmington, N. C	Jan. 1, 1871	E. to N.	E. to N.	SW. to SE.	W. to S.	S. to E.	SW. to SE.
Winnemucca, Nev	July 1, 1877	W. to S.	SW. to SE.	W. to S.	W. to S.	W. to S.	NW. to SW.
Wood's Holl, Mass	Jan. 1, 1873	S. to E.	SW. to SE.	S. to E.	S. to E.	SW. to SE.	SW. to SE.
Yankton, Dak	Apr. 1, 1878	NE. to NW.	NE. to NW.	SW. to SE.	SE. to NE.	S. to E.	SW. to SE.
Yuma, Ariz	Nov. 18, 1878	SW. to SE.	S. to E.	SW. to SE.	NW. to SW.	(*a*)	(*b*)

a No rainfall during May of any year.

b No rainfall during June of any year.

APPENDIX 45.—*Table showing the quadrants from which the winds most likely to be followed by rain or snow are observed, &c.*—Continued.

Stations.	Station established.	July.	August.	September.	October.	November.	December.
Albany, N. Y.	Dec. 22, 1873	W. to S.	SW. to SE.	SW. to SE.	SW. to SE.	W. to S.	SW. to SE.
Alpena, Mich.	Sept. 10, 1872	SW. to SE.	SW. to SE.	SW. to SE.	W. to S.	NW. to SW.	W. to S.
Atlanta, Ga.	Sept. 25, 1878	NW. to SW.	S. to E.	SE. to NE.	SE. to NE.	S. to E.	S. to E.
Atlantic City, N. J.	Dec. 10, 1873	SW. to SE.	SW. to SE.	S. to E.	SW. to SE.	SW. to SE.	SW. to SE.
Augusta, Ga.	Nov. 2, 1870	SW. to SE.	S. to E.	SE. to NE.	SE. to NE.	SE. to NE.	W. to S.
Baltimore, Md.	Jan. 1, 1871	W. to S.	SW. to SE.	S. to E.	SW. to SE.	S. to E.	SE. to NE.
Barnegat, N. J.	Dec. 10, 1873	SW. to SE.	SW. to SE.	S. to E.	SW. to SE.	SW. to SE.	S. to E.
Bismarck, Dak.	Sept. 15, 1874	S. to E.	S. to E.	SE. to NE.	NE. to NW.	NE. to NW.	S. to E.
Block Island, R. I.	Sept. 1, 1880	SW. to SE.	SE. to NE.	NE. to NW.	SW. to SE.	SW. to SE.	SE. to NE.
Boisé City, Idaho	July 1, 1877	NW. to SW.	NE. to NW.	N. to W.	S. to E.	SW. to SE.	S. to E.
Boston, Mass.	Nov. 1, 1870	W. to S.	SW. to SE.	SW. to SE.	S. to E.	S. to E.	NW. to SW.
Brackettville, Tex.	Sept. 1, 1875	S. to E.	SE. to NE.	S. to E.	SE. to NE.	E. to N.	E. to N.
Brownsville, Tex.	Aug. 25, 1875	S. to E.	SE. to NE.	SE. to NE.	SE. to NE.	S. to E.	S. to E.
Buffalo, N. Y.	Nov. 1, 1870	SW. to SE.	W. to S.	W. to S.	W. to S.	W. to S.	W. to S.
Burlington, Vt.	May 24, 1871	SW. to SE.	SW. to SE.	W. to S.	W. to S.	S. to E.	S. to E.
Cairo, Ill.	June 1, 1871	W. to S.	SW. to SE.	SW. to SE.	S. to E.	S. to E.	S. to E.
Campo, Cal.	Jan. —, 1874	W. to S.	W. to S.	N. to W.	W. to S.	W. to S.	W. to S.
Camp Thomas, Ariz.	Sept. 22, 1877	N. to W.	N. to W.	SE. to NE.	SE. to NE.	N. to W.	SE. to NE.
Cape Henry, Va.	Dec. 15, 1873	SW. to SE.	SW. to SE.	SE. to NE.	SW. to SE.	SE. to NE.	SW. to SE.
Cape May, N. J.	May 24, 1871	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.	SE. to NE.
Castroville, Tex.	Sept. 29, 1875	S. to E.	S. to E.	S. to E.	S. to E.	SE. to NE.	SE. to NE.
Cedar Keys, Fla.	Nov. 7, 1879	W. to S.	W. to S.	SW. to SE.	S. to E.	SE. to NE.	S. to E.
Champaign, Ill.	Oct. 13, 1880	N. to W.	N. to W.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.
Charleston, S. C.	Jan. 5, 1871	W. to S.	SW. to SE.	SW. to SE.	E. to N.	E. to N.	W. to S.
Charlotte, N. C.	Oct. 6, 1878	SW. to SE.	SW. to SE.	SW. to SE.	S. to E.	SE. to NE.	SW. to SE.
Chattanooga, Tenn.	Jan. 8, 1879	NW. to SW.	SW. to SE.	S. to E.	S. to E.	S. to E.	W. to S.
Cheyenne, Wyo.	Nov. 1, 1870	S. to E.	S. to E.	NE. to NW.	NE. to NW.	N. to W.	N. to W.
Chicago, Ill.	Nov. 1, 1870	W. to S.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.
Chincoteague, Va.	Mar. 16, 1880	SE. to NE.	W. to S.	S. to E.	SW. to SE.	SE. to NE.	NW. to SW.
Cincinnati, Ohio	Nov. 1, 1870	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	S. to E.	SW. to SE.
Cleveland, Ohio	Nov. 1, 1870	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.
Columbus, Ohio	July 1, 1878	W. to S.	W. to S.	SW. to SE.	SW. to SE.	SW. to SE.	W. to S.
Concho, Tex.	Oct. 10, 1875	S. to E.	S. to E.	SE. to NE.	SE. to NE.	E. to N.	SE. to NE.
Corsicana, Tex.	Sept. 15, 1874	SW. to SE.	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.
Davenport, Iowa	May 24, 1871	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	S. to E.	S. to E.
Dayton, Wash.	July 1, 1879	W. to S.	W. to S.	NW. to SW.	W. to S.	NW. to SW.	SW. to SE.
Deadwood, Dak.	Nov. 1, 1878	E. to N.	SE. to NE.	N. to W.	N. to W.	W. to S.	NW. to SW.
Decatur, Tex.	Feb. 1, 1876	SE. to NE.	SW. to SE.	SE. to NE.	SE. to NE.	E. to N.	SE. to NE.
Delaware Breakwater, Del.	Jan. 28, 1880	SW. to SE.	NW. to SW.	SW. to SE.	SW. to SE.	SW. to SE.	NW. to SW.
Denison, Tex.	Dec. 16, 1874	S. to E.	SW. to SE.	S. to E.	S. to E.	SE. to NE.	S. to E.
Denver, Col.	Nov. 19, 1871	NE. to NW.	NE. to NW.	N. to W.	E. to N.	NE. to NW.	NE. to NW.
Des Moines, Iowa	Aug. 1, 1878	SW. to SE.	SW. to SE.	W. to S.	W. to S.	NE. to NW.	SW. to SE.
Detroit, Mich.	Nov. 1, 1870	W. to S.	SW. to SE.	SW. to SE.	SW. to SE.	W. to S.	W. to S.
Dodge City, Kans.	Sept. 15, 1874	S. to E.	S. to E.	E. to N.	E. to N.	NE. to NW.	E. to N.

Dubuque, Iowa	*July 10, 1873*	*SW. to SE.*	*SW. to SE.*	*S. to E.*	*SW. to SE.*	*SW. to SE.*	*S. to E.*
Duluth, Minn	*Nov. 1, 1870*	*NE. to NW.*	*NE. to NW.*	*NE. to NW.*	*NE. to NW.*	*NW. to SW.*	*NW. to SW.*
Eagle Pass, Tex	*Jan. 19, 1875*	*S. to E.*	*SE. to NE.*	*S. to E.*	*SE. to NE.*	*NE. to NW.*	*SE. to NE.*
Eagle Rock, Idaho	Dec. 3, 1880	N. to W.	NE. to NW.	NE. to NW.	W. to S.	NW. to SW.	N. to W.
Eastport, Me	Apr. 1, 1873	W. to S.	SW. to SE.	S. to E.	SW. to SE.	SW. to SE.	SW. to SE.
El Paso, Tex	Nov. 5, 1877	SE. to NE.	SE. to NE.	E. to N.	SW. to SE.	SE. to NE.	E. to N.
Erie, Pa	May 25, 1873	W. to S.	W. to S.	SW. to SE.	W. to S.	W. to S.	W. to S.
Escanaba, Mich	May 24, 1871	SW. to SE.	SW. to SE.	SW. to SE.	W. to S.	W. to S.	N. to W.
Florence, Ariz	Nov. 12, 1874	W. to S.	W. to S.	W. to S.	W. to S.	SW. to SE.	W. to S.
Fort Apache, Ariz	Oct. 9, 1877	W. to S.	S. to E.	SE. to NE.	SW. to SE.	SE. to NE.	SE. to NE.
Fort Assinniboine, Mont	Oct. 6, 1879	W. to S.	SE. to NE.	NW. to SW.	SW. to SE.	NW. to SW.	SE. to NE.
Fort Bennett, Dak	Dec. 22, 1879	S. to E.	S. to E.	E. to N.	SE. to NE.	N. to W.	SE. to NE.
Fort Benton, Mont	Oct. 11, 1879	SE. to NE.	SE. to NE.	NW. to SW.	SE. to NE.	NW. to SW.	W. to S.
Fort Buford, Dak	Oct. 23, 1878	SE. to NE.	SE. to NE.	N. to W.	E. to N.	N. to W.	N. to W.
Fort Custer, Mont	Dec. 5, 1878	N. to W.	SE. to NE.	NE. to NW.	NE. to NW.	NE. to NW.	N. to W.
Fort Davis, Tex	Dec. 24, 1877	W. to S.	SE. to NE.	NE. to NW.	W. to S.	NE. to NW.	E. to N.
Fort Elliott, Tex	Nov. 29, 1879	SE. to NE.	S. to E.	S. to E.	SE. to NE.	NE. to NW.	SE. to NE.
Fort Gibson, Ind. Ter	Apr. 1, 1873	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.
Fort Grant, Ariz	Nov. 1, 1875	S. to E.	S. to E.	E. to N.	SW. to SE.	NW. to SW.	NW. to SW.
Fort Griffin, Tex	July 1, 1875	SE. to NE.	E. to N.	SE. to NE.	SE. to NE.	E. to N.	E. to N.
Fort Keogh, Mont	Nov. 18, 1878	N. to W.	SE. to NE.	N. to W.	N. to W.	N. to W.	NE. to NW.
Fort McKavett, Tex	Oct. 19, 1875	SE. to NE.	E. to N.	S. to E.	S. to E.	E. to N.	S. to E.
Fort Macon, N. C	May 23, 1878	NW. to SW.	S. to E.	E. to N.	SW. to SE.	SW. to SE.	SW. to SE.
Fort Missoula, Mont	Dec. 15, 1879	N. to W.	N. to W.	N. to W.	NW. to SW.	NE. to NW.	N. to W.
Fort Shaw, Mont	Apr. 1, 1880	W. to S.	E. to N.	N. to W.	N. to W.	N. to W.	W. to S.
Fort Sill, Ind. Ter	June 23, 1875	SE. to NE.	SW. to SE.	SE. to NE.	SW. to SE.	NE. to NW.	NE. to NW.
Fort Stevenson, Dak	Sept. 19, 1878	SE. to NE.	S. to E.	SE. to NE.	N. to W.	NW. to SW.	N. to W.
Fort Verde, Ariz	Nov. 9, 1874	SW. to SE.	W. to S.	SW. to SE.	S. to E.	SW. to SE.	SW. to SE.
Fredericksburg, Tex	Mar. 14, 1876	S. to E.	E. to N.	E. to N.	S. to E.	E. to N.	S. to E.
Galveston, Tex	Apr. 19, 1871	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.	SE. to NE.
Grand Haven, Mich	May 24, 1871	W. to S.	SW. to SE.	SW. to SE.	W. to S.	S. to E.	S. to E.
Hatteras, N. C	Dec. 1, 1880	SW. to SE.	SW. to SE.	SE. to NE.	SE. to NE.	SE. to NE.	W. to S.
Helena, Mont	Oct. 15, 1879	W. to S.	W. to S.	NW. to SW.	W. to S.	NW. to SW.	NW. to SW.
Henrietta, Tex	Feb. 1, 1877	SE. to NE.	SE. to NE.	S. to E.	S. to E.	SE. to NE.	E. to N.
Indianapolis, Ind	Feb. 10, 1871	SW. to SE.	W. to S.	SW. to SE.	SW. to SE.	SW. to SE.	W. to S.
Indianola, Tex	May 1, 1872	S. to E.	S. to E.	SE. to NE.	S. to E.	S. to E.	SE. to NE.
Jacksborough, Tex	May 8, 1875	S. to E.	SW. to SE.	SE. to NE.	SE. to NE.	SE. to NE.	E. to N.
Jacksonville, Fla	Sept. 11, 1871	SW. to SE.	SE. to NE.	SE. to NE.	E. to N.	E. to N.	E. to N.
Keokuk, Iowa	July 16, 1871	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	S. to E.	SE. to NE.
Key West, Fla	Nov. 1, 1870	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.
Kittyhawk, N. C	Jan. 15, 1875	W. to S.	SW. to SE.	S. to E.	E. to N.	E. to N.	E to N.
Knoxville, Tenn	Jan. 1, 1871	NW. to SW.	W. to S.	W. to S.	NW. to SW.	E. to N.	W. to S.
La Crosse, Wis	Oct. 15, 1872	SW. to SE.	SW. to SE.	SW. to SE.	W. to S.	S. to E.	S. to E.
La Mesilla, N. Mex	June 16, 1876	SW. to SE.	S. to E.	NE. to NW.	SW. to SE.	SE. to NE.	S. to E.
Laredo, Tex	Dec. 16, 1875	SE. to NE.	SE. to NE.	SE. to NE.	NE. to NW.	NE. to NW.	E. to N.
Leavenworth, Kans	May 21, 1871	SW. to SE.	S. to E.	SW. to SE.	S. to E.	S. to E.	S. to E.
Lewistown, Idaho	July 1, 1879	NE. to NW.	NW. to SW.	NW. to SW.	NW. to SW.	S. to E.	S. to E.
Little Rock, Ark	July 1, 1879	NW. to SW.	SW. to SE.	SW. to SE.	SW. to SE.	SE. to NE.	SE. to NE.
Los Angeles, Cal	July 1, 1877	(a)	(a)	(a)	W. to S.	SE. to NE.	S. to E.
Louisville, Ky	Sept. 11, 1871	SW. to SE.	W. to S.	SW. to SE.	SW. to SE.	S. to E.	SE. to NE.

a No rainfall during July, August, and September of any year.

APPENDIX 45.—*Table showing the quadrants from which the winds most likely to be followed by rain or snow are observed, &c.*—Continued.

Stations.	Station established.	July.	August.	September.	October.	November.	December.
Lynchburg, Va	May 24, 1871	W. to S.	W. to S.	SE. to NE.	W. to S.	SE. to NE.	W. to S.
Madison, Wis	Sept. 29, 1878	W. to S.	SW. to SE.	SW. to SE.	S. to E.	S. to E.	S. to E.
Marquette, Mich	May 1, 1871	SW. to SE.	SW. to SE.	SW. to SE.	W. to S.	NW. to SW.	NW. to SW.
Mason, Tex	Feb. 7, 1876	SE. to NE.	SE. to NE.	S. to E.	SE. to NE.	NE. to NW.	SE. to NE.
Memphis, Tenn	Feb. 28, 1871	NW. to SW.	E. to N.	SW. to SE.	S. to E.	S. to E.	SE. to NE.
Milwaukee, Wis	Nov. 1, 1870	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	NW. to SW.
Mobile, Ala	Nov. 7, 1870	S. to E.	SW. to SE.	S. to E.	S. to E.	S. to E.	E. to N.
Montgomery, Ala	Nov. 9, 1870	W. to S.	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.
Moorhead, Minn	Jan. 1, 1881	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.	SW. to SE.
Morgantown, W. Va	Jan. 25, 1873	W. to S.	SW. to SE.	SW. to SE.	NW. to SW.	SW. to SE.	W. to S.
Nashville, Tenn	Nov. 1, 1870	W. to S.	NW. to SW.	SW. to SE.	S. to E.	S. to E.	S. to E.
New Haven, Conn	Dec. 10, 1872	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SE. to NE.	SE. to NE.
New London, Conn	Jan. 10, 1871	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	NE. to NW.
New Orleans, La	Nov. 1, 1870	S. to E.	S. to E.	SE. to NE.	S. to E.	SE. to NE.	S. to E.
Newport, R. I	Aug. 1, 1875	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	NE. to NW.
New York, N. Y	Nov. 1, 1870	SW. to SE.	SW. to SE	SW. to SE.	SW. to SE.	SE. to NE.	SE. to NE.
Norfolk, Va	Jan. 1, 1871	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.
North Platte, Nebr	Sept. 18, 1874	SE. to NE.	S. to E.	SE. to NE.	NE. to NW.	NE. to NW.	NE. to NW.
Olympia, Wash	July 1, 1877	W. to S.	W. to S.	W. to S.	SW. to SE.	W. to S.	SW. to SE.
Omaha, Nebr	Nov. 1, 1870	SW. to SE.	SW. to SE.	S. to E.	S. to E.	NE. to NW.	NE. to NW.
Oswego, N. Y	Nov. 1, 1870	SW. to SE.	SW. to SE.	W. to S.	SW. to SE.	SW. to SE.	SW. to SE.
Pensacola, Fla	Oct. 27, 1879	NW. to SW.	S. to E.	SE. to NE.	SE. to NE.	SE. to NE.	E. to N.
Philadelphia, Pa	Jan. 1, 1871	W. to S.	W. to S.	SW. to SE.	W. to S.	SW. to SE.	SW. to SE.
Phœnix, Ariz	May 9, 1877	SW. to SE.	SE. to NE.	SW. to SE.	W. to S.	S. to E.	W. to S.
Pioche, Nev	July 29, 1877	W. to S.	SW. to SE.	W. to S.	S. to E.	W. to S.	SW. to SE.
Pittsburg, Pa	Nov. 1, 1870	NW. to SW.	W. to S.	W. to S.	W. to S.	SW. to SE.	W. to S.
Port Huron, Mich	July 25, 1874	W. to S.	SW. to SE.	SW. to SE.	SW. to SE.	W. to S.	W. to S.
Portland, Me	Jan. 15, 1871	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	N. to W.
Portland, Oreg	Nov. 1, 1871	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	S. to E.
Prescott, Ariz	Nov. 19, 1873	SW. to SE.	W. to S.	SW. to SE.	SW. to SE.	W. to S.	W. to S.
Punta Rassa, Fla	Aug. 15, 1871	W. to S.	SE. to NE.	SE. to NE.	SE. to NE.	S. to E.	SW. to SE.
Red Bluff, Cal	July 1, 1877	SW. to SE.	SW. to SE.	S. to E.	S. to E.	S. to E.	SW. to SE.
Rio Grande City, Tex	May 28, 1875	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.	N. to W.	NE. to NW.
Rochester, N. Y	Nov. 1, 1870	W. to S.	NW. to SW.	W. to S.	W. to S.	W. to S.	W. to S.
Roseburg, Oreg	July 15, 1877	N. to W.	W. to S.	NW. to SW.	W. to S.	W. to S.	SW. to SE.
Sacramento, Cal	July 1, 1877	W. to S.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.
Saint Louis, Mo	Nov. 1, 1870	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	S. to E.	S. to E.
Saint Paul, Minn	Nov. 1, 1870	SW. to SE.	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.
Saint Vincent, Minn	Sept. 5, 1880	SW. to SE.	S. to E.	SW. to SE.	NE. to NW.	S. to E.	SW. to SE.
Salt Lake City, Utah	Mar. 22, 1874	N. to W.	SW. to SE.	S. to E.	S. to E.	NW. to SW.	SW. to SE.
San Antonio, Tex	Sept. 22, 1875	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.	E. to N.	E. to N.
San Diego, Cal	Nov. 1, 1871	W. to S.	N. to W.	NE. to NW.	W. to S.	W. to S.	S. to E.
Sandusky, Ohio	Aug. 2, 1877	W. to S.	W. to S.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.
Sandy Hook, N. J	Dec. 10, 1873	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SE. to NE.	SE. to NE.

San Francisco, Cal	*Mar. 8, 1871*	*W. to S.*	*NW. to SW.*	*W. to S.*	*SW. to SE.*	*SW. to SE.*	*SW. to SE.*
Santa Fé, N. Mex	*Nov. 20, 1871*	*SW. to SE.*	*E. to N.*	*SW. to SE.*	*SE. to NE.*	S. to E.	SW. to SE.
Savannah, Ga	Jan. 1, 1871	*SW. to SE.*	S. to E.	SE. to NE.	*SE. to NE.*	E. to N.	*SW. to SE.*
Shreveport, La	Sept. *3*, 1871	S. to E.	S. to E.	S. to E.	SW. to SE.	S. to E.	S. to E.
Silver City, N. Mex	May 15, 1878	S. to E.	SW. to SE.	NW. to SW.	SW. to SE.	SE. to NE.	W. to S.
Smithville, N. C	Oct. 15, 1875	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	E. to N.	E. to N.
Springfield, Ill	July 1, 1879	W. to S.	S. to E.	SW. to SE.	SW. to SE.	S. to E.	S. to E.
Springfield, Mass	July 19, 1873	SW. to SE.	W. to S.	SW. to SE.	SW. to SE.	S. to E.	NE. to NW.
Stockton, Tex	Feb. 26, 1876	S. to E.	S. to E.	SE. to NE.	SW. to SE.	SE. to NE.	E. to N.
Thatcher's Island, Mass	Dec. 26 1875	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	S. to E.	SE. to NE.
Toledo, Ohio	Nov 1, 1870	W. to S.	W. to S	W. to S.	SW. to SE.	SW. to SE.	SW. to SE.
Tucson, Ariz	Dec. 2, 1875	S. to E.	NW. to SW.	W. to S.	W. to S.	SW. to SE.	NW. to SW.
Umatilla, Oreg	July 15, 1877	NW. to SW.	NW. to SW.	NW. to SW.	N. to W.	S. to E.	SE. to NE.
Uvalde, Tex	Sept. 6, 1875	S. to E.	S. to E.	SE. to NE.	SE. to NE.	S. to E.	SE. to NE.
Vicksburg, Miss	Sept. 10, 1871	NW. to SW.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.
Visalia, Cal	July 1, 1877	N. to W.	N. to W	S. to E.	SW. to SE.	W. to S.	S. to E.
Washington, D. C	Nov. 1, 1870	SW. to SE.	SW. to SE.	S. to E.	S. to E.	S. to E.	NE. to NW.
Wickenburg, Ariz	Jan. 6, 1874	W. to S.	S. to E.	W. to S.	SE. to NE.	W. to S.	W. to S.
Wilmington, N. C	Jan. 1, 1871	W. to S.	SW. to SE.	SE. to NE.	SW. to SE.	E. to N.	E. to N.
Winnemucca, Nev	July 1, 1877	N. to W.	W. to S.	W. to S.	W. to S.	W. to S.	NW. to SW.
Wood's Holl, Mass	Jan. 1, 1873	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SE. to NE.
Yankton, Dak	Apr. 1, 1873	S. to E.	S. to E.	SE. to NE.	NE. to NW.	NE. to NW:	NE. to NW.
Yuma, Ariz	Nov. 18, 1873	SW. to SE.	SW. to SE.	SW. to SE.	S. to E.	S. to E.	N. to W.

APPENDIX 46.

Table showing the quadrants from which the winds least likely to be followed by rain or snow are observed to blow during each month of the year at the principal stations of the Signal Service, United States Army.

[Computed from the commencement of observations to December 31, 1881.]

Stations.	Station established.	January.	February.	March.	April.	May.	June.
Albany, N. Y	Dec. 22, 1873	SE. to NE.	SE. to NE.	E. to N.	SE. to NE.	E. to N.	SE. to NE.
Alpena, Mich	Sept. 10, 1872	E. to N.	E. to N.	NE. to NW.	W. to S.	NE. to NW.	NE. to NW.
Atlanta, Ga	Sept. 25, 1878	N. to W.	N. to W.	N. to W.	NE. to NW.	NE. to NW.	NE. to NW.
Atlantic City, N. J	Dec. 10, 1873	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.	SE. to NE.
Augusta, Ga	Nov. 2, 1870	W. to S.	N. to W.	N. to W.	NE. to NW.	N. to W.	E. to N.
Baltimore, Md	Jan. 1, 1871	N. to W.	N. to W.	NW. to SW.	N. to W.	N. to W.	E. to N.
Barnegat, N. J	Dec. 10, 1873	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.	NE. to NW.
Bismarck, Dak	Sept. 15, 1874	SW. to SE.	W. to S.	NW. to SW.	NW. to SW.	W. to S.	NW. to SW.
Block Island, R. I	Sept. 1, 1880	N. to W.	N. to W.	W. to S.	S. to E.	N. to W.	E. to N.
Boisé City, Idaho	July 1, 1877	E. to N.	NW. to SW.	NE. to NW.	E. to N.	E. to N.	E. to N.
Boston, Mass	Nov. 1, 1870	E. to N.	N. to W.	NW. to SW.	NE. to NW.	N. to W.	NE. to NW.
Brackettville, Tex	Sept. 1, 1875	NW. to SW.	NW. to SW.	W. to S.	NW. to SW.	NW. to SW.	N. to W.
Brownsville, Tex	Aug. 25, 1875	NW. to SW.	NW. to SW.	W. to S.	NW. to SW.	N. to W.	NW. to SW.
Buffalo, N. Y	Nov. 1, 1870	NE. to NW.	NE. to NW.	NE. to NW.	N. to W.	NE. to NW.	NE. to NW.
Burlington, Vt	May 24, 1871	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.
Cairo, Ill	June 1, 1871	NW. to SW.	NW. to SW.	N. to W.	N. to W.	NW. to SW.	N. to W.
Campo, Cal	Jan. —, 1874	NE. to NW.	NE. to NW.	E. to N.	E. to N.	S. to E.	E. to N.
Camp Thomas, Ariz	Sept. 22, 1877	SW. to SE.	S. to E.	S. to E.	SE. to NE.	N. to W.	(a)
Cape Henry, Va	Dec. 15, 1873	NW. to SW.	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.
Cape May, N. J	May 24, 1871	N. to W.	NW. to SW.	N. to W.	NW. to SW.	N. to W.	E. to N.
Castroville, Tex	Sept. 29, 1875	W. to S.	W. to S.	NW. to SW.	NW. to SW.	N. to W.	E. to N.
Cedar Keys, Fla	Nov. 7, 1879	NW. to SW.	N. to W.	NE. to NW.	NE. to NW.	N. to W.	NE. to NW.
Champaign, Ill	Oct. 13, 1880	N. to W.	NE. to NW.	W. to S.	N. to W.	NE. to NW.	E. to N.
Charleston, S. C	Jan. 5, 1871	W. to S.	SW. to SE.	N. to W.	N. to W.	N. to W.	NE. to NW.
Charlotte, N. C	Oct. 6, 1878	N. to W.	N. to W.	NE. to NW.	N. to W.	N. to W.	N. to W.
Chattanooga, Tenn	Jan. 8, 1879	N. to W.	E. to N.	E. to N.	N. to W.	N. to W.	N. to W.
Cheyenne, Wyo	Nov. 1, 1870	S. to E.	SW. to SE.	S. to E.	W. to S.	W. to S.	NW. to SW.
Chicago, Ill	Nov. 1, 1870	SE. to NE.	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.
Chincoteague, Va	Mar. 16, 1880	S to E.	SE. to NE.	N. to W.	N. to W.	N. to W.	E. to N.
Cincinnati, Ohio	Nov. 1, 1870	N. to W.	NE. to NW.	N. to W.	NE. to NW.	NE. to NW.	E. to N.
Cleveland, Ohio	Nov. 1, 1870	NE. to NW.	E. to N.	NE. to NW.	N. to W.	E. to N.	NE. to NW.
Columbus, Ohio	July 1, 1878	N. to W.	NE. to NW.	N. to W.	E. to N.	SE. to NE.	NE. to NW.
Concho, Tex	Oct. 10, 1875	NW. to SW.	NW. to SW.	NW. to SW.	E. to N.	NW. to SW.	N. to W.
Corsicana, Tex	Sept. 15, 1874	NW. to SW.	N. to W.	NW. to SW.	NW. to SW.	NW. to SW.	N. to W.
Davenport, Iowa	May 24, 1871	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.	NE. to NW.
Dayton, Wash	July 1, 1879	NE. to NW.	SE. to NE.	E. to N.	E. to N.	NE. to NW.	E. to N.
Deadwood, Dak	Nov. 1, 1878	SE. to NE.	S. to E.	S. to E.	SE. to NE.	S. to E.	N. to W.

Decatur, Tex	*Feb. 1, 1876*	*NW. to SW.*	*W. to S.*	*N. to W.*	*E. to N.*	*N. to W.*	*N. to W.*
Delaware Breakwater, Del	*Jan. 28, 1880*	*S. to E.*	*SW. to SE.*	*W. to S.*	*N. to W.*	*N. to W.*	*W. to S.*
Denison, Tex	Dec. 16, 1874	NW. to SW.	N. to W.	NW. to SW.	NE. to NW.	NW. to SW.	N. to W.
Denver, Col	Nov. 19, 1871	NW. to SW.	NW. to SW.	NW. to SW.	S. to E.	SW. to SE.	W. to S.
Des Moines, Iowa	Aug. 1, 1878	NW. to SW.	W. to S.	NW. to SW.	N. to W.	N. to W.	NE. to NW.
Detroit, Mich	Nov. 1, 1870	NE. to NW.	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.
Dodge City, Kans	Sept. 15, 1874	NW. to SW.	NW. to SW.	W. to S.	NW. to SW.	N. to W.	NW. to SW.
Dubuque, Iowa	July 10, 1873	NW. to SW.	NW. to SW.	NW. to SW.	N. to W.	N. to W.	E. to N.
Duluth, Minn	Nov. 1, 1870	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.
Eagle Pass, Tex	Jan. 19, 1875	W. to S.	NW. to SW.	NW. to SW.	NW. to SW.	W. to S.	NE. to NW.
Eagle Rock, Idaho	Dec. 3, 1880	S. to E.	SE. to NE.	E. to N.	SE. to NE.	SE. to NE.	SE. to NE.
Eastport, Me	Apr. 1, 1873	N. to W.	N. to W.	N. to W.	NW. to SW.	N. to W.	N. to W.
El Paso Tex	Nov. 5, 1877	SW. to SE.	E. to N.	SW. to SE.	S. to E.	NW. to SW.	NW. to SW.
Erie, Pa	May 25, 1873	N. to W.	N. to W.	N. to W.	N. to W.	E. to N.	E. to N.
Escanaba, Mich	May 24, 1871	SE. to NE.	NW. to SW	NW. to SW.	NW. to SW.	NW. to SW.	NE. to NW.
Florence, Ariz	Nov. 12, 1874	S. to E.	NE. to NW.	N. to W.	SE. to NE.	SE. to NE.	(*a*)
Fort Apache, Ariz	Oct. 9, 1877	NE. to NW.	N. to W.	NE. to NW.	NE. to NW.	N. to W.	S. to E.
Fort Assinniboine, Mont	Oct. 6, 1879	S. to E.	S. to E.	S. to E.	SW. to SE.	W. to S.	(*b*)
Fort Bennett, Dak	Dec. 22, 1879	SW. to SE.	W. to S.	W. to S.	N. to W.	W. to S.	N. to W.
Fort Benton, Mont	Oct. 11, 1879	SW. to SE.	NE. to NW.	NW. to SW.	SE. to NE.	W. to S.	NW. to SW.
Fort Buford, Dak	Oct. 23, 1878	SW. to SE.	W. to S.	E. to N.	W. to S.	W. to S.	N. to W.
Fort Custer, Mont	Dec. 5, 1878	NE. to NW.	W. to S.	S. to E.	SE. to NE.	S. to E.	S. to E.
Fort Davis, Tex	Dec. 24, 1877	N. to W.	S. to E.	E. to N.	NW. to SW.	N. to W.	NE. to NW.
Fort Elliott, Tex	Nov. 29, 1879	W. to S.	S. to E.	W. to S.	NW. to SW.	NW. to SW.	N. to W.
Fort Gibson, Ind. T	Apr. 1, 1873	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	N. to W.	NE. to NW.
Fort Grant, Ariz	Nov. 1, 1875	SW. to SE.	SW. to SE.	SE. to NE.	E. to N.	NE. to NW.	SW. to SE.
Fort Griffin, Tex	July 1, 1875	NW. to SW.	W. to S.	NW. to SW.	NW. to SW.	NE. to NW.	NW. to SW.
Fort Keogh, Mont	Nov. 18, 1878	SE. to NE.	SE. to NE.	E. to N.	SW. to SE.	W. to S.	W. to S.
Fort McKavett, Tex	Oct. 19, 1875	NW. to SW.	NE. to NW.	NW. to SW.	NW. to SW.	NW. to SW.	NE. to NW.
Fort Macon, N. C	May 23, 1878	W. to S.	N. to W.	N. to W.	N. to W.	N. to W.	NE. to NW.
Fort Missoula, Mont	Dec. 15, 1879	E. to N.	N. to W.	SE. to NE.	S. to E.	SE. to NE.	W. to S.
Fort Shaw, Mont	Apr. 1, 1880	NE. to NW.	S. to E.	SE. to NE.	S. to E.	SW. to SE.	SW. to SE.
Fort Sill, Ind. T	June 23, 1875	NW. to SW.	NW. to SW.	NW. to SW.	N. to W.	NW. to SW.	NW. to SW.
Fort Stevenson, Dak	Sept. 19, 1878	W. to S.	E. to N.	NE. to NW.	N. to W.	NW. to SW.	NE. to NW.
Fort Verde, Ariz	Nov. 9, 1874	SE. to NE.	NE. to NW.	E. to N.	NE. to NW.	NE. to NW.	NE. to NW.
Fredericksburg, Tex	Mar. 14, 1876	SE. to NE.	SE. to NE.	N. to W.	NE. to NW.	N. to W.	N. to W.
Galveston, Tex	Apr. 19, 1871	NW. to SW.	NW. to SW.	NW. to SW.	N. to W.	NW. to SW.	NW. to SW.
Grand Haven, Mich	May 24, 1871	NE. to NW.	NE. to NW.	N. to W.	N. to W.	NE. to NW.	N. to W.
Hatteras, N. C	Dec. 1, 1880	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.	E. to N.
Helena, Mont	Oct. 15, 1879	SE. to NE.	SE. to NE.	SE. to NE.	E. to N.	NW. to SW.	NW. to SW.
Henrietta, Tex	Feb. 1, 1877	NW. to SW.	NW. to SW.	NW. to SW.	N. to W.	N. to W.	NW. to SW.
Indianapolis, Ind	Feb. 10, 1871	E. to N.	NE. to NW.	N. to W.	N. to W.	NE. to NW.	E. to N.
Indianola, Tex	May 1, 1872	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	N. to W.	NW. to SW.
Jacksborough, Tex	May 8, 1875	S. to E.	SE. to NE.	NW. to SW.	E. to N.	N. to W.	NW. to SW.
Jacksonville, Fla	Sept. 11, 1871	S. to E.	N. to W.	E. to N.	E. to N.	N. to W.	N. to W.
Keokuk, Iowa	July 16, 1871	N. to W.	W. to S.	NW. to SW.	N. to W.	NW. to SW.	N. to W.
Key West, Fla	Nov. 1, 1870	N. to W.	NW. to SW.	W. to S.	NW. to SW.	W. to S.	N. to W.
Kittyhawk, N. C	Jan. 15, 1875	NW. to SW.	N. to W.	NE. to NW.	N. to W.	N. to W.	NE. to NW.
Knoxville, Tenn	Jan. 1, 1871	S. to E.	S. to E.	N. to W.	S. to E.	S. to E.	N. to W.
La Crosse, Wis	Oct. 15, 1872	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	E. to N.

a No rainfall during June of any year.

b Data incomplete.

APPENDIX 46.—*Table showing the quadrants from which the winds least likely to be followed by rain or snow are observed, &c.*—Continued.

Stations.	Station established.	January.	February.	March.	April.	May.	June.
La Mesilla, N. Mex	June 16, 1876	W. to S.	N. to W.	E. to N.	E. to N.	NW. to SW.	NE. to NW.
Laredo, Tex	Dec. 16, 1875	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.
Leavenworth, Kans	May 21, 1871	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.
Lewiston, Idaho	July 1, 1879	NE. to NW.	NE. to NW.	SW. to SE.	NE. to NW.	SE. to NE.	SW. to SE.
Little Rock, Ark	July 1, 1879	NW. to SW.	N. to W.	NW. to SW.	N. to W.	NW. to SW.	N. to W.
Los Angeles, Cal	July 1, 1877	NW. to SW.	N. to W.	N. to W.	NE. to NW.	NE to NW.	NE to NW.
Louisville, Ky	Sept. 11, 1871	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.	E. to N.
Lynchburg, Va	May 24, 1871	N. to W.	N. to W.	N. to W.	N. to W.	NE. to NW.	NE. to NW.
Madison, Wis	Sept. 29, 1878	NE. to NW.	NE. to NW.	N. to W.	NW. to SW.	NE. to NW.	NE. to NW.
Marquette, Mich	May 1, 1871	SE. to NE.	SE. to NE.	W. to S.	W. to S.	W. to S.	SE. to NE.
Mason, Tex	Feb. 7, 1876	NW. to SW.	NW. to SW.	N. to W.	N. to W.	NE. to NW.	NW. to SW.
Memphis, Tenn	Feb. 28, 1871	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.	E. to N.
Milwaukee, Wis	Nov. 1, 1870	E. to N.	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.
Mobile, Ala	Nov. 7, 1870	NW. to SW.	NW. to SW.	NW. to SW.	N. to W.	N. to W.	NE. to NW.
Montgomery, Ala	Nov. 9, 1870	N. to W.	NW. to SW.	N. to W.	NE. to NW.	N. to W.	NE. to NW.
Moorhead, Minn	Jan. 1, 1881	W. to S.	W. to S.	W. to S.	NW. to SW.	NE. to NW.	N. to W.
Morgantown, W. Va	Jan. 25, 1873	N. to W.	SE. to NE.	E. to N.	NE. to NW.	E. to N.	E. to N.
Nashville, Tenn	Nov. 1, 1870	N. to W.	NE. to NW.	NW. to SW.	N. to W.	N. to W.	NE. to NW.
New Haven, Conn	Dec. 10, 1872	S. to E.	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.
New London, Conn	Jan. 10, 1871	SE. to NE.	SE. to NE.	NE. to NW.	NE. to NW.	N. to W.	E. to N.
New Orleans, La	Nov. 1, 1870	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.	NE. to NW.
Newport, R. I	Aug. 1, 1875	SE. to NE.	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.
New York, N. Y	Nov. 1, 1870	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.
Norfolk, Va	Jan. 1, 1871	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.	NE. to NW.
North Platte, Nebr	Sept. 18, 1874	W. to S.	NW. to SW.	W. to S.	N. to W.	NW. to SW.	NW. to SW.
Olympia, Wash	July 1, 1877	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.
Omaha, Nebr	Nov. 1, 1870	NW. to SW.	NW. to SW.	W. to S.	NW. to SW.	NW. to SW.	NW. to SW.
Oswego, N. Y	Nov. 1, 1870	E. to N.	E. to N.	E. to N.	NW. to SW.	E. to N.	E. to N.
Pensacola, Fla	Oct. 27, 1879	W. to S.	NW. to SW.	N. to W.	NE. to NW.	NW. to SW.	N. to W.
Philadelphia, Pa	Jan. 1, 1871	N. to W.	SE. to NE.	N. to W.	NE. to NW.	NE. to NW.	NE. to NW.
Phœnix, Ariz	May 9, 1877	NE. to NW.	N. to W.	SE. to NE.	E. to N.	W. to S.	SW. to SE.
Pioche, Nev	July 29, 1877	SE. to NE.	E. to N.	E. to N.	SE. to NE.	E. to N.	SE. to NE.
Pittsburg, Pa	Nov. 1, 1870	NE. to NW.	NE. to NW.	N. to W.	E. to N.	E. to N.	SE. to NE.
Port Huron, Mich	July 25, 1874	E. to N.	E. to N.	NW. to SW.	NW. to SW.	N. to W.	N. to W.
Portland, Me	Jan. 15, 1871	S. to E.	S. to E.	N. to W.	N. to W.	N. to W.	NE. to NW.
Portland, Oreg	Nov. 1, 1871	NE. to NW.	NE. to NW.	E. to N.	E. to N.	E. to N.	SE. to NE.
Prescott, Ariz	Nov. 19, 1873	SE. to NE.	NE. to NW.	NE to NW.	NE. to NW.	NE. to NW.	NE. to NW.
Punta Rassa, Fla	Aug. 15, 1871	NW. to SW.	N. to W.	NE. to NW.	E. to N.	NE. to NW.	NE. to NW.
Red Bluff, Cal	July 1, 1877	NE. to NW.	NW. to SW.	E. to N.	E. to N.	N. to W.	N. to W.
Rio Grande City, Tex	May 28, 1875	NW. to SW.	W. to S.	W. to S.	W. to S.	NW. to SW.	N. to W.
Rochester, N. Y	Nov. 1, 1870	E. to N.	NE. to NW.	NE. to NW.	NE. to NW.	E. to N.	E. to N.
Roseburg, Oreg	July 15, 1877	NE. to NW.	NE. to NW.	NE. to NW.	SE. to NE.	SE. to NE.	SE. to NE.
Sacramento, Cal	July 1, 1877	NE. to NW.	NE. to NW.	NE. to NW.	E. to N.	NE. to NW.	NE. to NW.
Saint Louis, Mo	Nov. 1, 1870	N. to W.	N. to W.	N. to W.	NE. to NW.	NE. to NW.	NE. to NW.

Saint Paul, Minn	*Nov. 1, 1870*	*W. to S.*	*W. to S.*	*NW. to SW.*	*NW. to SW.*	*N. to W.*	*NE. to NW.*
Saint Vincent, Minn	*Sept. 5, 1880*	*E. to N.*	*E. to N.*	*NW. to SW.*	*N. to W.*	*NW. to SW.*	*N. to W.*
Salt Lake City, Utah	*Mar. 22, 1874*	*E. to N.*	*NE. to NW.*	*W. to S.*	*W. to S.*	*E. to N.*	*W. to S.*
San Antonio, Tex	Sept. 22, 1875	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	N. to W.	NW. to SW.
San Diego, Cal	Nov. 1, 1871	NE. to NW.	NE. to NW.	E. to N.	SE. to NE.	E. to N.	SE. to NE.
Sandusky, Ohio	Aug. 2, 1877	NE. to NW.	E. to N.	N. to W.	N. to W.	SE. to NE.	N. to W.
Sandy Hook, N. J	Dec. 10, 1873	NW. to SW.	SW. to SE.	N. to W.	NE. to NW.	NE. to NW.	NE. to NW.
San Francisco, Cal	Mar. 8, 1871	E. to N.	E. to N.	NE. to NW.	E. to N.	E. to N.	E. to N.
Santa Fé, N. Mex	Nov. 20, 1871	N. to W.	SE. to NE.	E. to N.	S. to E.	NE. to NW.	N. to W.
Savannah, Ga	Jan. 1, 1871	SE. to NE.	N. to W.	NE. to NW.	NE. to NW.	NW. to SW.	N. to W.
Shreveport, La	Sept. 3, 1871	NW. to SW.	NW. to SW.	NW. to SW.	N. to W.	NE. to NW.	N. to W.
Silver City, N. Mex	May 15, 1878	N. to W.	E. to N.	E. to N.	NE. to NW.	SE. to NE.	W. to S.
Smithville, N. C	Oct. 15, 1875	NW. to SW.	N. to W.	N. to W.	N. to W.	N. to W.	NE. to NW.
Springfield, Ill	July 1, 1879	E. to N.	SE. to NE.	W. to S.	N. to W.	N. to W.	E. to N.
Springfield, Mass	July 19, 1873	SE. to NE.	SE. to NE.	SE. to NE.	NW. to SW.	N. to W.	N. to W.
Stockton, Tex	Feb. 26, 1876	S. to E.	NW. to SW.	NW. to SW.	N. to W.	NW. to SW.	N. to W.
Thatcher's Island, Mass	Dec. 26, 1875	N. to W.	N. to W.	NW. to SW.	N. to W.	N. to W.	SE. to NE.
Toledo, Ohio	Nov. 1, 1870	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.	NE. to NW.
Tucson, Ariz	Dec. 2, 1875	E. to N.	E. to N.	N. to W.	E. to N.	E. to N.	NE. to NW.
Umatilla, Oreg	July 15, 1877	N. to W.	NE. to NW.	E. to N.	SW. to SE.	S. to E.	E. to N.
Uvalde, Tex	Sept. 6, 1875	NW. to SW.	NW. to SW.	N. to W.	N. to W.	N. to W.	N. to W.
Vicksburg, Miss	Sept. 10, 1871	N. to W.	N. to W.	N. to W.	N. to W.	NE. to NW.	NE. to NW.
Visalia, Cal	July 1, 1877	W. to S.	NE. to NW.	NE. to NW.	NE. to NW.	SE. to NE.	S. to E.
Washington, D. C	Nov. 1, 1870	NW. to SW.	SE. to NE.	NW. to SW.	NW. to SW.	SE. to NE.	E. to N.
Wickenburg, Ariz	Jan. 6, 1874	N. to W.	NE. to NW.	NE. to NW.	NE. to NW.	E. to N.	NW. to SW.
Wilmington, N. C	Jan. 1, 1871	NW. to SW.	N. to W.	N. to W.	N. to W.	N. to W.	NE. to NW.
Winnemucca, Nev	July 1, 1877	S. to E.	N. to W.	SE. to NE.	S. to E.	SE. to NE.	S. to E.
Wood's Holl, Mass	Jan. 1, 1873	NE. to NW.	N. to W.	N. to W.	N. to W.	N. to W.	NE. to NW.
Yankton, Dak	Apr. 1, 1873	W. to S.	W. to S.	E. to N.	W. to S.	N. to W.	N. to W.
Yuma, Ariz	Nov. 18, 1873	NE. to NW.	NW. to SW.	E. to N.	S. to E.	(*a*)	(*b*)

a No rainfall during May of any year.

b Data incomplete.

APPENDIX 46.—*Table showing the quadrants from which the winds least likely to be followed by rain or snow are observed, &c.*—Continued.

Stations.	Station established.	July.	August.	September.	October.	November.	December.
Albany, N. Y	Dec. 22, 1873	E. to N.	SE. to NE.	E. to N.	SE. to NE.	SE. to NE.	E. to N.
Alpena, Mich	Sept. 10, 1872	E. to N.	NE. to NW.	E. to N.	SE. to NE.	E. to N.	E. to N.
Atlanta, Ga	Sept. 25, 1878	E. to N.	NE. to NW.	N. to W.	N. to W.	N. to W.	N. to W.
Atlantic City, N. J	Dec. 10, 1873	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.
Augusta, Ga	Nov. 2, 1870	E. to N.	N. to W.	W. to S.	N. to W.	W. to S.	E. to N.
Baltimore, Md	Jan. 1, 1871	E. to N.	NE. to NW.	NW. to SW.	N. to W.	N. to W.	N. to W.
Barnegat, N. J	Dec. 10, 1873	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.
Bismarck, Dak	Sept. 15, 1874	W. to S.	E. to N.	W. to S.	SW. to SE.	W. to S.	W. to S.
Block Island, R. I	Sept. 1, 1880	N. to W.	N. to W.	W. to S.	S. to E.	N. to W.	E. to N.
Boisé City, Idaho	July 1, 1877	S. to E.	W. to S.	SW. to SE.	E. to N.	E. to N.	E. to N.
Boston, Mass	Nov. 1, 1870	NE. to NW.	N. to W.	N. to W.	N. to W.	NE. to NW.	E. to N.
Brackettville, Tex	Sept. 1, 1875	N. to W.	NW. to SW.	NW. to SW.	NW. to SW.	W. to S.	SW. to SE.
Brownsville, Tex	Aug. 25, 1875	N. to W.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.
Buffalo, N. Y	Nov. 1, 1870	NE. to NW.	NE. to NW.	NE. to NW.	NE. to NW.	NE. to NW.	NE. to NW.
Burlington, Vt	May 24, 1871	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.	NW. to SW.	NW. to SW.
Cairo, Ill	June 1, 1871	N. to W.	N. to W.	NW. to SW.	E. to N.	NE. to NW.	NW. to SW.
Campo, Cal	Jan. —, 1874	E. to N.	S. to E.	S. to E.	E. to N.	E. to N.	NE. to NW.
Camp Thomas, Ariz	Sept. 22, 1877	SW. to SE.	W. to S.	NW. to SW.	NW. to SW.	S. to E.	NW. to SW.
Cape Henry, Va	Dec. 15, 1873	N. to W.	N. to W.	N. to W.	E. to N.	NW. to SW.	N. to W.
Cape May, N. J	May 24, 1871	NW. to SW.	N. to W.	N. to W.	N. to W.	NE. to NW.	NW. to SW.
Castroville, Tex	Sept. 29, 1875	NE. to NW.	N. to W.	NW. to SW.	NW. to SW.	W. to S.	W. to S.
Cedar Keys, Fla	Nov. 7, 1879	NE. to NW.	E. to N.	NE to NW.	N. to W.	NW. to SW.	NW. to SW.
Champaign, Ill	Oct. 13, 1880	S. to E.	S. to E.	E. to N.	N. to W.	N. to W.	E. to N.
Charleston, S. C	Jan. 5, 1871	NE. to NW.	N. to W.	N. to W.	NW. to SW.	NW. to SW.	SE. to NE.
Charlotte, N. C	Oct. 6, 1878	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.
Chattanooga, Tenn	Jan. 8, 1879	E. to N.	N. to W.	NW. to SW.	N. to W.	N. to W.	N. to W.
Cheyenne, Wyo	Nov. 1, 1870	NW. to SW.	NE. to NW.	SW. to SE.	S. to E.	SE. to NE	SE. to NE.
Chicago, Ill	Nov. 1, 1870	NE. to NW.	N. to W.	N. to W.	N. to W.	E. to N.	NE. to NW.
Chincoteague, Va	Mar. 16, 1880	N. to W.	E. to N.	N. to W.	N. to W.	NW. to SW.	S. to E.
Cincinnati, Ohio	Nov. 1, 1870	E. to N.	NE. to NW.	E. to N.	E. to N.	N. to W.	N. to W.
Cleveland, Ohio	Nov. 1, 1870	NE. to NW.	SE. to NE.	NE. to NW.	NE. to NW.	NE. to NW.	N. to W.
Columbus, Ohio	July 1, 1878	E. to N.	NE to NW.	E. to N.	E. to N.	NE. to NW.	NE. to NW.
Concho, Tex	Oct. 10, 1875	N. to W.	N. to W.	N. to W.	N. to W.	SW. to SE.	N. to W.
Corsicana, Tex	Sept. 15, 1874	N. to W.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.
Davenport, Iowa	May 24, 1871	N. to W.	N. to W.	N. to W.	N. to W.	NE. to NW.	NE. to NW.
Dayton, Wash	July 1, 1879	SE. to NE.	E. to N.	SE. to NE.	E. to N.	S. to E.	NE. to NW.
Deadwood, Dak	Nov. 1, 1878	NW. to SW.	N. to W.	SE. to NE.	S. to E.	S. to E.	SE. to NE.
Decatur, Tex	Feb. 1, 1876	N. to W.	N. to W	N. to W.	NW. to SW.	NW. to SW.	NW. to SW.
Delaware Breakwater, Del	Jan. 28, 1880	N. to W.	SE. to NE.	N. to W.	N. to W.	SE. to NE.	SE. to NE.
Denison, Tex	Dec. 16, 1874	N. to W.	NE. to NW.	NW. to SW.	NW. to SW.	W. to S.	NW. to SW.
Denver, Col	Nov. 19, 1871	W. to S.	W. to S.	SW. to SE.	W. to S.	W. to S.	W. to S.
Des Moines, Iowa	Aug. 1, 1878	N. to W.	N. to W.	SE. to NE.	NE. to NW.	S. to E.	E. to N.
Detroit, Mich	Nov. 1, 1870	NE. to NW.	N. to W.	NE. to NW.	NE. to NW.	NE. to NW.	NE. to NW.
Dodge City, Kans	Sept. 15, 1874	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.

Dubuque, Iowa	*July 10, 1873*	*N. to W.*	*E. to N.*	*E. to N.*	*E. to N.*	*E. to N.*	*N. to W.*
Duluth, Minn	*Nov. 1, 1870*	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.
Eagle Pass, Tex	Jan. 19, 1875	NW. to SW.	NW. to SW.	NW. to SW.	W. to S.	W. to S.	W. to S.
Eagle Rock, Idaho	Dec. 3, 1880	SE. to NE.	N. to W.	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.
Eastport, Me	Apr. 1, 1873	SE. to NE.	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.
El Paso, Tex	Nov. 5, 1877	NE. to NW.	W. to S.	SW. to SE.	NE. to NW.	SW. to SE.	SW. to SE.
Erie, Pa	May 25, 1873	E. to N.	NE. to NW.	E. to N.	E. to N.	E to N.	E. to N.
Escanaba, Mich	May 24, 1871	E. to N.	N. to W.	N. to W.	E. to N.	SE. to NE.	SE. to NE.
Florence, Ariz	Nov. 12, 1874	NE. to NW.	SE. to NE.	NE. to NW.	E. to N.	N. to W.	NE. to NW.
Fort Apache, Ariz	Oct. 9, 1877	NE. to NW.	NE. to NW.	N. to W.	N. to W.	NW. to SW.	N. to W.
Fort Assinniboine, Mont	Oct. 6, 1879	SE. to NE.	N. to W.	S. to E.	N. to W.	S. to E.	NW. to SW.
Fort Bennett, Dak	Dec. 22, 1879	NE. to NW.	NW. to SW.	W. to S.	NW. to SW.	S. to E.	W. to S.
Fort Benton, Mont	Oct. 11, 1879	N. to W.	NW. to SW.	S. to E.	N. to W.	S. to E.	S. to E.
Fort Buford, Dak	Oct. 23, 1878	NW. to SW.	W. to S.	SW. to SE.	W. to S.	SE. to NE.	S. to E.
Fort Custer, Mont	Dec. 5, 1878	W. to S.	W. to S.	SW. to SE.	S. to E.	W. to S.	W. to S.
Fort Davis, Tex	Dec. 24, 1877	N. to W.	N. to W.	S. to E.	S. to E.	S. to E.	W. to S.
Fort Elliott, Tex	Nov. 29, 1879	N. to W.	N. to W.	N. to W.	NW. to SW.	SW. to SE.	W. to S.
Fort Gibson, Ind. T	Apr. 1, 1873	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.
Fort Grant, Ariz	Nov. 1, 1875	NE. to NW.	N. to W.	W. to S.	N. to W.	S. to E.	S. to E.
Fort Griffin, Tex	July 1, 1875	NW. to SW.	W. to S.	NW. to SW.	N. to W.	NW. to SW.	NW. to SW.
Fort Keogh, Mont	Nov. 18, 1878	SW. to SE.	SW. to SE.	S. to E.	SW. to SE.	SE. to NE.	S. to E.
Fort McKavett, Tex	Oct. 19, 1875	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	N. to W.
Fort Macon, N. C	May 23, 1878	S. to E.	N. to W.	W. to S.	N. to W.	N. to W.	N. to W.
Fort Missoula, Mont	Dec. 15, 1879	SE. to NE.	SE. to NE.	S. to E.	SE. to NE.	SE. to NE.	S. to E.
Fort Shaw, Mont	Apr. 1, 1880	NE. to NW.	SW. to SE.	S. to E.	S. to E.	S. to E.	SE. to NE.
Fort Sill, Ind. T	June 23, 1875	NW. to SW.	NW. to SW.	N. to W.	N. to W.	NW. to SW.	NW. to SW.
Fort Stevenson, Dak	Sept. 19, 1878	NW. to SW.	NW. to SW.	SE. to NE.	SW. to SE.	SE. to NE.	SW. to SE.
Fort Verde, Ariz	Nov. 9, 1874	E. to N.	E. to N.	E. to N.	NE. to NW.	NE. to NW.	E. to N.
Fredericksburg, Tex	Mar. 14. 1876	N. to W.	NW. to SW.	NW. to SW.	N. to W.	NW. to SW.	NW. to SW.
Galveston, Tex	Apr. 19, 1871	N. to W.	N. to W.	NW. to SW.	N. to W.	NW. to SW.	NW. to SW.
Grand Haven, Mich	May 24, 1871	NE. to NW.	N. to W.	NE. to NW.	NE. to NW.	NE. to NW.	NE. to NW.
Hatteras, N. C	Dec. 1, 1880	N. to W.	N. to W.	NW. to SW.	N. to W.	N. to W.	N. to W.
Helena, Mont	Oct. 15, 1879	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.
Henrietta, Tex	Feb. 1, 1877	N. to W.	NW. to SW.	N. to W.	N. to W.	NW. to SW.	NW. to SW.
Indianapolis, Ind	Feb. 10, 1871	E. to N.	NE. to NW.	N. to W.	E. to N.	N. to W.	N. to W.
Indianola, Tex	May 1, 1872	N. to W.	N. to W.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.
Jacksborough, Tex	May 8, 1875	N. to W.	E. to N.	N. to W.	N. to W.	W. to S.	NW. to SW.
Jacksonville, Fla	Sept. 11, 1871	N. to W.	N. to W.	N. to W.	NW. to SW.	NW. to SW.	N. to W.
Keokuk, Iowa	July 16, 1871	N. to W.	NW. to SW.	E. to N.	N. to W.	NE. to NW.	W. to S.
Key West, Fla	Nov. 1, 1870	N. to W.	N. to W.	N. to W.	NW. to SW.	NW. to SW.	N. to W.
Kittyhawk, N. C	Jan. 15, 1875	SE. to NE.	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.
Knoxville, Tenn	Jan. 1, 1871	NE. to NW.	SE. to NE.	NE. to NW.	S. to E.	S. to E.	N. to W.
La Crosse, Wis	Oct. 15, 1872	E. to N.	NW. to SW.	NW. to SW.	SE. to NE.	NW. to SW.	NW. to SW.
La Mesilla, N. Mex	June 16, 1876	E. to N.	NE. to NW.	SW. to SE.	NE. to NW.	NW. to SW.	N. to W.
Laredo, Tex	Dec. 16, 1875	NW. to SW.	NW. to SW.	W. to S.	W. to S.	W. to S.	W. to S.
Leavenworth, Kans	May 21, 1871	N. to W.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.
Lewiston, Idaho	July 1, 1879	W. to S.	S. to E.	S. to E.	NE. to NW.	NE. to NW.	NE. to NW.
Little Rock, Ark	July 1, 1879	S. to E.	N. to W.	N. to W.	NW. to SW.	NW. to SW.	N. to W.
Los Angeles, Cal	July 1, 1877	(a)	(a)	(a)	SE. to NE.	N. to W.	NW. to SW.
Louisville, Ky	Sept. 11, 1871	E. to N.	E. to N.	E. to N.	NE. to NW.	NE. to NW.	N. to W.

a No rainfall during July, August, and September of any year.

APPENDIX 46.—*Table showing the quadrants from which the winds least likely to be followed by rain or snow are observed, &c.*—Continued.

COMPUTED FROM THE COMMENCEMENT OF OBSERVATIONS TO DECEMBER 31, 1881.

Stations.	Station established.	July.	August.	September.	October.	November.	December.
Lynchburg, Va	May 24, 1871	NE. to NW.	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.
Madison, Wis	Sept. 29, 1878	NE. to NW.	N. to W.	NE. to NW.	NW. to SW.	NE. to NW.	N. to W.
Marquette, Mich	May 1, 1871	N. to W.	E. to N.	E. to N.	E. to N.	E. to N.	E. to N.
Mason, Tex	Feb. 7, 1876	N. to W.	NW. to SW.	NW. to SW.	NW. to SW.	W. to S.	N. to W.
Memphis, Tenn	Feb. 28, 1871	S. to E.	NW. to SW.	NW. to SW.	N. to W.	NW. to SW.	N. to W.
Milwaukee, Wis	Nov. 1, 1870	NE. to NW.	N. to W.	E. to N.	E. to N.	E. to N.	E. to N.
Mobile, Ala	Nov. 7, 1870	NW. to SW.	NE. to NW.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.
Montgomery, Ala	Nov. 9, 1870	NE. to NW.	NE. to NW.	N. to W.	NW. to SW.	NW. to SW.	N. to W.
Moorhead, Minn	Jan. 1, 1881	NW. to SW.	NW. to SW.	W. to S.	NW. to SW.	W. to S.	E. to N.
Morgantown, W. Va	Jan. 25, 1873	SE. to NE.	E. to N.	N. to W.	SE. to NE.	N. to W.	NE. to NW.
Nashville, Tenn	Nov. 1, 1870	NE. to NW.	E. to N.	NE. to NW.	NE. to NW.	NE. to NW.	NE. to NW.
New Haven, Conn	Dec. 10, 1872	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.
New London, Conn	Jan. 10, 1871	E. to N.	N. to W.	N. to W.	N. to W.	N. to W.	S. to E.
New Orleans, La	Nov. 1, 1870	NE. to NW.	NE. to NW.	N. to W.	NW. to SW.	NW. to SW.	N. to W.
Newport, R. I	Aug. 1, 1875	SE. to NE.	N. to W.	N. to W.	N. to W.	N. to W.	S. to E.
New York, N. Y	Nov. 1, 1870	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.
Norfolk, Va	Jan. 1, 1871	N. to W.	N. to W.	N. to W.	N. to W.	NW. to SW.	N. to W.
North Platte, Nebr	Sept. 18, 1874	N. to W.	NW. to SW.	W. to S.	W. to S.	W. to S.	SW. to SE.
Olympia, Wash	July 1, 1877	SE. to NE.	SE. to NE.	SE. to NE.	N. to W.	SE. to NE.	SE. to NE.
Omaha, Nebr	Nov. 1, 1870	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	W. to S.	SE. to NE.
Oswego, N. Y	Nov. 1, 1870	E. to N.	E. to N.	E. to N.	E. to N.	E. to N.	E. to N.
Pensacola, Fla	Oct. 27, 1879	SE. to NE.	NW. to SW.	N. to W.	N. to W.	NW. to SW.	NW. to SW.
Philadelphia, Pa	Jan. 1, 1871	E. to N.	NE. to NW.	NE. to NW.	NE. to NW.	N. to W.	N. to W.
Phœnix, Ariz	May 9, 1877	NE. to NW.	N. to W.	N. to W.	SE. to NE.	NE. to NW.	NE. to NW.
Pioche, Nev	July 29, 1877	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.	E. to N.	NE. to NW.
Pittsburg, Pa	Nov. 1, 1870	SE. to NE.	E. to N.	NE. to NW.	E. to N.	E. to N.	NE. to NW.
Port Huron, Mich	July 25, 1874	NW. to SW.	N. to W.	E. to N.	E. to N.	NE. to NW.	E. to N.
Portland, Me	Jan. 15, 1871	N. to W.	N. to W.	N. to W.	N. to W.	NW. to SW.	S. to E.
Portland, Oreg	Nov. 1, 1871	E. to N.	E. to N.	E. to N.	E. to N.	E. to N.	NE. to NW.
Prescott, Ariz	Nov. 19, 1873	SE. to NE.	NE. to NW.	N. to W.	NE. to NW.	NE. to NW.	NE. to NW.
Punta Rassa, Fla	Aug. 15, 1871	NE. to NW.	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.
Red Bluff, Cal	July 1, 1877	NE. to NW.	NE. to NW.	NW. to SW.	NE. to NW.	NW. to SW.	E. to N.
Rio Grande City, Tex	May 28, 1875	N. to W.	NW. to SW.	W. to S.	NW. to SW.	W. to S.	W. to S.
Rochester, N. Y	Nov. 1, 1870	E. to N.	E. to N.	E. to N.	NE. to NW.	E. to N.	E. to N.
Roseburg, Oreg	July 15, 1877	S. to E.	SE. to NE.	S. to E.	E. to N.	E. to N.	NE. to NW.
Sacramento, Cal	July 1, 1877	E. to N.	NE. to NW.	NE. to NW.	N. to W.	E. to N.	NW. to SW.
Saint Louis, Mo	Nov. 1, 1870	N. to W.	NE. to NW.	E. to N.	E. to N.	N. to W.	NW. to SW.
Saint Paul, Minn	Nov. 1, 1870	E. to N.	NE. to NW.	N. to W.	E. to N.	N. to W.	NW. to SW.
Saint Vincent, Minn	Sept. 5, 1880	E. to N.	E. to N.	E. to N.	W. to S.	E. to N.	E. to N.
Salt Lake City, Utah	Mar. 22, 1874	E. to N.	E. to N.	E. to N.	E. to N.	NE. to NW.	E. to N.
San Antonio, Tex	Sept. 22, 1875	N. to W.	W. to S.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.
San Diego, Cal	Nov. 1, 1871	E. to N.	SE. to NE.	SW. to SE.	SE. to NE.	NE. to NW.	NE. to NW.
Sandusky, Ohio	Aug. 2, 1877	E. to N.	S. to E.	E. to N.	E. to N.	NE. to NW.	N. to W.

Sandy Hook, N. J.	*Dec. 10, 1873*	*NE. to NW.*	*N. to W.*	*N. to W.*	*N. to W.*	*N. to W.*	*N. to W.*
San Francisco, Cal	*Mar. 8, 1871*	*E. to N.*	*SE. to NE.*	*E. to N.*	*E. to N.*	*E. to N.*	*E. to N.*
Santa Fé, N. Mex.	*Nov. 20, 1871*	*E. to N.*	*W. to S.*	*E. to N.*	*N. to W.*	*N. to W.*	*E. to N.*
Savannah, Ga	Jan. 1, 1871	N. to W.	N. to W.	N. to W.	NW. to SW.	W. to S.	N. to W.
Shreveport, La	Sept. 3, 1871	N. to W.	N. to W.	NW. to SW.	N. to W.	NW. to SW.	NW. to SW.
Silver City, N. Mex	May 15, 1878	E. to N.	SE. to NE.	SE. to NE.	E. to N.	NW. to SW.	E. to N.
Smithville, N. C	Oct. 15, 1875	N. to W.	N. to W.	N. to W.	N. to W.	NW. to SW.	N. to W.
Springfield, Ill	July 1, 1879	SE. to NE.	NE. to NW.	NW. to SW.	NE. to NW.	NE. to NW.	NW. to SW.
Springfield, Mass	July 19, 1873	SE. to NE.	SE. to NE.	N. to W.	NW. to SW.	NW. to SW.	SE. to NE.
Stockton, Tex	Feb. 26, 1876	N. to W.	N. to W.	N. to W.	N. to W.	NW. to SW.	NW. to SW.
Thatcher's Island, Mass	Dec. 26, 1875	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.
Toledo, Ohio	Nov. 1, 1870	NE. to NW.	N. to W.	E. to N.	NE. to NW.	N. to W.	N. to W.
Tucson, Ariz	Dec. 2, 1875	E. to N.	E. to N.	E. to N.	E. to N.	NE. to NW.	E. to N.
Umatilla, Oreg	July 15, 1877	SE. to NE.	S. to E.	E. to N.	E. to N.	NE. to NW.	N. to W.
Uvalde, Tex	Sept. 6, 1875	N. to W.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.
Vicksburg, Miss	Sept. 10, 1871	E. to N.	E. to N.	N. to W.	N. to W.	N. to W.	N. to W.
Visalia, Cal	July 1, 1877	S. to E.	S. to E.	N. to W.	E. to N.	SE. to NE.	E. to N.
Washington, D. C	Nov. 1, 1870	E. to N.	N. to W.	N. to W.	N. to W.	N. to W.	NW. to SW.
Wickenburg, Ariz	Jan. 6, 1874	SE. to NE.	NE. to NW.	NE. to NW.	N. to W.	E. to N.	SE. to NE.
Wilmington, N. C	Jan. 1, 1871	N. to W.	N. to W.	N. to W.	N. to W.	NW. to SW.	N. to W.
Winnemucca, Nev	July 1, 1877	S. to E.	E. to N.	SE. to NE.	N. to W.	SE. to NE.	S. to E.
Wood's Holl, Mass	Jan. 1, 1873	NE. to NW.	N. to W.	N. to W.	NE. to NW.	N. to W.	N. to W.
Yankton, Dak	Apr. 1, 1873	N. to W.	N. to W.	W. to S.	W. to S.	W. to S.	W. to S.
Yuma, Ariz	Nov. 18, 1873	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.	E. to N.

b No rainfall during July, August, and September.

APPENDIX 47.

Table showing the quadrants from which the winds most likely to be followed by rain or snow are observed to blow during each month of the year in the several geographical districts of the United States.

[Computed from observations taken during a period of from one to eleven years.]

Geographical district.	January.	February.	March.	April.	May.	June.
Eastern Gulf States	S. to E.	S. to E.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.
Key West and Punta Rassa	SE. to NE.	S. to E.	S. to E.	S. to E.	SE. to NE.	SE. to NE.
Lower Lake Region	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	W. to S.	W. to S.
Lower Mississippi Valley	SW. to SE.	S. to E.	S. to E.	S. to E.	SW. to SE.	SW. to SE.
Middle Atlantic States	SE. to NE.	S. to E.	S. to E.	S. to E.	SW. to SE.	SW. to SE.
Middle Eastern Rocky Mountain Slope	NE. to NW.	E. to N.	E. to N.	E. to N.	SE. to NE.	S. to E.
Middle Pacific Coast Region	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.
Middle Plateau District	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	NW. to SW.	NE. to NW.
Missouri Valley	NE. to NW.	NE. to NW.	S. to E.	SE. to NE.	S. to E.	S. to E.
New England States	SW. to SE.	SW. to SE.	S. to E.	S. to E.	SW. to SE.	SW. to SE.
Northern Rocky Mountain Slope	NE. to NW.	NE. to NW.	NE. to NW.	NE. to NW.	NE. to NW.	SE. to NE.
North Pacific Coast Region	SW. to SE.	W. to S.	SW. to SE.	SW. to SE.	W. to S.	W. to S.
Northern Plateau District	W. to S.	SW. to SE.	SW. to SE.	NW. to SW.	W. to S.	NW. to SW.
Ohio Valley	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.
Rio Grande Valley	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.	S. to E.
South Atlantic States	E. to N.	SE. to NE.	W. to S.	SW. to SE.	SE. to NE.	SW. to SE.
Southeastern Rocky Mountain Slope	E. to N.	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.
South Pacific Coast Region	S. to E.	W. to S.	W. to S.	W. to S.	W. to S.	SW. to SE.
Southern Plateau District	W. to S.	W. to S.	SW. to SE.	W. to S.	SW. to SE.	S. to E.
Tennessee	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	W. to S.
Upper Lake Region	SW. to SE.	SW. to SE.	SE. to NE.	SE. to NE.	S. to E.	SW. to SE.
Upper Mississippi Valley	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.	SW. to SE.
Western Gulf States	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.

Geographical district.	July.	August.	September.	October.	November.	December.
Eastern Gulf States	SW. to SE.	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.
Key West and Punta Rassa	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.	SE. to NE.
Lower Lake Region	W. to S.	W. to S.	W. to S.	SW. to SE.	SW. to SE.	SW. to SE.
Lower Mississippi Valley	NW. to SW.	SW. to SE.	SW. to SE.	SW. to SE.	S. to E.	SE. to NE.
Middle Atlantic States	SW. to SE.	SW. to SE.	S. to E.	SW. to SE.	SW. to SE.	SW. to SE.
Middle Eastern Rocky Mountain Slope	S. to E.	S. to E.	S. to E.	SE. to NE.	NE. to NW.	E. to N.
Middle Pacific Coast Region	SW. to SE.	W. to S.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.
Middle Plateau District	N. to W.	SW. to SE.	SW. to SE.	SW. to SE.	W. to S.	SW. to SE.
Missouri Valley	S. to E.	S. to E.	S. to E.	S. to E.	NE. to NW.	NE. to NW.
New England States	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	NE. to NW.
Northern Rocky Mountain Slope	S. to E.	SE. to NE.	NE. to NW.	NE. to NW.	N. to W.	NE. to NW.

North Pacific Coast Region	W. to S.	SW. to SE.	SW. to SE.	W. to S.	SW. to SE.	S. to E.
Northern Plateau District	W. to S.	NW. to SW.	NW. to SW.	W. to S.	SW. to SE.	SW. to SE.
Ohio Valley	W. to S.	W. to S.	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.
Rio Grande Valley	S. to E.	SE. to NE.	SE. to NE.	SE. to NE.	E. to N.	SE. to NE.
South Atlantic States	SW. to SE.	SW. to SE.	SE. to NE.	SE. to NE.	E. to N.	SW. to SE.
Southeastern Rocky Mountain Slope	S. to E.	S. to E.	S. to E.	S. to E.	E. to N.	E. to N.
South Pacific Coast Region	W. to S.	NW. to SW.	N. to W.	W. to S.	W. to S.	S. to E.
Southern Plateau District	SW. to SE.	S. to E.	SW. to SE.	SW. to SE.	S. to E.	W. to S.
Tennessee	W. to S.	W. to S.	SW. to SE.	SW. to SE.	SW. to SE.	W. to S.
Upper Lake Region	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	W. to S.	W. to S.
Upper Mississippi Valley	SW. to SE.	SW. to SE.	SW. to SE.	SW. to SE.	S. to E.	S. to E.
Western Gulf States	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.	S. to E.

NOTES.

Eastern Gulf States.—Eastern Mississippi, Alabama, and Northwestern Florida.

Lower Lake Region.—Lakes Erie and Ontario, with adjacent territory.

Lower Mississippi Valley.—A belt of country two hundred miles broad, from Cairo to Vicksburg. Below Vicksburg the character of the country so changes that it is no longer described as a valley.

Middle Atlantic States.—New York, New Jersey, Pennsylvania, Delaware, Maryland, District of Columbia, and Virginia as the Middle States, and that part of those States lying east of the Alleghanies as the Middle Atlantic States.

Middle Eastern Rocky Mountain Slope.—Eastern Colorado, Southern Nebraska, Kansas, northwestern portion of Indian Territory, portion of Northern Texas, also a portion of Northeastern New Mexico.

Middle Pacific Coast Region.—Those portions of California west of the Sierra Nevadas and north of the 37th parallel of latitude.

Middle Plateau District.—Western Colorado, Utah, Nevada, southwestern corner of Wyoming, and the portion of California lying east of the Sierra Nevadas.

Missouri Valley.—A belt of country two hundred miles broad, from Fort Sully, Dak., to Jefferson City, Mo.

New England States.—Maine, New Hampshire, Vermont, Massachusetts, Connecticut, and Rhode Island.

Northern Rocky Mountain Slope.—Those portions of Montana and Wyoming lying east of the Rocky Mountains, Southwestern Dakota, and Northwestern Nebraska.

North Pacific Region.—Those portions of Oregon and Washington Territory lying west of the Cascade Range.

Northern Plateau District.—Portion of Western Wyoming, Western Montana, Idaho, and the portions of Oregon and Washington Territory lying east of the Cascade Range.

Ohio Valley.—The belt of country, about two hundred miles broad, from Pittsburgh, Pa., to Cairo, Ill.

Rio Grande Valley.—Southwestern Texas below the junction of the Rio Pecos with the Rio Grande.

South Atlantic States.—North Carolina, South Carolina, Georgia, and Northern and Eastern Florida.

Southeastern Rocky Mountain Slope.—Southeastern New Mexico, Central and Western Texas.

South Pacific Coast Region.—Those portions of California west of the Sierra Nevadas and south of the 37th parallel of latitude.

Southern Plateau District.—Western New Mexico, Arizona, and Southeastern California.

Upper Lake Region.—Lakes Superior, Huron, and Michigan, with adjacent country.

Upper Mississippi Valley.—The belt of country, about two hundred miles broad, from Saint Paul to Cairo.

Western Gulf States.—Western Louisiana, Western Arkansas, Eastern Texas, Southern Missouri, and southeastern portion of Indian Territory.

APPENDIX 48.

Table showing the quadrants from which the winds least likely to be followed by rain or snow are observed to blow during each month of the year in the several geographical districts of the United States.

[Computed from observations taken during a period of from one to eleven years.]

Geographical district.	January.	February.	March.	April.	May.	June.
Eastern Gulf States	NW. to SW.	NW. to SW.	N. to W.	N. to W.	N. to W.	NE. to NW.
Key West and Punta Rassa	NW. to SW.	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.
Lower Lake Region	NE. to NW.	NE. to NW.	NE. to NW.	N. to W.	E. to N.	E. to N.
Lower Mississippi Valley	N. to W.	N. to W.	N. to W.	N. to W.	NE. to NW.	E. to N.
Middle Atlantic States	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.	NE. to NW.
Middle Eastern Rocky Mountain Slope	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.
Middle Pacific Coast Region	E. to N.	E. to N.	NE. to NW.	E. to N.	E. to N.	NE. to NW.
Middle Plateau District	E. to N.	N. to W.	E. to N.	E. to N.	E. to N.	W. to S.
Missouri Valley	W. to S.	W. to S.	W. to S.	NW. to SW.	NW. to SW.	NW. to SW.
New England States	SE. to NE.	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.
Northern Rocky Mountain Slope	S. to E.	W. to S.	W. to S.	W. to S.	W. to S.	NW. to SW.
North Pacific Coast Region	NE. to NW.	NE. to NW.	E. to N.	E. to N.	SE. to NE.	SE. to NE.
Northern Plateau District	NE. to NW.	NE. to NW.	E. to N.	NE. to NW.	E. to N.	E. to N.
Ohio Valley	N. to W.	NE. to NW.	N. to W.	NE. to NW.	NE. to NW.	E. to N.
Rio Grande Valley	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.
South Atlantic States	NW. to SW.	N. to W.	N. to W.	N. to W.	N. to W.	NE. to NW.
Southeastern Rocky Mountain Slope	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	N. to W.	N. to W.
South Pacific Coast Region	NE. to NW.	NE. to NW.	NE. to NW.	E. to N.	E. to N.	E. to N.
Southern Plateau District	NE. to NW.	E. to N.	E. to N.	E. to N.	NE. to NW.	N. to W.
Tennessee	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.	NE. to NW.
Upper Lake Region	E. to N.	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.
Upper Mississippi Valley	NW. to SW.	NW. to SW.	NW. to SW.	N. to W.	N. to W.	NE. to NW.
Western Gulf States	NW. to SW.	N. to W.	NW. to SW.	N. to W.	N. to W.	N. to W.

Geographical district.	July.	August.	September.	October.	November.	December.
Eastern Gulf States	NE. to NW.	NE. to NW.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.
Key West and Punta Rassa	NE. to NW.	N. to W.	N. to W.	NW. to SW.	N. to W.	N. to W.
Lower Lake Region	E. to N.	E. to N.	NE. to NW.	NE. to NW.	NE. to NW.	NE. to NW.
Lower Mississippi Valley	E. to N.	E. to N.	NW. to SW.	N. to W.	NW. to SW.	N. to W.
Middle Atlantic States	E. to N.	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.
Middle Eastern Rocky Mountain Slope	NW. to SW.	W. to S.	NW. to SW.	NW. to SW.	NW. to SW.	W. to S.
Middle Pacific Coast Region	NE. to NW.	E. to N.	E. to N.	NE. to NW.	SE. to NE.	E. to N.
Middle Plateau District	SE. to NE.	E. to N.	E. to N.	E. to N.	E. to N.	E. to N.
Missouri Valley	NW. to SW.	N. to W.	NW. to SW.	NW. to SW.	W. to S.	W. to S.
New England States	N. to W.	N. to W.	N. to W.	N. to W.	N. to W.	NW. to SW.
Northern Rocky Mountain Slope	NW. to SW.	NW. to SW.	SW. to SE.	SW. to SE.	SE. to NE.	W. to S.
North Pacific Coast Region	SE. to NE.	SE. to NE.	E. to N.	E. to N.	E. to N.	NE. to NW.

Northern Plateau District	*SE. to NE.*	*S. to E.*	*S. to E.*	*E. to N.*	*E. to N.*	*NE. to NW.*
Ohio Valley	*E. to N.*	*E. to N.*	*N. to W.*	*E. to N.*	*N. to W.*	*N. to W.*
Rio Grande Valley	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.	W. to S.	W. to S.
South Atlantic States	N. to W.	N. to W.	N. to W.	NW. to SW.	NW. to SW.	N. to W.
Southeastern Rocky Mountain Slope	N. to W.	N. to W.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.
South Pacific Coast Region	E. to N.	S. to E.	S. to E.	SE. to NE.	NE. to NW.	NE. to NW.
Southern Plateau District	NE. to NW.	NE. to NW.	NE. to NW.	NE. to NW.	NE. to NW.	E. to N.
Tennessee	NE. to NW.	E. to N.	N. to W.	N. to W.	N. to W.	N. to W.
Upper Lake Region	N. to W.	N. to W.	N. to W.	E. to N.	E. to N.	E. to N.
Upper Mississippi Valley	N. to W.	NE. to NW.	E. to N.	N. to W.	NW. to SW.	NW. to SW.
Western Gulf States	NE. to NW.	N. to W.	NW. to SW.	NW. to SW.	NW. to SW.	NW. to SW.

NOTES.

Eastern Gulf States.—Eastern Mississippi, Alabama, and Northwestern Florida.

Lower Lake Region.—Lakes Erie and Ontario, with adjacent territory.

Lower Mississippi Valley.—A belt of country two hundred miles broad, from Cairo to Vicksburg. Below Vicksburg the character of the country so changes that it is no longer described as a valley.

Middle Atlantic States.—New York, New Jersey, Pennsylvania, Delaware, Maryland, District of Columbia, and Virginia as the Middle States, and that part of those States lying east of the Alleghanies as the Middle Atlantic States.

Middle Eastern Rocky Mountain Slope.—Eastern Colorado, Southern Nebraska, Kansas, northwestern portion of Indian Territory, portion of Northern Texas, also a portion of Northeastern New Mexico.

Middle Pacific Coast Region.—Those portions of California west of the Sierra Nevadas and north of the 37th parallel of latitude.

Middle Plateau District.—Western Colorado, Utah, Nevada, southwestern corner of Wyoming, and the portion of California lying east of the Sierra Nevadas.

Missouri Valley.—A belt of country two hundred miles broad, from Fort Sully, Dak., to Jefferson City, Mo.

New England States.—Maine, New Hampshire. Vermont, Massachusetts, Connecticut, and Rhode Island.

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Ohio Valley.—The belt of country, about two hundred miles broad, from Pittsburgh, Pa., to Cairo, Ill.

Rio Grande Valley.—Southwestern Texas below the junction of the Rio Pecos with the Rio Grande.

South Atlantic States.—North Carolina, South Carolina, Georgia, and Northern and Eastern Florida.

Southeastern Rocky Mountain Slope.—Southeastern New Mexico, Central and Western Texas

South Pacific Coast Region.—Those portions of California west of the Sierra Nevadas and south of the 37th parallel of latitude.

Southern Plateau District.—Western New Mexico, Arizona, and Southeastern California.

Upper Lake Region.—Lakes Superior, Huron, and Michigan, with adjacent country.

Upper Mississippi Valley.—The belt of country, about two hundred miles broad, from Saint Paul to Cairo.

Western Gulf States.—Western Louisiana, Western Arkansas, Eastern Texas, Southern Missouri, and southeastern portion of Indian Territory.

APPENDIX 49.

Directions from which the prevailing winds were observed to blow during each month of the year ending June 30, 1882, at stations on the Central Pacific and Southern Pacific Railroads and connecting branches.

Stations.	1881.						1882.					
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.
Alta, Cal	SE.	SE.	SE.	S.	SW.	SE.	SE.	S.	SE.	S.	S.	S.
Anaheim, Cal	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.
Antioch, Cal	NW.	NW.	NW.	NW.	N.	NE.	SW.	NW.	NW.	NW.	NW.	NW.
Auburn, Cal	E.	E.	W.	E.	SE.	E.	E.	E.	E.	(a)	E.	E.
Battle Mountain, Nev	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	SE.	W.	SW.
Benson, Ariz	(a)	E.	E.	SW.	SE.	(a)	SW.	SW.	SW.	SW.	NW.	W.
Beowawe, Nev	S.	NW.	S.	W.	S.	S.	S.	S.	S.	S.	S.	N.
Blue Creek, Utah	S.	S.	S.	S.	N.	N.	N.	N.	N.	N.	N.	S.
Boca, Cal	W.	W.	W.	W.	W.	W.	N.	W.	W.	W.	W.	W.
Borden, Cal	NW.	NW.	NW.	NW.	SE.	SE.	SE.	NW.	NW.	NW.	NW.	NW.
Brentwood, Cal	W.	W.	W.	NW.	NW.	W.	W.	S.	W.	W.	W.	W.
Brighton, Cal	S.	S.	N.	S.	N.	S.	N.	S.	S.	S.	S.	S.
Brown's, Nev	W.	W.	W.	W.	E.	SW.	NE.	SW.	SW.	SW.	E.	E.
Byron, Cal	W.	W.	W.	W.	W.	SE.	NW.	W.	NW.	W.	NW.	W.
Caliente, Cal	W.	E.	E.	W.	W.	W.	NE.	SW.	S.	N.	W.	S.
Calistoga, Cal	W.	W.	W.	W.	(a)	W.	W.	W.	W.	W.	W.	W.
Carlin, Nev	W.	W.	W.	W.	W.	W.	W.	W.	W.	W.	W.	W.
Casa Grande, Ariz	W.	SW.	W.	W.	NE.	(a)	(a)	SW.	W.	W	W.	W.
Chico, Cal	S.	S.	S.	S.	S.	N.	N.	N.	N.	N.	N.	S.
Cisco, Cal	SW.	SW.	NE.	E.	(a)	SW.	SW.	SW.	(a)	SW.	SW.	SW.
Colfax, Cal	N.	N.	N.	S.	N.	N.	N.	SW.	SW.	S.	N.	S.
Colton, Cal	W.	N.	W.	W.	NE.	N.	NE.	N.	N.	N.	W.	W.
Corinne, Utah	S.	N.	N.	S.	N.	N.	N.	N.	N.	N.	N.	N.
Davis, Cal	N.	SW.	NW.	N.	N.	N.	N.	N.	N.	N.	N.	S.
Delano, Cal	W.	NW.	NW.	NW.	NW.	SE.	S.	S.	NW.	NW.	NW.	NW.
Dunnigan, Cal	N.	SE.	N.	N.	N.	S.	N.	S.	N.	N.	N.	N.
Elko, Nev	NW.	NW.	NW.	SW.	N.	N.	N.	W.	NW.	W.	NW.	N.
Emigrant Gap, Cal	S.	(a)	S.	E.	S.	S.	(a)	SW.	SW.	SW.	SW.	E.
Farmington, Cal	NW.	NW.	NW.	NW.	NW.	SE.	NW.	NW.	NW.	NW.	NW.	NW.
Fresno City, Cal	NW.	NW.	NW.	NW.	(a)	NW.	NW.	SW.	SW.	NW.	NW.	NW.
Galt, Cal	W.	W.	W.	W.	N.	W.	N.	W.	SE.	W.	W.	W.
Gilroy, Cal	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.
Golconda, Nev	W.	W.	W.	(a)	E.	E.	NW.	E.	NW.	NW.	W.	W.

Goshen, Utah	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.	SE.	(a)	NW.	NW.
Halleck, Nev	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	SW.	SW.
Hollister, Cal	(a)	W.	W.	W.	W.	N.	NW.	SW.	(a)	W.	NW.	NW.
Hot Springs, Nev	N.	N.	N.	N.	N.	(a)	N.	N.	N.	N.	SW.	N.
Humboldt, Nev	S.	W.	S.	S.	S.	S.	S.	S.	S.	S.	S.	E.
Indio, Cal	W.	W.	W.	W.	NW.	W.	W.	W.	W.	W.	W.	W.
Ione, Cal	SW.	SW.	SW.	SW.	SW.	S.	SW.	SW.	SW.	SW.	SW.	SW.
Keene, Cal	NW.	NW.	NW.	NW.	E.	E.	NW.	NW.	NW.	NW.	NW.	NW.
Kelton, Utah	S.	(a)	NW.	SW.	S.	N.	N.	N.	S.	S.	S.	NE.
Kingsburgh, Cal	NW.	NW.	(a)	NW.	(a)	NW.	NW.	SE.	NW.	NW.	NW.	NW.
Knight's Landing, Cal	SE.	SE.	N.	N.	N.	N.	N.	N.	N.	S.	S.	S.
Lathrop, Cal	W.	W.	NW.	W.	SW.	SE.	NW.	NW.	NW.	NW.	NW.	NW.
Lemoore, Cal	N.	(a)	NW.	N.	NW.	(a)	NW.	SW.	S.	N.	N.	N.
Livermore, Cal	W.	W.	W.	W.	W.	(a)	W.	SW.	SW.	SW.	SW.	SW.
Los Angeles, Cal	S.	S.	S.	S.	S.	S.	N.	S.	S	S.	S.	SW.
Mammoth Tank, Cal	SE.	SE.	SE.	SE.	N.	SE.	N.	W.	N.	S.	S.	SW.
Maricopa, Ariz	W.	W.	W.	(a)	(a)	(a)	W.	W.	W.	W.	W.	NW.
Martinez, Cal	SW.	SW.	SW.	SW.	SW.	SW.	W.	SW.	W.	SW.	SW.	SW.
Marysville, Cal	S.	S.	S.	S.	S.	S.	S.	S.	(a)	S.	S.	S.
Menlo Park, Cal	NW.	NW.	NW.	NW.	N.	NW.	NW.	NW.	NW.	NW.	NW.	NW.
Merced, Cal	N.	N.	N.	N.	N.	N.	N.	N.	N.	S.	N.	N.
Modesto, Cal	NW.	NW.	NW.	NW.	(a)	(a)	NW.	NW.	SE.	NW.	NW.	NW.
Mojave, Cal	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.
Monterey, Cal	NW.	W.	W.	W.	W.	SW.	W.	NW.	W.	W.	W.	NW.
Napa City, Cal	N.	N.	N.	SE.	NE.	NE.	SE.	NE.	NE.	S.	S.	S.
Newhall, Cal	SE.	SE.	SE.	SE.	SE.	SE.	SE.	SE.	SE.	SE.	SE.	SE.
Niles, Cal	S.	SW.	W.	NW.	NW.	SW.	NW.	NW.	NW.	W.	NW.	W.
Oakland, Cal	SW.	SW.	SW.	S.	SW.	SW.	S.	SW.	SW.	SW.	S.	S.
Ogden City, Utah	S.	S.	(a)	SW.	NW.	SW.	(a)	SE.	S.	SW.	NW.	NE.
Otego, Nev	SW.	SW.	SE.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.
Pajarvo, Cal	W.	W.	W.	W.	W.	SW.	W.	SW.	W.	W.	W.	W.
Palisade, Nev	NE.	NE.	NW.	NW.	W.	E.	S.	(a)	W.	(a)	(a)	(a)
Pantano, Ariz	SW.	(a)	W.	E.	E.	E.	E.	W.	E.	E.	E.	E.
Petaluma, Cal	W.	W.	W.	W.	NW.	SE.	SE.	(a)	W.	W.	W.	W.
Pleasanton, Cal	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.
Promontory, Utah	SW.	SW.	SW.	SW.	NW.	NW.	NE.	SW.	SW.	N.	NW.	W.
Ravenna, Cal	SW.	W.	W.	W.	NE.	(a)	NE.	NE.	E.	E.	N.	SE.
Red Bluff, Cal	S.	S.	N.	N.	N.	S.	N.	N.	N.	N.	N.	S.
Redding, Cal	N.	NW.	N.	N.	N.	NW.	NW.	NW.	NW.	SW.	(a)	NW.
Reno, Nev	W.	W.	W.	W.	W.	W.	W.	W.	W.	W.	W.	W.
Rocklin, Cal	S.	S.	N.	S.	SE.	S.	N.	S.	S.	SE.	S.	S.
Sacramento, Cal	S.	S.	S.	S.	N.	SE.	NW.	S.	NW.	S.	S.	S.
Salinas, Cal	N.	N.	N.	S.	S.	S.	S.	S.	S.	W.	W.	W.
San Fernando, Cal	S.	S.	S.	S.	N.	N.	N.	S.	S.	S.	S.	S.
San José, Cal	NW.	NW.	S.	S.	NW.	S.	S.	S.	S.	S.	NW.	NW.
San Mateo, Cal	W.	W.	W.	W.	W.	W.	NW.	NW.	NW.	NW.	NW.	NW.
Santa Cruz, Cal	SW.	SW.	N.	N.	N.	N.	NE.	NE.	NE.	NE.	SW.	SW.
Soledad, Cal	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.	NW.	(a)	NW.
South Vallejo, Cal	SW.	SW.	SW.	SW.	NW.	SE.	SW.	SW.	W.	SW.	W.	SW.

a No report.

APPENDIX 49.—*Directions from which the prevailing winds were observed to blow during each month of the year ending June 30, 1882, &c.*—Continued.

Stations.	1881.						1882.					
	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.
Spadra, Cal	SW.	W.	W.	W.	N.	(a)	S.	N.	E.	W.	W.	W.
Stockton, Cal	NW.	NW.	NW.	NW.	NW.	SW.	N.	NW.	SE.	NW.	W.	NW.
Suisun, Cal	SW.	SW.	SW.	SW.	SW.	SW.	NE.	SW.	SW.	W.	SW.	SW.
Sumner, Cal	NW.	NW.	NW.	NW.	NW.	(a)	NW.	NW.	NW.	(a)	N.	N.
Summit, Cal	S.	S.	S.	SW.	NE.	SW.	SW.	SW.	NE.	NE.	NE.	NE.
Tecoma, Nev	SW.	SW.	W.	W.	W.	W.	W.	N.	SW.	SW.	SW.	SW.
Tehama, Cal	S.	S.	N.	N.	N.	S.	N.	(a)	N.	N.	N.	N.
Tehichipa, Cal	NW.	NW.	NW.	NW.	SE.	NW.	NW.	NW.	NW.	NW.	NW.	NW.
Tennant, Cal	NW.	NW.	NW.	NW.	NW.	NW.	NW.	(a)	NW.	NW.	NW.	(a)
Terrace, Utah	NW.	SW.	N.	NW.	N.	N.	N.	N.	NE.	NW.	SW.	S.
Texas Hill, Ariz	SW.	SE.	W.	W.	W.	W.	W.	SW.	W.	W.	W.	W.
Toana, Nev	SW.	SE.	NW.	W.	W.	W.	W.	W.	W.	W.	W.	W.
Tracy, Cal	W.	SW.	SW.	NW.	S.	NW.	NW.	N.	NW.	NW.	N.	N.
Truckee, Cal	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	SW.	(a)
Tucson, Ariz	SW.	SE.	SW.	SE.	SE.	E.	S.	SE.	E.	SE.	W.	S.
Tulare, Cal	NW.	NW.	(a)	NW.	(a)	(a)	NW.	(a)	SW.	S.	N.	NW.
Tuohey's Ranche, Cal	(a)	(a)	E.	(a)	(a)	E.	E.	E.	E.	(a)	W.	NW.
Turlock, Cal	N.	N.	N.	N.	N.	NW.	NW.	N.	S.	N.	NW.	NW.
Wadsworth, Nev	NW.	W.	NW.	SW.	W.	W.	W.	W.	W.	W.	W.	W.
Wells, Nev	S.	SW.	SW.	W.	W.	SW.	NW.	NW.	W.	W.	S.	S.
White Water, Cal	W.	W.	W.	W.	E.	(a)	E.	W.	W.	W.	W.	W.
Willcox, Ariz	(a)	NE.	(a)	(a)	(a)	(a)	(a)	NE.	N.	W.	W.	(a)
Williams, Cal	S.	S.	N.	S.	N.	S.	N.	N.	N.	S.	N.	S.
Willow, Cal	S.	S.	S.	S.	S.	S.	S.	N.	N.	S.	N.	S.
Winnemucca, Nev	SW.	SW.	SE.	SW.	SW.	NE.	NE.	SE.	SW.	SW.	SW.	SW.
Woodland, Cal	S.	S.	N.	W.	N.	N.	N.	S.	N.	N.	S.	S.
Yuma, Ariz	S.	SE.	SE.	NW.	N.	N.	N.	NW.	NE.	NE.	W.	SE.

a No report.

b Precipitation too small to measure.

APPENDIX 50.

Table showing the highest summer and lowest winter temperatures in each State and Territory. Deduced from observations taken at the several stations of the Signal Service, United States Army, from 1871 *to* 1881, *inclusive.*

State or Territory.	Temperatures, 1871–1881, inclusive.						
	Highest recorded.	Place.	Date.	Lowest recorded.	Place.	Date.	Absolute range.
	°						°
Alabama	106.9	Montgomery	July 7, 1881	8	Montgomery	Dec. 30, 1880	98.9
Arizona	118	Yuma	July 29, 1878	−18	Prescott	Dec. 25, 1879	136
Arkansas	102	Little Rock	Aug. 12, 1881	6	Little Rock	Dec. 29, 1880	96
California	110.5	Red Bluff	Aug. 12, 1878 Aug. 13, 1878	Zero.	Campo	Jan. 29, 1880	110.5
Colorado	105	Denver	Aug. 8, 1878	−29	Denver	Jan. 9, 1875	134
Connecticut	100	New Haven	Sept. 7, 1881	− 5	New Haven	Jan. 1, 1881	105
Dakota	112	Smithville	Aug. 7, 1881	−59	Pembina	Dec. 24, 1879	171
Delaware	93	Delaware Breakwater	Aug. 13, 1881 Sept. 6, 1881 Sept. 7, 1881	1	Delaware Breakwater	Dec. 30, 1880	92
District of Columbia	104.3	Washington	Sept. 7, 1881	−14	Washington	Jan. 1, 1881	118.3
Florida	104	Jacksonville	July 11, 1879	17	Pensacola	Dec. 30, 1880	87
Georgia	105	Augusta Savannah	July 22, 1878 Aug. 2, 1878 July 12, 1879	1	Atlanta	Dec. 30, 1880	104
Idaho	106	Boisé City	July 20, 1877	−25	Eagle Rock	Jan. 8, 1881	131
Illinois	103	Cairo	Aug. 12, 1881	−23	Chicago	Dec. 24, 1872	126
Indiana	101	Indianapolis	July 10, 1881 Aug. 12, 1881	−22	Indianapolis	Jan. 22, 1879	123
Indian Territory	109	Fort Gibson	July 15, 1879	−12	Fort Gibson	Jan. 10, 1881	121
Iowa	103	Des Moines	Aug. 17, 1881	−31	Dubuque	Feb. 9, 1875	134
Kansas	108	Dodge City	July 29, 1876	−29	Leavenworth	Jan. 20, 1873	137
Kentucky	104.6	Louisville	Aug. 12, 1881	−10	Louisville	Jan. 9, 1875 Jan. 3, 1879	114.6
Louisiana	107	Shreveport	July 16, 1875	6	Shreveport	Jan. 6, 1879	101
Maine	97	Portland	July 18, 1876	−20	Eastport	Jan. 26, 1874 Dec. 20, 1875 Feb. 24, 1876	117
Maryland	101	Baltimore	Sept. 7, 1881	− 6	Baltimore	Jan. 1, 1881	107
Massachusetts	101.5	Boston	Sept. 7, 1881	−14	Springfield	Jan. 1, 1881	115.5
Michigan	100	Detroit Marquette	July 17, 1878 July 16, 1878	−32	Escanaba	Feb. 7, 1875	132
Minnesota	101	Breckenridge	Aug. 8, 1876	−44	Saint Vincent	Jan. 31, 1881	145
Mississippi	101	Vicksburg	June 16, 1881	10	Vicksburg	Jan. 10, 1875	91

APPENDIX 50.—*Table showing the highest summer and lowest winter temperatures in each State and Territory, &c.*—Continued.

State and Territory.	Temperatures, 1871–1881, inclusive.						
	Highest recorded.	Place.	Date.	Lowest recorded.	Place.	Date.	Absolute range.
	°						°
Missouri	106.4	Saint Louis	Aug. 12, 1881	−16	Saint Louis	Jan. 9, 1875	122.4
Montana	109	Fort Keogh	July 30, 1881	−59	Fort Benton	Dec. 29, 1880	168
Nebraska	107	North Platte	July 5, 1877	−27	North Platte	Dec. 24, 1879 Jan. 9, 1881	134
Nevada	104	Winnemucca	July 20, 1877	−20	Winnemucca	Dec. 24, 1879	124
New Hampshire	100	Dunbarton	July 10, 1880	−34	Whitefield	Jan. 19, 1875	134
New Jersey	101	Sandy Hook	Sept. 7, 1881	−12	Barnegat	Jan. 19, 1875	113
New Mexico	107.8	La Mesilla	June 23, 1881	−13	Santa Fé	Dec. 25, 1879	120.8
New York	100.2	New York City	Sept. 7, 1881	−18	Albany	Feb. 13, 1875 Jan. 8, 1878	118.2
North Carolina	103	Wilmington	July 12, 1879	−5	Charlotte	Dec. 30, 1880	108
Ohio	103.5	Cincinnati	July 10, 1881	−20	Columbus	Jan. 3, 1879	123.5
Oregon	107	Umatilla	July 17, 1880	−22	Umatilla	Dec. 23, 1879	129
Pennsylvania	102.7	Pittsburgh	July 10, 1881	−16	Erie	Feb. 9, 1875	118.7
Rhode Island	92	Newport	July 18, 1878	−3	Newport	Dec. 20, 1875	95
South Carolina	103.5	Charleston	July 10, 1881	−10	Charleston	Jan. 3, 1879	113.5
Tennessee	104	Nashville	Aug. 11, 1874	−14	Knoxville	Jan. 3, 1877	118
Texas	116	Eagle Pass	May 21, 1879	−10	Fort Elliott	Dec. 24, 1879 Dec. 25, 1879	126
Utah	101	Salt Lake City	Aug. 6, 1875	−10	Salt Lake City	Dec. 25, 1879	111
Vermont	97	Burlington	Aug. 6, 1876	−20	Burlington	Feb. 2, 1874	117
Virginia	103	Cape Henry	Aug. 13, 1881	−5	Lynchburg	Dec. 31, 1880	108
Washington Territory	103	Almota	July 24, 1881	−17	Dayton	Dec. 23, 1879	120
West Virginia	97	Morgantown	July 8, 1874	−10	Morgantown	Feb. 10, 1875	107
Wisconsin	101	La Crosse	July 5, 1874	−43	La Crosse	Jan. 18, 1873	144
Wyoming	100.5	Cheyenne	July 14, 1881	−38	Cheyenne	Jan. 9, 1875	138.5

APPENDIX 51.

Table showing the highest and lowest water, with the dates of the same, at stations of the Signal Service, United States Army, east of the Rocky Mountains, from the commencement of observations to June 30, 1882.

HIGHEST WATER FOR THE YEAR ENDING JUNE 30—

Stations.	River.	1873.			1874.			1875.			1876.			1877.		
		Feet.	Inches.	Dates.	Feet.	Inches.	Dates.	Feet.	Inches.	Dates.	Feet.	Inches.	Dates.	Feet.	Inches.	Dates.
Augusta, Ga	Savannah							30	0	Mar. 8, 1875	27	5	Dec. 30, 1875	29	9	Apr. 14, 1877.
Cairo, Ill	Ohio	42	7	Mar. 26, 1873	47	4	Apr. 26, 27, 1874.	43	8	Mar. 20 and 21, 1875.	46	5	Apr. 6, 1876	40	7	Apr. 14, 1877.
Chattanooga, Tenn	Tennessee							42	1	Mar. 2, 1875	34	1	Dec. 31, 1875	28	6	Apr. 10, 1877.
Cincinnati, Ohio	Ohio	41	8	Feb. 20, 1873	47	11	Jan. 11, 1874	42	1	Mar. 2, 1875	55	5	Aug. 6, 1875	53	8	Jan. 20, 1877.
Davenport, Iowa	Mississippi				15	7	Mar. 9, 1874	12	11	Apr. 29, 1875	13	9	Apr. 16, 1876	10	5	July 8, 1876.
Dubuque, Iowa	do				11	5	May 13 to 17, 1874.	16	6	Apr. 26, 1875	16	5	May 27 to 29, 1876.	12	2	July 5, 1876.
Keokuk, Iowa	do				9	6	Mar. 12, 26, and 27, 1874.	12	10	May 3, 4, 5, 1875.	17	3	Apr. 17, 1876	14	2	July 5, 1876.
La Crosse, Wis	do	10	8	June 17 and 18, 1873.	8	5	May 10, 1874	9	7	Apr. 22, 1875	9	4	May 22, 1876	4	7	July 1, 1876; June 2 and 3, 1877.
Leavenworth, Kans	Missouri	*12	1	June 26 to 30, 1873.	13	3	July 5 and 6, 1873.	17	3	Apr. 30, 1875	15	9	June 30, 1876	19	8	June 13, 1877.
Louisville, Ky	Ohio	*17	6	Feb. 22, 1873	25	0	Jan. 12 and 13, 1874.	18	0	Mar. 21, 1875	31	0	Jan. 29, 1876	30	0	Jan. 21, 1877.
Little Rock, Ark	Arkansas				23	0	Apr. 24, 1874	23	0	May 5 and 6, 1875.	*23	3	Apr. 8, 1876	24	4	July 8, 1876.
Memphis, Tenn	Mississippi	33	4	Mar. 2, 1873	34	11	Apr. 29 to May 4, 1874.	33	10	Apr. 1, 1875	35	0	Apr. 7, 1876	33	0	Apr. 29, 1877.
Morgantown, W. Va	Monongahela				16	4	Apr. 26, 1874	9	11	Dec. 21, 1874	25	0	Aug. 3, 1875	27	6	Jan. 16, 1877.
Nashville, Tenn	Cumberland	39	0	Feb. 21 and 22, 1873.	49	2	Apr. 16 and 17, 1874.	41	4	Mar. 2, 1875	34	6	Jan. 29, 1876	40	4	Jan. 22, 1877.
New Orleans, La	Mississippi	— 2	3	June 2, 12, and 13, 1873.	zero		Apr. 15 and 16, 1874.	— 4	0	Apr. 22, 1875	— 2	10	May 8 and 10, 1876.	— 3	7	May 30 and June 1, 1877.
Omaha, Nebr	Missouri							17	10	Apr. 27, 1875	14	10	June 20, 1876	17	5	June 13, 1877.
Pittsburg, Pa	Alleghany				24	6	Dec. 14, 1873	21	0	Dec. 30, 1874	21	0	Aug. 3, 1875	20	9	Sept. 19, 1876.
Saint Louis, Mo	Mississippi	25	5	Apr. 11, 1873	25	0	July 10 and 11, 1873.	24	7	May 3, 1875	32	6	May 10 and 11, 1876.	30	1	July 7, 1876.
Saint Paul, Minn	do	18	4	Apr. 21, 1873	10	7	July 1, 1873	18	0	Apr. 16, 1875	11	0	Apr. 10, 1876	7	8	Mar. 25 and 26, 1877.

* Part of year only.

APPEEDIX 51.—*Statement showing the highest and lowest water, with the dates of the same, at stations of the Signal Service, United States Army, &c.*—Cont'd.

Stations.	River.	1873.			1874.			1875.			1876.			1877.		
		Feet.	Inches.	Dates.	Feet.	Inches.	Dates.	Feet.	Inches.	Dates.	Feet.	Inches.	Dates.	Feet.	Inches.	Dates.
Shreveport, La	Red	*27	9	June 8 and 9, 1873.	30	8	Apr. 29 and 30; May 1, 1874.	28	1	Apr. 22, 1875 ..	29	0	Apr. 10 and 11, 1876.	29	5	July 28, 1876.
Vicksburg, Miss	....do	40	7	May 28, 1873 ..	45	8	Apr. 29 and 30; May 1 to 5, 1874.	43	0	Apr. 21 to 24, 1875.	44	10	May 10 to 14, 1876.	41	9	May 9, 1877.
Yankton, Dak	Missouri	9	11	May 2, 1873...	15	2	Nov. 29, 1873 ..	15	10	Apr. 24 and 25, 1875.	13	9	Apr. 13, 1876 ..	13	0	June 11 and 12, 1877.

* Part of year only.

APPENDIX 51.—*Table showing the highest and lowest water, with the dates of the same, at stations of the Signal Service, United States Army, &c.*—Continued.

HIGHEST WATER FOR THE YEAR ENDING JUNE 30—

Stations.	River.	1878.			1879.			1880.			1881.			1882.		
		Feet.	Inches.	Dates.	Feet.	Inches.	Dates.	Feet.	Inches.	Dates.	Feet.	Inches.	Dates.	Feet.	Inches.	Dates.
Augusta, Ga	Savannah	23	6	Nov. 23, 1877	19	3	Apr. 17, 1879	30	1	Dec. 16, 1879	32	4	Mar. 18, 1881	27	0	Feb. 10, 1882.
Cairo, Ill	Ohio	37	1	Apr. 29, 1878	36	0	Jan. 25, 26, 1879.	44	7	Mar. 21, 22, 23, 1880.	45	10	Apr. 19 and 20, 1881.	51	10½	Feb. 25 and 26, 1882.
Chattanooga, Tenn	Tennessee	19	0	Feb. 25, 1878	38	0	Jan. 15, 1879	37	7	Mar. 18, 19, 1880.	26	6	Dec. 3, 1881	40	4	July 19, 1881.
Cincinnati, Ohio	Ohio	33	5	Mar. 17, 1878	41	2	Dec. 15, 1878	53	3	Feb. 17, 1880	50	9	Feb. 16, 1881	58	7	Feb. 21, 1882.
Davenport, Iowa	Mississippi	7	1	May 9, 1878	7	10	June 1, 1879	18	5	June 26, 1880	16	6	July 1, 1880; Apr. 12, 1881.	17	8	Oct. 25, 26, 27, 1881.
Dubuque, Iowa	do	8	8	July 18 and 19, 1877.	10	8	May 30, 1879	22	8	June 23 and 24, 1880.	17	11	July 1, 1880	21	2	Oct. 24 and 25, 1881.
Keokuk, Iowa	do	11	9	June 10, 1878	9	2	June 2, 1879	18	2	June 29, 1880	18	2	Apr. 24, 25, 1881.	19	7	Oct. 30, 1881.
La Crosse, Wis	do	4	11	July 12 and 13, 1877.	7	1	May 22 and 23, 1879	15	2	June 19, 1880	12	0	May 4 and 5, 1881.	13	3	Oct. 17, 1881.
Leavenworth, Kans	Missouri	18	7	July 3, 1877	18	6	July 2 and 3, 1878.	16	4	July 1, 1879	25	10	Apr. 29 and 30, 1881.	17	10	June 30, 1882.
Louisville, Ky	Ohio	12	4	Mar. 17, 1878	18	6	Jan. 16, 1879	30	6	Feb. 18, 1880	22	8	Feb. 17, 1881	37	5	Feb. 22, 1882.
Little Rock, Ark	Arkansas	22	3	June 22, 1878	14	4	Feb. 3, 1879	12	8	Mar. 14, 1880	15	1	Feb. 20, 1881	21	8	Feb. 24, 1882.
Memphis, Tenn	Mississippi	29	11	May 1 and 2, 1878.	28	11	Jan. 28 and 29, 1879.	34	4	Mar. 23 and 28, 1880.	34	2	Apr. 26 to 29, 1881.	36	0	Mar. 6, 7, and 9, 1882.
Morgantown, W. Va	Monongahela	14	6	Nov. 25, 1877	13	8	Nov. 23, 28, 1878.	20	3	Feb. 14, 1880	22	6	Dec. 5, 1880	20	0	Mar. 21, 1882.
Nashville, Tenn	Cumberland	27	3	Apr. 26, 1878	41	4	Jan. 19, 1879	46	6	Mar. 17, 1880	33	0	Jan. 24 and 25, 1881.	54	7	Jan. 22, 1882.
New Orleans, La	Mississippi	— 3	6	Mar. 21, and May 19 and 20, 1878.	— 3	8	Feb. 16, 1879	— 0	11	Apr. 24, 1880	— 2	2	Mar. 16; Apr. 8 and 12; May 30, 1881.	— 0	5	Mar. 27, 1882.
Omaha, Nebr	Missouri	17	10	June 25, 1878	17	0	Apr. 9, and June 28, 1879.	16	3	July 1 and 2, 1879.	23	10	Apr. 25, 1881	14	6	June 28, 1882.
Pittsburg, Pa	Allegheny	18	2	Nov. 25, 1877	24	6	Dec. 11, 1878	21	7	Feb. 14, 1880	25	1	June 10, 1881	21	8	Jan. 28, 1882.
Saint Louis, Mo	Mississippi	26	6	July 4, 1877	22	4	July 6 to 8, 1878.	22	2	June 30, 1880	33	7	May 5 and 6, 1881.	29	6	Nov. 19 and 20, 1881.
Saint Paul, Minn	do	7	1	July 8 and 9, 1877.	5	4	June 2 and 3, 1879.	15	3	June 17, 1880	19	6	Apr. 29, 1881	13	4	Apr. 13, 1882
Shreveport, La	Red	25	11	Jan. 31, 1878	24	6	July 1, 1878	23	0	Apr. 3, 1880	27	3	Mar. 7, 1881	31	5	Feb. 21, 1882.
Vicksburg, Miss	do	41	0	Mar. 25, 27, and 28, 1878.	39	6	Feb. 17, 1879	43	2	Apr. 8 and 9, 1880.	41	10	Mar. 9 and 13, 1881.	48	9	Mar. 20, 1882.
Yankton, Dak	Missouri	11	10	July 1, 1877	12	6	June 26 and 27, 1879.	12	2	July 1, 1879	36	0	Mar. 30, 1881	13	4	June 27, 1882.

APPENDIX 51.—*Table showing the highest and lowest water, with the dates of the same, at stations of the Signal Service, United States Army, &c.*—Continued.

LOWEST WATER FOR THE YEAR ENDING JUNE 30—

Stations.	River.	1873.			1874.			1875.			1876.			1877.		
		Feet.	Inches.	Dates.	Feet.	Inches.	Dates.	Feet.	Inches.	Dates.	Feet.	Inches.	Dates.	Feet.	Inches.	Dates.
Augusta, Ga	Savannah							3	4	June 16 and 17, 1875.	2	6	July 31, Aug. 1, 1875.	5	0	Aug. 1, 1876.
Cairo, Ill	Ohio	2	0	Dec. 5 and 6, 1872.	3	8	Oct. 16 and 17, 1873.	3	0	Nov. 10 and 13, 1874.	5	10	Nov. 3 to 7, 1875.	0	3	Dec. 30, 1876.
Chattanooga, Tenn	Tennessee										2	2	Oct. 27 to 31, 1875.	1	1	Oct. 17, 21, and 22, 1876.
Cincinnati, Ohio	Ohio	3	0	Oct. 14, 1872	3	8	Oct. 12, 1873	2	3	Sept. 23, 1874	4	1	Sept. 18, 1875	6	3	Sept. 4, 1876.
Davenport, Iowa	Mississippi				0	9	Nov. 23, 1873	0	7	Dec. 3, 1874	0	2	Nov. 27 and 28, 1875.	2	2	Mar. 8, 1877.
Dubuque, Iowa	do				3	1	Nov. 28, 1873	2	5	Dec. 3, 1874	1	4	Nov. 30, 1875	1	6	Mar. 10, 1877.
Keokuk, Iowa	do				1	8	Jan. 3 and Feb. 12, 1874.	1	3	Jan. 1, 1875	2	2	Dec. 2, 1875	1	11	Dec. 7, 1876.
La Crosse, Wis	do				1	4	Sept. 23, 1873	1	8	Aug. 19 to 24, 1874.	— 1*b*	5	Aug. 24 to 27, 1875.	— 1*b*	6	Mar. 29, 1877.
Leavenworth, Kans	Missouri	3*a*	8	May 20, 1873	— 4*b*	6	Dec. 9 and 10, 1873; Jan. 6, 1874	— 3*b*	3	Dec. 24, 1874	3	3	Dec. 2, 1875	4	8	Dec. 14 to 17, 1876.
Louisville, Ky	Ohio	4*a*	3	June 29, 1873	2	4	Oct. 9 and 12 to 17, 1873.	2	1	Sept. 24, 1874	3	0	Sept. 22 and 23, 1875.	4	1	Dec. 18, 1876.
Little Rock, Ark	Arkansas				1	0	Oct. 25, Nov. 4, 19, 20, 21, 22, 24, and 25, 1873.	— 1*b*	9	Oct. 28 and 29, 1874.	*2	3	July 14 and 15, 1875.	— 1*b*	10	Dec. 19, 1876.
Memphis, Tenn	Mississippi	— 0*b*	11	Dec. 25, 1872	2	1	Oct. 16, 17, 20, 21, 22, and 23, 1873.	2	4	Nov. 15 and 16, 1874.	5	2	Nov. 9 to 11, 1875.	0	10	Jan. 3, 1877.
Morgantown, W. Va	Monongahela				— 0*b*	3	Oct. 5 and 6, 1873.	0	1	Sept. 23, and Nov. 8, 9, 10, 13, 14, 15, 1874.	0	3	Sept. 10 to 15, 1875.	0	4	Sept. 6 and 7; Oct. 29 to 31; Nov. 1 to 3, 1876.
Nashville, Tenn	Cumberland	1	7	Dec. 17 and 18, 1872.	0	6	Oct. 13, 16, and 17, 1873.	1	0	July 8, 9, and 10, 1874.	1	6	Sept. 13, 1875	0	10	Oct. 19 to 21, 1876.
New Orleans, La	Mississippi				— 14*b*	5	Nov. 8, 1873	— 15*b*	8	Nov. 25, 1874	— 14*b*	10	Nov. 16, 1875	— 16*b*	2	Dec. 30, 1876.
Omaha, Nebr	Missouri							2	2	Dec. 4 and 6, 1874.	1	10	Nov. 23, 1875	1	7	Dec. 2 to 4, 1876.
Pittsburg, Pa	Alleghany				1	1	Oct. 5, 1873	0	3	Sept. 19, 1874	0	4	Sept. 10, 11, and 12, 1875	0	2	Sept. 3 and 5, 1876.
Saint Louis, Mo	Mississippi	2	6	Sept. 4, 1872	4	2	Jan. 19, 1874	2	10	Jan. 2, 1875	3	11	Dec. 5, 1875	6	9	Dec. 9, 1876.

Saint Paul, Minn	*do*	*3*	*10*	*Oct. 26 and 27, 1872.*	*2*	*5*	*Sept. 22, 1873*	*3*	*0*	*Nov. 25 to 28, 1874.*	*2*	*1*	*Aug. 22, 1875*	*1*	*11*	*Nov. 26, 1876.*
Shreveport, La	Red				3	8	Sept. 28, 1873	—	1b	7	Sept. 19, 1874	2	10	Nov. 29, 1875	2	8	Nov. 13, 1876.
Vicksburg, Miss	do	2	4	Jan., 1873	2	7	Oct. 23, 24, and 25, 1873.	3	0	Nov. 16, 1874	8	0	Nov. 13 and 14, 1875.	2	1	Jan. 7, 1877.
Yankton, Dak	Missouri	4	2	June 30, 1873	4	2	July 1, 1873	7	3	April 12, 1875	5	8	Nov. 7, 8, 13, and 14, 1875.	3	9	Nov. 11, 12, 1876.

a Part of year only.

b Below bench-mark.

APPENDIX 51.—*Table showing the highest and lowest water, with the dates of the same, at stations of the Signal Service, United States Army, &c.*—Continued.

LOWEST WATER FOR THE YEAR ENDING JUNE 30—

Stations.	River.	1878.			1879.			1880.			1881.			1882.		
		Feet.	Inches.	Dates.	Feet.	Inches.	Dates.	Feet.	Inches.	Dates.	Feet.	Inches.	Dates.	Feet.	Inches.	Dates.
Augusta, Ga	Savannah	4	3	Aug. 20 and 21; Sept. 5, 1877.	3	10	July 24 to 27, Aug. 12, Oct. 14, 15, and 29, 1878.	3	9	July 13, 1879	4	2	Oct. 27 and 28, 1880.	4	0	Sept. 15, 1881.
Cairo, Ill	Ohio	3	5	Oct. 11 to 13, 1877.	6	0	Oct. 18 and 22, 1878.	2	7	Oct. 9 and 10, 1879.	5	5	Jan. 7 and 8, 1881.	5	4	Sept. 7 to 9, 1881.
Chattanooga, Tenn	Tennessee	1	2	Oct. 5, 1877	0	11	Sept. 14 and 15, 1878.	0	2	Oct. 6, 7, 9 and 10, 1879.	1	0	Oct. 16, 24, 27, 28, and 30, 1880.	zero		Sept. 14, 1881.
Cincinnati, Ohio	Ohio	3	5	Oct. 7 to 9, 1877	4	4	Oct. 22 to 24, 1878.	2	5	Oct. 23, 1879	3	9	Oct. 28 and 29, 1880.	1	11	Sept. 17 to 19, 1881.
Davenport, Iowa	Mississippi	0	6	Sept. 15 and 17, 1877.	0	11	Sept. 19 and 20, 1878.	1	1	Sept. 30, Oct. 1, Dec. 14, 1879.	1	7	Nov. 20, 1880	1	8	Jan. 8, 1882.
Dubuque, Iowa	....do	1	9	Sept. 13 to 15, 24 to 26, 1877.	1	7	Dec. 13 and 17, 1878.	2	2	Oct. 1, 1879	2	8	Nov. 21, 1880	3	3	Jan. 5, 1882.
Keokuk, Iowa	....do	0	9	Oct. 1, 1877	2	3	Sept. 15, 19, 21, to 23, 1878.	zero		Dec. 20, 1879	0	3	Nov. 23 and 24, 1880.	2	4	Jan. 19, 1882.
La Crosse, Wis	....do	— 2*	3	Aug. 26, 1877	— 0*	8	Sept. 16 to 19, 1878.	0	6	Sept. 26 to 29, 1879.	1	0	Mar. 25 and 26, 1880.	1	9	Aug. 9, 1881.
Leavenworth, Kans	Missouri	3	7	Jan. 10, 1878	3	3	May 1, 1879	2	9	Feb. 3, 4, and 8, 1880.	5	0	Nov. 4 to 9, and 27; Dec. 4 and 5, 1880.	2	4	Feb. 27, 1882.
Louisville, Ky	Ohio	2	6	Oct. 8, 1877	3	0	Oct. 25 to 27, 1878.	1	11	Oct. 9 to 15, 1879.	3	0	Oct. 2, 3, 29, 30, and 31; Nov. 1, 1880.	1	11	Sept. 22 and 23, 1881.
Little Rock, Ark	Arkansas	0	2	Oct. 14 and 15, 1877.	— 1*	5	June 22 to 24, 1879.	— 2*	9	Oct. 12 to 22, 1879.	— 2*	7	Jan. 11, 1881	— 2*	0	Sept. 16, 17, 29, and 30, 1881.
Memphis, Tenn	Mississippi	3	2	Oct. 14 and 15, 1877.	3	4	Sept. 21, 1878	1	11	Nov. 12 and 15, 1879.	2	4	Jan. 10, 11, and 12, 1880.	3	0	Sept. 10, 1881.
Morgantown, W. Va	Monongahela	0	4	Aug. 29 to 31; Sept. 4 to 6, 10 to 13, and 17, 1877.	0	3	Oct. 16, 1878; May 19; from June 19 to 30, 1879.	0	2	July 2, 3, 4, 1879.	0	6	June 1 to 3, 1881	0	1	Aug 31, 1881.
Nashville, Tenn	Cumberland	1	1	Sept. 4; Oct. 20 and 21, 1877.	0	4	Sept. 27 and Oct. 9, 1878.	0	5	Oct. 3, 1879	0	7	Sept. 26, 1880	0	3	Sept. 12 to 14, 1881.
New Orleans, La	Mississippi	—14*	6	Oct. 10 and 24, 1877.	—14*	3	Nov. 27 and 28, 1878.	—14*	7	Nov. 22, 1879	—14*	5	Nov. 6, 1880	—14*	2	Sept. 10, 1881.
Omaha, Nebr	Missouri	5	2	Dec. 18, 19, 22, 1877; Jan. 4, 1878.	4	9	Dec. 14, 1878	2	1	Dec. 10, 1879	4	5	Nov. 27, 1880	3	11	Nov. 30, 1881.

Pittsburg, Pa	*Allegheny*	— 0*	7	*Oct. 2 and 3. 1877.*	— 0*	7	*Oct. 20, 1878*	— 1*	1	*Oct. 19 and 20, 1879.*	— 0*	6	*Oct. 20, 1880*	— 1*	3	*Sept. 28, 1881.*
Saint Louis, Mo	*Mississippi*	6	10	*Oct. 4, 1877*	5	11	*Dec. 27, 1878*	3	6	Dec. 26, 1879	2	10	Nov. 29, 1880	8	7	Sept. 3, 1881.
Saint Paul, Minn	do	1	9	Sept. 3 to 13, 1877.	0	7	Dec. 3 and 4, 1878.	0	11	Sept. 28, 1879	1	8	Oct. 10 to 14, 1880.	3	4	Aug. 14 and 15, 1881.
Shreveport, La	Red	2	6	Oct. 15, 1877	1	0	Nov. 21, 1878	— 3*	6	Nov. 1 to 4, 1879.	4	6	Oct. 28, 1880	— 1*	5	Sept. 1 and 2, 1881.
Vicksburg, Miss	do	11	4	Aug. 31, 1877	14	9	June 4 and 5, 1879.	3	4	Oct. 17 and 23, 1879.	7	8	Oct. 26, 1880	3	8	Sept. 14 and 17 to 20, 1881.
Yankton, Dak	Missouri	4	0	Dec. 29 to 31, 1877.	2	9	Dec. 12 and 13, 1878.	0	10	Mar. 16, 1880	1	5	Nov. 14 to 16, 1880.	1	9	Oct. 20, Nov. 5 and 8, 1881.

* Below bench-mark.

The zeros of the river gauges at the several places are as follows:

Augusta.—Low water of 1839.
Cairo.—Low water of October, 1871.
Chattanooga.—Low water of September, 1839.
Cincinnati.—Twenty-eight inches below low water of 1858.
Davenport.—Low water of December 14, 1878; 1.25 feet below low water of 1863.
Dubuque.—Low water of 1864.
Keokuk.—Low water of December 30, 1873.
La Crosse.—Low water of October 1, 1871.
Leavenworth.—Low water of November 27, 1871.
Louisville.—Sill of the lock of the Louisville and Portland Canal, foot of Tenth street.
Little Rock.—Low water of 1869.
Memphis.—Eleven inches below low water of December 25, 1872.
Morgantown.—Gauge rests upon bed of river; readings indicate the actual depth of water.
Nashville.—Low water of August, 1860.
New Orleans.—High water of April 16, 1874.
Omaha.—Low water of winter of 1867.
Pittsburg.—Wharf log foot of Market street.
Saint Louis.—Low water of December 21, 1863.
Saint Paul.—Twenty-one inches below low water of September 5, 1877.
Shreveport.—Low water of 1879.
Vicksburg.—Low water of 1871.
Yankton.—Bed of river.

APPENDIX 51.—*Table showing the highest and lowest water, with the dates of the same, at special river stations, of the Signal Service, United States Army, east of the Rocky Mountains, for each year from July 1, 1877, to June 30, 1882*

HIGHEST WATER FOR THE YEAR ENDING JUNE 30—

Stations.	River.	1878.			1879.			1880.			1881.			1882.		
		Feet.	Inches.	Dates.	Feet.	Inches.	Dates	Feet	Inches.	Dates.	Feet.	Inches.	Dates.	Feet.	Inches.	Dates.
Boonville, Mo	Missouri	16	7	July 5, 1877	16	3	July 6, 1878	17	0	July 1, 1879	21	11	May 3, 1881	16	7	June 30, 1882.
Brownsville, Pa	Monongahela	16	6	Nov. 25, 1877	15	2	Nov. 23, 1878	23	0	Feb. 14, 1880	20	6	Dec. 3, 1880	21	0	Mar. 21, 1882.
Brunswick, Mo	Missouri	12	10	July 2 and 3, 1877.	12	3	June 30, 1879	12	3	July 1, 1879	15	6	May 2, 1881	22	6	June 30, 1882.
Confluence, Pa	Youghiogheny	11	7	Nov. 24, 1877	10	0	Jan. 28, 1879	9	7	June 15, 1880	11	7	Feb. 12, 1881	10	6	Feb. 21, 1882.
Decatur, Ala	Tennessee	13	4	Feb. 26, 1878	20	6	Jan. 19, 1879	21	8	Mar. 19 to 22, 1880.	17	4	Dec. 5 and 6, 1880.	23	9	Jan. 23, 24, 1882.
Evansville, Ind	Ohio	27	10	Mar. 17, 1878	33	0	Apr. 1, 1879	42	1	Feb. 21, 1880	38	11	Feb. 19, 1881	44	11	Feb. 25, 1882.
Fort Smith, Ark	Arkansas				5	3	Apr. 27, 1879	5	11	Apr. 5, 1880	8	9	May 25, 1881	14	9	Feb. 23, 1882.
Freeport, Pa	Allegheny	17	0	Feb. 24, 1878	23	0	Dec. 11, 1878	17	6	Jan. 1, 1880	29	5	June 10, 1881	23	0	Jan. 28, 1882.
Helena, Ark	Mississippi	38	10	May 3, 1878	37	3	Jan. 31, 1879	43	8	Mar. 30, 1880	45	4	May 4, 5, 6, and 7, 1881.	47	2½	Mar. 9, 1882.
Hermann, Mo	Missouri	14	10	July 3, 1877	15	4	June 29, 1879	15	1	July 2, 1879	19	7	May 4, 1881	20	4	June 30, 1882.
Jefferson City, Mo	do	17	11	May 30, 1878	15	10	July 5 and 6, 1878.	14	4	July 1 and 2, 1879.	18	9	May 4, 1881	13	2	July 4, 1881.
Kansas City, Mo	do	19	6	July 1 and 2, 1877, and June 10, 1878.	19	10	July 2, 1878	18	9	July 7, 1879	26	4	Apr. 30, 1881	18	10	June 30, 1882.
Le Claire, Iowa	Mississippi	5	6	Jan. 5, 1878	6	6	June 1, 1879	14	6	June 25, 1880	12	9	July 1, 1880	13	11	Oct. 26 and 27, 1881.
Lexington, Mo	Missouri	16	6	June 30, 1878	17	6	July 3, 1878	16	3	July 1, 1879	23	6	Apr. 30 and May 1, 1881.	14	5	June 30, 1882.
Marietta, Ohio	Ohio	22	8	Feb. 25, 1878	32	1	Dec. 13, 1878	31	6	Feb. 16, 1880	39	6	Feb. 13, 1881	35	1	Feb. 23, 1882.
Muscatine, Iowa	Mississippi	10	2	June 10, 1878	10	5	July 17, 1878	17	6	July 26 and 27, 1879.	16	1	July 1, 1880	17	8	Oct. 28, 1881.
New Geneva, Pa	Monongahela	21	9	Nov. 25, 1877	21	2	Dec. 11, 1878	26	3	Feb. 14, 1880	25	6	Dec. 5, 1880	25	5	Mar. 21, 1882.
Oil City, Pa	Allegheny	10	2	Feb. 23, 1878	13	6	Mar. 11, 1879	7	2	Nov. 16, 1879	14	6	Feb. 10, 1881	10	5	Jan. 27, 1882.
Paducah, Ky	Ohio	29	0	Apr. 29, 1878	38	10	Jan. 25, 1879	44	0	May 22 and 23, 1880.	40	6	Feb. 23 and 24, 1881.	49	11	Feb. 26, 1882.
Plattsmouth, Nebr	Missouri	14	1	June 25 and 26, 1878.	13	3	July 1, 1878	11	11	July 5, 1879	19	3	Apr. 25, 1881	13	3	June 29, 1882.
Saint Joseph, Mo	do	17	2	June 27 and 28, 1878.	17	3	July 2 and 3, 1878.	15	0	July 1, 1879	22	8	Apr. 29, 1881	19	5	June 30, 1882.
Warsaw Ill	Mississippi	12	4	July 1, 1877	9	10	June 2, 1879	19	9	June 28, 1880	19	11	Apr. 25, 1881	20	8	Oct. 28, 29, 1881.

Boonville, Mo	*Missouri*	2	2	Jan. 11 and 12, 1878.	*a*—1	3	Dec. 24, 1878	*a*—2	5	Dec. 20, 1879	1	9	Dec. 11 and 12, 1880.	1	10	Jan. 23, 1882.
Brownsville, Pa	Monongahela	*a*—1	6	Oct. 3, 1877	*a*—2	8	Sept. 28, 1878	2	7	Oct. 18, 19, 24, and 25, 1879.	*a*—1	3	Sept. 25 and Oct. 17, 1880.	*a*—2	9	Oct. 7, 9, 1881.
Brunswick, Mo	Missouri	*a*—3	3	Jan. 12 and 13, 1878.	*a*—4	0	Dec. 20 and 22, 1878.	*a*—4	0	Mar. 20 and 22, 1880.	*a*—4	4	Nov. 22, 1880	3	0	Feb. 3, 1882.
Confluence, Pa	Youghiogheny	*a*—0	6	Oct. 3, 1877	*a*—0	7	Oct. 9 to 18, 1878.	*a*—0	8	Oct. 8 to 10, 1879.	*a*—0	7	Sept. 27, and Oct. 16 to 27, 1880.	*a*—0	10	Sept. 11 to 17, 1881.
Decatur, Ala	Tennessee	0	3	Oct, 18, 1877	zero		Sept. 16 and 30 to Oct. 11, 1878.	0	1	Oct. 3 to 10, 1879.	0	5	Oct. 28, 1880	*a*—0	8	Sept. 14 and 15, 1881.
Evansville, Ind	Ohio	1	0	Oct. 14, 1877	1	5	Oct. 26 to 29, 1878.	0	5	Oct. 28 and 29, 1879.	2	0	Oct. 10, 1880	0	3	Sept. 18, 1881.
Fort Smith, Ark	Arkansas				*a*—3	7	June 17 to 23, 1879.	*a*—5	7	Oct. 7 to 15, 1879.	*a*—5	5	Jan. 2, 1881	—4	2	Sept. 25 and 26, 1881.
Freeport, Pa	Allegheny	0	4	Oct. 1, 2, and 3, 1877.	0	4	Sept. 1, 1878	*a*—0	6	Oct. 16 to 24, 1879.	0	2	Sept. 25 to 27, 1880.	*a*—0	7	Sept. 19, 20, 23, 25, 26, 28, 1881.
Helena, Ark	Mississippi	5	0	Oct. 16 and 17, 1877.	7	3	Oct. 25 and Nov. 3 and 4, 1878.	4	11	Nov. 14, 1879	7	6	Dec. 12 and 13, 1880.	6	4	Sept. 13 and 14, 1881.
Hermann, Mo	Missouri	1	6	Jan. 12, 1878	*a*—5	0	Dec. 21 and 22, 1878.	*a*—0	10	Dec. 22, 1879	*a*—0	10	Dec. 6, 1880	6	0	Feb. 11, 1882.
Jefferson City, Mo	....do	1	9	Sept. 25 to Oct. 2, 1877.	zero		Dec. 16, 17, and 27, 1878.	0	4	Dec. 22 to 25, 1879.	0	3	Dec. 31, 1880	1	6	Jan. 11 and 12, 1882.
Kansas City, Mo	....do	3	6	Jan. 12 and 13, 1878.	3	2	Mar. 1, 1879	2	7	Mar. 19, 1880	2	0	Nov. 23, 1880	2	4	Jan. 5, 6, 7, 8, and 9, 1882.
Le Claire, Iowa	Mississippi	1	0	Sept. 25 to 27, 1877, and Jan. Jan. 9, 1878.	*a*—0	6	Dec. 14, 1878	0	8	Dec. 15, 1879, and Feb. 3, 1880.	0	2	Nov. 24, 1880	0	11	Jan. 7 and 8, 1882.
Lexington, Mo	Missouri	3	3	Dec. 20 to 22, 1877, and Feb. 9, 1878.	1	11	Jan. 22 and 23, 1879.	0	1	Jan. 10 to 12 and 22, and Feb. 7, 1880.	0	7	Dec. 12, 29, 30, and 31, 1880.	0	8	Jan. 19, 20, 21, 22, 1882.
Marietta, Ohio	Ohio	2	5	Oct. 6 and 7, 1877.	2	8	Oct. 21 and 22, 1878.	1	8	Oct. 25, 28, and 31, and Nov. 1, 1879.	2	9	Sept. 28 and 29, 1880.	1	7	Oct. 6 to 9, 1881.
Muscatine, Iowa	Mississippi	2	7	Jan. 9, 1878	0	5	Dec. 15, 1878	1	11	Sept. 26 to Oct. 12, 1879.	2	3	Nov. 20, 1880	2	9	Jan. 9, 1882.
New Geneva, Pa	Monongahela	0	10	Oct. 2 and 3, 1877.	0	1	Oct. 17 to 21, 1878.	0	9	Nov. 1 to 9, 1879.	1	8	Oct. 15 to 23, 1880.	0	5	Oct. 1, 2, 3, 4, 7, 8, 1881.
Oil City, Pa	Allegheny	*a*—0	5	Sept. 30 and Oct. 1 to 4, 1877.	*a*—0	3	Oct. 16 to 18, 1878.	*a*—0	6	Oct. 6 and 7, and 16 to 18, 1879.	*a*—0	6	Sept. 19 to 27, 1880.	*a*—0	8	Sept. 22, 1881.
Paducah, Ky	Ohio	0	8	Sept. 15 and 16, 1877.	0	11	Oct. 30 and 31, 1878.	0	8	Oct. 16, 1879	1	9	Oct. 12 and 13, 1880.	zero		Sept. 17, 1881.

a Below bench-mark.

APPENDIX 51.—*Table showing the highest and lowest water, with the dates of the same, at stations of the Signal Service, United States Army, &c.*—Continued.

LOWEST WATER FOR THE YEAR ENDING JUNE 30—

Stations.	River.	1878.			1879.			1880.			1881.			1882.		
		Feet.	Inches.	Dates.	Feet.	Inches.	Dates.	Feet..	Inches.	Dates.	Feet.	Inches.	Dates.	Feet.	Inches.	Dates.
Plattsmouth, Nebr.....	Missouri.....	a—0	4	Jan. 4 and 5, 1878.	2	10	Dec. 12 and 13, 1878.	a—1	3	Mar. 15, 1880..	0	11	Nov. 20, 1880 ..	—0	4	Feb. 22, 1882.
Saint Joseph, Mo.	....do	1	0	Jan. 12, 1878...	0	4	Dec. 22 and 23, 1878.	a—0	2	Dec. 20 and 27, 1879.	zero		Nov. 26 to 28, 1880.	2	2	Jan. 5 and 6, 1882.
Warsaw, Ill.....	Mississippi.....	zero		Oct. 4, 1877....	2	0	Jan. 2, 3, and 4, 1879.	0	10	Dec. 21 and 22, 1879.	2	0	Nov. 23 and 24, 1880.	3	8	Aug. 28, 1881.

a Below bench-mark.

The zeros of the river gauges at the several stations are as follows:

Boonville.—Low water of December 1, 1872.
Brownsville.—Low water of June 5, 1873.
Brunswick.—Low water of 1876.
Confluence.—Twelve inches above the bed of river.
Decatur.—Low water of 1865.
Evansville.—Low water of 1867.
Fort Smith.—Seven feet above low water of 1856.
Freeport.—Low water of 1868.
Helena.—Low water of 1872.
Hermann—Low water of December 21, 1878.
Jefferson City.—Low water of 1867.
Kansas City—Low water of 1872.
Le Claire.—Low water of 1864.
Lexington.—Low water of 1861.
Marietta.—Bottom of Duck Creek Bar.
Muscatine.—Low water of 1864.
New Geneva.—Bed of channel.
Oil City.—One foot six inches above the bed of channel.
Paducah.—Low water of 1857.
Plattsmouth.—Low water of December 6, 1873.
Saint Joseph.—Low water of 1871.
Warsaw.—Three feet above the bottom of river.

APPENDIX 52.

Table showing the normal barometer, corrected for temperature and instrumental error only, at the following meteorological stations in the Dominion of Canada; computed for each month of the year.

Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual mean.
Chatham, New Brunswick	29.880	29.840	29.890	29.860	29.900	29.820	29.810	29.820	30.010	29.900	29.900	29.880	29.876
Charlottetown, Prince Edward Island	29.810	29.820	29.897	29.750	29.910	29.833	29.830	29.790	30.080	29.920	29.850	29.910	29.867
Father Point, Quebec	29.957	29.877	29.933	29.786	29.990	29.840	29.837	29.843	29.963	29.923	29.910	29.910	29.897
Fort Garry, Manitoba	29.150	29.180	29.160	29.090	29.100	29.060	29.080	29.090	29.110	29.090	29.190	29.290	29.132
Halifax, Nova Scotia	29.787	29.763	29.790	29.690	29.830	29.793	29.810	29.773	29.757	29.877	29.857	29.797	29.794
Kingston, Ontario	29.690	29.650	29.690	29.530	29.630	29.610	29.590	29.570	29.700	29.690	29.710	29.640	29.642
Montreal, Quebec	29.830	29.770	29.790	29.640	29.720	29.690	29.700	29.740	29.830	29.680	29.810	29.780	29.748
Parry Sound, Ontario	29.290	29.270	29.310	29.210	29.270	29.250	29.260	29.266	29.340	29.310	29.300	29.280	29.279
Port Dover, Ontario	29.690	29.290	29.290	29.190	29.310	29.260	29.280	29.250	29.390	29.360	29.310	29.310	29.327
Port Stanley, Ontario	29.670	29.350	29.350	29.260	29.350	29.340	29.330	29.290	29.430	29.400	29.360	29.360	29.374
Quebec, Quebec	29.680	29.640	29.670	29.550	29.620	29.580	29.590	29.590	29.720	29.670	29.660	29.660	29.636
Rockliffe, Ontario	29.550	29.520	29.550	29.420	29.470	29.570	29.510	29.470	29.560	29.530	29.540	29.520	29.517
Saugeen, Ontario	29.270	29.260	29.290	29.170	29.260	29.240	29.250	29.250	29.310	29.290	29.290	29.250	29.261
Sydney, Cape Breton	29.840	29.840	29.890	29.810	29.940	29.860	29.880	29.860	30.050	29.940	29.910	29.850	29.889
Toronto, Ontario	29.660	29.630	29.640	29.620	29.620	29.580	29.580	29.580	29.680	29.680	29.660	29.640	29.631
Yarmouth, Nova Scotia	29.920	29.940	29.880	29.880	29.940	29.870	29.880	29.970	29.940	29.990	30.070	29.790	29.922

Table showing the normal temperature at selected meteorological stations in the Dominion of Canada; computed for each month of the year.

Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual mean.
Chatham, New Brunswick	10.0	14.2	22.6	35.6	48.2	59.9	64.8	63.9	56.0	43.9	29.9	15.8	38.7
Father Point, Quebec	11.6	15.0	20.4	32.8	43.9	53.2	58.3	56.4	51.7	41.1	29.2	15.4	35.7
Fort Garry, Manitoba	-3.5	2.1	12.7	34.2	52.2	60.7	66.4	63.8	52.4	39.0	17.8	3.0	33.4
Halifax, Nova Scotia	21.2	22.4	28.6	37.1	48.5	57.8	62.7	63.6	57.6	47.0	35.9	29.0	42.6
Kingston, Ontario	19.4	19.1	26.5	40.0	53.2	63.3	69.1	68.7	60.3	47.8	33.8	22.0	43.6

APPENDIX 52.—*Table showing the normal temperature at selected meteorological stations in the Dominion of Canada; computed for each month of the year*—Continued.

Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual mean.
Montreal, Quebec	13.6	16.6	25.1	39.8	55.2	65.2	70.0	68.1	59.0	46.2	31.0	17.0	42.2
Parry Sound, Ontario	16.1	14.9	22.5	38.0	51.4	61.6	67.3	65.7	56.0	44.7	31.7	19.2	40.8
Quebec, Quebec	19.4	13.3	21.4	34.8	49.7	61.5	67.1	64.5	56.3	43.5	28.0	14.1	39.5
Rockliffe, Ontario	10.9	14.6	21.1	40.3	53.3	60.7	67.1	63.7	55.6	45.4	28.8	15.7	39.8
Saugeen, Ontario	22.6	20.7	26.0	38.2	51.1	60.2	65.7	65.1	57.8	47.1	34.2	25.0	42.8
Sydney, Cape Breton	19.3	19.5	25.5	34.4	45.6	56.1	62.0	63.4	56.5	47.1	36.3	26.9	41.0
Toronto, Ontario	23.5	22.3	28.3	39.7	54.1	63.5	69.1	67.7	59.2	47.4	34.4	26.2	44.6
Yarmouth, Nova Scotia	23.0	23.6	28.2	38.7	48.7	56.3	60.7	59.8	55.5	30.5	36.7	27.9	41.2

APPENDIX 53.

Table showing the highest and lowest temperatures recorded at the several stations of observation of the Signal Service, United States Army, from the commencement of observations to December 31, 1881.

Stations.	Stations established.	Temperature.				
		Highest.	Date.	Lowest.	Date.	Extreme range.
		°		°		°
Albany, N. Y.	Dec. 22, 1873	96	Sept. 7, 1881	−18	Feb. 13, 1875 Jan. 8, 1878	114
Alpena, Mich	Sept. 10, 1872	97	June 28, 1874 July 8, 1876	−27	Feb. 24, 1881	124
Atlanta, Ga.	Sept. 25, 1878	97. 5	July 9, 1881	1	Dec. 30, 1880	96. 5
Atlantic City, N. J.	Dec. 10, 1873	90	July 13, 1880	− 7	Dec. 30, 1880	106
Augusta, Ga.	Nov. 2, 1870	105	July 22, 1878 Aug. 2, 1878	7	Dec. 30, 1880	98
Baltimore, Md	Jan. 1, 1871	101	Sept. 7, 1881	− 6	Jan. 1, 1881	107
Barnegat, N. J	Dec. 10, 1873	96	July 16, 1879 Sept. 7, 1881	−12	Jan. 19, 1875	108
Bismarck, Dak	Sept. 15, 1874	105	Aug. 8, 1876	−38	Dec. 24, 1879	143
Boisé City, Idaho.	July 1, 1877	100	July 20, 1877	− 4	Dec. 24, 1879	110
Boston, Mass	Nov. 1, 1870	101. 5	Sept. 7, 1881	−11	Dec. 20, 1875	112. 5
Brackettville, Tex	Sept. 1, 1875	109	May 21, 1879	13	Dec. 29, 1880 Dec. 30, 1880	96
Breckenridge, Minn *	Apr. 10, 1872	101	Aug. 8, 1876	−40	Dec. 24, 1879 Dec. 25, 1879	141
Brownsville, Tex	Aug. 25, 1875	101	Aug. 3, 1877	18	Dec. 30, 1880 Jan. 1, 1881	83
Buffalo, N. Y.	Nov. 1, 1870	92	June 30, 1878	−13	Feb. 9, 1875	105
Burlington, Vt.	May 24, 1871	97	Aug. 6, 1876	−20	Feb. 2, 1874	117
Cairo, Ill.	June 1, 1871	103	Aug. 12, 1881	−11	Jan. 9, 1875	114
Campo, Cal	Jan. — 1874	103	Aug. 11, 1879	zero	Jan. 29, 1880	103
Camp Thomas, Ariz	Sept. 22, 1877	109	July 1, 1881	14	Jan. 10, 1881 Jan. 23, 1881 Jan. 24, 1881	95
Cape Hatteras, N. C	Sept. 1, 1874	92	July 17, 1881 July 25, 1881 Aug. 12, 1881 Aug. 28, 1881	15	Jan. 4, 1879	77
Cape Henry, Va	Dec. 15, 1873	103	Aug. 13, 1881	7	Dec. 30, 1880	96
Cape May, N. J	May 24, 1871	90	July 20, 1875 July 19, 1878 July 10, 1880	1	Jan. 3, 1879	89
Castroville, Tex	Sept. 29, 1875	108	May 21, 1879	16	Jan. 1, 1881	92
Cedar Keys, Fla	Nov. 7, 1879	94	June 10, 1880 July 9, 1880 July 19, 1880 July 8, 1881 July 9, 1881 July 30, 1881 Sept. 4, 1881 Sept. 5, 1881	22	Dec. 30, 1880	72
Charleston, S. C.	Jan. 5, 1871	103. 5	July 10, 1881	−10	Jan. 3, 1879	113. 5
Charlotte, N. C	Oct. 6, 1878	101	July 12, 1879	− 5	Dec. 30, 1880	106
Chattanooga, Tenn	Jan. 8, 1879	101	July 12, 1879	3	Dec. 30, 1880	98
Cheyenne, Wyo.	Nov. 1, 1870	100. 5	July 14, 1881	−38	Jan. 9, 1875	138. 5
Chicago, Ill.	Nov. 1, 1870	99	July 6, 1874	−28	Dec. 24, 1872	122
Chincoteague, Va.	Mar. 16, 1880	94	July 10, 1880 July 6, 1881	1	Dec. 30, 1880 Dec. 31, 1880	93
Cincinnati, Ohio	Nov. 1, 1870	103. 5	July 10, 1881	−10	Jan. 3, 1879	113. 5
Cleveland, Ohio	Nov. 1, 1870	98. 7	Aug. 12, 1881	−17	Jan. 29, 1873	115. 7
Coleman City, Tex	July 1, 1877	107	July 12, 1879	3	Dec. 29, 1880	104
Columbus, Ohio	July 1, 1878	103	July 10, 1881	−20	Jan. 3, 1879	123
Concho, Tex	Oct. 10, 1875	108	July 13, 1879	− 1	Jan. 10, 1881	109

* Station at Breckenridge, Minn., closed November 30, 1880.

APPENDIX 53.—*Table showing the highest and lowest temperatures, &c.*—Continued.

Stations.	Stations established.	Temperature.				
		Highest.	Date.	Lowest.	Date.	Extreme range.
		°		°		°
Corsicana, Tex.*	Sept. 15, 1874	108	July 20, 1881	3	Jan. 9, 1875	105
Davenport, Iowa	May 24, 1871	98	July 5, 1874 July 6, 1874	−22	Jan. 9, 1875	120
Dayton, Wash	July 1, 1879	102	July 5, 1880	−17	Dec. 23, 1879	119
Deadwood, Dak	Nov. 1, 1878	101	Aug. 7, 1881	−25	Dec. 17, 1878	126
Decatur, Tex	Feb. 1, 1876	107	July 21, 1879 July 23, 1879 Aug. 16, 1881	2	Jan. 6, 1879	105
Denison, Tex	Dec. 16, 1874	109	July 19, 1881	1	Jan. 6, 1879	108
Denver, Colo	Nov. 19, 1871	105	Aug. 8, 1878	−29	Jan. 9, 1875	134
Des Moines, Iowa	Aug. 1, 1878	103	Aug. 17, 1881	−21	Jan. 3, 1879	124
Detroit, Mich	Nov. 1, 1870	100	July 17, 1878	−24	Dec. 22, 1872	124
Dodge City, Kans	Sept. 15, 1874	108	July 29, 1876	−19	Jan. 13, 1875	127
Dubuque, Iowa	July 10, 1873	101	July 5, 1874	−31	Feb. 9, 1875	132
Duluth, Minn	Nov. 1, 1870	96	July 13, 1878	−38	Jan. 9, 1875	134
Eagle Pass, Tex	Jan. 19, 1875	116	May 21, 1879	17	Dec. 30, 1880	99
Eastport, Me	Apr. 1, 1873	88	Aug. 1, 1880	−20	Jan. 26, 1874 Dec. 20, 1875 Feb. 24, 1876	108
Edinburg, Tex	May 27, 1877	107	July 23, 1879 Aug. 3, 1879	21	Jan. 1, 1881	86
El Paso, Tex	Nov. 5, 1877	109	June 24, 1881	− 5	Dec. 18, 1880	114
Erie, Pa	May 25, 1873	94	July 17, 1878	−16	Feb. 9, 1875	110
Escanaba, Mich	May 24, 1871	92	July 19, 1874 July 20, 1878	−32	Feb. 7, 1875	124
Florence, Ariz	Nov. 12, 1874	116	July 31, 1879	19	Dec. 25, 1879	97
Fort Apache, Ariz	Oct. 9, 1877	102.5	July 1, 1881	− 9	Feb. 4, 1880	111.5
Fort Assiniboine, Mont	Oct. 6, 1879	95	Aug. 6, 1881	−42	Dec. 29, 1880	137
Fort Bennett, Dak	Dec. 22, 1879	104	Aug. 7, 1881 Aug. 25, 1881	−36	Jan. 9, 1881	140
Fort Benton, Mont	Oct. 11, 1879	108	Aug. 6, 1881	−59	Dec. 29, 1880	167
Fort Buford, Dak	Oct. 23, 1878	104	July 31, 1881	−46	Dec. 24, 1879	150
Fort Custer, Mont	Dec. 5, 1878	103	July 30, 1881	−42	Dec. 29, 1880	145
Fort Davis, Tex	Dec. 24, 1877	111	June 23, 1881	Zero	Jan. 10, 1881	111
Fort Elliott, Tex	Nov. 29, 1879	102	July 20, 1881	−10	Dec. 24, 1879 Dec. 25, 1879	112
Fort Gibson, Ind. Ter	Apr. 1, 1873	109	July 15, 1879	−12	Jan. 10, 1881	121
Fort Grant, Ariz	Nov. 1, 1875	103	Aug. 14, 1879	17	Jan. 13, 1880 Jan. 23, 1881	86
Fort Griffin, Tex	July 1, 1875	107.3	June 23, 1881	4	Jan. 10, 1881	103.3
Fort Keogh, Mont	Nov. 18, 1878	109	July 30, 1881	−46	Dec. 24, 1879	155
Fort McKavett, Tex	Oct. 19, 1875	107	May 21, 1879	6	Jan 9, 1879	101
Fort Missoula, Mont	Dec. 15, 1879	100	Aug. 6, 1881	−30	Jan. 16, 1881 Jan. 17, 1881	130
Fort Shaw, Mont	Apr. 1, 1880	99	Aug. 6, 1881	−42	Dec. 29, 1880	141
Fort Sill, Ind. Ter	June 23, 1875	106	July 21, 1880	− 9	Jan. 6, 1879	115
Fort Stevenson, Dak	Sept. 19, 1878	101	July 3, 1881	−46	Dec. 24, 1879	147
Fort St. Michael's, Alaska	June 28, 1874	75	June 28, 1876 July 19, 1877	−52	Feb. 6, 1878	127
Fort Verde, Ariz	Nov. 9, 1874	114	July 2, 1881	6	Dec. 25, 1879	108
Fredericksburg, Tex	Mar. 14, 1876	104	May 21, 1879	8	Dec. 29, 1880	96
Galveston, Tex	Apr. 19, 1871	98.5	Aug. 14, 1874	18	Dec. 29, 1880	80.5
Grand Haven, Mich	May 24, 1871	92	Aug. 29, 1881	−24	Feb. 9, 1875	110
Helena, Mont	Oct. 15, 1879	98	July 3, 1880	−40	Dec. 30, 1880	138
Henrietta, Tex	Feb. 1, 1877	105	July 13, 1879 Aug. 16, 1881	3	Nov. 18, 1880	102
Indianapolis, Ind	Feb. 10, 1871	101	July 10, 1881 Aug. 12, 1881	−22	Jan. 22, 1879	123
Indianola, Tex	May 1, 1872	100	Aug. 15, 1874 Aug. 2, 1877	14	Dec. 29, 1880	86
Jacksborough, Tex	May 8, 1875	107	July 14, 1879 July 23, 1879 June 22, 1881 June 23, 1881 July 1, 1881	− 2	Jan. 6, 1879	109
Jacksonville, Fla	Sept. 11, 1871	104	July 11, 1879	19	Dec. 30, 1880	85
Keokuk, Iowa	July 16, 1871	102	Aug. 31, 1873	−22	Dec. 24, 1872	124
Key West, Fla	Nov. 1, 1870	97	July 19, 1880	44	Dec. 2, 1876	53
Kittyhawk, N. C	Jan. 15, 1875	100	July 14, 1876	8	Dec. 30, 1880	92
Knoxville, Tenn	Jan. 1, 1871	100	July 12, 1879 Aug. 12, 1881	−14	Jan. 3, 1877	114
La Crosse, Wis	Oct. 15, 1872	101	July 5, 1874	−43	Jan. 18, 1873	144
La Mesilla, New Mex	June 16, 1876	107.8	June 23, 1881	2	Dec. 31, 1880	105.8

*Station at Corsicana, Texas, closed October 31, 1881.

APPENDIX 53.—*Table showing the highest and lowest temperatures, &c.*—Continued.

Stations.	Stations established.	Temperature.				
		Highest.	Date.	Lowest.	Date.	Extreme range.
		°		°		°
Laredo, Tex	Dec. 10, 1875	111	May 21, 1879	19	Jan. 10, 1884	92
Leavenworth, Kans	May 21, 1871	107	Aug. 5, 1874	−29	Jan. 29, 1873	136
Lewiston, Idaho	July 1, 1879	103	July 24, 1881	5	Jan. 16, 1881	98
Little Rock, Ark	July 1, 1879	102	Aug. 12, 1881	6	Dec. 29, 1880	96
Los Angeles, Cal	July 1, 1877	103.5	June 2, 1879	30	Dec. 14, 1878 Dec. 25, 1879 Jan. 29, 1880	73.5
Louisville, Ky	Sept. 11, 1871	104.6	Aug. 12, 1881	−10	Jan. 9, 1875 Jan. 3, 1879	114.6
Lynchburg, Va	May 24, 1871	101.8	July 13, 1881	− 5	Dec. 31, 1880	106.8
Madison, Wis	Sept. 29, 1878	95	Aug. 4, 1881	−22	Jan. 2, 1879	117
Marquette, Mich	May 1, 1871	100	July 16, 1878	−27	Feb. 12, 1878	127
Mason, Tex	Feb. 7, 1876	105	July 13, 1879 July 23, 1879	9	Dec. 25, 1879 Jan. 10, 1881	96
Memphis, Tenn	Feb. 28, 1871	102	Aug. 11, 1881	2	Jan. 9, 1875 Jan. 10, 1875	100
Milwaukee, Wis	Nov. 1, 1870	98	Aug. 11, 1874	−23	Jan. 16, 1875	121
Mobile, Ala	Nov. 7, 1870	100.8	July 8, 1881	14	Dec. 30, 1880	86.8
Montgomery, Ala	Nov. 9, 1870	100.9	July 7, 1881	8	Dec. 30, 1880	98.9
Moorhead, Minn	Jan. 1, 1881	95.1	July 14, 1881	−33	Jan. 13, 1881	128.1
Morgantown, W. Va	Jan. 25, 1873	97	July 8, 1874	−10	Feb. 10, 1875	107
Mount Washington, N. H	Dec. 1, 1870	74	Aug. 9, 1872	−49	Mar. 5, 1872	123
Nashville, Tenn	Nov. 1, 1870	104	Aug. 11, 1874	− 8	Jan. 3, 1877	112
New Haven, Conn	Dec. 10, 1872	100	Sept. 7, 1881	− 5	Jan. 1, 1881	105
New London, Conn	Jan. 10, 1871	93	July 9, 1876 July 19, 1878	+ 1	Dec. 20, 1875 Dec. 30, 1880	94
New Orleans, La	Nov. 1, 1870	97	June 22, 1881	20	Dec. 24, 1870 Jan. 6, 1879 Dec. 20, 1880	77
Newport, R. I	Aug. 1, 1875	92	July 18, 1878	− 3	Dec. 20, 1875	95
New York, N. Y	Nov. 1, 1870	100.2	Sept. 7, 1881	− 6	Dec. 31, 1880	106.2
Norfolk, Va	Jan. 1, 1871	102.5	July 10, 1876	6	Dec. 30, 1880	96.5
North Platte, Nebr	Sept. 18, 1874	107	July 5, 1877	−27	Dec. 24, 1879 Jan. 9, 1881	134
Olympia, Wash	July 1, 1877	95	June 6, 1878	8	Dec. 23, 1879	87
Omaha, Nebr	Nov. 1, 1870	105	July 25, 1874 Aug. 10, 1874	−22	Jan. 3, 1879	127
Oswego, N. Y	Nov. 1, 1870	100	July 1, 1878	−14	Dec. 20, 1875	114
Pembina, Dak.*	Nov. 1, 1872	96	May 8, 1874	−59	Dec. 24, 1879	155
Pensacola, Fla	Oct. 27, 1879	97	June 15, 1881 June 20, 1881 July 9, 1881	17	Dec. 30, 1880	80
Philadelphia, Pa	Jan. 1, 1871	101.5	Sept. 7, 1881	− 5	Jan. 10, 1875 Dec. 30, 1880	106.5
Phœnix, Ariz	May 9, 1877	111	June 17, 1880	18	Dec. 25, 1879	93
Pike's Peak, Colo	Nov. 1, 1873	64	July 19, 1879	−37	Feb. 3, 1875	101
Pioche, Nev	July 29, 1877	98	July 29, 1878	−13	Dec. 24, 1879	111
Pittsburg, Pa	Nov. 1, 1870	102.7	July 10, 1881	−12	Jan. 10, 1875	114.7
Port Huron, Mich	July 25, 1874	97	Sept. 6, 1881	−20	Feb. 9, 1875	117
Portland, Me	Jan. 15, 1871	97	July 18, 1876	−12	Dec. 20, 1875	109
Portland, Oreg	Nov. 1, 1871	90	June 17, 1876	3	Jan. 14, 1875 Dec. 23, 1879	96
Portsmouth, N. C	Apr. 23, 1876	94	July 12, 1879	15	Dec. 30, 1880	79
Prescott, Ariz	Nov. 19, 1873	103	July 29, 1878	−18	Dec. 25, 1879	121
Punta Rassa, Fla	Aug. 15, 1871	93	June 27, 1877 July 8, 1877 July 29, 1877 Aug. 31, 1879 June 26, 1880	33	Jan. 7, 1879	60
Red Bluff, Cal	July 1, 1877	110.5	Aug. 12, 1878 Aug. 13, 1878	25	Jan. 4, 1878 Dec. 27, 1878 Dec. 23, 1879	85.5
Rio Grande City, Tex	May 28, 1875	112	Aug. 7, 1877 Aug. 21, 1877 May 21, 1879	19	Jan. 1, 1881	93
Rochester, N. Y	Nov. 1, 1870	98	Sept. 6, 1881	−12	Jan. 30, 1873 Feb. 9, 1875	110
Roseburg, Oreg	July 15, 1877	97	July 15, 1880	7	Dec. 21, 1879	90
Sacramento, Cal	July 1, 1877	103	July 12, 1877 Aug. 1, 1879	23.5	Dec. 29, 1878	79.5
Saint Louis, Mo	Nov. 1, 1870	106.4	Aug. 12, 1881	−16	Jan. 9, 1875	122.4
Saint Paul, Minn	Nov. 1, 1870	99	July 6, 1874	−39	Dec. 25, 1879	138
Saint Paul's Island, Alaska	Aug. 18, 1872	62	Aug. 20, 1874	−22	Feb. —, 1877	84
Saint Vincent, Minn	Sept. 5, 1880	92.5	July 1, 1881	−44	Jan. 31, 1881	136.5
Salt Lake City, Utah	Mar. 22, 1874	101	Aug. 6, 1875	−10	Dec. 25, 1879	111

*Station at Pembina, Dak., moved to Saint Vincent, Minn., on September 4, 1880.

APPENDIX 53.—*Table showing the highest and lowest temperatures, &c.*—Continued.

Stations.	Stations established.	Temperature.				
		Highest.	Date.	Lowest.	Date.	Extreme range.
		°		°		°
San Antonio, Tex	Sept. 22, 1875	108	Aug. 5, 1877	10	Dec. 29, 1880	98
San Diego, Cal	Nov. 1, 1871	100	Sept. 11, 1878	32	Dec. 25, 1879; Jan. 31, 1880	68
Sandusky, Ohio	Aug. 2, 1877	98	Aug. 12, 1881	−16.5	Jan. 3, 1879	114.5
Sandy Hook, N. J	Dec. 10, 1873	101	Sept. 7, 1881	− 5	Dec. 30, 1881	106
San Francisco, Cal	Mar. 8, 1871	93	June 12, 1876	34	Dec. 24, 1879	59
Santa Fé, N. Mex	Nov. 20, 1871	97	Aug. 9, 1878	−13	Dec. 25, 1879	110
Savannah, Ga	Jan. 1, 1871	105	July 12, 1879	15	Dec. 30, 1880	90
Shreveport, La	Sept. 3, 1871	107	July 16, 1875	6	Jan. 6, 1879	101
Silver City, N. Mex	May 15, 1878	99	June 14, 1881	5	Dec. 31, 1880	94
Sitka, Alaska	Mar. 30, 1881	79	Aug. 14, 1881	14	Dec. 14, 1881	65
Smithville, N. C	Oct. 15, 1875	100	July 12, 1879	10	Dec. 30, 1880	90
Spokane Falls, Wash	Feb. 5, 1881	96	July 2, 1881	− 7	Feb. 15, 1881	103
Springfield, Ill	July 1, 1879	101.5	July 11, 1879	−14	Dec. 29, 1880	115.5
Springfield, Mass	July 19, 1873	94.5	July 9, 1876	−14	Jan. 1, 1881	108.5
Stockton, Tex	Feb. 26, 1876	100.6	June 23, 1881	2	Jan. 10, 1881	104.6
Thatcher's Island, Mass	Dec. 26, 1875	95	Sept. 7, 1881	− 7	Dec. 30, 1880	102
Toledo, Ohio	Nov. 1, 1870	99	June 20, 1872	−15	Dec. 22, 1872	114
Tucson, Ariz	Dec. 2, 1875	111	June 17, 1881; June 23, 1881	14	July 30, 1880	97
Umatilla, Oreg	July 15, 1877	107	July 17, 1880	−22	Dec. 23, 1879	129
Uvalde, Tex	Sept. 6, 1875	113	May 21, 1879	10	Dec. 27, 1879	103
Vicksburg, Miss	Sept. 19, 1871	101	June 16, 1881	10	Jan. 10, 1875	91
Visalia, Cal	July 1, 1877	109	June 3, 1879	21.5	Dec. 27, 1878	87.5
Washington, D. C	Nov. 1, 1870	104.3	Sept. 7, 1881	−14	Jan. 1, 1881	118.3
Wickenburg, Ariz	Jan. 6, 1874	113	Aug. 14, 1877	12	Dec. 13, 1878	101
Wilmington, N. C	Jan. 1, 1871	103	July 12, 1879	10	Dec. 30, 1880	93
Winnemucca, Nev	July 1, 1877	104	July 20, 1877	−20	Dec. 24, 1879	124
Wood's Holl, Mass	Jan. 1, 1873	90	July 9, 1876	− 5.7	Dec. 20, 1875	95.7
Yankton, Dak	Apr. 1, 1873	103	Aug. 14, 1873	−34	Dec. 25, 1879	137
Yuma, Ariz	Nov. 18, 1873	118	July 29, 1878	25	Feb. 1, 1880	93

APPENDIX 54.

ANNUAL METEOROLOGICAL SUMMARY OF STATIONS OF THE SIGNAL SERVICE, UNITED STATES ARMY.

The following tables show in a comprehensive form the local meteorological data for the preceding twelve months, from observations taken at each of the regular reporting stations of the Signal Service:

[FORM NO. 132—A.]

ALBANY, N. Y.

Latitude, 42° 39′; longitude west of Greenwich, 73° 45′. Elevation of barometer above sea-level, 75 feet. Elevation of rain-gauge (top) above ground, 70 feet. Elevation of exposed thermometer above ground, 51 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometer.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
							°	°	°	°	°	°											
1881.																							
July	29.949	29.896	29.949	29.932	30.317	29.559	71.3	79.5	70.8	73.9	91	59.5	67.4	51.4	71.4	63.4	6.0	7.0	4.0	5 7	2.22	.83	8,9
August	30.041	29.982	30.018	30.014	30.323	29.596	69.6	79.7	70.5	73.3	92.5	55.3	76.4	53.7	71.9	67.3	4.7	5.0	4.1	4.6	2.07	.59	6,7
September	30.117	30.048	30.101	30.089	30.428	29.829	67.1	77.3	68.4	70.9	96	52.5	74.5	56.9	71.7	67.7	5.7	4.7	2.7	4.5	2.38	.62	27,28
October	30.171	30.100	30.139	30.137	30.617	29.488	52.0	60.3	53.0	55.1	84	31	68.7	57.0	68.6	64.8	6.5	7.0	4.2	5.9	3.19	1.40	2,3
November	30.187	30.143	30.182	30.170	30.685	29.561	41.5	46.9	42.1	43.5	67	18	76.6	59.0	68.6	68.0	7.5	7.8	6.7	7.4	3.44	.79	18, 19
December	30.148	30.113	30.164	30.142	30.662	29.325	37.0	41.7	37.5	38.7	63	10.5	80.7	67.0	73.8	73.9	7.8	7.6	5.4	6.9	4.88	1.40	26, 27
Year 1881	30.059	30.004	30.046	30.036	.....	.....	48.4	56.4	49.4	51.4	.....	.....	72.5	56.5	70.3	66.4	6.4	6.2	4.9	5.8	36.34	.....	.....
1882.																							
January	30.143	30.129	30.142	30.138	30.947	29.482	25.5	30.2	26.5	27.4	48	−14	74.1	62.3	72.2	69.5	6.7	6.9	5.2	6.3	2.64	.41	26, 27
February	30.161	30.121	30.162	30.145	30.885	29.573	30.2	37.2	30.3	32.6	56	7	70.8	58.4	68.4	65.9	6.1	5.5	5.4	5.7	3.31	1.22	21, 22
March	30.103	30.043	30.113	30.086	30.733	29.462	36.8	42.7	36.9	38.8	58	18	71.5	57.1	65.2	64.6	7.0	6.9	4.6	6.2	1.79	.66	1, 2
April	30.041	29.953	30.034	30.009	30.544	29.258	43.9	52.8	44.3	47.0	69	25	60.3	44.1	55.9	53.4	6.4	7.3	5.3	6.3	1.27	.40	7
May	30.048	29.977	30.023	30.016	30.465	29.552	52.5	62.1	53.2	55.9	79	36	62.0	43.9	59.0	55.0	7.3	7.0	4.7	6.3	4.15	1.28	28, 29
June	29.893	29.836	29.890	29.873	30.262	29.404	66.6	75.3	65.0	69.0	90	51	65.6	45.5	64.8	58.6	5.6	6.3	3.6	5.2	3.98	.93	19

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.13 a. m., 3.13 p. m., and 11.13 p. m., local time.

J. O. BARNES,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

ALBANY, N. Y.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	3,636	E. N. S.	16	1 17 25	10	13	7	1	28	9	10	12	3	8	15	8	11	0	5	0	0	0	
August	3,411	W.	16	10	21	8	3	3	28	8	7	12	3	10	14	7	11	0	3	0	0	0	
September	3,734	S.	19	22 30	16	6	3	7	33	11	7	5	2	10	15	5	10	0	6	2	0	0	
October	3,943	S.	22	12	12	9	4	3	28	9	13	15	0	6	13	12	13	0	0	0	0	1	Early frost October 5th.
November	4,314	W. S.	20	9 15 17	13	4	3	1	25	12	18	14	0	2	12	16	11	4	0	0	0	7	
December	4,775	S.	24	12	12	7	0	1	28	15	12	16	2	3	14	14	*11	*4	0	0	2	12	
Year 1881	50,712	.....	....	.....	168	126	44	26	265	100	182	169	15	80	149	136	113	34	18	5	39	91	
1882.																							
January	4,668	N. W.	32	27	7	6	4	2	25	7	18	19	5	5	12	14	†6	†13	0	0	8	25	
February	3,441	W.	24	8	14	9	2	2	22	7	7	14	7	8	12	8	†10	‡4	0	0	6	22	
March	5,657	W.	28	24	12	4	2	2	23	5	20	15	10	4	17	10	11	5	0	1	1	15	
April	5,513	W.	25	17	18	10	0	2	16	4	21	17	2	5	12	13	9	3	1	3	0	4	
May	4,120	N. W.	25	2	19	11	1	3	17	7	22	5	8	5	13	13	15	0	1	0	0	0	Late frost May 24th.
June	4,217	W.	21	9	14	1	2	0	26	7	26	12	2	6	17	7	14	0	5	0	0	0	

* Both rain and snow fell on 1 day of this month. † Both rain and snow fell on 3 days of this month. ‡ Both rain and snow fell on 2 days of this month.

J. O. BARNES,
Sergeant, Signal Corps, U. S. A.

Location of office on June 30, 1882, No. 44 State street.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

ALPENA, MICH.

[Latitude, 45° 5′; longitude west of Greenwich, 83° 30′. Elevation of barometer above sea-level, 609 feet. Elevation of rain-gauge (top) above ground, 52 feet. Elevation of exposed thermometer above ground, 54 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0. 10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Highest.	Lowest.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.992	29.964	29.970	29.975	30.245	29.647	64.1	74.3	66.1	68.2	91	53	77.3	58.0	72.0	68.4	4.6	4.4	3.1	4.0	2.09	.70	10
August	30.044	30.031	30.026	30.034	30.269	29.619	62.4	72.0	65.0	66.5	89	45	82.2	62.8	79.0	74.7	3.8	4.7	3.1	3.9	3.02	1.15	5
September	30.007	29.973	29.986	29.989	30.248	29.566	59.3	67.5	60.3	62.4	92	43	83.0	67.9	82.4	77.9	7.4	6.5	9.5	7.8	6.16	2.50	24
October	30.126	30.098	30.121	30.115	30.538	29.594	42.3	51.3	44.2	45.9	68	26	87.6	65.7	80.4	77.9	6.7	6.4	6.0	6.3	10.25	2.82	15
November	30.041	30.008	30.029	30.026	30.649	29.387	32.1	36.6	32.8	33.8	60	9	81.0	70.0	77.0	76.0	8.7	8.4	6.8	8.0	3.01	.78	30
December	30.084	30.058	30.075	30.072	30.554	29.384	27.6	33.8	29.6	30.3	49	10	79.9	70.0	77.4	75.8	8.2	7.9	6.5	7.5	2.28	.63	28
Year 1881	30.045	30.008	30.027	30.027	.....	.....	38.2	47.1	40.6	42.1	.....	.....	80.3	67.0	78.2	75.2	5.8	6.0	5.2	5.7	45.61	.....	....
1882.																							
January	30.110	30.073	30.080	30.088	30.803	29.329	16.9	23.8	19.9	20.2	38	—27	81.8	75.6	78.8	78.7	8.4	7.8	6.6	7.6	3.70	.83	8
February	30.055	30.004	30.035	30.031	30.774	29.218	24.8	32.9	28.1	28.6	54	2	79.8	68.8	77.8	75.5	7.1	7.2	6.3	6.9	2.56	.82	28
March	30.088	30.053	30.092	30.078	30.726	29.246	24.1	31.6	26.3	27.3	55	0	83.1	73.2	82.3	79.6	7.1	7.2	6.1	6.8	4.62	.62	27
April	30.094	30.070	30.063	30.076	30.451	29.212	34.0	41.2	34.9	36.7	60	12	73.0	59.6	72.6	68.4	5.3	5.8	3.7	4.9	2.65	1.02	19
May	*30.056	30.028	30.024	*30.036	30.422	29.462	*43.2	47.4	42.7	*44.4	68	25	*66.7	58.1	68.9	*64.6	5.3	6.0	4.0	5.1	4.49	1.52	10
June	29.884	29.855	29.862	29.867	30.199	29.332	55.7	62.5	55.1	57.8	85	39	75.0	64.1	78.3	72.5	3.8	5.2	4.7	4.6	6.66	1.70	3, 4

* Means for thirty days only.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, corresponds with 6.34 a. m., 2.34 p. m., and 10.34 p. m., local time.

JAMES J. FITZGERALD,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

ALPENA, MICH.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	6,032	W.	27	16	2	2	7	19	4	2	19	37	1	13	11	7	11	0	7	0	0	0	
August	5,258	SE. SW.	24	8 17	6	6	4	23	4	12	15	21	2	11	11	9	10	0	3	0	0	0	
September	6,896	S.	36	24 15	4	7	14	18	8	13	13	12	1	5	8	17	17	0	7	6	0	0	
October	6,863	W. SE.	28	14 29	4	5	5	13	7	9	25	23	2	7	6	18	17	1	3	2	0	4	First light frost occurred October 1.
November	9,179	SE.	42	12	1	3	1	9	16	19	27	14	0	2	12	16	11	11	0	1	7	21	First heavy frost occurred October 6.
December	7,249	NW.	36	7	5	1	7	1	13	26	25	14	1	4	7	20	4	12	0	3	5	26	
Year 1881	79,325	.....	....	.....	70	53	96	163	103	111	200	280	19	97	123	145	112	63	29	21	75	165	
1882.																							
January	7,877	NW.	36	26	2	0	4	9	15	18	32	12	1	4	11	16	2	20	0	1	19	30	
February	8,048	E.	36	21	2	3	4	21	8	13	20	13	0	8	4	16	11	6	0	2	10	23	
March	8,908	E.	40	21	8	2	11	19	7	4	18	24	0	2	15	14	6	17	1	1	12	29	
April	7,410	SE.	30	3	11	6	16	11	5	3	14	24	0	12	9	9	5	6	2	8	1	24	
May	7,582	E.	30	10	8	7	21	23	6	2	9	16	1	10	12	9	7	0	0	3	0	8	Last frost occurred May 23.
June	6,562	E.	36	30	1	3	17	20	5	2	15	25	2	8	19	3	15	0	7	2	0	0	

Location of office, June 30, 1882, northwest corner of Fletcher and Dock streets.

JAMES J. FITZGERALD
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

ATLANTA, GA.

[Latitude, 33° 45′; longitude west of Greenwich, 84° 23′. Elevation of barometer above sea-level, 1,131 feet. Elevation of rain-gauge (top) above ground, 92 feet. Elevation of exposed thermometer above ground, 78 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.032	29.989	30.007	30.009	30.224	29.802	75.3	88.1	79.2	80.9	97.5	59.5	75.4	44.8	63.0	61.1	4.4	7.0	3.3	4.9	.56	.20	25
August	30.048	30.001	30.030	30.026	30.265	29.766	72.5	85.1	76.8	78.1	96.2	65.0	92.0	51.0	73.4	68.8	6.9	7.7	3.5	5.7	4.10	2.29	29
September	30.119	30.072	30.104	30.098	30.270	29.728	69.1	81.3	74.3	74.9	90.5	60.0	86.6	58.5	75.6	73.6	4.1	7.9	3.6	5.2	3.76	2.40	16
October	30.228	30.179	30.200	30.202	30.467	29.898	60.6	73.4	65.9	66.6	84.5	47.5	84.3	57.5	73.8	71.9	4.2	6.5	4.3	5.0	3.44	2.66	30
November	30.266	30.220	30.260	30.249	30.633	29.913	47.0	58.2	51.8	52.3	75.0	20.0	80.1	61.0	72.1	71.1	5.6	6.1	5.3	5.7	4.30	1.65	7
December	30.245	30.210	30.238	30.231	30.623	29.753	44.7	54.3	48.9	49.3	66.5	29.0	78.2	61.6	69.0	69.6	7.2	6.7	5.8	6.6	7.53	2.14	26
Year 1881	30.094	30.038	30.073	39.068	.....	.....	56.5	68.1	61.4	62.0	.....	.....	76.8	52.7	67.3	65.6	5.8	6.6	4.3	5.6	61.74	.....	.....
1882.																							
January	30.224	30.199	30.230	30.218	30.555	29.722	45.2	50.9	48.1	48.1	73.0	22.2	84.4	71.6	78.5	78.2	8.4	7.6	6.6	7.5	6.40	1.60	30, 31
February	30.218	30.188	30.224	30.208	30.568	29.488	46.7	57.4	52.6	52.2	72.0	31.0	77.5	60.1	68.0	68.5	6.8	6.9	6.2	6.6	10.29	2.78	28
March	30.176	30.141	30.177	30.165	30.547	29.769	50.6	63.7	56.6	57.0	81.0	33.5	75.6	51.0	61.4	62.7	5.5	5.4	4.6	5.2	4.16	1.66	27
April	30.074	30.028	30.050	30.051	30.403	29.678	57.6	71.7	63.7	64.3	82.2	42.8	78.5	48.0	64.3	63.6	5.9	5.1	4.7	5.2	5.25	2.11	22
May	30.049	30.000	30.023	30.024	30.274	29.654	60.5	73.2	65.0	66.2	84.2	45.0	75.0	52.5	65.3	64.3	4.9	5.6	3.4	4.6	3.02	.75	21, 22
June	30.029	29.991	30.018	30.013	30.239	29.760	71.3	82.6	74.6	76.2	93.2	55.5	79.1	53.7	71.3	68.0	7.1	5.6	3.8	5.5	3.22	1.61	15, 16

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, corresponds with 6.31 a. m., 2.31 p. m., and 10.31 p. m., local time.

H. HALL,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

ATLANTA, GA.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	6,424	E.	40	12	5	9	20	5	3	7	8	35	1	6	19	6	6	0	4	0	0	0	
August	6,828	NW.	34	20	2	15	20	16	6	11	11	12	0	3	18	10	12	0	3	0	0	0	
September	5,173	E.	27	30	8	7	32	13	2	6	3	19	0	8	13	9	9	0	3	0	0	0	
October	6,779	SE.	25	30	2	23	25	13	2	2	7	18	1	11	11	9	8	0	1	0	0	0	Lunar halo on 9th.
November	7,423	NW.	36	24	2	11	21	12	6	5	8	25	0	10	7	13	13	0	0	0	0	3	Lunar halo 1st, 2d, and 4th; first and killing frost, a. m. of 4th.
December	8,158	W.	41	29	4	8	32	6	4	10	8	21	0	6	12	13	14	0	0	0	0	2	Luna halo 24th.
Year 1881	64,025				48	103	284	97	45	83	115	311	9	97	148	120	119	3	21	0	0	30	
1882.																							
January	8,088	NW.	29	29	1	11	18	8	9	10	5	31	0	2	8	21	20	2	0	0	0	7	
February	7,741	NW. / SE.	35	4 / 28	0	8	22	11	7	8	12	16	0	6	6	16	11	0	1	0	0	1	
March	*8,088	NW.	36	13	0	7	14	7	11	14	20	20	0	9	14	8	12	0	1	0	0	0	
April	5,278	SW.	26	10	5	6	17	19	6	7	13	17	0	8	13	9	12	0	3	0	0	0	
May	5,755	E.	28	8	5	4	11	11	14	17	10	20	1	10	17	4	12	0	0	0	0	0	
June	5,089	N.	49	17	4	5	11	6	9	17	17	21	0	4	21	5	13	0	6	0	0	0	

*For 28 days.

Location of office on June 30, 1882, Kimball House, corner of Prior and Decatur streets.

H. HALL,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM NO. 132—A.]

ATLANTIC CITY, N. J.

[Latitude, 39° 22′; Longitude west of Greenwich, 74° 25′. Elevation of barometer above sea-level, 13 feet. Elevation of rain-gauge (top) above ground, 37 feet. Elevation of exposed thermometer above ground, 10 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	8 p. m.	11 p. m.	Mean.	Highest.	Lowest.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.960	29.930	29.956	29.949	30.226	29.628	70.9	77.7	71.1	73.2	92.0	57.0	81.9	70.7	84.0	78.9	4.5	5.5	4.6	4.9	1.01	.50	30, 31
August	30.055	30.017	30.039	30.037	30.339	29.676	69.1	75.8	70.1	71.7	91.8	57.0	87.2	74.1	87.0	82.8	4.1	4.1	3.3	3.8	2.79	2.31	7
September	30.117	30.078	30.106	30.100	30.351	29.857	70.6	75.7	71.3	72.6	92.0	55.0	89.2	78.6	88.9	85.6	5.3	5.3	4.6	5.1	2.20	1.16	10
October	30.191	30.126	30.156	30.158	30.578	29.508	58.2	65.5	59.9	61.2	83.0	34.6	83.7	71.2	83.8	79.6	5.2	5.2	4.4	4.9	3.03	.81	24
November	30.217	30.171	30.197	30.195	30.717	29.665	46.2	52.8	47.5	48.8	70.0	22.0	81.0	71.6	81.7	78.1	5.1	5.3	5.3	5.2	3.64	1.46	23, 24
December	30.186	30.135	30.182	30.168	30.664	29.402	39.2	45.8	41.4	42.2	62.0	18.8	82.6	74.3	81.3	79.4	5.7	6.6	5.4	5.9	2.14	.66	22, 23
Year 1881	30.067	30.025	30.052	30.048	.....	.....	50.2	56.6	51.2	52.7	.....	.....	83.3	72.8	83.8	80.0	5.3	5.8	4.7	5.2	40.08	.....	.....
1882.																							
January	30.189	30.130	30.170	30.163	30.860	29.228	31.2	37.9	32.8	34.0	58.6	Zero.	78.0	69.6	78.8	75.5	5.8	6.9	5.1	5.9	6.74	1.27	25, 26
February	30.174	30.126	30.148	30.149	30.740	29.273	34.7	42.0	37.0	37.9	53.7	20.3	81.5	70.4	83.5	78.5	4.7	5.4	3.7	4.6	4.37	1.02	9
March	30.101	30.049	30.110	30.087	30.693	29.593	38.7	45.9	39.5	41.4	65.5	21.0	78.7	64.4	77.3	73.5	6.2	5.0	2.9	4.7	3.43	1.07	27, 28
April	30.052	29.992	30.020	30.021	30.516	29.416	44.1	51.2	44.9	46.7	71.0	24.3	76.1	66.5	81.0	74.5	5.6	5.9	5.4	5.6	3.21	1.74	26, 27
May	30.020	29.987	29.997	30.001	30.439	29.443	52.1	56.2	51.3	53.2	82.2	33.7	82.2	74.7	84.2	80.4	6.7	5.8	6.1	6.2	5.27	1.18	11, 12
June	29.922	29.885	29.906	29.904	30.262	29.537	65.1	70.7	63.9	66.6	86.8	50.0	77.4	69.9	84.3	77.2	4.8	4.7	2.8	4.1	1.72	.77	1

NOTE.—7. a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.11 a. m., 3.11 p. m., and 11.11 p. m., local time.

JAMES M. WATSON,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM NO. 132—B.]

ATLANTIC CITY, N. J.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	5,942	NE.	25	30	12	13	13	8	21	13	8	5	0	5	21	5	7	0	1	0	0	0	
August	5,611	SW.	26	6	19	7	9	16	20	16	4	2	0	11	14	6	10	0	4	0	0	0	
September	7,136	E. SE.	....	15 16	9	18	14	11	11	23	1	2	1	11	12	7	4	0	1	0	0	0	
October	6,915	NW.	31	5	7	8	8	12	12	26	5	14	1	12	11	8	10	0	2	0	0	0	
November	6,891	S.	29	5	10	11	4	3	10	20	15	13	4	10	8	12	13	0	0	0	0	6	First frost 16th.
December	6,776	NE.	28	5	18	7	6	6	10	22	11	13	0	7	11	13	11	2	0	0	0	11	
Year 1881	83,581	....	....	....	160	147	109	97	146	167	102	157	10	100	152	113	112	17	9	0	18	83	
1882.																							
January	6,945	W. NE.	32	22 31	20	9	3	0	7	15	17	19	3	6	14	11	16	2	0	0	5	22	
February	7,041	E.	44	4	10	3	8	9	17	11	11	14	1	11	9	8	10	1	1	0	0	16	
March	8,190	S.	33	27	15	5	5	12	14	5	13	22	2	9	17	5	11	1	0	0	0	11	Latest frost 29th.
April	7,578	SE.	30	26	12	12	7	10	17	7	13	12	0	8	12	10	11	0	2	2	0	2	
May	9,307	NE.	48	11	14	18	8	11	20	12	2	8	0	6	12	13	14	0	1	0	0	0	
June	6,246	NE.	29	11	6	8	2	11	24	19	11	9	0	7	20	3	6	0	4	2	0	0	

JAMES M. WATSON,
Sergeant, Signal Corps, U. S. A.

Location of office on June 30, 1882, Apsley Cottage, Rhode Island avenue.

Annual meteorological summary—Continued.

[FORM NO. 132—A.]

AUGUSTA, GA.

[Latitude 33° 28′; Longitude west of Greenwich 81° 54′. Elevation of barometer above sea-level, 183 feet. Elevation of rain-gauge (top) above ground, 40 feet. Elevation of exposed thermometer above ground, 18 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0.10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometer.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.028	29.963	29.999	29.997	30.213	29.738	77.9	93.3	81.5	84.2	102.3	64.3	76.4	42.0	67.6	62.0	4.7	4.2	1.9	3.6	3.46	1.28	20
August	30.044	29.994	30.025	30.021	30.266	29.744	75.4	87.3	78.3	80.5	100.1	66.1	82.8	54.0	74.4	70.4	5.9	6.4	4.9	5.7	4.82	2.79	7
September	30.123	30.048	30.102	30.091	30.302	29.787	78.3	87.9	77.0	79.4	96.8	64.4	86.0	50.2	78.7	71.6	5.1	5.8	1.6	4.2	7.01	4.94	17
October	30.218	30.151	30.194	30.188	30.483	29.810	64.2	79.1	68.3	70.6	90.0	48.2	81.3	53.6	74.5	69.8	4.0	5.0	2.4	3.8	2.33	1.42	31
November	30.259	30.199	30.253	30.237	30.653	29.813	50.8	64.5	54.6	56.6	81.4	26.0	82.3	57.1	75.1	71.5	5.0	5.4	3.9	4.8	3.81	1.46	23
December	30.258	30.198	30.250	30.235	30.677	29.778	48.3	60.8	51.3	53.5	74.6	31.8	78.6	54.0	71.4	68.0	7.1	5.4	4.2	5.6	4.96	1.61	29
Year 1881	30.123	30.055	30.098	30.091	.....	.....	59.5	73.9	63.6	65.7	.....	.....	79.2	49.9	71.9	67.0	5.0	5.4	3.2	4.5	54.77	.....	.....
1882.																							
January	30.244	30.207	30.253	30.235	30.644	29.732	48.5	58.2	51.5	52.7	75.6	25.5	80.9	64.4	77.8	74.4	7.9	7.0	6.4	7.1	3.39	1.09	30
February	30.256	30.206	30.255	30.239	30.643	29.491	49.1	63.8	54.9	55.9	78.0	30.7	77.3	49.2	69.7	65.4	5.5	5.6	3.5	4.9	3.95	1.29	3, 4
March	30.203	30.137	30.194	30.178	30.614	29.769	53.3	70.5	59.0	60.9	89.3	37.3	77.2	47.0	68.2	64.1	4.4	5.0	3.3	4.2	6.80	4.17	27
April	30.096	30.024	30.069	30.063	30.438	29.582	59.9	75.1	64.6	66.5	87.0	45.0	82.7	48.6	72.6	68.0	5.0	6.2	2.6	4.6	4.77	3.26	22, 23
May	30.083	30.009	30.053	30.048	30.334	29.676	63.4	78.6	67.3	69.8	90.0	48.0	80.8	47.2	75.4	67.8	5.3	6.3	3.1	4.9	3.70	1.21	28
June	30.059	30.001	30.044	30.035	30.287	29.794	73.6	86.3	76.0	78.6	97.0	57.0	81.3	52.0	78.8	70.7	6.1	6.2	4.1	5.5	4.12	1.72	1

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.41 a. m., 2.41 p. m., and 10.41 p. m., local time.

JNO. HEALY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM NO. 132—B.]

AUGUSTA, GA.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	2,728	NE.	27	2	9	15	9	12	16	10	7	9	6	14	14	3	6	0	5	0	0	0	
August	3,302	NE.	32	27	6	21	19	12	9	9	5	5	7	3	19	9	15	0	2	0	0	0	
September	1,964	NE.	15	13	2	11	14	21	9	3	2	2	26	11	14	5	6	0	3	1	0	0	Aurora observed on 23d.
October	2,628	NE.	24	5	2	26	7	7	12	2	8	4	25	15	11	5	5	0	0	0	0	0	
November	2,382	NE.	17	21	9	15	6	2	6	4	8	13	27	12	9	9	12	0	0	0	0	3	First frost of season on 4th.
December	3,308	SW.	29	29	8	22	3	4	7	12	8	14	15	5	17	9	14	0	1	1	0	1	Aurora visible on 18th.
Year 1881	38,045	.....	....	.....	66	171	104	122	113	103	127	110	179	126	150	89	119	1	23	2	0	14	
1882.																							
January	3,038	SW.	17	21	5	18	3	3	10	10	12	11	21	5	7	19	17	1	0	0	0	3	
February	2,890	W.	24	9	1	6	13	7	10	2	20	6	19	10	10	8	10	0	0	0	0	2	
March	3,648	NW.	23	13	3	9	3	9	14	7	17	10	21	13	11	7	10	0	2	0	0	0	Last frost of season on 14th.
April	2,739	SW.	22	10	4	12	2	15	13	10	8	3	23	13	9	8	8	0	4	2	0	0	Light frost reported in the country on 18th. Aurora last hour of 16th and early a. m. 17th.
May	2,975	SW.	24	10	3	8	7	11	19	11	10	8	15	5	21	5	10	0	5	0	0	0	
June	2,636	NE.	36	27	4	3	4	11	17	15	8	11	17	5	19	6	8	0	5	0	0	0	

JNO. HEALY,
Sergeant, Signal Corps, U. S. A.

Location of office on June 30, 1882, Cotton Exchange Building, Reynolds street.

Annual meteorological summary—Continued.

(FORM No. 132—A.)

BALTIMORE, MD.

[Latitude, 39° 18; longitude west of Greenwich, 76° 37'. Elevation of barometer above sea-level, 45 feet. Elevation of rain-gauge (top) above ground, 69 feet. Elevation of exposed thermometer above ground, 33 feet.]

	Baremeter (to sea).						Temperature.						Relative humidity.				Average cloudiness. Amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Highest.	Lowest.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.998	29.946	29.973	29.972	30.257	29.691	74.1	85.4	76.2	78.6	96	65	68.5	45.3	70.0	61.3	5.3	5.5	3.7	4.8	1.40	.80	13
August	30.079	30.013	30.052	30.048	30.315	29.689	71.3	84.9	74.5	76.9	98	60	71.4	44.3	67.5	61.1	3.3	5.1	2.5	3.6	2.15	1.01	7
September	30.120	30.059	30.105	30.095	30.333	29.864	71.6	84.1	74.9	76.9	101	59	80.0	53.8	74.2	69.3	5.3	5.6	3.2	4.7	2.98	1.59	11
October	30.204	30.127	30.165	30.165	30.608	29.585	58.0	69.8	61.5	63.1	89	39	75.3	54.6	71.3	67.1	4.9	5.6	3.9	4.9	4.06	1.42	30, 31
November	30.240	30.190	30.215	30.215	30.748	29.732	45.9	53.5	48.1	49.1	71	24	71.1	60.5	71.7	67.8	3.9	5.9	4.2	4.7	2.41	0.87	23, 24
December	30.207	30.152	30.202	30.187	30.686	29.433	40.4	48.9	42.2	43.8	71	24	78.9	60.7	72.3	70.6	5.2	6.9	4.9	5.7	5.90	1.73	22
Year 1881	30.090	30.036	30.073	30.066	.....	.....	52.8	62.8	55.6	57.1	.....	.....	73.9	54.2	69.8	66.0	5.5	6.2	4.1	5.3	49.12	.....	.....
1882.																							
January	30.218	30.172	30.201	30.197	30.918	29.381	32.2	38.0	34.0	34.7	59	7	75.0	64.8	77.9	72.6	6.5	7.3	4.7	6.2	5.38	0.92	13
February	30.204	30.144	30.177	30.175	30.765	29.350	37.1	46.6	40.3	41.3	59	23	72.8	58.1	69.5	66.8	4.8	5.8	3.9	4.8	3 73	0.79	19
March	30.150	30.101	30.151	30.134	30.739	29.565	41.2	49.7	43.9	44.9	69	26	72.2	55.4	64.4	64.0	6.5	6.3	4.2	5.7	3.43	0.67	27
April	80.102	30.019	30.060	30.060	30.518	29.404	47.5	57.2	51.4	52.0	82	29	67.9	49.0	65.8	60.9	5.8	6.7	5.5	6.0	2.14	1.37	26, 27
May	30.065	30.011	30.025	30.034	30.465	29.546	55.8	64.9	57.6	59.4	83	38	73.4	56.7	77.2	69.1	7.1	6.6	6.3	6.7	3.42	0.55	25
June	29.961	29.908	29.948	29.939	30.274	29.562	69.9	80.6	71.5	74.0	97	53	67.3	46.6	67.0	60.3	5.2	5.7	3.8	4.9	2.30	0.81	19

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time correspond with 7.02 a. m., 3.02 p. m., and 11.02 p. m., local time.

ROBERT SEYBOTH,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132–B.]

BALTIMORE, MD.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—								Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																						
July	3,867	NW.	23	13	13	7	1	15	4	7	31	15	0	9	17	5	8	0	2	0	0	0	
August	3,073	NW.	20	1	19	9	5	9	16	12	9	10	4	11	17	3	7	0	3	0	0	0	Damaging drought with much haziness latter part of month.
September	3,252	W. SW. SE.	16	23 30 15 16	11	5	12	17	17	7	10	7	4	8	14	8	8	0	2	0	0	0	Hottest September on record; mean temperature same as August.
October	3,456	N.	19	4	13	8	8	8	17	15	7	11	6	8	16	7	9	0	0	0	0	0	First frost on the 6th.
November	4,135	NW.	24	4	13	5	8	4	14	7	11	22	6	11	8	11	10	0	1	0	0	3	First snow on 24th, first ice on 25th, heavy frost on 27th.
December	3,795	NW.	24	7	12	4	10	4	14	9	16	16	8	7	15	9	13	3	0.	0	0	4	Warmest December on record; 7°.4 above normal.
Year 1881	48,844	.....	...	.....	131	96	104	107	118	86	204	200	49	88	164	113	119	13	13	0	12	61	
1882.																							
January	4,325	NW.	28	22	12	8	8	10	9	5	13	26	2	5	14	12	11	7	0	0	6	18	Polar bands 27th.
February	3,567	NW.	27	10	11	7	4	8	14	6	4	19	11	9	12	7	9	2	1	0	0	11	Solar halos on 3d and 8th; lunar halos on 26th.
March	4,466	NW.	24	10	21	3	6	5	21	3	3	22	9	8	12	11	11	3	0	0	0	4	Lunar halos 6th, 7th.
April	4,422	SW.	25	19	12	11	5	6	12	5	6	22	11	7	13	10	10	1	1	3	0	2	Damaging frost on 12th; brilliant auroras 16th, 17th; faint aurora 20th.
May	4,210	NW. SW.	28	2 28	15	9	12	10	22	6	8	6	5	6	10	15	21	0	1	0	0	0	Lowest May mean temperature on record; 5°.9 below normal; killing frost on 3d.
June	4,723	NW.	26	19	8	4	1	5	24	8	18	21	1	4	25	1	8	0	4	0	0	0	Lunar halo on 2d; solar halo on 30th.

Location of office on June 30, 1882, corner Water and South streets.

ROBERT SEYBOTH,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

BARNEGAT, N. J.

[Latitude, 39° 46′; longitude west of Greenwich, 74° 6′. Elevation of barometer above sea-level, 20 feet. Elevation of rain-gauge (top) above ground, 2 feet; elevation of exposed thermometer above ground, 5 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Highest.	Lowest.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.942	29.914	29.932	29.929	30.226	29.595	71.6	76.0	69.6	72.4	92.0	60.0	80.5	70.9	87.5	79.6	4.6	6.0	3.9	4.8	1.99	1.68	31
August	30.036	29.995	30.010	30.014	30.332	29.637	70.2	74.2	68.7	71.1	88.0	59.0	82.4	74.0	87.4	81.3	4.6	4.0	3.6	4.1	5.54	4.86	7
September	30.103	30.062	30.084	30.083	30.343	29.844	70.8	74.1	70.0	71.6	96.0	58.2	85.9	79.6	89.8	85.1	5.9	5.6	2.9	4.8	3.55	2.18	10
October	30.173	30.103	30.128	30.134	30.558	29.473	57.7	63.4	58.2	59.8	82.5	38.5	82.1	72.8	82.4	79.1	6.4	6.2	4.8	5.8	4.35	2.34	30
November	30.196	30.147	30.167	30.170	30.692	29.590	44.3	51.7	46.0	47.3	70.5	22.5	80.5	68.9	81.2	76.9	5.3	5.5	4.4	5.1	3.64	1.41	23
December	30.167	30.111	30.162	30.147	30.645	29.400	38.5	44.6	39.2	40.8	60.0	21.0	87.4	73.3	82.3	81.0	5.9	6.1	5.2	5.7	3.50	.48	27
Year 1881	30.028	29.983	30.009	30.007	.....	.....	50.0	55.0	49.8	51.6	.....	.....	82.3	71.9	84.7	79.6	5.8	5.7	4.5	5.4	53.28	.....	.....
1882.																							
January	30.168	30.110	30.141	30.140	30.843	29.141	30.7	36.4	31.1	32.7	54.0	1.0	83.1	75.3	81.2	79.9	6.5	7.0	4.5	6.0	8.29	1.30	31
February	30.162	30.114	30.137	30.138	30.736	29.282	33.9	39.7	35.2	36.3	52.0	18.0	82.5	76.3	86.0	81.6	5.0	5.6	4.1	4.9	8.91	3.90	4,5
March	30.103	30.056	30.115	30.091	30.704	29.568	38.3	43.8	38.3	40.1	60.2	20.0	80.2	65.0	77.5	74.2	6.5	6.1	3.6	5.4	4.44	.94	1
April	30.055	29.996	30.029	30.027	30.534	29.420	44.3	49.6	43.9	45.9	74.0	26.6	73.3	64.0	78.2	71.8	5.9	5.8	5.0	5.6	4.16	2.16	26, 27
May	30.030	29.996	30.008	30.011	30.452	29.442	52.1	54.3	50.2	52.2	75.8	36.0	80.2	74.4	83.5	79.4	6.5	5.6	5.9	6.0	7.22	2.55	12
June	29.922	29.888	29.901	29.904	30.269	29.530	66.0	69.8	62.8	66.2	95.6	52.0	74.7	70.9	84.8	76.8	5.1	6.3	3.2	4.9	3.26	1.10	10

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.12 a. m., 3.12 p. m., and 11.12 p. m., local time.

GEO. A. HILL,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

BARNEGAT, N. J.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	7,411	NW.	33	17	4	9	15	11	27	8	10	9	0	6	19	6	7	0	0	0	0	0	
August	7,615	NW.	36	13	12	3	8	10	33	17	1	9	0	13	13	5	11	0	1	0	0	0	Lunar halo, 12th.
September	8,872	E.	36	15	5	7	22	10	18	24	2	2	0	9	14	7	5	0	2	0	0	0	
October	9,120	N.	46	5	8	5	8	8	19	23	4	18	0	8	11	12	9	0	2	0	0	0	Waterspout, 18th.
November	9,379	NW.	38	15	9	6	7	3	9	18	21	17	0	9	7	14	14	0	0	0	0	5	Lunar halo, 6th; first frost, 27th.
December	9,524	NW.	40	23	6	4	8	8	8	21	16	22	0	7	9	15	14	1	0	0	2	13	Lunar halo, 4th.
Year 1881	109,259	..	..	.....	120	81	131	92	196	156	97	220	2	92	140	133	125	17	8	0	25	93	
1882.																							
January	10,557	W. NE.	42	22 31	10	1	6	12	4	10	21	29	0	6	11	14	16	2	0	0	7	23	Lunar halo, 28th.
February	9,848	N.	56	5	8	2	10	6	16	11	13	18	0	9	10	9	11	2	0	0	1	17	Lunar halo, 4th, 25th, 26th; first frost, 27th.
March	11,532	SE.	40	1	16	3	8	11	15	15	12	26	1	9	13	9	11	1	0	0	0	9	Lunar halo, 7th; solar halo, 5th.
April	9,680	N.	40	27	12	6	8	10	17	17	15	15	0	9	9	12	11	1	2	1	0	3	Aurora 16th and 17th; lunar halo, 25th.
May	9,878	E.	48	12	10	2	22	10	25	10	6	7	0	3	19	9	13	0	0	0	0	0	Solar halo, 26th; lunar halo, 24th and 30th.
June	7,473	NW.	30	20	8	2	3	2	38	15	14	8	0	5	20	5	11	0	5	0	0	0	

Location of office, on June 30, 1882, Life-Saving Station No. 17.

GEO. A. HILL,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

BISMARCK, DAK.

[Latitude, 46° 47′; longitude west of Greenwich, 100° 38′. Elevation of barometer above sea-level, 1,694 feet. Elevation of rain-gauge (top) above ground, 31 feet. Elevation of exposed thermometer above ground, 18 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0. 10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Highest.	Lowest.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	8 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.913	29.871	29.874	29.886	30.140	29.421	64.4	81.9	70.2	72.4	102	46	79.1	43.0	65.5	62.5	4.1	4.3	2.9	3.8	1.28	.59	11
August	29.899	29.871	29.872	29.880	30.270	29.463	61.5	80.0	69.3	70.1	97	49	75.1	45.2	65.0	61.8	5.6	3.3	2.9	3.9	2.98	2.10	3
September	29.934	29.906	29.924	29.922	30.291	29.442	45.0	62.0	51.5	52.8	90	29	83.2	46.9	69.5	66.5	5.0	5.4	3.2	4.5	1.26	.29	28
October	30.153	30.120	30.143	30.139	30.669	29.543	32.2	50.0	39.4	40.5	71	17	81.6	50.2	70.0	67.3	5.2	5.5	5.4	5.2	.51	.35	31
November	30.128	30.125	30.155	30.137	30.731	29.516	19.9	30.9	23.4	24.7	63	−13	78.8	64.5	74.7	72.7	5.1	5.7	3.7	4.8	.35	.20	13
December	30.138	30.143	30.152	30.144	30.694	29.506	19.7	33.6	24.9	26.1	60	− 8	81.7	60.6	70.3	70.9	2.6	4.9	2.4	3.3	.06	.03	1
Year 1881	30.026	30.006	30.022	30.018	.....	.....	33.3	47.9	39.0	40.1	.....	.....	82.4	58.9	74.5	71.9	5.0	5.1	3.8	4.6	15.76	.....	.....
1882.																							
January	30.142	30.101	30.152	30.132	30.841	29.628	6.0	18.7	10.5	11.8	40	−22	80.7	71.4	71.5	74.5	4.2	4.7	2.8	3.9	.23	.11	12
February	30.070	30.052	30.074	30.065	30.812	29.557	13.9	31.3	21.1	22.1	60	−24	80.0	56.5	72.5	69.7	3.9	5.8	2.9	4.2	.30	.22	17
March	30.087	30.069	30.101	30.086	30.697	29.421	17.0	28.4	21.0	22.1	67	−20	83.0	69.2	79.7	77.3	7.0	7.0	5.0	6.3	1.22	0.40	4
April	30.049	30.037	30.071	30.052	30.506	29.663	34.2	46.2	38.3	39.6	72	17	84.4	59.5	77.6	73.8	7.0	6.7	4.9	6.2	3.56	1.19	8
May	29.939	29.914	29.918	29.924	30.275	29.460	44.3	59.7	50.7	51.6	77	24	79.1	45.9	65.2	63.4	4.3	5.6	4.2	4.7	3.46	1.47	8
June	29.843	29.829	29.839	29.837	30.170	29.432	56.5	71.9	61.9	63.4	89	37	81.1	49.8	73.1	68.0	5.1	5.6	4.5	5.1	3.88	1.07	17

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.26 a. m., 1.26 p. m., and 9.26 p. m., local time.

CYRUS CRAMER,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

BISMARCK, DAK.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder storms.	Aurora.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	8,681	N. W. SE. NE. NW.	36	7 8 18 19 4	6	11	13	29	10	1	7	13	3	15	12	4	6	0	0	1	0	0	August 3d a severe hail-storm did much damage to crops and windows.
August	7,910	W.	50	3	11	10	20	20	5	4	4	13	6	11	17	3	7	0	1	1	0	0	First light frost August 7th; first heavy frost on 15th of September.
September	7,218	N.	35	16	14	7	13	10	2	3	13	22	6	9	16	5	14	0	0	3	0	2	
October	6,357	NW.	55	31	12	10	14	14	5	1	8	18	11	9	12	10	3	2	0	0	0	21	
November	7,679	W.	50	13	3	3	9	9	4	6	6	46	4	9	15	6	1	7	0	3	10	26	River closed November 17.
December	5,778	NW.	40	28 29 6	3	4	17	8	9	4	9	31	8	12	18	1	0	3	0	2	5	31	
Year 1881	80,352				108	82	166	163	60	37	98	258	123	115	158	92	59	48	8	14	92	186	
1882.																							
January	5,431	NW.	44	17	0	1	22	15	5	3	2	37	8	12	16	3	0	7	0	1	20	31	
February	5,787	NW.	36	6	0	3	19	8	3	0	7	29	15	9	15	4	0	2	0	1	9	27	
March	8,887	N.	44	5	4	6	22	11	4	2	3	35	6	3	15	13	1	10	0	1	13	29	
April	10,035	E.	40	8	10	13	26	23	2	2	2	12	0	5	13	12	11	2	2	4	0	11	
May	8,707	NW.	36	20 21	9	16	23	15	8	1	5	13	3	11	13	7	13	0	4	2	0	5	
June	5,977	SE.	34	12	8	11	23	14	6	4	4	11	9	9	11	10	14	0	4	3	0	0	

[a] Office changed April 1, 3 p. m. observation.
Location of office on June 30, 1882, Raymond's brick block, corner of Main and Third streets.

CYRUS CRAMER,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

BLOCK ISLAND, R. I.

[Latitude, 41° 10′; longitude west of Greenwich, 71° 36′. Elevation of barometer above sea-level, 27 feet. Elevation of rain-gauge (top) above ground, 23 feet. Elevation of exposed thermometer above ground, 8 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.938	29.922	29.938	29.933	30.293	29.531	66.3	71.9	66.3	68.2	86.0	59.8	87.3	74.3	85.9	82.5	6.4	4.5	3.5	4.8	1.61	1.04	4
August	30.021	29.993	30.004	30.006	30.336	29.621	66.5	72.2	67.6	68.8	81.2	55.0	86.5	76.5	85.2	82.7	6.5	4.5	3.9	5.0	4.30	2.04	2
September	30.116	30.084	30.111	30.104	30.425	29.796	65.0	69.6	65.9	66.8	86.5	57.2	87.1	77.5	86.6	83.7	4.1	3.7	5.1	4.0	3.78	2.05	2
October	30.165	30.104	30.126	30.132	30.554	29.404	55.0	60.4	56.5	57.3	75.4	35.2	76.7	68.3	77.9	74.3	4.2	4.4	4.4	4.3	5.29	1.76	31
November	30.169	20.129	30.148	30.149	30.655	29.457	45.7	49.9	47.9	47.8	70.0	24.2	76.2	68.1	74.5	73.0	5.8	5.3	5.0	5.4	6.47	1.77	1
December	30.150	30.102	30.140	30.131	30.635	29.232	41.0	43.9	41.7	42.2	59.1	19.0	77.8	69.7	76.0	74.5	6.0	5.9	4.5	5.5	5.66	1.09	23
Year 1881	30.068	30.031	30.054	30.051	.....	....	48.3	53.3	49.2	50.3	.....	.....	80.3	71.3	79.2	76.9	5.3	4.7	4.2	4.7	59 44	.....	....
1882.																							
January	30.118	30.083	30.086	30.096	30.797	29.282	30.8	34.3	32.4	32.5	49.0	−4.0	74.1	68.9	75.0	72.7	5.8	6.1	4.4	5.4	8.57	2.01	11
February	30.115	30.111	30.114	30.113	30.756	29.333	32.3	37.3	34.4	34.7	51.5	14.0	76.6	68.9	78.3	74.6	5.1	3.8	4.7	4.5	9.73	2.17	21
March	30.089	30.026	30.069	30.055	30.675	29.470	36.2	40.5	37.0	37.9	51.4	20.0	74.2	71.4	73.7	73.1	4.7	5.8	3.8	4.8	5.39	1.08	9
April	30.028	29.962	30.002	29.997	30.575	29.339	40.7	47.0	41.8	43.2	59.4	29.0	71.9	66.0	74.5	70.8	4.8	5.4	4.1	4.8	4.83	2.32	27
May	30.024	29.997	30.020	30.014	30.464	29.422	47.8	51.5	47.3	48.9	69.0	36.0	81.0	75.1	83.5	79.9	5.8	5.9	6.1	5.9	5.51	2.42	20
June	29.908	29.865	29.898	29.890	30.265	29.542	61.8	66.7	60.6	63.0	81.5	50.0	78.2	70.0	82.5	76.9	4.5	3.2	2.7	3.5	2.86	.85	1

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.22 a. m., 3.22 p. m., and 11.22 p. m., local time.

WM. DAVIS,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

BLOCK ISLAND, R. I.

	Wind.				Winds at 7a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	7,922	NW.	48	4	6	12	5	8	10	26	9	14	3	13	15	3	10	0	3	0	0	0	
August	8,146	NE.	45	17	4	16	3	3	6	37	6	7	11	8	16	7	9	0	1	0	0	0	Solar halo on 7th.
September	9,884	NE.	36	19	1	27	3	12	2	31	3	9	2	7	21	2	7	0	0	0	0	0	
October	11,052	N.	48	5	9	12	3	9	4	35	8	10	3	10	15	6	13	0	0	0	0	0	Lunar halo on 9th and 28th.
November	12,501	NW.	40	15, 19, 20, 24	8	13	1	6	2	21	15	23	1	10	11	9	15	0	0	0	0	4	Solar halo on 5th; lunar halo on 3d, 6th, and 10th; frost on 6th, 18th, and 20th.
December	12,736	N.	48	23	14	9	8	10	3	21	13	14	1	7	11	8	11	5	0	0	2	11	Solar halo on 2d and 20th; lunar halo on 2d, 6th, and 31st.
Year 1881	128,140	.....	.....	.....	120	177	41	82	54	265	107	196	53	110	163	73	113	21	6	0	23	78	
1882.																							
January	13,733	NE.	55	31	19	8	2	9	4	5	14	27	5	8	13	10	16	5	0	1	6	19	Aurora on 19th; frost on 9th, 15th, 22d, 23d, and 27th.
February	11,417	NE.	64	5	10	7	5	7	0	21	8	22	4	10	12	6	10	4	0	2	5	16	Aurora on 5th and 17th; lunar halo on 1st and 26th.
March	13,887	SW.	44	27	11	16	0	9	3	16	8	26	4	12	11	8	10	4	0	0	1	14	Frost on 23rd; lunar halo on 8th.
April	11,552	NE.	48	27	7	14	2	10	4	26	7	19	1	9	14	7	9	2	0	1	0	3	Aurora on 16th; solar halo on 14th.
May	12,382	NE.	48	12	4	30	1	6	2	33	7	7	3	8	10	13	13	0	0	0	0	0	Solor halo on 8th.
June	8,957	SW.	42	1	6	4	6	3	2	43	8	17	1	10	18	2	9	0	3	0	0	0	

Location of office on June 30, 1882, J. B. Dodge's store.

WM. DAVIS,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

BOISE CITY, IDAHO.

[Latitude, 43° 37′; longitude west of Greenwich, 116° 8′. Elevation of barometer above sea-level, 2,750 feet. Elevation of rain-gauge (top) above ground, 32 feet. Elevation of exposed thermometer above ground, 19 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
							°	°	°	°	°	°											
1881.																							
July	29.934	29.892	29.840	29.889	30.200	29.547	57.9	81.5	74.3	71.2	101	46.5	56.7	30.4	33.0	41.7	3	3	2	2.7	.13	.08	2
August	29.952	29.906	29.848	29.902	30.106	29.588	54.0	77.7	70.2	67.3	100	39	57.7	29.6	38.2	41.8	2	2	2	2.0	.00	.00	....
September	30.038	29.994	29.949	29.994	30.341	29.635	44.6	66.4	58.9	56.6	88	30	68.2	35.6	44.5	49.4	3	4	3	3.3	.25	.12	25
October	30.131	30.106	30.080	30.106	30.334	29.729	36.9	52.6	47.8	45.8	73	23	82.5	53.5	63.8	66.6	6	6	5	5.7	2.12	.65	14
November	30.336	30.315	30.299	30.317	30.676	29.678	29.2	42.6	36.9	36.2	61	18	88.0	62.1	73.3	74.5	5	5	4	4.7	.94	.72	28
December	30.355	30.328	30.323	30.335	30.701	29.795	27.3	37.9	33.7	33.0	53.5	16	89.1	72.8	81.7	81.2	7	3	5	5.0	.65	.15	7
Year 1881	30.129	30.006	30.062	30.091	.....	.....	40.6	57.3	52.0	50.0	.....	.....	74.9	47.8	58.3	60.4	5.9	6	5.8	5.9	13.56	.....	....
1882.																							
January	30.194	30.175	30.183	30.184	30.542	29.724	17.7	30.5	26.6	24.9	49	3	91.7	79.2	85.7	85.5	7.4	6.7	4.4	6.4	1.62	.44	10
February	30.182	30.151	30.124	30.153	30.541	29.614	22.8	35.2	32.2	30.0	55	−5	88.1	74.7	80.4	81.0	7.7	7.6	7.8	7.8	1.73	.52	8,9
March	30.176	30.167	30.156	30.166	30.713	29.664	28.6	44.4	37.4	36.8	73	9	84.9	62.0	71.0	72.6	5.4	5.6	4.0	5.0	1.54	.55	4,5
April	29.998	29.959	29.938	29.965	30.346	29.596	39.9	53.4	49.4	47.6	73.5	29	75.8	50.3	61.1	62.4	5.3	5.3	4.6	5.1	2.33	.75	5,6
May	29.982	29.963	29.926	29.957	30.282	29.506	46.8	66.2	59.5	57.5	87	38	70.2	37.4	51.8	53.1	3.9	4.8	4.7	4.5	.34	.21	4
June	29.883	29.862	29.827	29.857	30.057	29.575	52.6	76.6	69.1	66.1	95	36	65.3	33.4	42.1	46.9	2.8	4.1	2.8	3.2	.29	.16	12

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.24 a. m., 12.24 p. m., and 8.24 p. m., local time.

BARNET E. LIGHT,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

BOISE CITY, IDAHO.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	3,359	SE. NW. W.	20	2 30 6 19	2	2	6	6	3	6	43	22	3	17	13	1	3	0	0	0	0	0	
August	3,218	SE. W. NW. E.	16	7 26 6 13 14	3	0	9	7	2	7	44	16	5	22	8	1	0	0	0	0	0	0	Light frost, 29.
September	3,202	W.	24	28	5	2	5	3	1	6	39	24	5	19	5	6	4	0	0	0	0	2	Light frost, 6, 7, 9, 10, 19, 26, 27, 29, and 30.
October	3,216	W. SE.	22	13 30	3	7	13	4	3	1	38	17	7	10	8	13	9	2	0	0	0	4	Light frost, 1, 2, 3, 5, 7, 8, 9, 13, 22, and 23.
November	2,864	E.	26	14	6	0	11	6	3	2	27	28	7	12	8	10	4	0	0	0	0	20	Light frost, 1, 3, 4, 8, 9, 10, 18, 21, 22, 23, 24, 25, 26, 27, 28, 29, and 30.
December	2,534	E.	24	26	8	3	10	9	1	5	32	19	6	7	12	12	4	4	0	0	0	26	Light frost, 1, 2, 3, 9, 14, 17, 18, 19, and 29.
Year 1881	39,681	.....	..	.....	61	48	97	124	28	55	400	222	60	137	129	99	54	23	6	0	6	99	
1882.																							
January	2,863	E.	20	6 30	8	9	13	15	3	5	24	11	5	7	8	16	3	8	0	0	10	30	Frost, 7, 12, 13, 15, 16, and 19.
February	3,537	SE. E.	20	8 9 26	2	7	23	8	0	0	20	7	2	4	1	18	3	9	0	0	5	16	Frost, 6, and 7.
March	4,311	SE.	28	18	4	3	11	22	5	3	25	11	9	8	15	8	2	8	0	0	0	22	Frost, 1, 6, 7, 9, 10, 12, and 21.
April	5,064	W.	29	5	5	5	9	4	4	5	40	15	3	9	13	8	6	1	1	1	0	5	Frost, 8, 12, 14, 17, 20, 21, 24, and 25.
May	4,985	W.	28	7	7	6	6	4	0	4	36	27	3	12	14	5	3	0	1	0	0	0	Frost, 7, 8, 9, 14, 15, and 17.
June	3,507	NW.	28	9	8	2	5	6	0	5	45	15	4	13	16	1	4	0	1	0	0	0	Frost, 21.

Location of office on June 30, 1882, Davis building, north side Main street.

BARNET E. LIGHT, *Sergeant, Signal Corps, U. S. A.*

Annual meteorological summary—Continued.

[Form No. 132—A.]

BOSTON, MASS.

[Latitude, 42° 21′; longitude west of Greenwich, 71° 4′. Elevation of barometer above sea-level, 142 feet. Elevation of rain-gauge (top) above ground, 162 feet. Elevation of exposed thermometer above ground, 156 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Highest.	Lowest.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.926	29.908	29.922	29.919	30.337	29.506	66.9	72.9	65.7	68.5	89.0	53.9	76.0	63.5	79.7	73.1	5.3	5.6	4.0	5.0	2.96	.88	26
August	30.008	29.970	29.993	29.990	30.322	29.559	66.4	75.6	66.5	69.5	96.8	53.4	79.5	60.8	81.5	74.0	3.9	4.8	3.9	4.2	1.23	.46	18
September	30.129	30.090	30.119	30.113	30.473	29.812	62.6	70.8	63.7	65.7	101.5	49.0	84.3	68.4	84.2	78.8	6.0	5.2	4.7	5.3	2.50	.78	2
October	30.156	30.096	30.118	30.123	30.582	29.414	49.4	58.9	51.5	53.3	90.0	28.0	77.4	59.7	74.9	70.6	3.3	4.7	4.1	4.0	2.84	1.04	31
November	30.161	30.114	30.133	30.136	30.624	29.427	38.4	47.7	41.0	42.4	71.0	15.0	80.5	64.4	78.7	74.5	4.7	5.5	5.0	5.1	3.73	1.70	19
December	30.144	30.096	30.132	30.124	30.665	29.180	34.7	42.1	36.5	37.8	66.0	10.0	81.9	62.4	75.6	73.3	5.8	6.1	4.8	5.6	3.80	1.23	27
Year 1881	30.028	29.981	30.013	30.007	.....	....	45.4	53.5	46.5	48.5	.....	.....	77.2	62.0	76.6	71.9	5.32	5.57	4.74	5.22	52.63	.....	.....
1882.																							
January	30.084	30.080	30.083	30.082	30.822	29.341	23.4	30.8	24.9	26.4	52.5	−13.0	77.5	61.4	77.3	72.1	5.7	4.9	4.4	5.0	3.68	.70	11
February	30.088	30.089	30.114	30.097	30.766	29.316	25.6	36.5	29.0	30.4	60.0	4.0	77.0	59.9	76.2	71.0	6.2	4.4	4.7	5.1	4.77	1.34	4, 5
March	30.059	30.007	30.063	30.043	30.665	29.457	32.8	39.5	33.6	35.3	61.0	15.0	74.0	59.6	70.8	68.1	5.2	5.6	4.0	4.9	3.35	1.50	1, 2
April	30.023	29.932	29.989	29.981	30.590	29.278	38.7	47.4	40.0	42.0	68.0	19.0	67.6	50.7	68.8	62.4	4.5	6.6	4.3	5.1	2.50	1.71	27, 28
May	30.037	29.983	30.018	30.013	30.486	29.493	47.5	54.4	47.6	49.8	81.2	31.0	70.6	57.3	71.9	66.6	5.5	6.9	4.5	5.6	6.05	2.00	14, 15
June	29.879	29.818	29.866	29.854	30.253	29.480	62.5	72.9	62.3	65.9	94.0	47.5	70.4	50.7	70.4	63.8	5.6	4.6	3.8	4.7	1.03	.30	10, 11

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.23 a. m., 3.23 p. m., and 11.23 p. m., local time.

O. B. COLE,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

BOSTON, MASS.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,240	N. W.	26	1	1	8	10	5	9	17	19	6	18	7	19	5	10	0	2	0	0	0	
August	5,796	S. W. / N. E.	24	2 / 18	4	9	11	3	4	24	21	11	6	9	14	8	11	0	2	0	0	0	
September	6,342	E.	24	2	6	18	12	9	8	17	14	6	0	7	12	11	11	0	3	2	0	0	
October	7,386	N. W.	34	5	5	6	13	3	9	16	24	15	2	9	15	7	14	0	0	0	0	4	First frost October 5th.
November	7,998	N. W.	31	28	2	11	6	0	10	16	34	10	1	9	10	11	12	0	0	0	0	12	
December	8,047	S. W.	34	30	7	1	4	8	14	23	23	13	0	7	12	12	14	0	0	0	2	13	
Year 1881	84,051	.....		.....	58	106	110	48	81	169	278	175	70	102	142	121	130	16	7	2	26	107	
1882.																							
January	8,742	W.	40	22 / 27	3	3	3	7	4	13	41	19	0	11	9	11	4	13	0	0	7	30	
February	8,095	NE.	42	4 / 21	3	5	4	5	4	19	15	29	0	6	16	6	4	8	0	0	7	23	
March	9,425	NW.	42	4	6	7	3	9	10	7	21	30	0	9	15	7	7	9	0	1	2	22	
April	8,239	NE.	34	27	5	9	8	11	6	9	25	17	0	6	19	5	5	5	0	3	0	9	
May	8,955	NE.	40	15	8	15	11	5	7	16	16	13	2	8	15	8	14	0	0	0	0	1	Last frost May 16th.
June	5,586	W.	28	20	1	6	7	4	8	17	30	12	5	7	19	4	11	0	2	0	0	0	

Location of office on June 30, 1882, Equitable building, corner Milk and Devonshire streets.

O. B. COLE,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM NO. 132—A.]

BROWNSVILLE, TEX.

[Latitude, 25° 53′; longitude west of Greenwich, 97° 26′. Elevation of barometer above sea-level, 43 feet. Elevation of rain-gauge (top) above ground, 40 feet. Elevation of exposed thermometer above ground, 19 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Highest.	Lowest.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.947	29.917	29.932	29.932	30.109	29.826	79.7	90.8	82.9	84.5	96.0	73.0	87.8	57.7	77.7	74.4	3.6	4.8	0.5	3.0	1.49	.95	11
August	29.905	29.883	29.914	29.901	30.034	29.672	78.1	90.6	82.0	83.6	97.0	69.0	91.0	58.4	83.7	77.7	4.0	6.4	2.1	4.2	3.01	1.04	7
September	29.925	29.895	29.927	29.916	30.065	29.705	74.8	86.8	78.2	79.9	93.0	58.0	90.6	62.8	86.7	80.0	5.1	5.7	1.6	4.1	5.02	1.55	8
October	29.990	29.954	29.995	29.980	30.172	29.663	74.8	82.5	77.1	78.1	90.0	65.0	93.6	72.3	91.0	85.6	5.9	8.0	4.5	6.1	8.72	1.90	24
November	30.092	30.059	30.104	30.085	30.505	29.754	60.6	70.0	63.4	64.9	84.0	35.0	91.2	68.4	88.8	82.8	6.8	6.7	5.4	6.3	3.74	1.53	9
December	30.148	30.117	30.157	30.140	30.473	29.827	57.9	69.3	61.0	62.7	80.0	39.0	94.4	68.4	91.6	84.8	4.7	7.0	4.2	5.3	1.92	.86	24
Year 1881	29.993	29.968	29.999	29.987	.....	.....	67.7	78.9	70.8	72.5	.....	.....	91.6	67.5	87.9	82.3	5.5	6.8	4.0	5.4	31.74	....	.....
1882.																							
January	30.067	30.032	30.063	30.054	30.405	29.864	59.1	67.4	61.9	62.8	79.0	33.0	97.5	80.6	95.8	91.3	7.9	8.6	8.2	8.2	2.95	.51	23, 24
February	30.057	30.030	30.064	30.050	30.290	29.658	64.6	74.9	67.3	69.0	82.0	43.0	90.8	65.0	88.0	81.3	5.6	5.7	4.3	5.2	1.24	.85	23
March	30.049	30.028	30.066	30.048	30.486	29.782	67.0	75.1	69.3	70.5	85.0	48.0	92.1	70.2	89.9	84.1	6.5	8.2	5.6	6.8	3.54	1.97	24
April	29.924	29.908	29.937	29.923	30.242	29.627	71.2	79.6	73.6	74.8	94.0	48.0	90.0	67.6	87.8	81.8	7.0	7.7	6.7	7.1	1.63	.95	30
May	29.883	29.875	29.889	29.882	30.126	29.513	75.4	82.9	76.7	78.3	92.0	64.0	91.0	70.6	87.9	83.2	6.8	7.2	4.0	6.0	7.07	3.01	18, 19
June	29.930	29.918	29.941	29.930	30.077	29.744	78.0	86.8	80.6	81.8	92.0	67.0	88.9	68.1	86.4	81.1	3.1	5.7	1.6	3.5	1.69	1.33	4, 5

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.38 a. m., 1.38 p. m., and 9.38 p. m., local time.

MORRIS McCARTY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

BROWNSVILLE, TEX.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days with—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunderstorms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,519	SE.	20	20	1	1	6	50	21	0	0	0	14	12	19	0	4	0	0	0	0	0	Lunar halos observed January 3d and March 29th.
August	3,161	S.	16	22	2	2	17	32	11	3	1	0	25	13	13	5	4	0	0	0	0	0	
September	2,541	N.	20	15	4	5	11	26	4	1	0	2	37	14	13	3	11	0	0	0	0	0	
October	4,132	NE. S.	28	8 27 28	12	13	9	30	6	1	1	0	15	7	11	11	18	0	0	0	0	0	Six observations missed in October.
November	5,759	S.	28	7	32	10	8	12	15	1	1	4	5	5	12	13	6	0	0	0	0	0	Two observations missed in November.
December	4,289	S.	28	12	17	10	8	11	19	7	0	8	13	7	14	10	10	0	0	0	0	0	
Year 1881	54.901	.....	....	.....	130	81	102	374	152	25	5	38	178	114	150	99	83	0	2	0	0	1	
1882.																							
January	5,126	S.	28	3	18	6	4	14	18	2	0	12	17	1	9	21	20	0	0	0	0	0	Two observations missed in January.
February	6,873	NW.	34	3	5	6	7	29	22	1	1	5	8	8	11	9	3	0	0	0	0	0	
March	6,173	S.	34	5	7	6	10	26	23	0	0	6	15	5	12	14	8	0	0	0	0	0	
April	5,614	S.	28	7	7	4	5	40	13	1	0	3	17	2	15	13	2	0	0	0	0	0	
May	5,435	S.	28	5 & 9	4	2	29	33	12	0	0	3	10	5	13	13	8	0	1	0	0	0	
June	5,335	S.	24	18	3	1	22	33	19	1	0	0	11	16	11	3	7	0	1	0	0	0	

Location of office on June 30, 1882, Fransico Yturrias brick building on Elizabeth street, adjoining custom-house.

MORRIS McCARTY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

BUFFALO, N. Y.

[Latitude, 42° 53′; logitude west of Greenwich, 78° 53′. Elevation of barometer above sea-level, *696 feet. Elevation of rain-gauge (top) above ground, *98 feet. Elevation of exposed thermometer above ground, *107 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 a. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.955	29.926	29.932	29.938	30.230	29.682	66.9	74.9	69.0	70.3	85.0	55.0	76.9	62.8	72.6	70.8	5.4	5.1	3.2	4.6	2.17	.53	25
August	30.043	30.003	30.011	30.019	30.272	29.640	66.7	78.1	69.7	71.5	90.8	50.0	72.8	50.8	69.1	64.2	4.0	3.8	1.4	3.1	.85	.37	6
September	30.059	30.021	30.032	30.037	30.268	29.787	67.2	76.0	70.8	71.3	86.8	45.3	77.3	60.8	69.7	69.3	5.2	4.3	2.5	4.0	1.21	.38	27, 28
October	30.140	30.107	30.125	30.124	30.549	29.604	51.1	57.8	53.2	54.0	76.3	29.2	76.4	66.2	72.8	71.8	7.1	7.5	5.6	6.7	7.33	3.10	2, 3
November	30.118	30.089	30.105	30.104	30.629	29.527	38.8	43.5	40.2	40.8	68.3	18.6	77.9	71.0	76.3	75.0	7.8	8.2	9.0	8.3	2.96	.94	11, 12
December	30.117	30.100	30.127	30.114	30.602	29.477	35.6	38.2	36.0	36.6	56.8	19.7	83.0	77.1	80.7	80.3	7.6	7.6	6.0	7.1	5.86	1.24	12, 13
Year 1881	30.036	30.002	30.016	30.018	.....	.....	44.2	51.2	46.4	47.3	.....	.....	78.3	67.1	76.3	73.9	6.4	6.4	5.0	5.9	35.95	.....	.....
1882.																							
January	30.135	30.125	30.111	30.124	30.815	29.466	24.7	27.6	25.9	26.1	50.5	−5.0	86.7	84.0	86.1	85.6	7.9	8.4	7.2	7.8	3.29	1.11	26
February	30.125	30.101	30.090	30.105	30.771	29.440	30.6	35.0	32.2	32.6	57.5	13.0	79.3	75.4	82.6	79.1	6.4	7.3	5.6	6.4	2.16	.64	20, 21
March	30.094	30.072	30.082	30.083	30.704	29.370	31.6	35.7	33.1	33.5	56.9	16.0	78.9	73.8	81.2	78.0	7.5	8.0	6.0	7.2	2.63	.39	9
April	30.038	30.006	30.033	30.026	30.416	29.259	38.4	44.3	39.6	40.8	64.5	19.4	74.3	65.2	74.7	71.4	7.0	6.3	5.2	6.2	2.23	.92	19, 20
May	30.019	29.978	29.975	29.991	30.361	29.489	46.6	53.3	48.1	49.3	68.5	29.6	70.0	61.1	74.0	68.4	5.5	6.1	5.0	5.5	6.89	1.60	27
June	†29.907	29.876	29.881	†29.888	30.211	29.523	†59.9	66.2	61.1	†62.4	83.1	45.5	†72.9	61.9	77.0	†70.6	†6.6	6.2	4.0	†5.6	2.96	.88	17, 18

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.52 a. m., 2.52 p. m., and 10.52 p. m., local time.

WM. FINN,
Sergeant, Signal Corps, U. S. A.

*Elevations since November 1, 1881. † For 29 days only.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

BUFFALO, N. Y.

	Wind.				Winds at 7 a. m., 3and 11 p. m.. Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurora.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	5,347	W.	27	26	2	12	12	1	0	37	19	10	0	9	19	3	9	0	2	0	0	0	
August	3,821	SW.	24	12	1	12	13	1	0	36	12	15	3	15	15	1	6	0	2	0	0	0	Protracted drought; hot period ended on 1st, the drought on the 12th; ground dry as ashes to a depth of 6 feet; exceedingly smoky and hazy.
September	5,003	SW.	28	11, 23	0	10	9	7	6	47	6	5	0	8	20	2	11	0	3	1	0	0	
October	4,961	W.	32	8	3	13	9	9	5	23	10	19	2	4	13	14	17	0	2	0	0	1	Extraordinary rainfall on 2d; first ice and first killing frost 5th.
November	10,114	SW.	44	27	1	8	7	7	11	28	15	13	0	1	13	16	8	5	1	0	1	11	First snow on 1st.
December	9,172	SW.	40	30, 31	4	10	5	6	10	30	16	12	0	3	9	19	13	6	0	2	3	14	
Year 1881	73,018	.....	.....	.....	17	183	89	42	43	413	185	117	6	79	141	145	106	57	15	8	59	123	
1882.																							
January	*10,651	SW.	51	27	3	13	7	5	9	29	20	6	1	1	10	20	5	15	0	0	9	28	Lowest minimum temperature on record for January; extraordinary movement of wind; first ice in river 1st.
February	8,387	SW.	56	22	5	9	2	12	13	29	11	3	0	6	7	15	4	8	0	1	8	21	
March	8,811	SW.	46	21	4	15	4	6	15	23	20	6	0	3	12	16	12	6	1	0	6	24	First thunder-storm of the season 27th.
April	7,666	SW.	42	20	5	20	3	5	10	29	8	8	2	7	10	13	8	3	3	1	1	8	Remarkable auroral display on the 16th.
May	6,723	SW.	34	1	10	28	2	3	16	17	9	7	1	8	7	16	15	1	0	0	0	1	Excessive rainfall, nearly three times the average.
June	6,192	SW.	35	4	2	9	5	2	18	35	5	5	8	4	14	11	11	0	5	1	0	0	

*Incomplete; loss estimated at 50 miles; anemometer cups blown away on the 6th.

Location of office on June 30, 1882, No. 298 Main street, the White Fire-Proof Building.

WM. FINN,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary.—Continued.

[FORM No. 132—A.]

BURLINGTON, VT.

[Latitude, 44° 29′; longitude west of Greenwich, 73° 13′. Elevation of barometer above sea-level, 268 feet. Elevation of rain-gauge (top) above ground, 74 feet. Elevation of exposed thermometer above ground, 56 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Highest.	Lowest.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.910	29.864	29.888	29.887	30.282	29.484	66.9	75.7	67.3	70.0	90.0	52.0	74.3	53.9	74.8	67.7	6.9	5.5	4.8	5.4	2.22	.50	26
August	30.003	29.959	29.968	29.977	30.308	29.550	65.9	74.5	67.2	69.2	93.5	50.0	80.3	63.6	78.7	74.2	6.4	5.9	4.4	5.2	2.69	.85	6
September	30.077	30.026	30.061	30.055	30.380	29.834	63.2	71.7	63.7	66.2	89.7	41.2	78.9	65.2	78.0	74.2	7.0	5.9	4.1	5.4	2.34	.64	23
October	30.139	30.071	30.100	30.103	30.595	29.469	45.2	52.7	47.8	48.6	74.0	25.0	76.1	64.2	72.0	70.8	7.6	7.0	6.6	6.9	1.54	.23	3, 23, 25
November	30.123	30.077	30.101	30.100	30.643	29.465	35.2	40.4	36.8	37.5	64.7	3.0	77.3	64.1	70.4	70.6	8.2	8.3	7.4	7.8	1.30	.47	12
December	30.104	30.062	30 097	30.088	30.645	29.183	31.3	35.6	32.6	33.2	56.3	4.0	75.4	69.3	74.7	73.1	8.2	7.8	7.3	7.7	1.89	.39	23
Year 1881	30.026	29.978	30.005	30.003	.....	.....	43.1	50.6	44.8	46.4	.....	.....	75.1	60.6	72.5	69.5	7.0	6.5	5.6	6.2	20.99	.....	.....
1882.																							
January	30.072	30.064	30.069	30.068	30.890	29.291	18.0	22.2	18.9	19.7	48.8	—24.8	77.6	69.4	79.1	75.4	8.0	7.4	6.3	7.2	.44	.09	11
February	30.106	30.095	30.101	30.101	30.925	29.565	21.8	28.2	24.8	24.9	51.3	— 5.5	78.1	61.7	72.1	70.6	6.5	6.1	5.6	6.1	1.10	.42	21
March	30.064	30.033	30.054	30.050	30.731	29.313	26.7	33.3	29.4	29.8	54.0	3.5	72.1	59.7	68.6	66.8	7.0	6.3	4.7	6.0	2.34	1.30	1, 2
April	29.996	29.949	29.987	29.977	30.547	29.190	35.8	42.5	37.7	38.7	59.3	14.5	69.2	52.9	67.7	63.3	6.2	6.9	6.3	6.5	1.23	.26	20
May	30.016	29.962	29.983	29.987	30.461	29.551	47.7	57.0	49.1	51.3	75.7	27.3	65.3	46.2	63.0	58.2	6.9	6.2	5.7	6.3	2.00	.68	28
June	29.844	29.798	29.841	29.828	30.242	29.369	62.2	70.7	61.0	64.6	87.5	44.0	70.1	49.4	72.3	63.9	5.5	5.4	4.7	5.2	3.17	.89	1

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.15 a. m., 3.15 p. m., and 11.15 p. m., local time.

G. C. SCHAEFFER,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

BURLINGTON, VT.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time. Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,843	SE.	24	25	22	9	3	2	28	11	9	7	2	4	21	6	15	0	12	3	0	0	24th and 26th, double rainbow; 29th, light rain from cloudless sky.
August	4,474	W.	27	6	27	13	5	6	27	7	5	3	0	8	14	9	13	0	4	0	0	0	
September	5,566	S.	28	30	18	5	4	11	39	7	6	0	0	4	16	10	11	0	7	7	0	0	6th, dense smoke, dark at sunrise; 24th, meteor; 29th, first light frost of the season.
October	6,823	S.	33	15	17	6	8	5	34	8	4	11	0	4	10	17	17	1	0	4	0	5	5th, ice and snow; 26th ice and snow; 28th, first heavy (killing) frost of the season.
November	8,346	S.	39	29	13	3	3	6	41	5	8	11	0	3	7	20	6	4	0	0	3	17	
December	8,069	S.	39	12	15	7	6	2	53	3	3	4	0	3	7	21	7	6	0	1	4	18	3d, 4th, 11th, and 16th, snow from cloudless sky.
Year 1881	71,701	.....	.....	.....	265	94	63	56	372	70	75	97	3	60	147	158	108	51	29	37	57	129	
1882.																							
January	8,185	W.	45	27	15	7	6	6	34	3	9	13	0	2	11	18	2	9	0	2	13	30	4th and 22d, snow from cloudless sky; 23d, navigation closed.
February	6,229	S.	35	19	21	7	6	4	31	5	4	6	0	4	15	9	3	12	0	2	13	24	2d, 5th, 22d, and 23d, snow from cloudless sky; 13th, rain from cloudless sky.
March	6,533	S.	39	30	30	8	0	6	21	3	4	10	11	6	15	10	3	12	0	5	8	27	
April	5,293	S.	39	4	25	3	0	7	11	3	10	6	25	6	10	14	7	4	0	10	1	16	5th, navigation opened.
May	4,316	S.	25	26	24	2	1	2	17	7	5	2	33	5	12	14	13	1	0	3	0	2	
June	4,846	NW.	31	26	15	6	3	1	29	13	2	11	10	7	13	10	16	0	5	6	0	0	12th, heavy frost.

Location of office on June 30, 1882, Howard Opera House, Nos. 165 and 167 Bank street.

G. C. SCHAEFFER,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

CAIRO, ILL.

[Latitude, 37° 0′; longitude west of Greenwich, 89° 10′. Elevation of barometer above sea-level, 377 feet. Elevation of rain-gauge (top) above ground, 78 feet. Elevation of exposed thermometer above ground, 44 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Highest.	Lowest.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.072	30.036	30.038	30.049	30.272	29.850	77.5	89.0	80.5	82.3	99.0	66.0	75.5	48.4	73.0	65.6	2.2	3.6	0.9	2.2	.18	.18	17
August	30.035	29.989	30.002	30.009	30.219	29.844	75.7	91.8	80.7	82.8	103.0	66.0	74.9	42.5	69.6	62.3	2.2	3.6	1.4	2.3	.11	.05	29
September	30.080	30.025	30.044	30.050	30.281	29.659	68.8	83.9	72.7	75.1	97.0	50.0	82.3	51.2	78.6	70.7	2.8	4.5	2.3	3.2	2.74	1.26	27, 28
October	30.169	30.130	30.146	30.148	30.383	29.709	59.5	72.1	63.5	65.1	88.0	44.0	86.0	62.8	82.5	77.1	5.7	5.8	4.7	5.4	2.74	.97	23
November	30.237	30.182	30.223	30.214	30.700	29.848	42.5	53.6	46.3	47.5	71.5	19.0	81.5	65.8	75.5	74.3	4.5	5.4	4.5	4.8	4.98	1.25	8
December	30.238	30.201	30.232	30.224	30.693	29.788	41.2	50.0	44.2	45.1	67.0	21.5	82.4	64.3	75.6	74.1	6.7	6.2	4.9	5.9	3.70	2.01	13
Year 1881	30.108	30.062	30.084	30.085	.....	.....	54.8	65.7	58.5	59.6	.....	.....	78.7	58.8	75.1	70.9	4.94	5.67	3.88	4.83	32.18	.....	.....
1882.																							
January	30.232	30.194	30.230	30.219	29.780	30.780	35.9	41.3	38.4	38.5	64.0	13.0	86.2	78.4	82.8	82.5	6.5	8.0	6.9	7.1	6.35	1.66	12, 13
February	30.156	30.127	30.150	30.144	30.594	29.344	45.1	52.8	49.2	49.0	69.0	28.0	82.8	67.8	76.1	75.6	7.1	6.6	5.2	6.3	10.14	2.66	16
March	30.166	30.124	30.145	30.145	30.590	29.631	46.9	56.9	51.8	51.9	73.0	35.0	76.7	60.6	72.0	69.8	4.4	5.2	4.9	4.8	4.22	1.87	8, 9
April	30.074	30.032	30.042	30.049	30.348	29.473	55.4	66.3	59.7	60.5	82.0	33.0	75.5	54.1	68.1	65.9	5.2	5.5	3.9	4.9	4.14	1.64	8, 9
May	30.029	29.999	29.998	30.009	30.361	29.653	59.5	69.1	62.7	63.8	82.5	47.0	79.1	59.8	76.9	71.9	6.4	6.8	5.8	6.3	10.22	4.31	9
June	30.004	29.970	29.972	29.982	30.286	29.644	72.4	81.8	74.4	76.2	94.0	56.0	79.9	62.3	79.2	73.8	4.8	6.5	3.0	4.8	3.34	1.45	11, 12

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.11 a. m., 2.11 p. m., and 10.11 p. m., local time.

WM. H. RAY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

CAIRO, ILL.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,171	E.	22	13	11	16	5	7	7	26	6	7	8	23	8	0	1	0	1	0	0	0	Drought during July and August, and the warmest months known for many years. Crops fail, and stock die for want of water. First light frost occurred October 20. Highest stage of water in Ohio River ever known, 51 feet 10½ inches, occurred on February 25 and 26. Tornado on April 22 and June 17. Grand auroral display on April 16. Last frost occurred on April 17.
August	4,218	SE. S.	30	29	14	16	11	6	15	16	4	10	1	20	10	1	3	0	2	0	0	0	
September	4,801	N.	37	2	9	8	1	4	49	10	3	4	2	18	10	2	7	0	5	0	0	0	
October	5,554	NE.	34	4	8	10	6	5	36	19	3	6	0	8	13	10	7	0	2	0	0	0	
November	7,062	NW.	32	30	8	5	4	18	23	7	10	15	0	12	9	9	10	0	2	0	1	6	
December	6,169	NW.	31	30	24	10	2	5	34	5	4	8	1	4	15	12	8	1	0	0	0	6	
Year 1881	64,165	.....	.....	.....	140	115	70	108	221	143	69	139	90	119	149	97	79	12	40	0	13	67	
1882.																							
January	6,446	NW.	36	16	10	13	14	10	10	12	12	12	0	4	13	14	15	4	0	0	3	14	
February	6,676	W.	52	21	11	2	0	14	34	2	10	11	0	5	9	14	10	0	3	0	0	4	
March	7,797	SW. W.	40	9 21	19	3	6	9	30	3	8	14	1	12	8	11	12	0	4	0	0	0	
April	6,481	W.	37	19	22	6	7	8	27	4	4	6	6	8	14	8	9	0	5	1	0	0	
May	6,015	SW.	40	7	19	9	3	13	14	16	7	9	3	5	12	14	18	0	9	0	0	0	
June	4,581	SW.	58	17	3	6	1	8	12	31	9	14	6	10	15	5	9	0	8	0	0	0	

Location of office on June 30, 1882, United States custom-house.

WM. H. RAY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

CAMPO, CAL.

[Latitude, 32° 37′; longitude west of Greenwich, 116° 25′. Elevation of barometer above sea-level, 2,500 feet. Elevation of rain-gauge (top) above ground, 2 feet. Elevation of exposed thermometer above ground, 5 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.968	29.945	29.955	29.956	30.097	29.841	50.0	91.7	67.3	69.7	101.3	32.8	64.8	27.1	54.5	48.8	1.2	1.3	0.2	1.2	.07	.07	3
August	29.943	29.920	29.928	29.930	30.050	29.817	48.5	86.8	63.0	66.1	101.7	30.0	75.4	31.1	67.0	57.8	0.6	1.7	0.7	1.0	1.27	1.18	6
September	29.906	29.872	29.887	29.885	30.005	29.747	42.9	84.6	57.0	61.6	98.2	33.0	71.6	25.5	62.5	53.5	1.8	0.3	1.0	1.8	.02	.02	23
October	29.973	29.946	29.961	29.960	30.113	29.852	34.3	73.0	46.4	51.2	88.5	19.3	82.3	35.0	73.4	63.5	1.8	2.2	1.2	1.8	.73	.48	26
November	30.036	30.005	30.025	30.022	30.178	29.867	31.5	63.5	40.0	45.0	77.8	16.0	62.3	23.5	54.3	46.7	1.8	1.8	0.8	1.5	.11	.11	17
December	30.087	30.056	30.078	30.074	30.236	29.929	30.9	61.8	41.6	44.8	76.3	15.0	71.5	31.5	60.2	54.4	1.8	2.1	1.0	1.6	.24	.16	16
Year 1881	29.989	29.967	29.979	29.978	....	....	38.8	72.8	50.8	54.2	.....	.....	74.1	34.8	67.5	58.8	2.3	2.1	1.5	2.0	11.39	.....	....
1882.																							
January	30.052	30.026	30.036	30.038	30.236	29.560	27.1	49.5	35.2	37.2	75.5	6.5	82.9	50.5	77.8	70.4	4.4	4.2	3.6	4.1	3.10	.97	25
February	30.117	30.116	30.120	30.118	30.328	29.894	30.7	52.1	38.2	40.2	67.4	17.3	78.5	49.1	77.8	68.7	4.2	4.1	3.6	4.0	4.57	1.36	17
March	30.081	30.069	30.087	30.079	30.195	29.892	34.6	61.7	44.0	46.8	84.8	15.4	81.2	38.3	74.4	64.6	3.1	3.4	2.6	3.0	1.01	.67	13
April	29.996	29.980	29.989	29.988	30.077	29.874	36.3	68.3	48.1	50.9	89.0	27.0	85.6	41.4	79.0	68.7	2.5	2.6	2.9	2.7	1.10	.42	20
May	29.890	29.876	29.888	29.885	30.014	29.666	39.2	78.1	51.7	56.3	95.0	30.0	76.6	31.3	75.5	61.4	2.6	1.2	1.0	1.6	.18	.18	25
June	29.845	29.833	29.837	29.838	29.929	29.746	41.7	80.5	56.5	59.6	97.2	30.7	80.3	37.0	72.2	63.2	2.0	2.3	1.3	1.9	.26	.12	9

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.22 a. m., 12.22 p. m., and 8.22 p. m., local time.

W. H. CLENDENON.
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

CAMPO, CAL.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,014	W.	20	25	0	1	0	0	14	20	56	2	0	27	4	0	1	0	3	0	0	0	
August	3,556	E.	17	17	3	2	4	2	9	10	58	2	3	27	3	1	3	0	4	0	0	2	Sharp earthquake shock on October 2, 1881.
September	2,567	W.	18	17	0	2	7	6	10	8	36	1	0	19	3	0	1	0	0	0	0	0	
October	3,532	E.	23	29	0	0	7	4	11	25	37	8	1	23	5	3	2	0	0	0	0	15	
November	5,177	E.	42	19	0	7	48	0	9	10	11	4	1	26	2	2	1	0	0	0	0	21	Heaviest fall of snow in memory of oldest person; began on January 12 and ended on 15th. Four feet of snow fell in some valleys; destruction of stock and game very great.
December	4,138	E.	30	20	0	6	36	3	9	14	19	6	0	15	14	2	3	0	0	0	0	21	
Year 1881	48,256	.....	...	.....	3	34	200	27	125	246	372	43	10	240	74	38	36	2	10	0	0	117	
1882.																							
January	3,808	NE.	33	12	0	8	31	2	5	15	13	10	2	13	10	5	6	3	0	0	0	25	
February	3,446	E.	24	14	0	4	24	0	1	28	15	0	2	12	6	6	10	0	0	0	0	18	
March	4,543	E.	27	20	0	4	29	2	4	32	21	1	0	15	12	4	6	0	0	0	0	18	
April	3,979	W.	23	15	0	2	1	4	7	40	23	4	2	17	5	5	5	0	0	0	0	10	
May	3,692	W.	21	6	0	4	2	1	8	32	27	5	1	20	6	0	1	0	0	0	0	5	
June	3,863	W.	19	9	0	0	0	2	13	33	40	1	1	20	9	1	3	0	0	0	0	1	

Location of office on June 30, 1882, corner Grant avenue and Blaine street.

W. H. CLENDENON,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

CAMP THOMAS, ARIZ.

[Latitude, 36° 4′; longitude west of Greenwich, 110° 2′. Elevation of barometer above mean sea-level, 2,710 feet. Elevation of rain-gauge (top) above ground, 2 feet. Elevation of exposed thermometer above ground, 3 feet.

	Barometer (to sea).*						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Highest.	Lowest.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
							°	°	°	°	°	°											
1881.																							
July	.....	.....	.....	.....	.....	.....	72.4	91.7	81.7	81.9	109.0	65.5	77.9	42.7	61.0	60.5	5.2	4.2	6.5	5.3	4.18	1.11	4
August	.....	.....	.....	.....	.....	.....	71.0	87.4	77.9	78.7	101.5	55.0	85.9	48.0	69.4	67.8	5.9	5.2	4.6	5.2	2.49	1.25	16
September	.....	.....	.....	.....	.....	.....	59.6	83.3	70.2	71.0	98.0	45.0	82.6	36.4	59.8	59.6	2.1	2.5	1.8	2.1	1.55	1.18	5
October†	.....	.....	.....	.....	.....	.....	†41.5	69.8	55.7	55.7	87.0	30.0	†79.9	37.2	59.3	58.8	†3.0	3.2	1.6	2.6	†.40	.27	26
November	.....	.....	.....	.....	.....	.....	30.6	58.1	44.4	44.4	72.0	19.0	78.5	38.2	62.2	59.6	1.8	2.5	1.1	1.8	.32	.19	10
December	.....	.....	.....	.....	.....	.....	31.1	55.8	43.7	43.5	72.0	18.5	82.2	43.4	62.2	62.6	4.3	3.8	2.6	3.6	.40	.36	18
Year 1881	.....	.....	.....	.....	.....	.....	47.5	73.2	61.3	60.7	.....	.....	71.4	33.3	51.3	52.0	2.89	36.2	2.44	2.98	11.41	.....	.....
1882.																							
January‡	30.113	30.034	30.047	30.064	30.269	29.761	31.2	52.3	42.0	41.8	66.5	16.5	85.1	51.1	69.2	68.5	4.7	4.8	3.8	4.4	.33	.26	29
February	30.125	30.111	30.115	30.117	30.329	29.852	35.0	54.4	45.9	45.1	66.5	21.5	87.2	50.3	72.3	70.0	3.7	5.6	3.0	4.1	1.01	.68	15
March	30.035	30.008	30.010	30.018	30.218	29.800	41.4	64.6	55.3	53.8	84.5	23.5	74.8	30.9	46.2	50.6	2.3	3.0	2.3	2.5	.70	.39	25, 26
April	29.901	29.861	29.863	29.875	30.059	29.641	44.8	72.3	61.4	59.5	91.5	30.0	59.1	19.3	30.4	36.3	1.0	2.0	1.8	1.6	.02	.02	13
May	29.800	29.769	29.756	29.775	29.917	29.547	52.6	82.1	69.3	68.0	93.0	40.0	56.4	19.7	32.7	36.3	2.0	2.9	1.6	2.2	.47	.21	8
June	29.794	29.762	29.746	29.767	29.920	29.588	62.1	90.2	77.7	76.7	101.5	49.5	59.2	22.8	40.3	40.8	2.1	3.6	2.9	2.9	1.26	.50	16

NOTE.—7 a. m., 3 p. m., and 11 p. m. Washington time, correspond with 4.49 a. m., 12.49 p. m., and 8.49 p.m., local time.
*No barometer at station prior to January, 1882. †Observations discontinued from 2d to 15th, inclusive. ‡Observations discontinued from 15th to 24th, inclusive.

J. T. FITZGERALD,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

CAMP THOMAS, ARIZ.

	Wind.*				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder storms.	Aurorns.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July					9	1	8	15	8	2	10	11	29	8	16	7	13	0	6	0	0	0	
August					13	2	3	14	7	4	5	5	40	9	15	7	12	0	0	0	0	0	
September					8	4	10	14	3	2	6	5	38	20	7	3	4	0	0	0	0	3	
October†					4	0	2	9	3	0	4	3	26	11	4	2	4	0	0	0	0	22	First killing frost October 16.
November					1	0	1	20	3	1	3	10	51	23	6	1	3	0	0	0	0	25	
December					1	1	7	21	6	2	3	8	44	12	15	4	2	0	0	0	0		
Year 1881					88	18	59	127	54	30	107	108	462	199	114	38	52	1	8	0	0	107	
1882.																							
January‡					1	0	2	11	3	1	1	8	36	8	6	7	3	0	0	0	0	14	
February					2	0	1	20	4	1	3	26	27	9	16	3	5	0	0	0	0	14	
March					6	0	1	19	6	6	12	12	31	20	7	4	4	0	0	0	0	6	
April					11	0	1	20	2	5	12	16	23	25	4	1	1	0	0	0	0	4	Light frost reported April 19: no injury done to crops.
May					10	4	2	16	10	9	16	7	19	22	7	2	3	0	0	0	0	0	
June					5	2	5	16	13	11	12	12	14	15	14	1	5	0	4	0	0	0	

* No anemometer at station. †Observations discontinued from the 2d to 15th, inclusive. ‡Observations discontinued from the 15th to 24th, inclusive.
Location of office on June 30, 1882: Inside the post.

J. T. FITZGERALD,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

CAPE HENRY, VA.

[Latitude, 36° 56′; longitude west of Greenwich, 76° 0′. Elevation of barometer above sea-level, 16 feet. Elevation of rain-gauge (top) above ground, 6 feet. Elevation of exposed thermometer above ground, 16 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometer.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.970	29.949	29.962	29.960	30.203	29.547	75.8	85.3	76.0	79.0	98	60	77.3	59.1	78.4	71.6	4.5	4.2	3.9	4.2	8.57	1.80	8
August	30.050	30.021	30.033	30.035	30.317	29.711	73.3	81.2	73.5	76.0	103	60	83.1	65.6	80.0	76.2	4.1	4.0	4.3	4.1	2.30	1.04	7
September	30.117	30.080	30.109	30.102	30.372	29.851	73.9	83.7	75.0	77.5	94	66	87.3	64.0	81.1	77.5	3.9	3.5	2.7	3.4	.93	.65	11
October	30.203	30.146	30.162	30.170	30.538	29.563	63.8	72.9	66.3	67.7	89	48	76.9	60.2	75.6	70.9	5.1	5.3	3.6	4.5	3.48	1.04	31
November	30.235	30.188	30.215	30.212	30.731	29.664	53.2	60.4	54.3	56.0	79	26	78.1	63.2	76.9	72.7	5.6	5.3	5.2	5.4	8.96	2.81	23
December	30.215	30.162	30.204	30.194	30.643	29.499	45.5	52.5	48.1	48.7	74	23	77.0	66.5	73.9	72.5	4.5	6.8	4.0	5.1	1.89	.80	22
Year 1881	30.076	30.034	30.061	30.057	.....	.....	56.6	64.1	57.7	59.5	.....	.....	78.1	63.5	76.9	72.9	3.4	3.6	3.0	3.3	50.18	.....	.....
1882.																							
January	30.207	30.171	30.217	30.198	30.874	29.389	40.7	43.8	41.1	41.9	64	19	82.9	75.6	80.7	79.7	5.6	7.7	6 2	6.5	6.92	1.59	28
February	30.215	30.160	30.189	30.188	30.723	29.334	43.1	50.4	45.9	46.5	74	27	75.4	65.7	72.7	71.3	4.5	5.4	3.2	4.4	4.17	2.13	4
March	30.147	30.110	30.164	30.140	30.691	29.627	46.6	52.4	47.0	48.7	76	33	73.6	63.7	73.1	70.2	5.0	6.0	4.8	5.3	3.73	1.38	1
April	30.087	30.033	30.050	30.057	30.493	29.466	51.5	58.6	51.9	54.0	82	34	75.4	61.5	76.6	71.2	4.7	5.9	5.5	5.4	3.92	1.13	29, 30
May	30.052	30.010	30.026	30.029	30.422	29.569	58.7	66.1	58.7	61.2	88	42	78.3	63.2	77.3	72.9	5.3	5.8	4.6	5.2	5.18	1.46	11
June	29.980	29.942	29.961	29.961	30.279	29.650	70.5	78.5	70.2	73.1	92	52	74.7	60.4	76.9	70.7	4.8	5.0	2.0	3.9	2.87	1.05	16

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.04 a. m., 3.04 p. m., and 11.04 p. m., local time.

A. K. ALDERSON,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

CAPE HENRY, VA.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed below from—								Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	7,904	SE.	48	7	9	16	6	11	11	20	7	12	1	13	13	5	13	0	3	0	0	0	
August	7,686	NW.	40	13	7	26	9	15	14	13	2	5	2	16	12	3	4	0	2	0	0	0	
September	8,094	SE.	35	9	5	7	12	18	14	23	3	4	4	11	17	2	5	0	0	0	0	0	
October	8,659	NW.	56	25	8	15	2	16	26	17	0	9	0	11	13	7	8	0	0	0	0	0	
November	9,712	NW.	52	3, 4	13	9	7	10	9	17	2	23	0	12	5	13	13	0	0	0	0	2	First light frost, 2d; first heavy frost of the season, 25th.
December	8,799	N.	44	15	24	10	2	8	15	16	3	15	0	5	19	7	11	0	0	0	0	2	
Year 1881	107,716	.....	....	.....	143	164	54	149	144	174	65	190	12	115	155	95	127	4	16	0	7	41	
1882.																							
January	9,879	NW.	52	1	11	14	3	7	3	18	14	23	0	3	13	15	15	3	0	0	2	10	
February	8,952	NE.	52	4	6	11	5	13	13	15	5	16	0	11	11	6	8	0	0	0	0	5	
March	10,953	NW.	52	13	8	10	9	10	13	11	6	25	1	11	10	10	12	0	0	0	0	0	
April	9,757	NE.	40	5	12	25	6	12	14	12	1	7	1	10	11	9	14	0	2	1	0	0	Last frost of the season, April 12th.
May	10,298	NE. NE. NW.	36	6, 11, 29	7	22	4	14	18	15	4	9	0	8	14	9	14	0	1	0	0	0	
June	8,749	NE. NW.	40	11, 18	4	10	1	20	20	22	7	6	0	10	18	2	9	0	0	0	0	0	

Location of office on June 30, 1882, new building 150 feet east of light-house keeper's residence.

A. K. ALDERSON,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

CAPE MAY, N. J.

[Latitude, 38° 56′; longitude west of Greenwich, 74° 58′. Elevation of barometer above mean sea-level, 27 feet. Elevation of rain-gauge (top) above ground, 6 feet. Elevation of exposed thermometer above ground, 19 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness. Amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.948	29.934	29.930	29.929	30.196	29.671	73.0	78.4	74.4	75.4	87	62	72.2	61.0	72.5	68.6	4	4	4	4	1.20	.47	4
August	30.060	30.034	30.039	30.048	30.315	29.665	71.0	77.2	71.6	73.5	87	58	81.5	71.5	80.6	77.5	3	5	5	4	2.26	1.00	7
September	30.111	30.076	30.082	30.094	30.324	29.836	72.3	78.2	72.9	74.5	85	55	84.3	74.0	78.6	79.8	2	2	2	2	1.22	.40	12
October	30.181	30.119	30.121	30.141	30.517	29.541	60.0	66.5	61.8	62.7	81	39	79.9	71.7	76.7	76.1	3	5	3	3	4.53	1.35	24
November	30.209	30.166	30.177	30.184	30.712	29.642	48.8	55.7	50.3	51.6	67	27	80.0	71.9	79.0	77.0	6	6	6	6	5.22	1.38	23
December	30.216	30.161′	30.190	30.189	30.649	29.460	41.3	46.9	41.8	43.3	62	20	78.7	71.7	76.1	75.5	6	6	5	6	2.07	.58	22
Year 1881	30.063	30.026	30.040	30.043	.....	.....	52.3	58.0	53.8	54.7	.....	.....	79.0	71.1	79.1	76.4	4.5	4.7	4	4.4	42.99	.....	.....
1882.																							
January	30.171	30.111	30.140	30.140	30.867	29.215	33.6	39.4	35.2	36.0	52	5	78.3	75.0	78.4	77.2	6.1	7.3	4.7	6.0	6.32	1.00	18
February	30.175	30 111	30.117	30.135	30.692	29.295	37.4	44.9	40.2	40.8	58	23	77.6	72.2	70.9	73.6	3.6	5.9	4.6	4.7	3.23	1.00	9
March	30.070	30.042	30.104	30.072	30.669	29.602	42.3	49.1	43.7	45.0	63	23	73.1	68.0	71.0	70.7	7.0	7.2	4.0	6.1	4.90	1.02	16
April	30.074	30.022	30.023	30.040	30.513	29.450	46.8	52.5	49.5	49.6	66	29	75.1	71.8	76.2	74.4	5.0	6.4	4.2	5.2	2.44	.80	26
May	30.009	29.959	29.982	29.983	30.433	29.458	52.9	58.5	53.8	55.1	75	34	82.2	73.6	79.9	78.6	5.7	6.3	5.9	6.0	4.40	1.05	10
June	29.929	29.871	29.904	29.901	30.294	29.576	65.9	73.0	66.7	68.5	83	53	79.4	69.9	79.9	76.4	5.4	5.2	3.3	4.6	2.62	1.28	19

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.08 a. m., 3.08 p. m., and 11.08 p. m., local time.

WILLIAM BOLTON,
Corporal, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

CAPE MAY, N. J.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	7,780	SW.	60	14	6	8	5	14	22	7	6	14	1	15	3	9	12	0	7	0	0	0	
August	7,661	S.	48	13	7	9	4	21	21	12	0	8	1	17	3	6	8	0	6	0	0	0	
September	8,874	NE.	34	15	4	5	11	15	20	15	3	5	0	16	3	4	8	0	1	0	0	0	Light frost, 11th.
October	11,256	N.	48	5	6	11	1	7	33	13	5	15	0	14	4	11	10	0	0	0	0	0	
November	12,675	NW.	66	20	6	15	2	4	13	9	4	28	1	8	2	17	15	0	1	0	0	2	
December	12,018	NW.	52	7	15	9	2	6	14	19	7	16	0	7	6	15	12	2	0	0	0	6	Light snow, 15th.
Year 1881	129,755	.. ....	....	.....	96	133	68	127	187	114	77	215	8	128	78	127	117	20	20	0	15	59	
1882.																							
January	11,310	W.	63	22	2	16	4	3	7	7	12	32	2	8	6	15	13	4	0	0	3	17	
February	12,003	NW.	60	4	5	2	10	7	14	2	12	20	1	10	6	8	10	1	0	0	0	10	
March	11,807	NW.	48	13	2	7	6	14	12	4	6	19	3	6	5	12	11	1	0	0	0	7	
April	9,432	W.	44	21	2	12	10	11	12	8	9	14	6	9	5	11	12	0	0	1	0	2	
May	9,771	E.	41	{11 12}	4	19	9	9	13	11	2	9	5	5	10	9	12	0	0	0	0	0	
June	8,788	NW.	38	5	1	6	3	12	28	7	14	8	1	6	12	6	5	0	5	0	0	0	

Location of office, Cape May Point.

WILLIAM BOLTON,
Corporal, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

CEDAR KEYS, FLA.

[Latitude, 29° 8′; longitude west of Greenwich, 83° 2′. Elevation of barometer above sea-level, 22 feet. Elevation of rain-gauge (top) above ground, 35 feet. Elevation of exposed thermometer above ground, 20 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.031	30.015	30.028	30.025	30.170	29.860	80.7	86.9	81.8	83.1	94	69	77.6	60.8	74.8	71.1	4.5	5.5	3.3	4.4	11.86	3.20	12
August	30.002	29.980	30.002	29.995	30.171	29.733	78.7	86.7	79.8	81.7	93	69	80.1	62.8	76.9	73.3	3.9	3.6	3.2	3.6	2.68	1.05	6
September	30.047	30.001	30.040	30.029	30.167	29.825	76.6	86.1	79.3	80.7	94	68	86.0	63.3	78.9	76.1	2.3	4.6	2.9	3.3	7.41	4.49	16
October	30.116	30.063	30.107	30.095	30.348	29.885	71.3	81.0	74.4	75.6	89	57	83.8	60.8	77.8	74.1	2.0	2.6	1.0	1.9	1.25	0.51	31
November	30.151	30.100	30.155	30.136	30.399	29.703	62.7	73.0	65.8	67.2	81	33	81.0	62.5	79.7	74.4	3.5	4.5	3.3	3.8	2.19	0.85	23
December	30.171	30.136	30.177	30.161	30.399	29.935	58.6	65.9	60.9	61.8	78	42	83.4	71.5	78.4	77.8	4.6	5.6	3.2	4.5	3.52	1.54	26
Year 1881	30.079	30.044	30.073	30.066	.....	.....	66.8	75.2	69.5	70.5	.....	.....	79.9	63.2	76.9	73.4	3.8	4.4	2.7	3.6	53.03	.....	....
1882.																							
January	30.201	30.182	30.218	30.200	30.465	29.804	59.8	66.5	61.4	62.6	74	34	84.2	72.2	80.0	78.8	4.4	4.6	2.1	3.7	3.19	1.52	24
February	30.218	30.184	30.224	30.209	30.457	29.732	57.7	67.4	61.7	62.3	76	40.5	80.0	60.2	73.4	71.2	3.2	4.7	2.5	3.5	1.02	.84	9
March	30.187	30.154	30.188	30.176	30.453	29.918	63.0	72.5	66.2	67.2	82	47	79.8	60.4	75.5	71.9	3.5	3.4	2.3	3.1	2.60	2.38	1
April	30.059	30.020	30.044	30.041	30.333	29.786	69.5	78.9	71.8	73.4	85	60	83.3	58.4	74.7	72.1	5.5	5.2	2.5	4.4	3.00	1.70	8
May	30.051	30.017	30.032	30.034	30.239	29.827	71.7	79.9	74.0	75.2	90	54	74.9	55.9	70.7	67.2	4.9	4.4	3.5	4.3	1.71	1.20	24
June	30.066	30.049	30.071	30.062	30.221	29.882	78.2	83.0	78.5	79.9	91	68	79.2	67.7	79.0	75.3	6.2	6.1	5.6	6.0	9.56	3.11	8, 9

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.36 a. m., 2.36 p. m., and 10.36 p. m., local time.

FRED. W. MIXER,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

CEDAR KEYS, FLA.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Dates.													Rain.	Snow.					
1881.																							
July	6,604	W.	42	18	2	14	10	3	8	23	26	5	2	9	20	2	14	0	13	0	0	0	
August	7,515	NE.	32	1	8	22	15	3	5	13	22	5	0	13	13	5	8	0	4	0	0	0	
September	6,217	S.	50	24	3	38	20	4	6	5	11	3	0	17	10	3	8	0	4	0	0	0	
October	7,147	SE.	28	31	6	42	13	6	8	4	10	3	1	24	7	0	5	0	0	0	0	0	
November	6,477	NW.	33	24	9	37	16	5	7	1	2	8	5	13	12	5	6	0	0	0	0	0	
December	7,611	NW.	36	30	15	18	16	5	10	8	6	12	3	8	18	5	8	0	0	0	0	0	Last frost, November 25th.
Year 1881	89,601	.....	.....	.....	84	250	158	51	107	119	189	117	20	172	149	44	90	0	30	0	0	0	
1882.																							
January	6,289	S.	32	31	6	11	14	10	32	5	8	6	1	10	17	14	7	0	0	0	0	0	
February	5,364	S.	40	4	9	11	14	9	20	3	12	5	1	11	15	2	4	0	0	0	0	0	
March	6,446	S.	35	1	6	10	8	5	11	14	17	11	11	13	17	1	5	0	1	0	0	0	
April	7,053	S.	39	19	4	20	13	5	8	19	16	2	3	10	16	4	8	0	2	0	0	0	
May	7,106	SE. / S.	28	6 / 11	5	11	19	8	14	11	18	6	1	10	17	4	7	0	3	0	0	0	
June	6,249	S.	32	1	2	10	8	0	9	26	29	2	4	6	15	9	13	0	3	0	0	0	

Location of office on June 30, 1882, corner Second and C streets, Rogers's building.

FRED. W. MIXER,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

CHAMPAIGN, ILL.

[Latitude 40° 8′; longitude west of Greenwich, 88° 14′. Elevation of barometer above sea-level, 767 feet. Elevation of rain-gauge (top) above ground, 2 feet. Elevation of exposed thermometer above ground, 48 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.008	29.947	29.956	29.970	30.223	29.623	70.5	85.2	74.9	76.9	95.2	53.7	74.0	48.9	69.0	64.0	3.8	5.4	2.2	3.8	1.07	.47	14
August	29.997	29.918	29.933	29.949	30.187	29.713	67.7	87.7	74.9	76.7	99.5	53.7	69.9	37.8	60.3	56.0	4.0	5.7	2.2	4.0	.64	.61	6
September	29.963	29.880	29.912	29.919	30.219	29.492	63.8	79.9	68.8	70.8	95.0	47.7	84.9	54.2	73.4	70.8	4.4	5.7	2.9	4.3	4.89	1.58	30
October	30.068	30.025	30.051	30.048	30.467	29.529	53.1	62.8	56.3	57.4	78.0	38.8	86.3	70.0	83.0	79.8	6.2	6.9	5.7	6.3	5.77	1.67	2
November	30.115	30.054	30.103	30.091	30.697	29.566	35.9	44.6	38.7	39.7	62.0	10.8	81.4	65.9	75.0	74.1	6.0	6.6	5.4	6.0	7.78	2.72	18
December	30.121	30.081	30.116	30.106	30.597	29.595	34.5	42.0	36.3	37.6	60.0	11.6	80.6	69.6	76.5	75.6	6.9	7.0	5.1	6.3	8.54	3.21	13
Year 1881	30.025	29.971	30.000	29.998	.....	.....	46.3	58.1	50.3	51.6	.....	.....	77.6	60.5	72.5	69.9	5.8	6.8	4.6	5.7	51.07	.....	....
1882.																							
January	30.195	30.147	30.175	30.172	30.720	29.605	24.9	32.3	28.7	28.7	60.8	3.1	75.1	67.2	75.2	72.5	6.9	7.3	6.6	6.9	1.99	.58	4
February	30.097	30.058	30.098	30.084	30.572	29.313	34.4	44.5	39.5	39.4	63.0	12.3	76.6	64.6	76.1	72.4	5.9	5.8	5.1	5.6	5.49	2.34	18, 19
March	30.095	30.060	30.088	30.081	30.575	29.500	36.8	47.1	41.6	41.8	68.8	21.0	76.4	61.8	73.6	70.6	6.1	7.9	5.1	6.4	4.54	1.36	17, 18
April	30.036	30.012	30.021	30.023	30.305	29.443	45.8	58.6	50.7	51.7	78.8	26.0	77.8	51.5	69.7	66.3	6.8	7.0	5.0	6.3	3.86	1.05	9
May	29.952	29.933	29.941	29.942	30.361	29.580	51.2	62.2	54.0	55.8	79.0	32.6	79.2	62.2	75.7	72.4	6.4	7.5	5.5	6.5	8.55	3.03	5
June	29.902	29.886	29.890	29.893	30.148	29.495	64.7	74.8	67.8	69.1	90.2	44.5	76.9	59.9	75.6	70.8	6.9	7.9	5.8	6.9	9.93	2.42	10, 11

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.15 a. m., 2.15 p. m., and 10.15 p. m., local time.

L. A. WELSH,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132–B.]

CHAMPAIGN, ILL.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	6,687	N.	28	22	26	9	2	2	18	16	8	12	0	17	10	4	4	0	4	0	0	0	
August	6,960	N.W. / S. E.	28	6 / 29	23	16	5	18	20	4	5	2	0	11	18	2	2	0	1	0	0	0	
September	7,982	N. W.	40	4	6	3	1	7	33	29	2	9	0	11	12	7	10	0	3	1	0	0	
October	8,263	S. W.	46	15	9	9	4	12	21	19	5	12	2	7	11	13	16	0	0	0	0	0	
November	9,808	S. W.	40	12	3	3	3	8	27	15	13	17	1	5	14	11	9	0	1	0	1	10	
December	9,321	N.	38	23	9	8	2	7	25	18	3	20	1	5	12	14	6	3	0	0	2	17	
Year 1881	102,808	.....	...	.....	135	130	45	132	214	176	79	171	13	90	146	129	92	27	14	1	40	112	
1882.																							
January	9,070	W.	52	26	6	8	6	9	23	13	11	17	0	4	10	17	8	4	0	0	11	26	
February	7,305	S. W.	51	21	6	7	2	10	21	15	11	11	1	6	12	10	8	0	0	0	2	11	
March	12,433	S. W.	50	9	6	10	5	12	17	11	6	26	0	4	17	10	11	0	2	0	0	15	
April	10,051	S. W.	44	18	10	27	12	6	15	9	5	6	0	7	13	10	10	0	3	1	0	3	
May	9,610	E.	45	5	18	18	8	9	23	8	3	6	0	6	12	13	18	0	2	0	0	0	
June	8,415	NW.	44	27	4	11	6	5	11	32	14	6	1	2	14	14	16	0	6	0	0	0	

Location of office on June 30, 1882, Illinois Industrial University.

L. A. WELSH,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

CHARLESTON, S. C.

[Latitude, 32° 47′; longitude west of Greenwich, 79° 56′. Elevation of barometer above sea-level, 52 feet. Elevation of rain-gauge (top) above ground, 57 feet. Elevation of exposed thermometer above ground, 40 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometer.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.018	29.984	30.012	30.005	30.206	29.744	80.6	88.4	81.3	83.4	103	67	76.2	61.0	77.5	71.6	2.7	6.4	2.4	3.8	4.99	2.00	1
August	30.023	29.991	30.020	30.009	30.221	29.509	78.0	85.5	79.6	81.0	97 5	69	83.1	65.5	80.7	76.4	4.4	5.5	3.6	4.5	7.25	4.69	27
September	30.096	30.059	30.093	30.083	30.280	29.884	77.1	85.5	79.5	80.7	92 5	68	87.0	65.2	79.8	77.4	4.3	4.6	1.8	3.6	5.49	2.46	13
October	30.176	30.138	30.157	30.157	30.432	29.781	68.5	77.1	70.5	72.0	89	54	85.4	65.8	84.0	78.4	3.8	4.5	3.2	3.8	1.59	.72	17
November	30.221	30.172	30.204	30.199	30.602	29.721	56.3	65.9	59.5	60.6	80	28	82.9	66.9	81.9	77.2	4.2	5.3	3.6	4.4	2.15	1.05	23
December	30.206	30.160	30.205	30.190	30.586	29.714	51.8	60.5	54.1	55.5	76	33	82.7	67.6	78.0	76.1	5.7	5.2	2.7	4.5	4.76	1.25	26
Year 1881	30.095	30.048	30.082	30.077	.....	.....	63.0	71.9	65.5	66.8	.....	.....	79.4	57.6	77.0	72.7	4.22	4.96	3.09	4.09	43.20	.....	.....
1882.																							
January	30.235	30.188	30.233	30.218	30.589	29.640	51.9	59.5	53.8	55.1	76	26.0	84.8	70.9	80.8	78.8	4.4	6.2	5.5	5.4	1.69	.80	31
February	30.236	30.188	30.232	30.219	30.614	29.452	52.3	63.1	56.6	57.3	78	32.0	82.1	63.7	77.0	74.3	4.4	6.0	4.1	4.8	1.09	.54	9
March	30.169	30.125	30.172	30.155	30.535	29.740	57.0	68.1	60.7	62.0	85	40.0	81.4	57.8	73.6	70.9	4.0	4 8	2.2	3.7	5.96	1.80	28
April	30.082	30.034	30.055	30.057	30.427	29.587	62.8	71.7	65.2	66.6	86	46.0	84.3	66.4	83.1	77.9	5.9	5.8	4.4	5.4	2.72	1.45	23
May	30.056	30.021	30.038	30.038	30.312	29.718	68.0	76.9	70.0	71.6	87	51.5	82.4	58.9	81.3	74.2	4.5	5.7	2.9	4.4	1.82	.95	28, 29
June	30.026	29.991	30.015	30 011	30.217	29.811	76.8	84.3	76.8	79.3	97	63.0	79.0	64.8	81.3	75.0	5.2	6.7	4.3	5.4	9.12	4.06	18, 19

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.49 a. m., 2.49 p. m., and 10.49 p. m., local time.

J. H. SMITH,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

CHARLESTON, S. C.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	6,663	W.	32	17	11	9	21	2	15	27	7	1	0	18	10	3	6	0	3	0	0	0	
August	7,062	NE.	54	27	6	21	22	7	14	14	7	1	1	9	15	7	13	0	1	0	0	0	
September	5,372	SE.	28	16	6	15	14	26	10	10	2	2	5	15	14	1	9	0	4	0	0	0	
October	5,669	NE.	24	5	6	27	17	8	10	10	7	7	1	13	13	5	8	0	0	0	0	0	
November	4,898	NE.	24	20	9	31	10	6	0	9	9	13	3	12	9	9	8	0	0	0	0	1	First frost (killing), November 28.
December	6,533	NW.	26	29	14	28	8	6	5	8	21	3	0	8	18	5	9	0	0	0	0	0	
Year 1881	73,891	.....	....	.....	121	198	175	76	132	177	138	62	16	154	141	70	104	0	13	0	0	9	
1882.																							
January	5,638	W.	24	1	12	19	6	2	5	26	9	9	3	5	9	17	11	0	0	0	0	1	
February	5,468	SW.	32	4	4	13	14	9	4	18	14	5	3	9	14	5	5	0	0	0	0	0	
March	6,809	W.	32	1	2	11	12	3	9	32	16	6	2	14	11	6	9	0	1	0	0	0	Last frost, March 26.
April	6,064	SW.	24	{19 / 23}	6	17	19	4	8	24	7	2	3	8	10	12	7	0	1	0	0	0	
May	6,454	E.	24	7	3	11	16	5	7	28	13	5	5	9	16	6	6	0	2	0	0	0	
June	6,160	W.	27	18	3	6	11	1	3	40	23	3	0	6	19	5	15	0	10	0	0	0	

Location of office on June 30, 1882, corner East Bay and Broad streets, Carolina Savings Bank.

J. H. SMITH,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

CHARLOTTE, N. C.

[Latitude, 35° 13′; longitude west of Greenwich, 80° 51′. Elevation of barometer above sea-level, 808 feet. Elevation of rain-gauge (top) above ground, 47 feet. Elevation of exposed thermometer above ground, 34 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0-10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.036	29.984	30.011	30.010	30.245	29.695	78.1	88.6	81.2	82.6	100.4	63.2	64.0	40.6	56.8	53.8	4.1	5.7	3.5	4.4	1.83	0.58	15
August	30.077	30.010	30.054	30.047	30.296	29.802	76.0	87.1	79.7	80.9	100.5	64.4	68.0	40.7	58.0	55.6	5.3	6.2	2.2	4.6	1.15	0.55	7
September	30.124	30.074	30.112	30.103	30.319	29.853	71.8	84.7	75.6	77.4	94.0	61.0	82.0	48.8	72.2	67.7	5.5	6.5	3.4	5.1	4.85	2.24	15, 16
October	30.240	30.182	30.209	30.211	30.499	29.782	59.9	73.1	64.3	65.8	87.0	42.0	77.6	52.8	74.1	68.2	4.6	5.6	3.4	4.5	2.69	1.28	31
November	30.270	30.221	30.262	30.251	30.719	29.822	46.2	57.0	49.5	50.9	74.8	20.0	81.6	62.0	76.1	73.2	5.3	5.9	4.8	5.3	4.58	1.69	23
December	30.251	30.200	30.254	30.235	30.681	29.672	41.9	52.5	44.8	46.4	70.0	28.0	80.8	58.5	70.6	70.0	6.7	6.4	4.3	5.8	4.77	1.36	21, 22
Year 1881	30.089	30.024	30.069	30.061	.....	.....	56.3	68.0	59.9	61.4	.....	.....	73.2	48.9	66.2	62.8	5.4	6.1	3.9	5.1	41.62	.....	.....
1882.																							
January	30.202	30.171	30.215	39.196	30.680	29.599	39.3	46.5	42.4	42.7	67.0	16.2	84.4	74.2	79.6	79.4	5.9	8.7	7.8	7.5	7.24	1.38	27, 28
February	30.208	30.151	30.206	30.188	30.595	29.518	43.8	55.3	49.0	49.4	73.0	25.5	80.6	56.7	71.5	69.6	5.3	6.2	4.4	5.3	5.35	1.93	3, 4
March	30.145	30.092	30.157	30.131	30.531	29.744	48.2	61.0	51.7	53.6	76.0	30.2	74.7	48.1	66.4	63.1	5.4	6.1	3.8	5.1	2.88	.89	8, 9
April	30.063	29.991	30.028	30.027	30.406	29.509	54.8	68.0	59.5	60.8	83.0	36.0	78.7	50.2	68.9	65.9	6.7	6.4	4.8	6.0	5.93	2.38	22, 23
May	30.022	29.962	29.992	29.992	30.328	29.608	60.8	72.0	63.0	65.3	87.0	45.0	75.9	50.1	73.6	66.5	5.2	6.4	5.4	5.7	3.22	1.02	6, 7
June	29.975	29.930	29.971	29.959	30.200	29.672	73.5	82.9	75.9	77.4	96.5	61.4	68.6	48.0	65.1	60.6	4.5	7.1	3.0	4.9	1.98	1.04	11, 12

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.45 a. m., 2.45 p. m., and 10.45 p. m., local time.

D. O'DONOGHUE,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

CHARLOTTE, N. C.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	3,603	NW.	26	15	16	17	10	4	8	13	10	15	0	9	17	5	9	0	8	0	0	0	
August	4,013	NE.	23	27	8	11	22	8	14	19	6	5	0	8	18	5	6	0	2	0	0	0	
September	3,283	SE.	20	15	7	13	11	11	21	11	4	8	4	3	19	8	6	0	0	0	0	0	
October	3,476	W.	24	5	10	13	10	13	13	11	13	7	3	14	10	7	9	0	1	0	0	0	Lunar halo, 11th.
November	3,655	NW. / NE.	18 / 18	24 / 20	16	20	6	3	7	23	6	9	0	10	8	12	14	0	0	0	0	2	First killing frost, 4th; first light frost, 5th.
December	4,284	SW.	25	30	13	28	6	28	11	23	6	4	0	5	13	13	12	0	0	0	0	4	
Year 1881	48,682	.....	....	.....	134	217	115	66	130	206	108	110	9	106	150	109	114	6	29	0	1	40	
1882.																							
January	3,602	NW.	23	22	10	23	17	4	1	23	7	8	0	3	5	23	20	2	1	0	0	10	Lunar halo, 24th.
February	4,329	SW.	28	21	9	8	3	12	11	23	9	9	0	9	6	13	11	0	1	0	0	4	
March	4,885	NW.	32	13	8	21	11	5	13	18	11	6	0	7	14	10	11	0	1	0	0	1	Frost, 26th.
April	4,186	NW.	22	10	4	19	15	4	12	24	8	4	0	5	15	10	13	0	5	0	0	0	
May	4,224	NE.	21	6	7	16	8	5	13	28	8	8	0	7	14	10	15	0	7	0	0	0	
June	3,382	W.	30	17	3	8	7	1	14	32	13	12	0	7	18	5	8	0	5	0	0	0	

Location of office on June 30, 1882, over Traders' National Bank, corner Trade and Tryon streets.

D. O'DONOGHUE,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

CHATTANOOGA, TENN.

[Latitude, 35° 4′; longitude west of Greenwich, 85° 15′. Elevation of barometer above sea-level, 783 feet. Elevation of rain-gauge (top) above ground, 59 feet. Elevation of exposed thermometer above ground, 43 feet.

	Barometer (to sea.)						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	2 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.053	29.993	30.023	30.023	30.249	29.796	74.4	89.4	77.9	80.6	99.0	62.5	78.9	46.2	70.6	65.2	2.8	4.2	2.7	3.2	2.09	1.06	25, 26
August	30.060	29.995	30.028	30.027	30.265	29.838	73.4	88.3	78.2	80.0	100.5	65.0	82.4	49.2	71.8	67.8	5.2	5.7	4.2	5.0	2.95	1.02	8, 9
September	30.132	30.062	30.098	30.097	30.292	29.643	67.9	83.3	72.7	74.6	96.0	55.0	88.4	53.4	78.3	73.4	4.0	5.6	3.3	4.6	5.74	1.39	15
October	30.226	30.169	30.189	30.195	30.462	29.883	59.6	72.5	63.5	65.2	85.0	45.0	86.8	59.2	81.1	75.7	4.9	4.7	3.9	4.5	5.07	1.62	29
November	30.266	30.215	30.248	30.243	30.617	29.907	45.0	56.4	49.2	50.2	75.0	21.0	85.8	64.7	80.0	76.8	5.2	5.0	5.0	5.1	4.29	1.39	6, 7
December	30.242	30.206	30.237	30.228	30.636	29.836	43.1	51.1	45.6	46.6	64.0	28.5	80.5	60.6	74.0	71.7	6.2	5.9	6.7	6.3	8.83	3.08	21, 22
Year 1881	30.113	30.049	30.085	30.082	.....	.....	55.3	67.7	59.5	60.8	.....	.....	80.9	55.0	73.3	69.7	5.4	5.4	4.5	5.1	60.97	.....	.....
1882.																							
January	30.234	30.203	30.228	30.222	30.641	29.718	42.0	47.4	45.6	45.0	67.0	21.0	85.4	74.8	79.3	79.8	8.2	8.0	8.1	8.1	14.74	2.92	15, 16
February	30.220	30.188	30.219	30.209	30.547	29.590	45.6	55.0	49.8	50.2	72.0	29.5	78.7	60.5	69.6	69.6	6.0	6.2	5.4	5.9	7.24	1.78	28
March	30.188	30.143	30.177	30.169	30.586	29.726	49.3	61.3	54.8	55.1	82.5	34.0	74.3	53.5	64.9	64.2	5.1	5.8	3.6	4.9	4.56	1.19	8
April	30.087	30.022	30.053	30.054	30.372	29.648	56.2	70.7	60.8	62.6	85.0	41.0	76.7	46.7	66.7	63.4	5.0	6.4	5.1	5.5	4.61	2.99	22
May	30.041	29.991	30.016	30.016	30.301	29.638	59.1	71.7	62.7	64.5	87.0	45.0	78.5	55.9	74.2	69.5	5.1	6.5	4.5	5.3	4.46	1.45	10
June	30.049	30.000	30.026	30.025	30.262	29.758	70.9	83.2	73.2	75.8	94.5	52.0	80.4	53.9	76.5	70.3	4.4	6.1	3.8	4.8	4.97	2.38	17, 18

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.27 a. m., 2.27 p. m., and 10.27 p. m., local time.

B. L. GOULDING,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

CHATTANOOGA, TENN.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	3,616	NW.	32	22	6	24	4	2	2	8	7	16	24	13	17	1	8	0	6	0	0	0	
August	4,139	W.	28	20	9	16	7	12	8	3	3	4	21	6	19	6	13	0	2	0	0	0	
September	3,143	S.	28	25	5	11	5	10	12	8	8	7	24	10	17	3	11	0	7	0	0	0	
October	3,571	N.	24	5	10	10	2	8	17	5	8	6	27	12	15	4	10	0	1	0	0	0	
November	3,702	NW.	25	19	7	15	4	5	14	8	2	10	25	11	9	10	13	0	0	0	0	5	First light frost, November 4; first killing frost, November 16.
December	4,926	NW.	30	29	9	23	4	6	14	11	4	7	15	7	10	14	12	3	1	0	0	4	
Year 1881	53,257	.....	....	.....	88	175	47	83	139	131	96	134	202	115	151	99	138	9	40	0	2	39	
1882.																							
January	5,339	NW.	28	1	7	21	10	10	20	8	3	11	3	2	7	22	22	2	0	0	0	8	
February	5,296	W.	36	21	6	11	3	11	22	9	9	11	2	6	11	11	12	0	1	0	0	4	
March	5,853	NW.	36	21	8	11	2	9	17	16	6	22	2	11	10	10	14	0	2	0	0	0	
April	4,634	SW.	28	19	11	12	3	3	20	14	5	12	10	8	13	9	10	0	4	2	0	0	Last frost, April 17; Aurora, April 16 and 17.
May	4,458	S.	25	31	10	6	2	7	20	15	11	12	10	8	14	9	12	0	3	0	0	0	
June	3,598	NW.	29	29	4	9	4	7	14	16	20	8	8	8	18	4	12	0	13	0	0	0	

Location of office on June 30, 1882, Hamilton County court-house.

B. L. GOULDING,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

CHEYENNE, WYO.

[Latitude, 41° 8′; longitude west of Greenwich, 104° 48′. Elevation of barometer above sea-level, 6,089 feet. Elevation of rain-gauge (top) above ground, 24 feet. Elevation of exposed thermometer above ground, 15 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.971	29.947	29.960	29.959	30.150	29.714	58.8	82.9	67.6	69.7	100.5	45.0	78.0	33.5	56.2	55.9	3.7	2.5	3.1	3.1	1.40	.48	16–17
August	29.987	29.978	29.984	29.983	30.225	29.813	58.2	80.1	65.7	68.0	95.2	47.5	71.5	35.1	60.2	55.6	2.5	4.2	4.6	3.8	1.97	.86	8
September	30.026	29.990	30.008	30.008	30.298	29.642	43.0	66.2	51.3	53.5	86.3	31.5	62.5	27.7	48.0	46.1	3.0	3.0	3.0	3.0	1.75	100.00	5–6
October	30.169	30.147	30.175	30.164	30.445	29.834	34.5	55.8	41.6	43.9	76.3	17.5	65.7	37.2	58.3	53.7	1.8	3.7	3.6	3.0	.88	.52	27
November	30.224	30.226	30.244	30.229	30.618	29.849	26.8	38.3	29.7	31.6	56.1	9.0	66.4	47.7	62.3	58.8	3.7	4.9	4.2	4.3	.29	.17	11
December	30.299	30.295	30.329	30.308	30.643	29.829	27.8	42.8	30.9	33.8	57.6	11.2	58.3	31.8	54.0	48.0	2.2	3.3	2.4	2.6	.01	.01	2
Year 1881	30.007	29.986	30.010	30.001	.....	.....	37.5	55.9	44.1	45.8	.....	.....	65.8	36.1	55.6	52.5	2.8	3.6	3.5	3.3	11.88	.....	.....
1882.																							
January	30.119	30.100	30.142	30.120	30.502	29.745	20.1	34.5	21.4	25.3	60.0	−11.8	59.7	39.2	64.7	54.5	1.8	3.8	3.2	2.9	.14	.05	3
February	30.164	30.157	30.177	30.166	30.394	29.857	24.3	40.5	27.3	30.7	55.2	4.3	54.2	33.6	52.9	46.9	2.8	2.9	3.0	2.9	.05	.03	21
March	30.139	30.123	30.143	30.135	30.537	29.774	26.1	45.3	32.5	34.6	69.2	2.5	53.4	25.1	46.4	41.6	2.5	3.9	2.7	3.1	.06	.03	6
April	29.921	29.915	29.929	29.922	30.370	29.581	31.9	50.1	39.0	40.3	74.0	15.0	63.5	33.4	52.0	49.6	4.2	6.1	4.8	5.1	.46	.17	10–11
May	29.856	29.852	29.864	29.857	30.113	29.390	38.6	54.5	44.0	45.7	77.4	23.4	73.5	42.6	65.9	60.7	5.6	8.0	5.2	6.3	2.73	.68	7
June	29.790	29.768	29.792	29.783	30.001	29.491	51.3	69.6	56.7	59.2	88.6	38.4	75.5	39.4	66.5	60.5	4.8	6.3	5.1	5.4	1.85	.36	19

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.09 a. m., 1.09 p. m., and 9.09 p. m., local time.

EDGAR McGOVERN,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

CHEYENNE, WYO.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	7,069	NW.	32	19	9	11	4	5	29	15	9	10	1	16	9	6	13	0	8	0	0	0	
August	6,135	NW.	32	16	7	3	4	9	28	17	5	18	2	12	16	3	12	0	8	0	0	0	
September	7,432	W.	40	24	12	7	1	3	12	15	17	19	4	17	9	4	5	2	2	0	0	2	First light frost, September 10; first killing, on 15.
October	6,559	NW.	36	31	5	6	4	3	17	10	16	29	3	15	13	3	2	1	0	0	0	13	
November	8,350	NW.	40	4–6	11	3	3	2	5	11	16	39	0	12	14	4	0	17	0	0	5	26	
December	9,174	NW.	48	27	6	1	2	1	4	16	16	46	1	21	6	4	0	1	0	0	1	28	
Year 1881	94,696	.....	.....	.....	129	64	27	55	160	137	159	340	24	162	144	59	49	50	33	0	34	152	
1882.																							
January	8,328	NW.	41	5	12	3	1	1	2	18	21	34	1	18	9	4	0	6	0	0	9	29	
February	8,540	NW.	48	4	4	0	1	1	7	11	30	30	0	14	13	1	0	3	0	0	4	24	
March	10,339	NW.	52	28	13	2	0	4	12	4	20	38	0	15	12	4	0	3	0	0	4	26	
April	7,990	NW.	48	8	15	10	4	5	15	11	10	20	0	8	15	7	2	6	0	2	2	20	Dates of auroras, April 16 and 20.
May	8,457	NW.	36	9	19	9	2	10	24	9	7	13	0	2	20	9	12	4	3	0	0	3	Last killing frost, May 21.
June	6,261	NW.	32	17	12	6	2	12	19	10	8	20	1	6	16	8	17	0	11	0	0	0	

Location of office, June 30, 1882, 17th street, between Dodge and Ransom.

EDGAR McGOVERN,
Sergeant Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

CHICAGO, ILL.

[Latitude, 41° 52′; longitude west of Greenwich, 87° 38′. Elevation of barometer above sea-level, 661 feet. Elevation of rain-gauge (top) above ground, 93 feet. Elevation of exposed thermometer above ground, 70 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.010	29.991	29.977	29.993	30.257	29.641	69.4	77.4	72.0	72.9	93.0	56.7	77.5	59.0	74.7	70.4	4.3	4.1	2.4	3.6	4.31	1.69	21
August	30.025	30.002	29.993	30.007	30.246	29.776	71.3	79.2	74.5	75.0	97.9	58.5	68.8	52.7	69.4	63.6	3.9	3 7	2.5	3.4	.54	.30	6
September	29.976	29.935	29.951	29.954	30.213	29.422	64.9	75.2	68.5	69.5	93.9	49.0	75.6	60.0	73.0	69.5	5.0	5.0	2.9	4.3	4.34	1.08	15
October	30.110	30.085	30.099	30.098	30.551	29.599	53.2	59.4	55.2	55.9	76.8	41.3	83.8	70.6	82.7	79.0	5.9	6.1	5 2	5.8	6.89	1.15	14
November	30.100	30.069	30.101	30.090	30.687	29.579	37.4	43.3	39.0	39.9	64.1	14.5	81.2	71.7	78.0	77.0	5.6	5.9	5.6	5.7	5.97	3.18	11
December	30.137	30.115	30.137	30.130	30.596	29.669	34.6	39.9	36.6	37.1	59.0	12.8	86.0	76.7	82.5	81.8	5.1	6.7	4.7	5.5	2.67	1.14	21
Year 1881	30.035	30.007	30.020	30.021	.....	.....	46.2	53.1	48.7	49.4	.....	.....	76.18	64.92	74.70	71.94	4.97	5.25	3.88	4.72	44.18	.....	....
1882.																							
January	30.156	30.118	30.145	30.140	30.717	29.472	25.6	31.3	28.1	28.3	58.5	0.6	83.2	83.5	82.8	83.2	4.1	6.7	5.2	5.3	1.55	.49	7,8
February	30.065	30.024	30.050	30.046	30.551	29.373	34.0	42.8	37.8	38.2	62.3	10.5	82.3	70.9	77.9	77.0	5.1	5.7	3.8	4.9	2.24	1.35	28
March	30.074	30.036	30.057	30.056	30.604	29.437	35.0	41.2	38.7	38.3	63.0	21.8	84.6	74.5	81.2	80.1	6.6	6.4	5.8	6.3	3.43	1.43	9
April	30.051	30.042	30.037	30.043	30.293	29.252	43.4	48.4	45.8	45.9	75.5	25.2	77.7	64.7	74.4	72.3	6.4	6.7	5.2	6.1	6.72	1.49	9
May	29.984	29.964	29.969	29.972	30.379	29.514	49.5	55.2	50.5	51.7	75.8	34.4	76.1	63.6	74.4	71.4	5.8	6.7	5.7	6.1	5.52	1.60	27
June	29.884	29.872	29.870	29.875	30.136	29.417	61.2	66.7	62.8	63.6	88.3	41.8	82.2	68.9	80.8	77.3	6.4	6.7	4.7	5.9	5.71	1.92	2,3

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.18 a. m., 2.18 p. m., and 10.18 p. m., local time.

J. MITCHELL,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

CHICAGO, ILL.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.			Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.	Rain and snow.					
1881.																								
July	4,862	N. W.	20	24	15	17	9	8	4	15	15	10	0	17	8	6	10	0	0	7	0	0	0	
August	5,501	S. W.	20	30	14	22	9	15	15	13	3	2	0	15	13	3	4	0	0	1	0	0	0	
September	5,906	S. W.	27	24	12	5	7	6	23	27	6	2	2	8	16	6	13	0	0	5	0	0	0	
October	5,768	S. W.	23	15	10	14	8	12	17	15	5	8	4	6	12	13	17	0	0	0	1	0	0	Killing frost (1st of season) on October 19.
November	7,619	S. E.	28	11	3	3	2	6	15	24	28	8	1	7	13	10	10	2	2	1	0	1	10	First snow on November 3.
December	6,606	S. W.	26	16	7	7	3	4	12	26	20	14	0	10	11	10	7	2	0	1	0	2	11	
Year 1881	69,536	.....	.....	.....	166	128	88	104	128	197	156	110	18	111	141	113	97	36	6	26	1	42	115	
1882.																								
January	6,926	S. W.	30	26	2	1	7	9	10	22	26	16	0	8	17	6	7	5	2	1	0	9	28	
February	6,625	N. E.	27	20	2	5	4	5	13	22	19	14	0	10	8	10	9	2	1	0	0	2	14	
March	7,778	W.	32	21	5	12	8	11	14	8	17	18	0	5	13	13	8	6	2	2	0	0	13	
April	7,275	N. E.	28	9	11	24	14	7	6	9	11	8	0	5	15	10	10	0	2	6	1	0	3	
May	7,232	N. E.	27	6	21	18	10	11	12	8	8	4	1	6	12	13	14	0	0	1	0	0	0	
June	5,916	S. W.	24	18	12	19	10	5	3	21	13	6	1	5	16	9	14	0	0	9	0	0	0	Light frost on June 1.

Location of office on June 30, 1882, Room 78. Major Block, southeast corner Madison and La Salle streets.

J. MITCHELL,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

CHINCOTEAGUE, VA.

[Latitude, 37° 55′; longitude west of Greenwich, 75° 23′. Elevation of barometer above sea-level, 18 feet. Elevation of rain-gauge (top) above ground, 26 feet. Elevation of exposed thermometer above ground, 22 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.964	29.949	29.961	29.958	30.208	29.643	73.9	77.6	73.1	74.9	94	62	81.9	72.7	87.9	80.7	4.6	5.2	5.2	5.0	1.53	.67	22
August	30.058	30.028	30.040	30.042	30.341	29.708	71.1	75.3	71.5	72.6	91	60	87.7	75.9	89.2	84.3	4.4	2.5	3.4	3.4	.67	.23	14
September	30.117	30.080	30.102	30.100	30.362	29.852	72.5	76.4	73.7	74.2	86	59	91.4	78.4	94.1	87.1	3.5	2.6	2.8	3.0	2.05	.80	27
October	30.198	30.141	30.149	30.163	30.534	29.561	62.7	65.8	62.0	63.5	82	42	83.7	73.9	87.0	81.5	3.9	3.8	4.1	3.9	3.52	1.70	25
November	30.225	30.179	30.199	30.201	30.707	29.669	49.8	55.3	51.1	52.1	70	23	83.1	71.7	84.8	79.9	4.7	4.3	4.5	4.5	5.31	1.11	24
December	30.214	30.169	30.211	30.198	30.627	29.504	41.9	48.5	43.4	44.6	64	25	87.4	74.4	88.6	83.5	5.1	5.7	4.5	5.1	.88	.51	23
Year 1881	30.075	30.036	30.060	30.058	.....	.....	52.9	57.7	53.7	54.7	.....	.....	84.8	74.7	86.6	82.0	4.6	5.0	4.4	4.6	35.54	.....	.....
1882.																							
January	30.202	30.148	30.190	30.180	30.861	29.308	35.5	39.0	36.5	37.0	60	8	85.8	79.7	82.5	82.7	7.0	7.4	5.9	6.8	5.41	1.95	31
February	30.190	30.143	30.165	30.166	30.718	29.272	39.3	46.0	40.8	42.0	58	21	83.4	66.0	83.5	77.7	5.6	4.5	4.4	4.8	3.82	1.06	4
March	30.120	30.078	30.128	30.109	30.691	29.603	42.3	48.1	43.1	44.5	72.2	28	78.7	67.8	80.0	75.5	5.0	5.9	4.4	5.1	3.11	.49	9
April	30.071	30.009	30.031	30.037	30.500	29.458	47.4	52.4	47.2	49.0	74	30	76.9	65.4	81.1	74.5	5.3	5.7	6.0	5.7	.63	.15	29
May	30.032	29.997	30.011	30.013	30.425	29.516	55.2	59.7	53.6	56.2	80	42	85.2	73.2	85.9	81.4	5.9	6.0	5.5	5.8	4.16	1.70	14
June	29.953	29.918	29.934	29.935	30.276	29.609	68.7	74.2	66.3	69.7	92	50.3	83.0	72.7	86.2	80.6	5.4	4.6	3.4	4.5	2.06	.93	24

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.07 a. m., 3.07 p. m., and 11.07 p. m., local time.

VER. P. TEMPLE,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.

CHINCOTEAGUE, VA.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	9,434	SE., S. & SW.	33	25, 8, & 20	2	15	8	16	8	22	6	15	1	9	15	7	11	0	2	0	0	0	
August	8,476	W.	36	13	5	13	6	21	15	21	3	9	0	15	11	5	6	0	1	0	0	0	
September	9,837	SE.	32	10	3	8	4	26	21	19	4	4	1	16	11	3	4	0	0	0	0	0	
October	11,054	NW.	36	5	9	4	6	10	25	23	4	12	0	12	14	5	7	0	0	0	0	0	
November	10,261	S.	42	5	9	14	10	9	5	17	3	19	4	12	9	9	10	0	0	0	0	2	Frost, 21st and 25th.
December	7,018	NW.	42	23	15	7	2	11	7	15	6	18	3	10	9	9	5	0	0	0	0	6	
Year 1881	121,728				73	159	59	158	125	207	65	231	9	109	159	94	111	8	18	0	13	71	
1882.																							
January	9,301	NW.	49	29	17	10	7	5	6	11	9	27	1	3	15	13	17	3	0	0	4	15	
February	8,545	NW.	48	5	10	2	3	14	14	12	5	19	5	10	12	6	9	1	0	0	0	8	Frost, 26th.
March	10,101	NW.	46	13	11	4	10	12	17	7	1	31	0	9	14	8	14	2	0	0	0	7	
April	8,035	NW.	34	21	6	10	17	6	16	10	5	19	1	8	12	10	10	0	0	1	0	1	Aurora, 16th.
May	7,880	NE. NW.	30	5 23	11	13	14	11	31	3	7	3	0	9	12	10	15	0	1	0	0	0	
June	6,342	NE.	38	11	5	7	10	9	33	6	7	12	1	7	22	1	8	0	1	0	0	0	

Location of office on June 30, 1882, Life-saving Station No. 7.

VER. P. TEMPLE,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

CINCINNATI, OHIO.

[Latitude, 39° 6′; longitude west of Greenwich, 84° 30′. Elevation of barometer above sea-level, 620 feet. Elevation of rain-gauge (top) above ground, 78 feet. Elevation of exposed thermometer above ground, 68 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.042	30.000	30.012	30.018	30.244	29.656	74.5	87.8	80.2	80.8	103.5	63.5	72.8	41.7	60.4	58.3	3.5	5.0	1.2	3.2	3.12	1.74	14, 15
August	30.065	30.012	30.034	30.037	30.233	29.814	72.2	87.6	78.8	79.5	101.0	62.3	70.1	38.7	56.8	55.2	3.3	4.3	2.2	3.3	.76	.29	31
September	30.096	30.031	30.051	30.060	30.280	29.586	69.7	83.6	74.9	76.1	95.0	58.0	78.3	47.2	68.5	64.7	4.2	6.4	2.9	4.5	2.10	.94	15
October	30.181	30.137	30.151	30.156	30.454	29.803	58.9	68.3	62.0	63.1	83.5	43.3	82.5	64.2	79.6	75.4	5.3	6.4	4.9	5.5	6.01	2.29	2, 3
November	30.236	30.169	30.192	30.199	30.705	29.743	43.3	53.2	46.0	47.5	70.0	20.6	74.3	62.2	75.0	70.5	5.2	5.9	3.7	4.9	4.06	1.67	18, 19
December	30.217	30.184	30.206	30.202	30.637	29.775	40.4	47.3	43.1	43.6	65.0	21.0	82.6	68.1	80.1	76.9	7.0	7.5	5.2	6.6	5.67	1.60	20, 21
Year 1881	30.097	30.046	30.066	30.070	.....	.....	52.6	63.4	57.2	57.7	.....	.....	75.2	54.4	69.5	66.3	5.4	6.3	4.2	5.3	47.24	.....	.....
1882.																							
January	30.207	30.182	30.202	30.197	30.669	29.646	34.4	40.8	37.4	37.5	63.0	18.6	76.9	69.4	72.7	73.0	8.4	7.7	7.5	7.9	6.02	1.16	12, 13
February	30.151	30.122	30.144	30.139	30.564	29.538	42.4	50.5	46.7	46.5	63.8	23.5	71.1	62.2	68.6	67.3	7.3	8.0	6.0	7.1	7.04	2.27	19, 20
March	30.142	30.110	30.135	30.129	30.577	29.568	44.0	54.9	48.2	49.0	70.2	31.2	66.8	50.1	62.6	59.8	5.6	6.9	6.3	6.3	6.17	2.54	20
April	30.072	30.028	30.055	30.052	30.347	29.478	49.8	61.3	55.0	55.4	81.8	28.0	72.5	50.3	59.1	60.6	5.8	6.2	3.3	5.1	2.71	.56	26
May	30.014	29.958	29.972	29.981	30.353	29.573	55.7	66.6	60.6	61.0	82.8	41.0	77.0	54.1	70.4	67.2	5.7	6.5	5.3	5.8	8.47	2.47	27, 28
June	29.972	29.924	29.943	29.946	30.170	29.633	68.6	78.6	71.7	73.0	95.5	52.0	75.7	54.3	72.0	67.3	5.1	6.3	3.9	5.1	4.34	.83	15

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.30 a. m., 2.30 p. m., and 10.30 p. m., local time.

R. B. WATKINS,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

CINCINNATI, OHIO.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	3,505	NE.	21	14	11	11	7	6	2	19	16	18	3	17	12	2	6	0	3	0	0	0	Maximum temperature 103.5; the highest and longest continued heat in eleven years.
August	3,072	NW. S.	24	6 24 31	19	15	21	19	1	6	2	6	4	16	11	4	7	0	3	0	0	0	Drought; smallest rainfall and warmest August in eleven years.
September	3,388	SW.	20	26	7	3	6	19	21	13	6	7	8	11	11	8	7	0	1	0	0	0	
October	3,940	SW.	22	15	11	8	3	22	15	15	6	6	7	8	12	11	14	0	1	0	0	0	First frost on 19th; numerous fogs.
November	4,165	S. SW. SW.	19	2 5 12	2	4	9	15	16	15	5	14	10	8	15	7	12	1	0	0	1	6	First snow on 3d; frost and halos numerous.
December	4,398	S. SW. NW.	20	6 7 30	14	2	5	23	15	6	10	15	3	7	10	14	13	3	0	0	1	6	
Year 1881	49,616				118	127	121	182	105	145	102	147	48	99	146	120	118	33	24	0	14	68	
1882.																							
January	4,916	W.	24	26	12	9	14	8	13	8	21	8	0	3	8	20	10	6	0	0	4	16	
February	4,643	W.	24	21	6	3	11	16	16	9	15	8	0	5	9	14	18	2	0	0	0	5	River 58 feet 7 inches; highest since 1847.
March	6,176	W.	28	9	11	6	10	16	7	8	16	18	1	4	15	12	14	0	3	0	0	2	
April	4,421	SW. N.	28	19 26	21	13	6	11	10	10	6	11	2	9	14	7	10	0	4	3	0	2	Several auroras; on 16th a very brilliant one
May	4,113	S.	20	9	17	7	13	12	12	7	11	12	2	8	10	13	20	0	8	0	0	0	Coldest and wettest May in twelve years.
June	4,291	SW. W.	23	3 25	5	7	7	9	15	20	17	9	1	7	18	5	14	0	8	0	0	0	

Location of office on June 30, 1882, Pike's Opera House, Fourth street, between Walnut and Vine.

R. B. WATKINS,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

CLEVELAND, OHIO.

[Latitude, 41° 30′; longitude west of Greenwich, 81° 42′. Elevation of barometer above mean sea-level, 690 feet. Elevation of rain gauge (top) above ground, 73 feet. Elevation of exposed thermometer above ground, 73 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.010	29.990	29.990	29.997	30.262	29.764	70.3	77.7	71.8	73.2	93	56	73.5	58.9	72.0	68.1	4.7	4.3	2.4	3.8	.90	.41	22
August	30.073	30.045	30.046	30.055	30.285	29.745	66.6	78.0	71.7	72.1	98.7	50.8	69.0	54.7	64.6	62.8	3.5	3.7	1.6	2.9	.17	.12	7
September	30.076	30.038	30.040	30.051	30.281	29.762	68.0	76.9	70.2	71.7	98	49.8	75.0	58.9	73.3	69.1	5.8	6.0	2.5	4.8	1.66	.97	16
October	30.170	30.143	30.147	30.153	30.520	29.680	53.8	61.4	56.0	57.1	83	36.8	78.4	63.4	76.7	72.8	6.9	7.1	5.9	6.5	5.79	2.45	2
November	30.181	30.146	30.154	30.160	30.673	29.630	39.3	45.4	40.9	41.9	72	15.1	74.3	62.6	72.9	69.9	8.6	7.2	6.5	7.5	3.64	1.41	18
December	30.166	30.162	30.172	30.167	30.624	29.632	36.2	39.8	37.2	37.7	61.5	16.8	80.7	71.7	77.5	76.6	7.3	8.2	6.6	7.4	4.89	1.59	22, 23
Year 1881	30.072	30.043	30.053	30.056	.....	.....	46.5	53.2	49.1	49.8	.....	.....	78.6	66.0	75.9	73.5	6.4	6.3	4.7	5.8	34.96	.....	.....
1882.																							
January	30.169	30.154	30.154	30.159	30.745	29.624	26.3	30.3	28.2	28.3	60	1.5	85.5	76.9	79.1	80.5	8.0	8.1	7.1	7.7	2.47	.74	26
February	30.142	30.105	30.114	30.120	30.615	29.295	34.0	40.5	36.5	37.0	58	17.2	79.5	64.6	74.1	72.7	5.5	6.6	4.2	5.4	2.83	1.02	20, 21
March	30.108	30.091	30.104	30.101	30.664	29.453	35.5	41.0	38.4	38.3	66	22	79.5	66.5	72.4	72.8	7.8	6.7	6.7	7.1	3.82	1.08	18
April	30.070	30.049	30.067	30.062	30.352	29.329	42.1	47.4	43.6	44.4	76.8	21.8	70.4	60.9	65.1	65.5	7.0	6.0	5.2	6.1	2.20	.96	4, 5
May	30.010	29.981	29.973	29.988	30.364	29.539	48.6	55.3	51.8	51.9	74	31	75.0	63.7	71.8	70.2	5.7	6.6	5.1	5.8	5.27	1.08	27, 28
June	29.936	29.910	29.910	29.919	30.210	29.576	62.5	70.7	65.3	66.2	91	46.2	70.8	56.5	68.4	65.2	6.0	6.1	3.6	5.2	4.22	1.92	8, 9

NOTE.—7 a. m., 3 p. m , and 11 p. m., Washington time, corresponds with 6.42 a. m., 2.42 p. m., and 10.42 p. m., local time.

JAS. B. NEWLIN,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

CLEVELAND, OHIO.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	5,206	W.	28	12, 13	22	5	4	19	10	6	21	5	1	13	14	4	7	0	4	0	0	0	Great deficiency of rainfall. Vegetation suffering.
August	4,795	SW.	21	9	25	11	6	25	12	3	8	3	0	18	12	1	3	0	0	0	0	0	Intense drought, everything suffering for rain.
September	5,837	S.	30	30	13	5	6	20	26	10	4	4	2	9	17	4	10	0	3	1	0	0	Highest temperature for September since opening station.
October	5,015	SW.	34	15	20	5	3	25	21	7	7	4	1	4	14	13	18	0	1	0	0	0	First frost of season on the 6th.
November	9,283	W.	39	19	4	2	3	19	23	22	12	5	0	1	10	19	11	4	0	0	2	12	First snow on 3d, first ice on 15th, and first killing frost on the 16th.
December	7,714	W.	36	7	10	5	0	20	24	9	17	5	3	4	10	17	11	2	0	0	2	16	
Year 1881	74,340	.....	.....	.....	178	117	51	207	181	116	161	77	7	88	145	132	102	48	17	1	53	24	
1882.																							
January	8,609	SW.	44	26	7	0	6	14	21	14	18	13	0	3	8	20	6	9	0	0	12	25	
February	7,772	SW.	36	21	6	4	4	12	24	11	17	5	1	10	8	10	6	3	0	1	3	18	The warmest February since station was established.
March	8,776	SW.	36	21	10	8	8	14	15	7	17	13	1	1	15	15	9	7	2	0	1	18	Navigation opened on the 14th.
April	6,833	W.	33	20	14	30	2	5	8	10	16	5	0	4	17	9	9	1	2	1	1	3	Remarkably brilliant aurora on the night of the 16th.
May	6,029	SW.	28	31	16	21	6	17	10	5	5	9	4	8	11	12	19	0	2	0	0	1	The coldest and wettest May since the station was established.
June	6,483	W.	28	24	11	14	3	8	19	21	8	5	1	7	18	5	17	0	8	0	0	0	An enormous tidal wave rolled in from Lake Erie on the 23d.

Location of office on June 30 1882, National Bank building.

JAS. B. NEWLIN,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM NO. 132—A.]

COLEMAN CITY, TEX.

[Latitude, 31° 53′; Longitude west of Greenwich, 99° 18′. Elevation of barometer above mean sea-level, 1,709 feet. Elevation of rain-gauge (top) above ground, 4 feet. Elevation of exposed thermometer above ground, 4 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July																							
August																							
September																							
October																							
November							39.0	56.8	44.4	46.7	72	22	83.7	47.1	73.5	68.1	3.5	3.2	2.1	2.7	.17	.17	10
December*							42.5	57.5	48.0	49.3	77	28	79.6	53.4	70.6	67.9	4.9	5.4	4.0	4.8	2.35	1.98	19
Year 1881																							
1882.																							
January							40.6	49.8	43.5	44.6	74	15	85.6	71.9	80.2	79.2	6.9	7.6	6.6	7.0	2.36	.67	12
February	30.117	30.111	30.122	30.117	30.361	29.696	47.5	63.1	51.3	54.0	75	30	88.1	60.3	80.2	76.2	6.0	6.6	3.7	5.4	3.90	1.44	16
March	30.106	30.098	30.117	30.107	30.555	29.756	48.0	64.9	54.0	55.6	85	26	83.5	56.0	74.5	71.3	5.0	5.2	3.2	4.5	1.09	.41	7
April	29.973	29.940	29.940	29.951	30.281	29.581	55.6	78.7	64.8	66.4	93	32	81.9	36.1	64.5	60.8	4.8	5.2	3.2	4.4	.24	.20	8
May	29.937	29.907	29.915	29.920	30.211	29.479	60.3	78.1	67.0	68.5	94	47	81.5	44.8	68.3	64.9	6.2	6.2	4.7	5.7	3.91	1.04	26
June	29.930	29.895	29.902	29.909	30.178	29.666	70.4	89.8	77.6	79.3	108	54	81.1	43.1	63.9	62.7	5.2	5.6	2.6	4.5	2.11	1.40	30 20

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.32 a. m, 1.32 p. m., and 9.32 p. m., local time.
NOTE.—Observations recommenced in November, 1881.
*11 days only.

LOUIS DORMAN.
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

COLEMAN CITY, TEX.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July*																							
August*																							
September*																							
October*																							
November†	1949	N.	26	30	14	2	0	1	6	7	2	0	1	7	2	2	1	0	0	0	0	4	First light frost occurred, November 14.
December	6,380	N.	36	20	23	7	5	16	14	10	4	13	1	9	16	6	4	0	2	0	0	6	First killing frost on December 26.
Year 1881																							
1882.																							
January	6,870	N.	34	16, 17	26	10	7	11	12	12	3	6	3	4	9	17	14	1	0	0	1	8	
February	4,899	N.	35	7	6	2	2	15	19	7	5	10	3	4	13	6	8	0	4	0	0	3	
March	5,570	N. / NW.	30	21, 27	14	3	1	13	17	14	6	4	0	10	7	7	7	0	3	0	0	3	
April	7,017	NE.	32	29	4	7	5	27	17	9	7	7	1	10	13	5	4	0	5	1	0	0	Aurora, April 16. Began, 9.28. p. m.; ended, 10.20 p. m.
May	8,230	NW. / N.	28	10, 28	8	13	7	31	20	5	3	6	0	5	15	11	8	0	8	0	0	0	
June	7,411	NW.	28	20	2	5	8	40	20	11	0	2	2	10	15	5	10	0	2	0	0	0	

Location of office on June 30, 1882, corner Commercial avenue and Live Oak street.
* No observations taken. Observations recommenced in November, 1881.
† 11 days only.
‡ 4 days only.

LOUIS DORMAN,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

COLUMBUS, OHIO.

[Latitude, 39° 58′; Longitude west of Greenwich, 83° 0′. Elevation of barometer above sea-level, 805 feet. Elevation of rain-gauge (top) above ground, 70 feet. Elevation of exposed thermometer above ground, 52 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.996	29.952	29.982	29.977	30.217	29.542	71.6	86.1	76.5	78.1	103	60	71.3	40.2	61 8	57.8	3.8	5.7	3.4	4.3	5.33	2.24	22
August	30.057	30.011	30.029	30.032	30.232	29.765	67.6	84.2	73.7	75.2	98	56	71.3	40.5	61.3	57.7	3.2	3.2	1.9	2.8	2.09	87	6
September	30.090	30.032	30.052	30.058	30.269	29.669	66.7	82.1	72.3	73.7	98	50	79.3	46.2	69.3	64.9	5.1	5.7	3.1	4.6	1.54	89	16
October	30.175	30.138	30.161	30.158	30.497	26.710	55.1	65.5	58.5	59.7	84	39	81.0	62.2	76.4	73.2	5.4	6.9	5.3	5.9	8.64	2.23	1
November	30.217	30.160	30.184	30.187	30.688	29.692	39.2	48.7	42.9	43.6	72	15	74.4	59.1	71.6	68.4	6.6	6.7	4.4	5.9	5.35	2.81	18
December	30.187	30.171	30.194	30.184	30.612	29.689	37.3	42.4	39.3	39.7	63	17	77.1	66.8	75.0	73.0	7.6	7.9	5.9	7.1	5.28	1.30	14
Year 1881	30.071	30.025	30.050	30.049	....	.....	48.7	59.5	52.9	53.7	.....	...	76.1	54.0	70.9	67.0	5.7	6.3	4.9	5.6	46.99	.....	.....
1882.																							
January	30.188	30.160	30.172	30.173	30.707	29.643	29.8	34.9	32.4	32.4	59	11	77.1	70.3	75.0	74.1	8.2	8.4	6.8	7.8	4.69	.80	{12 13
February	30.146	30,105	30.126	30.126	30.545	29.454	37.5	44.7	41.5	41.2	63	20	73.5	60.1	69.6	67.7	6.7	7.5	6.5	6.9	5.94	1.96	20, 21
March	30.108	30.078	30.104	30.097	30.604	29.518	39.5	49.1	43.9	44.2	69	25	71.8	51.6	62.6	62.0	7.3	6.8	6.1	6.7	4.76	1.40	20
April	30.059	30.016	30.052	30.042	30.320	29.383	44.9	56.6	49.5	50.3	81	23	74.2	51.7	62.9	62.9	6.0	7.4	4.4	5.9	4.87	1.64	23
May	29.984	29.947	29.962	29.964	30.321	29.548	51.9	63.4	55.7	57.0	77	38	76.6	55.9	73.6	68.7	5.9	7.2	4.7	6.0	9.59	1.97	5
June	29.941	29.906	29.924	29.924	30.178	29.595	64.6	74.6	67.4	68.9	91	48	76.7	58.5	73.6	69.6	7.3	7.8	4.9	6.7	6.01	2.26	25

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.36 a. m., 2.36 p. m., and 10.36 p. m., local time.

D. CUTHBERTSON,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM NO. 132—B.]

COLUMBUS, OHIO.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from.—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,534	W.	23	7	13	12	7	6	3	8	20	24	0	8	20	3	12	0	6	0	0	0	Total eclipse of moon, June 11.
August	3,552	NW.	28	31	25	16	12	10	10	6	1	12	1	16	14	1	7	0	4	0	0	0	
September	4,010	SW.	28	10	7	9	3	11	25	18	10	6	2	10	13	7	13	0	3	1	0	0	Comet in N. W. each evening from June 24 to end of month. Last frost, April 14.
October	5,015	SW.	30	17	14	4	9	11	17	21	7	8	1	8	11	12	18	0	3	0	0	0	
November	6,382	W.	36	14	3	6	3	14	23	14	17	10	0	3	19	8	10	3	0	0	1	9	Beautiful aurora, September 13.
December	5,411	W.	36	7	19	3	6	6	27	11	13	8	0	5	10	16	13	3	0	0	1	9	First light frost, October 11. First killing frost, November 4.
Year 1881	63,603	.....	....	.....	156	128	95	101	155	148	167	137	8	89	149	127	129	42	25	1	29	92	
1882.																							
January	6,662	W.	46	27	8	4	8	15	16	6	24	12	0	0	14	17	14	5	0	0	8	20	Last frost of season, May 3.
February	5,865	W.	44	21	5	5	3	14	22	11	17	7	0	4	9	15	10	0	0	0	2	12	Beautiful aurora from 9.15 p. m. of April 16 to daybreak, April 17.
March	8,250	W.	54	21	8	5	8	11	8	19	15	19	0	3	16	12	13	1	3	0	0	8	
April	5,950	W.	44	19	23	19	4	1	10	7	13	13	0	7	11	12	11	1	5	1	0	3	
May	4,990	SW. S.	24	1 10	23	7	5	7	11	18	11	10	1	5	17	9	20	0	8	0	0	0	
June	5,554	W.	30	24	3	9	5	6	14	26	18	9	0	3	13	14	16	0	8	0	0	0	

Location of office on June 30, 1882, Broad and High streets, Huntington Bank building.

D. CUTHBERTSON,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

CONCHO, TEX.

[Latitude, 31° 25′; longitude west of Greenwich, 100° 24′. Elevation of barometer above sea-level, 1,900 feet. Elevation of rain-gauge (top) above ground, 6 feet. Elevation of exposed thermometer above ground, 6 feet.]

	Barometer (to sea.)						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.986	29.940	29.951	29.959	30.076	29.816	74.0	94.5	80.5	83.0	105	66	63.8	54.6	63.5	60.7	3.3	4.8	2.0	3.4	.51	1.23	17
August	29.981	29.931	29.947	29.953	30.078	29.884	72.8	94.4	80.2	82.5	103	65	80.5	44.6	53.1	59.4	1.9	5.4	1.3	2.9	.54	.29	24
September	30.007	29.954	29.981	29.981	30.227	29.708	67.3	85.7	72.1	75.0	98	51	83.6	47.8	74.3	68.7	5.2	4.2	2.4	3.9	2.48	1.83	30
October	30.127	30.087	30.116	30.110	30.276	29.718	62.2	75.2	65.4	67.6	88	40	89.2	61.2	84.2	78.2	6.0	6.4	4.3	5.6	2.72	1.26	19
November	30.205	30.169	30.213	30.195	30.611	29.743	43.4	61.3	49.0	51.2	84	25	86.9	52.2	72.5	70.5	3.9	3.9	1.6	3.1	.64	.39	10
December	30.270	30.227	30.263	30.253	30.639	29.935	41.5	59.0	47.5	49.3	74	23	87.7	58.1	83.1	75.2	4.7	4.8	3.6	4.0	2.10	1.33	19
Year 1881	29.951	29.882	29.926	29.949	.....	.....	55.0	75.4	61.3	63.9	.....	.....	74.6	49.5	66.5	63.5	3.8	4.1	2.7	3.5	18.96	.....	....
1882.																							
January	30.154	30.132	30.161	30.149	30.613	29.883	41.5	52.7	44.4	46.2	74	18	88.2	69.3	84.7	80.7	6.2	6.3	6.2	6.2	1.48	.49	29
February	30.143	30.109	30.133	30.128	30.340	29.711	47.4	63.9	52.2	54.5	76	31	88.4	69.8	86.4	81.5	5.6	5.7	5.0	5.4	4.14	2.10	20
March	30.092	30.067	30.092	30.084	30.546	29.748	50.3	69.9	57.4	59.2	89	26	85.2	57.5	77.6	73.4	5.0	5.0	2.7	4.2	1.25	.52	20
April	29.967	29.925	29.947	29.946	30.306	29.603	55.5	78.3	62.6	65.5	96	29	76.3	37.3	61.9	58.5	4.6	4.2	2.7	3.8	.17	.15	7
May	29.907	29.866	29.887	29.887	30.195	29.433	61.8	82.9	68.3	71.0	97	47	72.1	34.6	59.2	55.3	5.3	4.3	4.3	4.6	2.26	1.31	30
June	29.915	29.871	29.886	29.891	30.143	29.643	71.4	90.9	77.8	80.0	110	54	81.4	45.0	66.5	64.3	4.5	4.0	2.9	3.8	2.86	1.47	13

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.26 a. m., 1.26 p. m., and 9.26 p. m., local time.

W. W. McCONIHE,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

CONCHO, TEX.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—								Number of days—										Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurorus.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	6,700	NE.	32	2	0	12	18	37	8	5	2	0	11	18	11	2	4	0	0	0	0	0	First light frost, November 9.
August	6,344	NE. and E.	28	7 and 1-30	1	9	16	30	25	3	0	0	9	21	8	2	3	0	0	0	0	0	First killing frost, November 25.
September	8,398	S.	38	6	7	8	1	20	39	0	2	3	10	13	12	5	5	0	0	0	0	0	Last frost, March 10.
October	6,938	NW. W.	36	29	3	16	8	14	24	6	3	5	14	7	15	9	6	0	1	0	0	0	
November	7,110	S. W.	32	29	12	14	3	5	18	11	4	6	17	14	12	4	5	0	0	0	0	3	
December	5,764	SW. & E.	36	12-19	4	14	8	6	10	13	14	7	17	14	7	10	3	0	0	0	0	7	
Year 1881	84,420	.....	...	.....	69	114	83	166	258	91	75	68	168	174	129	62	50	0	4	0	1	44	
1882.																							
January	6,247	S. W.	36	16	10	17	2	4	7	18	6	6	23	6	10	15	7	0	0	0	0	9	
February	6,747	N. W.	45	20	2	5	1	2	24	13	10	9	18	9	9	10	7	0	2	0	0	1	
March	7,401	W.	40	27	6	8	2	4	24	21	9	4	15	14	9	8	4	0	1	0	0	2	
April	8,363	NE.	36	29	8	10	4	8	23	12	10	5	10	13	13	4	2	0	1	1	0	1	
May	9,364	SE. and S. W.	40	3-17	7	11	9	17	24	12	5	4	4	7	18	6	7	0	2	0	0	0	
June	9,339	S. E.	41	9	1	12	5	12	42	6	4	1	7	14	12	4	8	0	3	0	0	0	

Location of office on June 30, 188—, south of post-trader's store.

W. W. McCONIHE,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

DAVENPORT, IOWA.

[Latitude, 41° 30′; longitude west of Greenwich, 90° 38′. Elevation of barometer above sea-level, 615 feet. Elevation of rain-gauge (top) above ground, 77 feet. Elevation of exposed thermometer above ground, 46 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometer.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.039	30.004	29.997	30.014	30.274	29.640	71.2	84.9	76.8	77.6	94	57	76.3	51.0	72.1	66.5	4.2	4.7	2.6	3.8	.91	.39	10
August	30.015	29.986	29.982	29.994	30.252	29.744	70.2	85.1	76.3	77.2	96.3	53.5	70.3	44.8	63.1	59.4	4.4	5.4	3.1	4.3	.83	.64	25
September	29.953	29.916	29.932	29.934	30.240	29.590	63.9	77.1	68.3	69.8	94	46	77.0	50.7	67.1	64.9	5.0	4.4	4.4	4.6	5.59	1.37	3
October	30.099	30.076	30.086	30.087	30.532	29.695	52.3	61.1	56.2	56.5	79	37	81.4	64.4	75.2	73.7	7.4	6.2	5.5	6.4	6.85	2.29	17
November	30.120	30.087	30.119	30.109	30.723	29.559	36.1	43.3	39.6	39.7	65	6	71.8	61.5	66.2	66.5	6.2	6.4	5.1	5.9	2.19	1.49	11
December	30.157	30.134	30.163	30.151	30.559	29.681	35.0	42.0	37.7	38.2	55	12	72.9	58.1	64.1	65.0	5.9	6.9	5.0	5.9	1.71	.50	13
Year 1881	30.050	30.013	30.033	30.032	.....	.....	45.2	56.2	49.7	50.4	.....	.....	76.0	58.3	71.1	68.5	6.0	5.9	4.4	5.5	37.28	.....	.....
1882.																							
January	30.195	30.143	30.180	30.173	30.789	29.461	25.2	32.4	29.2	28.9	58.2	0	69.2	55.4	64.1	62.9	5.3	6.5	4.5	5.4	.90	0.25	7,8
February	30.073	30.028	30.057	30.052	30.542	29.434	35.1	45.3	40.6	40.3	66.7	6	69.0	53.0	61.9	61.3	5.4	5.0	3.3	4.6	.62	0.20	20
March	30.080	30.039	30.072	30.064	30.602	29.326	35.3	44.9	40.8	40.3	64.7	10	68.6	57.2	65.0	63.6	6.5	7.1	6.0	6.5	2.90	0.82	9
April	30.027	30.004	30.008	30.013	30.275	29.299	46.0	57.6	50.4	51.3	78.2	28	73.1	52.0	65.5	63.5	5.5	6.7	5.7	6.0	3.15	1.05	18,19
May	29.969	29.945	29.958	29.957	30.359	29.592	51.2	60.6	54.9	55.6	78.7	33	73.8	57.1	70.4	67.1	6.4	6.4	5.2	6.0	5.49	1.39	5
June	29.901	29.877	29.881	29.886	30.154	29.474	63.6	74.5	67.7	68.6	89.2	43	82.8	62.8	79.2	74.9	7.3	7.1	5.9	6.8	8.43	1.66	24,25

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.06 a. m., 2.06 p. m., and 10.06 p. m., local time.

ROBERT R. MARTIN,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

DAVENPORT, IOWA.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 20°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,385	NW.	24	12	7	13	14	7	6	22	6	14	4	14	12	5	5	0	5	0	0	0	Last frost of spring occurred, May 3.
August	5,605	SE.	38	29	2	18	22	11	9	17	3	8	3	11	14	6	5	0	3	0	0	0	First frost of autumn occurred, October 5.
September	6,510	SW.	36	24	7	8	9	4	15	25	9	11	2	9	14	7	12	0	6	2	0	0	First ice of autumn occurred, November 10.
October	5,940	S &SW.	28	11,15	10	10	12	11	15	15	7	13	0	5	13	13	15	0	2	0	0	0	First snow of autumn occurred, November 11.
November	7,786	SW& S.	28	12,16,25	4	6	3	5	12	16	21	22	1	5	15	10	5	3	0	1	1	12	Freshet from October 10 to November 17; highest water, 17 feet 8 inches, October 25, 26, 27, and 28.
December	6,563	SW.	36	16	8	9	4	4	9	26	13	20	0	6	14	11	7	3	1	0	2	15	
Year 1881	71,546	.....	....	.....	78	140	157	82	114	175	130	180	39	89	164	112	106	20	31	3	51	125	
1882.																							
January	6,964	SW.	33	26	6	7	9	8	9	23	16	15	0	8	13	10	7	5	0	0	8	28	
February	6,469	SW.	32	12	2	5	5	9	10	13	15	20	0	10	12	6	7	1	0	0	2	17	
March	8,960	W.	36	21	5	7	14	7	8	11	16	24	1	2	15	14	8	1	2	0	0	18	First boat arrived, and navigation opened, March 10.
April	7,665	E.	38	22	6	15	29	4	2	15	5	12	2	5	14	11	9	2	5	2	0	3	
May	7,680	S.	44	9	5	23	12	13	18	5	3	11	3	8	12	11	14	1	3	0	0	0	Last frost occurred, May 27; last snow, May 23.
June	6,348	SW.	31	8	3	10	14	13	3	22	14	10	1	3	14	13	21	0	13	1	0	0	

Location of office on June 30, 1882, First National Bank building, corner Second and Main streets.

ROBERT R. MARTIN,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

DAYTON, WASH.

[Latitude, 46° 19′; longitude west of Greenwich, 117°, 56′. Elevation of barometer above sea-level, 1,660 feet. Elevation of rain-gauge (top) above ground, 2 feet. Elevation of exposed thermometer above ground, 6 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0. 10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.015	29.992	29.954	29.987	30.288	29.718	54.7	80.3	66.1	67.0	99.0	37.4	64.2	40.8	62.6	55.9	3.0	3.0	3.0	2.9	.65	.19	28
August	30.017	29.998	29.974	29.996	30.207	29.753	52.5	79.3	62.6	64.8	96.0	38.4	61.8	39.0	55.0	51.9	2.0	3.0	2.0	2.3	.22	.17	15
September	30.057	30.066	30.041	30.054	30.364	29.809	48.0	69.1	55.3	57.5	91.3	29.0	71.2	50.4	64.3	62.0	3.0	5.0	3.0	3.7	1.47	.33	17
October	30.131	30.156	30.136	30.141	30.407	29.743	40.5	54.8	44.9	46.7	71.0	19.0	84.4	63.2	83.3	76.9	6.0	7.0	6.0	6.3	3.04	1.05	29,30
November	30.309	30.329	30.295	30.311	30.715	29.658	33.3	40.1	35.0	36.1	57.0	5.0	85.8	76.9	87.5	83.4	7.0	8.0	6.0	7.0	2.47	.60	16,17
December	30.256	30.250	30.239	30.248	30.635	29.503	33.6	41.2	36.5	37.1	59.8	11.5	84.3	75.3	80.1	79.9	6.0	8.0	6.0	7.7	2.37	.58	26,27
Year 1881	30.070	30.054	30.042	30.056	.....	.....	41.9	58.2	47.8	49.3	.....	.....	76.5	59.0	73.4	69.6	5.0	5.8	4.5	5.1	27.70	.....	.....
1882.																							
January	30.120	30.129	30.143	30.131	30.604	29.499	29.2	36.2	29.5	31.6	49.8	Zero.	84.0	74.9	83.3	80.7	7.0	7.7	4.5	6.4	2.56	.62	23, 24
February	30.114	30.096	30.092	30.100	30.512	29.501	28.2	38.5	31.1	32.6	52.2	4.5	77.3	65.8	75.5	72.9	5.8	7.3	5.2	6.1	6.16	1.26	28
March	30.139	30.146	30.131	30.139	30.623	29.591	34.6	49.1	39.3	41.0	77.2	19.2	78.8	53.6	75.9	69.4	4.8	6.6	4.3	5.2	1.97	.63	16
April	30.021	30.020	30.005	30.015	30.421	29.647	37.4	56.2	45.1	46.2	73.0	28.8	82.1	49.8	70.6	67.5	5.3	5.6	3.4	4.8	4.08	1.13	19
May	30.042	30.032	30.000	30.025	30.343	29.684	43.3	66.1	53.7	54.4	85.8	30.2	80.5	44.0	66.0	63.5	3.5	4.2	4.0	3.9	1.93	.64	4
June	29.971	29.962	29.915	29.949	30.088	29.746	51.6	75.7	63.5	63.6	92.7	42.9	78.9	47.2	65.2	63.8	3.3	3.5	3.9	3.6	.77	.52	9

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.16 a. m., 12.16 p. m., and 8.16 p. m. local time.

HARRY CLIFFORD,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 122—B.]

DAYTON, WASH.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	3,805	SW.	20	2, 3, 7	3	6	2	4	11	46	5	3	13	16	13	2	6	0	1	0	0	0	
August	3,851	SW.	19	9	12	6	3	5	6	42	4	0	15	19	12	0	3	0	2	0	0	0	
September	3,560	SW.	24	23	11	6	0	12	5	41	4	3	8	11	16	3	13	0	1	1	0	1	The first killing frost of the season occurred, September 28.
October	2,587	SW.	16	17, 30	5	5	0	6	13	44	3	1	16	3	18	10	15	0	0	0	0	12	
November	2,770	SW.	24	5	3	7	0	2	2	49	7	2	18	9	11	10	10	4	0	0	6	21	
December	3,078	S.	22	26	6	8	0	1	16	46	5	1	10	7	15	9	10	3	0	0	4	21	
Year 1881	41,422	.....	....	.....	93	63	12	47	217	437	57	31	138	101	156	108	122	23	4	2	22	111	
1882.																							
January	3,440	SW.	20	8, 20, 25	3	11	1	4	12	55	2	1	4	3	16	12	6	11	0	0	3	25	
February	4,282	S.	24	27	1	1	1	5	19	50	3	1	3	6	12	10	4	10	0	0	4	23	
March	4,522	SW.	34	28	2	7	3	16	3	52	3	0	7	7	17	7	1	10	0	1	0	16	
April	4,145	SW. NE.	18	4, 15, 28	6	11	3	6	7	42	8	4	3	10	14	6	10	3	0	1	0	8	
May	3,833	SW. NE.	18	12, 22	2	15	7	1	5	38	11	3	11	16	9	6	7	1	0	0	0	2	The last frost occurred, May 9.
June	3,305	W.	16	16	11	0	4	1	8	35	12	3	16	14	12	4	7	0	0	1	0	0	

Location of office on June 30, 1882, Main street, near Wait's Mills.

HARRY CLIFFORD,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

DEADWOOD, DAK.

[Latitude, 44° 23′; longitude west of Greenwich, 103° 43′. Elevation of barometer above sea-level, 4,600 feet. Elevation of rain-gauge (top) above ground, 24 feet. Elevation of exposed thermometer above ground, 16 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July*											102	44	68.8	44.5	65.8	59.7	3.5	3.5	3.1	3.4	1.56	1.05	20
August	29.985	29.987	29.985	29.986	30.205	29.754	62.1	76.8	65.9	68.3	101	43	58.6	34.4	53.0	48.7	3.1	2.9	2.3	2.8	.56	.37	30
September	30.046	30.012	30.042	30.033	30.387	29.667	45.0	57.9	48.6	50.5	91	29	72.8	49.2	67.7	63.2	4.3	4.9	3.2	4.1	1.80	.37	6
October	30.233	30.216	30.237	30.229	30.634	29.832	35.4	46.9	37.4	39.9	73	17	73.4	54.5	68.4	65.4	4.3	3.9	2.9	3.7	.58	.38	22
November	30.293	30.288	30.302	30.294	30.876	29.794	28.1	35.2	29.3	30.9	60	—2	69.3	66.6	74.4	70.1	4.2	5.0	3.4	4.2	.84	.17	4
December	30.320	30.335	30.352	30.336	30.768	29.645	28.2	39.4	30.2	32.6	58	6	67.2	53.2	62.6	61.0	2.0	2.7	1.4	2.0	.05	.03	8
Year 1881	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	21.13	.....	.....
1882.																							
January	30.155	30.143	30.177	30.158	30.586	29 738	18.8	28.8	20.2	22.6	49	—11	72.5	66.7	75.3	71.4	2.7	5.2	3.1	3.7	.33	0.17	15
February	30.146	30.131	30.147	30.141	30.419	29.770	22.5	35.3	27.7	28.5	59.8	—13.5	75.6	54.4	68.5	66.2	2.8	5.6	3.3	3.9	.21	0.16	16
March	30.113	30.090	30.152	30.118	30.535	29.690	25.8	39.1	29.8	31.6	73	— 1	74.0	59.7	73.5	69.1	4.1	6.7	3.8	4.9	1.29	0.60	4
April	29.967	29.971	29.998	29.979	30.458	29.605	32.9	43.6	36.0	37.5	76.8	14	80.0	64.8	76.5	73.8	5.4	6.5	6.4	6.1	7.31	2.10	17, 18
May	29.838	29.825	29.843	29.835	30.093	29.435	41.8	52.2	47.0	47.0	70	30	80.8	63.4	74.2	72.8	5.9	7.7	4.8	6.1	7.05	3.33	7,8
June†	29.764	29.769	29.776	29.770	30.023	29.436	52.5	63.8	56.8	57.7	82	41	83.7	64.9	79.2	75.9	6.0	6.7	5.2	6.0	5.78	1.24	1,2

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.14 a. m., 1.14 p. m., and 9.14 p. m., local time.

* Barometer record incomplete.

† 29 days only.

GEO. W. SCOTT,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

DEADWOOD, DAK.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	(†)	SW.	22	1	8	22	0	2	9	40	4	7	1	....	....	....	6	0	....	....	....	....	
August	(†)	S.	20	14	9	15	2	8	15	21	5	3	15	....	....	....	4	0	....	....	....	....	
September	(†)	SW.	24	23	7	21	2	2	11	17	9	6	15	....	....	....	7	0	....	....	....	....	
October	3,612	SW.	26	31	4	25	6	5	4	14	7	3	25	15	8	8	4	0	0	0	6	17	
November	3,554	SW.	39	14	7	13	1	1	9	31	12	0	16	13	6	11	13	0	0	0	5	25	First light frost, October 2; first killing frost, October 8.
December	3,932	SW.	28	27	1	11	2	0	9	40	7	3	20	23	5	3	2	0	0	0	4	30	
Year 1881	.....	.....	..	.....	..	..	....	....	..	....	....	....	....	..	....	..	..	....	....	....	....	....	
1882.																							
January	3,274	SW.	32	27	5	10	1	1	12	38	6	5	15	13	15	3	2	5	0	0	11	31	
February	4,051	SW.	27	11	0	12	0	4	11	44	4	1	8	10	16	2	2	1	0	0	6	25	
March	3,940	SW.	28	16	2	16	0	1	1	44	5	7	15	9	14	8	6	10	0	0	5	29	
April	3,178	NE. SW. N.	20	3 20 23	3	30	1	6	4	26	2	0	18	7	9	14	16	0	1	1	2	18	
May	4,463	SW.	20	15	21	12	6	5	10	34	0	4	1	4	16	11	13	0	1	0	0	4	
June*	3,582	SE.	22	27	28	6	1	2	12	26	9	1	4	4	15	10	20	0	1	0	0	0	

*29 days only.
† Wind movement incomplete.

GEO. W. SCOTT,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

DECATUR, TEX.

[Latitude, 33° 12′; longitude west of Greenwich, 97° 35′. Elevation of barometer above sea-level, 1,129 feet. Elevation of rain-gauge (top) above ground, 30 feet. Elevation of exposed thermometer above ground, 17 feet.]

	Barometer (to sea.)						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°												
July	29.946	29.881	29.903	29.910	30.054	29.683	78.7	94.5	82.9	85.4	105	70	67.8	39.4	61.3	56.2	2.8	3.0	1.8	2.5	2.66	1.14	11
August	29.899	29.819	29.855	29.860	30.006	29.706	79.0	96.7	85.1	86.9	107	71	60.9	34.9	50.5	48.8	1.5	5.6	0.8	2.6	.04	.02	14 and 22
September	29.933	29.857	29.885	29.888	30.167	29.729	70.1	86.3	76.6	78.1	100	49	65.5	44.1	56.6	55.4	2.4	2.0	0.8	1.7	7.57	4.44	30
October	30.061	30.019	30.061	30.046	30.216	29.898	64.7	75.8	69.7	70.1	90	48	77.2	63.8	75.9	72.3	1.9	2.8	1.2	2.0	4.16	1.24	1
November	(*)	.... ..	.. ....	.....	.....	.....	46.5	58.9	50.8	52.1	78	27	78.9	55.4	71.4	68.5	1.4	2.0	1.9	1.8	1.78	1.26	10 and 11
December	.. ..	.....	.....	.....	.....	.....	44.4	58.5	50.0	51.0	73	28	75.2	57.9	69.2	67.6	1.2	1.8	2.6	1.9	2.47	2.09	19
Year 1881	.....	.....	.....	.....	.....	.....	58.0	72.8	63.8	64.9	.....	.....	71.5	49.3	64.3	61.7	1.7	2.4	1.4	1.8	34.01	.....	....
1882.																							
January	(*)	.....	.....	.....	.....	.....	39.8	47.5	42.9	43.4	75	16	81.2	65.9	75.1	74.1	6.1	6.7	5.5	6.1	2.87	1.07	12
February	.....	.....	.....	.....	.....	.....	48.0	60.2	51.0	52.9	76	33	70.6	55.7	64.9	63.7	5.3	6.0	4.7	5.3	5.24	2.73	8
March	....	.....	.....	.....	.....	.....	53.3	66.4	56.8	58.9	84	26	66.0	43.6	62.4	57.3	5.4	5.1	3.9	4.8	.78	.50	5
April	.....	.....	.....	.....	.....	.....	58.7	72.4	63.2	64.8	90	38	62.0	39.8	61.1	54.3	3.6	4.3	4.5	4.1	1.99	1.36	7, 8
May	.....	.....	.....	.....	.....	.....	59.6	75.0	64.5	66.4	86	45	62.1	44.6	61.4	56.0	4.8	5.2	4.6	4.9	4.61	1.74	30
June	.....	.....	.....	.....	.....	.....	74.0	90.0	77.5	80.5	102	42	55.3	36.7	49.5	47.9	3.2	4.4	3.1	3.6	2.91	2.45	10

* Barometer unserviceable.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.38 a. m., 1.38 p. m., and 9.38 p. m., local time.

D. J. CARR,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

DECATUR, TEX.

	Wind.				Winds at 7 a. m., 3 and 11 p.m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	6,461	SE.	36	14	1	14	6	54	10	0	1	3	1	18	9	2	7	0	1	0	0	0	
August	4,590	SE.	28	22	4	7	4	55	7	5	0	0	0	19	6	1	2	0	0	0	0	0	
September	8,887	SE.	33	5	14	8	0	24	33	7	0	0	0	19	5	4	6	0	0	0	0	0	
October	5,780	SE.	24	12, 14	9	7	1	34	11	11	1	4	1	9	11	5	10	0	0	0	0	0	
November	7,824	S.	28	29	16	11	9	14	23	0	2	14	0	13	11	5	5	0	0	0	0	4	First frost, November 23.
December	5,310	S.	27	12	13	4	1	13	13	7	2	18	0	9	9	4	5	0	1	0	0	1	Last frost, December 23.
Year 1881	85,166	.....	...	.....	170	89	59	363	151	50	20	94	4	159	113	54	64	3	12	0	4	41	
1882.																							
January	5,675	NW.	28	16	13	12	0	17	17	8	5	6	0	6	6	14	9	1	0	0	1	7	
February	7,229	W.	37	20	7	5	2	17	30	4	5	9	0	9	7	9	8	0	1	0	0	0	
March	7,066	N. NW. SE. W.	28	5 7 25 26	15	4	2	18	20	4	8	8	0	11	6	8	4	0	1	0	0	2	
April	7,713	NW.	41	22	13	13	0	21	14	4	5	8	0	11	8	6	5	0	2	1	0	0	Aurora, April 16 to 17.
*May	†6,285	NW.	44	30	11	15	0	18	7	6	0	14	0	7	8	5	5	0	1	0	0	0	
†June	§5,738	SE.	38	10	5	0	3	42	14	3	0	3	0	9	8	2	4	0	0	0	0	0	

*20 days. †19 days. ‡23½ days. §20½ days.

Location of office on June 30, 1882, southwest corner public square.

D. J. CARR,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

DELAWARE BREAKWATER, DEL.

[Latitude, 38° 48′; longitude west of Greenwich, 75° 10′. Elevation of barometer above sea-level, 20 feet. Elevation of rain-gauge (top) above ground, 27 feet. Elevation of exposed thermometer above ground, 13 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.966	29.937	29.955	29.953	30.204	29.685	71.2	77.9	71.7	73.7	90	60	87.3	65.3	84.2	78.9	5.4	6.9	5.0	5.8	.67	.25	17
August	30.054	30.014	30.030	30.033	30.339	29.676	70.3	77.5	70.2	72.7	93	60	85.7	67.5	85.9	79.7	4.5	5.3	3.5	4.4	1.48	.82	7
September	30.102	30.060	30.092	30.084	30.339	29.841	71.4	78.6	72.5	74.2	93	63	89.6	71.2	86.7	82.5	6.7	5.7	5.5	6.0	.50	.28	11
October	30.179	30.117	30.142	30.146	30.556	29.532	60.8	68.0	62.0	63.6	84	47	85.6	68.3	80.6	78.2	5.2	6.0	4.4	5.2	2.35	1.07	18
November	30.209	30.161	30.187	30.186	30.718	29.653	49.2	55.6	50.2	51.7	73	26	82.8	68.8	81.5	77.7	5.2	6.1	5.7	5.7	3.59	1.15	23
December	30.178	30.123	30.173	30.161	30.665	29.414	42.4	48.2	42.6	44.4	69	22	84.8	73.3	82.9	80.3	6.5	7.6	6.0	6.7	.91	.42	22
Year 1881	30.062	30.022	30.047	30.044	.....	.....	52.0	58.2	52.9	54.4	.....	.....	84.9	70.5	83.6	79.7	4.0	4.5	3.6	4.0	25.50	.....	.....
1882.																							
January	30.184	30.131	30.163	30.159	30.865	29.187	34.4	38.8	35.7	36.3	56	10	90.4	81.1	89.6	87.0	7.2	7.8	7.4	7.5	4.46	.77	31
February	30.176	30.121	30.141	30.146	30.722	29.307	37.1	44.1	39.1	40.1	61	24	86.5	71.9	85.5	81.3	5.4	6.3	5.7	5.8	2.14	.94	9
March	30.116	30.076	30.124	30.105	30 706	29.597	40.5	45.6	42.3	42.8	62	28	83.0	72.9	81.7	79.2	6.6	5.8	4.2	5.5	3.15	1.04	1
April	30.077	30.016	30.036	30.043	30.524	29.424	45.6	50.3	47.5	47.8	72	29	82.0	72.3	83.6	79.3	5.2	5.6	5.4	5.4	2.07	.68	29
May	30.032	29.994	30.011	30.012	30.438	29.494	53.2	58.3	53.6	55.0	76	42	84.7	74.0	86.7	81.8	6.4	6.1	6.8	6.4	2.36	.87	14
June	29.943	29.904	29.926	29.924	30.276	29.548	66.2	72.2	65.3	67.9	88	50	83.8	65.6	83.4	77.6	6.0	5.4	3.7	5.0	1.13	.50	19, 20

NOTE.—7 a. m., 3 p. m. and 11 p. m., Washington time, correspond with 7.08 a. m., 3.08 p. m., and 11.08 p. m., local time.

F. C. PRATZ,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

DELAWARE BREAKWATER, DEL.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days —									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	7,938	NW.	48	13	11	13	4	11	17	7	10	13	7	6	16	9	9	0	0	0	0	0	
August	8,233	SW.	50	13	14	13	6	15	15	20	2	5	3	5	20	6	7	0	2	0	0	0	
September	10,039	E.	35	15	8	4	19	18	17	15	5	4	0	5	15	10	3	0	0	0	0	0	
October	12,222	N.	52	5	11	6	3	12	30	17	2	12	0	11	11	9	9	0	1	0	0	0	
November	12,861	NW.	54	24	13	9	5	5	13	17	9	18	1	9	8	13	14	0	0	0	0	3	
December	12,833	NW.	54	23	20	8	3	4	20	19	10	9	0	4	12	15	11	2	0	0	0	4	
Year 1881	131,729	....	....	.....	152	136	88	120	155	157	89	176	22	75	163	127	109	19	5	0	15	68	
1882.																							
January	13,423	NW.	52	22&29	16	17	4	5	5	14	13	15	4	1	12	18	14	3	0	0	3	16	
February	12,058	NE.	56	4	14	4	4	11	21	7	6	13	4	9	6	13	10	1	0	0	0	6	
March	14,345	SE.	52	1	26	7	4	16	16	4	3	17	0	8	15	8	11	0	0	0	0	4	
April	11,473	SW.	37	2	8	11	7	14	11	18	7	14	0	11	5	14	9	0	1	1	0	1	
May	12,967	E.	58	11	12	29	8	6	18	13	5	2	0	4	15	12	14	0	0	0	0	0	Aurora commenced about 9 p. m., 16th, ended about 3.50 a. m., 17th.
June	9,303	NW.	39	20	9	8	3	10	20	21	11	8	0	7	18	5	8	0	2	0	0	0	

Location of office on June 30, 1882, on the Breakwater.

F. C. PRATZ,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

DENISON, TEX.

[Latitude, 33° 48′; longitude west of Greenwich, 96° 32′. Elevation of barometer above sea-level, 767 feet. Elevation of rain-gauge (top) above ground, 28 feet. Elevation of exposed thermometer above ground, 16 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0-10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometer.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.010	29.968	29.974	29.981	30.123	29.798	78.1	93.9	83.8	85.3	109.0	68.0	78.5	47.8	65.8	64.0	7.6	9.2	3.0	6.6	1.14	.61	22, 23
August	29.981	29.944	29.942	29.953	30.092	29.858	81.2	97.0	86.6	88.3	107.0	74.0	65.7	37.5	56.7	53.2	4.2	7.4	1.4	2.8	.26	.24	1
September	30.011	29.967	29.982	29.987	30.201	29.764	70.7	85.1	75.9	77.2	103.0	48.0	77.8	52.7	66.1	65.5	4.2	4.2	1.8	3.4	5.59	2.71	13
October	30.099	30.062	30.080	30.080	30.263	29.667	64.5	75.0	68.0	69.2	89.0	44.0	87.6	39.0	80.8	79.8	6.6	6.6	3.6	5.6	6.76	2.82	1
November	30.175	30.150	30.183	30.169	30.585	29.683	45.3	56.7	49.3	50.4	78.3	24.4	83.2	60.2	74.2	72.5	4.0	4.6	4.2	4.2	3.26	.93	10
December	30.218	30.180	30.211	30.203	30.585	29.817	44.3	55.6	49.3	49.8	72.5	32.0	76.6	58.5	72.9	69.4	4.2	4.2	5.0	4.4	1.42	.88	19, 20
Year 1881	30.051	30.036	30.033	30.040	....	...	58.1	71.2	63.5	64.4	.....	.....	77.3	52.2	69.7	67.3	7.4	7.6	4.8	6.6	36.98	.....	.....
1882.																							
January	30.152	30.121	30.157	30.143	30.667	29.801	40.4	47.8	43.6	43.9	75.0	16.0	84.3	70.0	80.8	78.4	7.3	7.7	5.7	6.9	3.58	1.09	12
February	30.097	30.075	30.098	30.090	30.375	29.522	48.1	59.9	53.1	53.7	74.5	29.0	85.0	67.2	77.9	76.7	6.1	6.7	4.8	5.9	5.66	1.49	20
March	30.085	30.066	30.094	30.082	30.549	29.632	54.0	66.8	59.1	60.0	85.0	32.0	79.7	54.9	69.5	68.0	6.1	5.9	3.9	5.3	1.03	.49	8, 9
April	29.964	29.933	29.937	29.945	30.236	29.557	57.8	73.5	64.7	65.3	94.0	40.0	81.4	53.6	70.9	68.6	5.3	5.4	3.6	4.8	2.60	1.00	11, 12
May	29.935	29.912	29.926	29.924	30.233	29.464	60.9	76.1	66.7	67.9	89.0	46.0	79.6	55.0	75.2	69.9	4.6	5.5	3.3	4.5	4.64	2.55	6, 7
June	29.954	29.933	29.929	29.939	30.251	29.627	71.7	88.0	78.8	79.5	102.5	57.0	82.3	50.3	68.8	67.1	3.7	3.9	2.1	3.2	1.86	1.25	13

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.41 a. m., 1.41 p. m., and 9.41 p. m., local time.

JOHN McGLONE,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

DENISON, TEX.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,487	S.	18	9	4	15	18	25	22	3	2	3	1	13	17	1	5	0	2	0	0	0	
August	4,076	SE.	20	16	5	5	12	22	37	7	1	1	2	29	2	0	2	0	1	0	0	0	
September	5,472	S.	28	29	3	7	2	7	50	8	1	11	1	25	0	5	7	0	0	0	0	0	
October	4,359	S.	18	29	12	1	10	14	35	10	1	4	6	8	14	9	10	0	0	0	0	0	
November	5,624	SW.	25	29	26	6	3	6	26	8	5	5	5	12	12	6	11	0	1	0	0	3	First frost occurred, November 3d.
December	4,785	S.	23	12	21	5	12	11	19	6	5	12	2	9	15	7	6	0	0	0	0	0	
Year 1881	64,595				169	70	93	173	331	82	40	111	25	178	112	75	80	2	23	0	2	41	
1882.																							
January	5,136	S. & N.	20	7 & 16	18	9	6	17	19	4	3	6	11	3	13	15	13	3	0	0	1	10	
February	5,437	S.	28	6	13	1	1	12	26	13	6	10	2	9	8	11	11	0	3	0	0	2	
March	6,789	S.	28	19	15	6	2	6	31	16	4	4	9	12	9	10	3	1	1	0	0	0	
April	5,082	SW.	24	8	15	6	6	9	30	7	3	3	3	9	13	5	10	0	4	0	0	0	Last frost, April 15th.
May	5,050	NE.	24	30	12	4	5	15	26	5	3	11	10	11	12	7	9	0	3	0	0	0	
June	5,561	S. & N.	20	2	5	4	1	10	49	11	0	2	8	15	13	2	3	0	4	0	0	0	

Location of office on June 30, 1882, southwest corner of Gandy street and Rusk avenue.

JOHN McGLONE,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

DENVER, COLO.

[Latitude, 39° 45′; longitude west of Greenwich, 105° 0′. Elevation of barometer above sea-level, 5,294 feet. Elevation of rain-gauge (top) above ground, 86 feet. Elevation of exposed thermometer above ground, 73 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.922	29.885	29.896	29.901	30.136	29.605	66.4	84.6	74.9	75.3	99.0	57.0	63.1	29.4	50.3	47.6	2.8	3.7	3.4	3.3	2.50	1.60	30
August	29.937	29.926	29.939	29.934	30.198	29.748	64.6	81.3	72.0	72.6	95.8	53.1	69.3	36.7	57.3	54.4	3.2	3.7	5.0	4.0	2.33	.77	11, 12
September	29.998	29.940	29.961	29.966	30.300	29.572	49.1	70.0	60.6	59.9	88.0	37.0	61.5	29.9	42.3	44.6	2.1	2.5	1.6	2.1	.57	.38	5, 6
October	30.152	30.085	30.137	30.125	30.424	28.760	41.3	50.7	50.3	50.3	81.7	28.0	63.3	33.9	51.5	49.8	2.6	2.9	4.0	3.2	.32	.16	4
November	30.286	30.258	30.297	30.280	30.694	29.863	30.5	42.8	35.1	36.1	66.0	10.5	67.0	51.1	62.4	60.2	3.3	3.7	2.1	3.0	1.68	.48	10, 11
December	30.332	30.312	30.370	30.338	30.720	29.873	32.0	47.6	37.7	39.1	67.0	18.0	63.7	35.1	53.5	50.8	1.6	2.5	2.1	2.1	00	00	.....
Year 1881	30.022	29.984	30.016	30.007	.....	.....	42.2	59.6	50.5	50.8	.....	.....	65.2	36.5	52.9	51.5	2.0	2.7	2.3	2.3	12.78	.....	.....
1882.																							
January	30.155	30.116	30.161	30.144	30.554	29.714	23.2	37.0	28.9	29.7	67.0	1.2	64.7	46.9	58.7	56.8	1.5	2.4	1.9	1.9	.57	.39	7
February	30.187	30.150	30.195	30.177	30.399	29.845	29.3	46.2	37.2	37.6	61.0	10.5	59.2	33.6	50.5	47.8	2.9	1.9	2.0	2.3	.20	.10	20
March	30.133	30.080	30.122	30.112	30.529	29.694	33.1	52.3	44.2	43.2	71.0	10.0	54.7	26.4	38.4	39.8	2.4	3.2	1.9	2.5	.20	.20	5, 6
April	29.902	29.861	29.900	29.888	30.387	29.503	34.4	55.5	48.2	47.4	76.0	21.0	62.1	34.5	49.8	48.8	4.4	5.4	3.6	4.5	1.47	.43	28, 29
May	29.846	29.821	29.849	29.839	30.158	29.406	45.4	59.3	52.6	52.4	78.0	34.0	70.2	46.6	61.4	59.4	4.7	6.7	5.6	5.7	2.98	.74	27
June	29.772	29.734	29.771	29.759	29.985	29.468	57.1	73.0	64.7	64.9	88.2	43.0	72.4	40.4	62.2	58.3	3.8	4.2	4.7	4.2	4.96	1.82	10, 11

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.08 a. m., 1.08 p. m., and 9.08 p. m., local time.

F. M. NEAL,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

DENVER, COLO.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurorus.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	5,521	S.	36	23	15	7	8	16	19	6	2	19	1	13	14	2	9	0	4	0	0	0	
August	4,517	N.	33	4	15	7	4	13	22	12	4	15	1	12	16	3	16	0	2	0	0	0	
September	4,787	NW.	44	9	20	12	3	7	28	4	7	8	1	23	4	3	3	0	0	0	0	0	First frost, September 30.
October	4,751	NW.	46	14	20	11	7	5	22	3	5	19	0	16	9	6	2	1	0	0	0	2	
November	5,332	NW.	32	12	18	4	2	15	27	8	8	8	0	19	6	5	0	13	0	0	1	21	
December	5,919	W.	34	29	6	11	2	12	30	7	12	12	1	20	11	0	0	0	0	0	0	22	
Year 1881	57,956				157	100	69	141	281	86	88	168	5	154	158	53	44	40	15	0	26	106	
1882.																							
January	5,099	NW.	32	26	20	5	7	6	38	7	6	4	0	20	10	1	0	5	0	0	8	26	
February	5,879	NW.	38	14	12	8	3	7	29	2	8	15	0	17	10	1	0	3	0	0	2	17	
March	7,424	W.	44	20, 28	19	3	6	9	26	5	19	5	0	21	7	3	0	2	0	0	2	19	
April	6,093	SW.	38	7	14	10	3	20	19	4	7	12	1	12	13	5	4	6	1	0	1	7	
May	5,708	N.	30	19	16	9	7	8	18	4	12	19	0	7	14	10	12	1	1	0	0	0	Last frost, May 11.
June	5,259	NW., SW., W.	36	1, 9, 16	15	11	2	9	23	7	6	17	0	8	18	4	15	0	3	0	0	0	

Location of office on June 30, 1882, corner of Sixteenth and Larimer streets.

F. M. NEAL,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

DES MOINES, IOWA.

[Latitude, 41° 35′; longitude west of Greenwich, 93° 37′. Elevation of barometer above sea-level, 849 feet. Elevation of rain-gauge (top) above ground, 45 feet. Elevation of exposed thermometer above ground, 35 feet.]

	Barometer (to sea.)						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–4.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.030	30.001	29.989	30.006	30.243	29.583	69.4	85.1	74.2	76.2	98.5	56	86.8	55.8	79.9	74.2	4.5	4.1	2.6	3.7	5.57	2.31	9
August	29.997	29.967	29.962	29.975	30.143	29.738	69.7	88.3	75.7	77.9	103.0	57	79.8	46.9	72.3	66.3	5.0	4.6	3.4	4.3	5.29	.82	18
September	29.917	29.894	29.904	29.905	30.214	29.548	59.8	74.7	64.2	66.2	93.0	40	84.1	55.7	78.6	72.8	6.0	5.5	5.4	5.6	4.70	1.08	10
October	30.105	30.079	30.079	30.088	30.522	29.435	49.2	61.1	53.7	54.7	83.0	32	86.3	63.8	80.4	76.8	6.8	6.5	5.9	6.4	6.45	1.98	4
November	30.132	30.116	30.140	30.130	30.759	29.590	32.9	39.8	34.8	35.8	60.0	6	78.2	63.5	77.1	72.9	6.0	7.3	4.6	6.0	3.97	1.67	11
December	30.171	30.151	30.180	30.167	30.512	29.666	31.5	40.0	33.6	35.0	56.0	10	80.4	67.8	78.0	75.4	5.2	7.0	5.7	6.0	1.85	.60	21
Year 1881	30.052	30.019	30.031	30.034	.....	.....	43.8	55.7	48.0	49.2	.....	.....	81.8	61.3	78.0	73.7	5.6	5.8	4.6	5.3	56.81	....	....
1882.																							
January	30.184	30.150	30.176	30.170	30.721	29.511	22.6	30.9	26.6	26.7	51.0	— 1	77.7	69.3	73.2	73.4	5.2	6.3	5.0	5.5	.63	.22	4
February	30.079	30.044	30.072	30.065	30.465	29.579	30.2	43.1	34.8	36.0	65.0	1	76.4	57.7	72.8	69.0	4.3	5.4	3.3	4.3	1.21	.62	18
March	30.101	30.064	30.113	30.093	30.677	29.422	32.4	44.4	36.6	37.8	74.0	10	71.2	60.6	70.9	67.6	6.4	7.3	4.6	6.1	2.28	1.43	26
April	30.026	29.996	29.993	30.005	30.333	29.365	43.3	58.4	51.5	51.1	83.0	31	76.0	53.2	65.0	64.7	5.7	7.7	6.3	6.6	3.47	1.10	5
May	29.972	29.947	29.944	29.954	30.330	29.506	48.8	61.3	54.3	54.8	83.0	33	80.0	57.0	74.5	70.5	6.7	7.6	6.0	6.8	8.53	2.81	5
June	29.900	29.874	29.875	29.883	30.200	29.392	62.0	74.6	67.0	67.9	92.0	44	81.5	61.3	79.9	74.2	7.3	8.0	6.9	7.4	12.16	3.51	10

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.53 a. m., 1.53 p. m., and 9.53 p. m., local time.

F. W. CONRAD,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

DES MOINES, IOWA.

	Wind.				Winds at 7 a.m., 3 and 11 p.m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurora.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,097	SE.	20	9.10	16	8	2	15	13	27	6	2	4	15	11	5	6	0	6	0	0	0	
August	4,312	SW.	34	31	7	10	8	22	16	20	3	4	3	10	15	6	10	0	4	0	0	0	
September	5,520	W.	36	29	14	9	3	8	8	32	8	7	1	6	14	10	19	0	8	0	0	0	
October	5,086	SW.	28	11	17	8	9	9	15	18	5	7	5	6	9	16	17	0	2	0	0	0	First light frost of the season, October 18th.
November	6,360	SW. / N.	26	16 / 23	22	4	3	3	5	18	7	27	1	6	11	13	7	4	1	1	3	15	First killing frost of the season, November 9th.
December	5,664	NE.	32	20	21	9	4	5	6	21	15	10	2	5	18	8	8	4	0	0	2	18	
Year 1881	61,729	.....	..	.....	202	139	63	144	121	196	67	118	44	90	153	122	104	53	43	1	52	130	
1882.																							
January	5,663	N.	27	26	15	5	5	11	12	17	12	16	0	7	13	11	2	9	0	0	11	28	
February	5,470	W.	28	12	9	5	4	10	7	13	9	25	2	10	12	6	5	2	1	0	5	18	Brilliant meteor, February 4th.
March	7,188	W. / NW. / SW.	32	4 / 20 / 21 / 29	23	8	4	13	9	10	6	15	5	4	16	11	7	2	5	0	3	16	Severe thunder-storms.
April	6,351	SW.	32	5	18	7	12	18	13	9	7	3	3	5	12	13	12	0	4	1	0	3	Tornado passed through Story county, Iowa, April 8th; brilliant aurora, April 16.
May	6,268	S. / SW. / NW.	26	8 / 19 / 21	9	22	12	2	21	8	6	4	9	6	9	16	16	1	3	0	0	0	Light frost, May 22d.
June	5,262	NW.	29	22	11	8	8	15	10	15	13	6	4	3	9	18	20	0	11	0	0	0	Destructive tornado passed through central Iowa June 17. Severe thunder-storm.

Location of office on June 30, 1882, McCain's Block, corner Sixth and Walnut streets.

F. W. CONRAD,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

DETROIT, MICH.

[Latitude, 42° 20′; longitude west of Greenwich, 83° 3′. Elevation of barometer above sea-level, 661 feet. Elevation of rain-gauge (top) above ground, 71 feet. Elevation of exposed thermometer above ground, 61 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.003	29.972	29.980	29.985	30.260	29.746	68.1	81.6	73.1	74.3	95.2	54.5	74.0	49.9	67.7	63.9	4.0	5.3	3.5	4.3	3.33	2.25	12
August	30.068	30.029	30.036	30.044	30.289	29.704	68.5	81.2	72.5	74.1	98.8	52.6	75.6	48.6	67.5	63.9	3.4	5.1	1.7	3.4	1.32	1.10	6
September	30.054	30.009	30.028	30.030	30.290	29.677	67.6	78.4	70.9	72.3	94.0	50.0	78.6	55.1	73.3	69.0	4.5	5.6	3.5	4.5	2.86	1.38	15
October	30.153	30.121	30.134	30.136	30.523	29.691	53.8	61.5	57.4	57.6	75.2	36.8	80.1	63.1	74.1	72.5	6.4	7.0	5.1	6.2	6.52	1.95	2
November	30.138	30.110	30.127	30.125	30.679	29.589	42.7	47.2	43.6	44.5	66.0	18.8	73.6	60.3	70.8	68.6	7.3	7.1	5.5	6.6	4.36	1.15	12
December	30.155	30.136	30.157	30.149	30.590	29.584	38.3	42.3	39.9	40.2	59.8	23.9	82.0	68.9	80.2	77.0	7.3	7.5	6.0	6.9	4.17	1.15	13
Year 1881	30.056	30.018	30.042	30.038	.....	.....	47.1	56.4	50.1	51.2	.....	.....	78.9	58.5	74.5	70.7	5.6	6.2	4.4	5.4	45.44	.....	.....
1882.																							
January	30.168	30.142	30.152	30.154	30.782	29.658	29.2	33.1	30.8	31.0	56.1	8.0	84.3	68.5	80.9	77.9	6.8	7.9	6.3	7.0	1.97	.53	26
February	30.106	30.061	30.079	30.082	30.647	29.313	37.5	43.1	39.3	40.0	57.5	20.0	78.8	60.8	75.6	71.7	4.5	6.2	4.6	5.1	1.92	.53	21
March	30.110	30.069	30.095	30.091	30.694	29.353	37.2	43.7	39.4	40.1	63.6	23.1	80.5	61.1	77.3	73.0	7.4	7.1	7.0	7.2	3.34	.93	18
April	30.068	30.040	30.068	30.059	30.361	29.239	42.8	51.3	43.6	45.9	71.0	24.3	72.1	52.4	69.0	64.5	5.0	6.4	3.9	5.1	1.13	.45	5
May	30.013	29.977	29.986	29.992	30.384	29.516	49.3	58.7	51.7	53.2	70.5	32.7	74.9	53.9	70.1	66.3	5.6	5.7	4.6	5.3	4.82	1.68	27
June	29.885	29.866	29.878	29.876	30.211	29.466	63.0	72.8	65.9	67.2	86.0	46.1	71.6	54.4	72.3	66.1	5.0	6.8	4.5	5.4	3.70	.99	30

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.36 a. m., 2.36 p. m., and 10.36 p. m., local time.

C. F. R. WAPPENHANS,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

DETROIT, MICH.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	6,151	NW.	37	12	13	10	14	2	6	12	24	11	1	11	15	5	7	0	7	1	0	0	Polar bands, 2d.
August	4,866	NE.	21	31	18	7	18	7	17	9	5	10	2	16	12	3	5	0	0	0	0	0	
September	5,651	SE.	39	16	3	8	8	7	27	16	10	5	6	9	13	8	11	0	2	1	0	0	
October	5,476	W.	30	17	8	5	11	9	16	11	7	20	6	7	10	14	19	0	1	0	0	0	First frost, 5th.
November	8,315	SW.	32	5	4	2	4	12	25	17	17	7	2	5	10	15	14	1	0	1	0	9	First snow, 4th; shooting stars and brilliant meteor, 29th.
December	7,732	W.	42	7	8	6	3	4	25	19	14	12	2	6	8	17	12	4	0	1	1	10	
Year 1881	75,780	.....	....	.....	116	99	139	74	170	151	163	131	52	101	135	129	104	46	20	6	47	99	
1882.																							
January	8,536	W.	39	26	3	4	10	9	14	15	23	15	0	3	13	15	9	4	0	0	8	22	
February	7,854	SW.	36	21	3	2	10	9	17	13	22	8	0	11	9	8	10	2	0	0	0	13	
March	8,800	S.	36	26, 29	9	5	14	10	9	7	21	18	0	5	11	15	12	5	1	0	1	12	Thunder-storm, 18th.
April	8,072	SW. NE.	32	19, 20, 23	12	19	9	1	6	9	19	15	0	14	6	10	6	0	1	2	0	3	Tornado near Detroit, 6th; auroras, 16th and 17th; thunder-storm, 2d; last snow, 10th (inappreciable).
May	7,931	E. N.	30	12, 14	16	20	15	4	15	6	12	5	0	12	9	10	15	0	1	0	0	0	Many hoar-frosts, 2d, 3d, 16th, 23d, 24th, 29th; thunder-storm, 1st.
June	7,006	SW.	32	3	5	11	16	11	7	18	15	7	0	5	18	6	15	0	6	0	0	0	Last hoar-frost, 6th; tornado near Detroit, 8th.

Location of office on June 30, 1882: Board of Trade building, corner Jefferson avenue and Griswold street.

C. F. R. WAPPENHANS,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

DODGE CITY, KANS.

[Latitude, 37° 45′; longitude west of Greenwich, 100° 0′. Elevation of barometer above sea-level, 2,512 feet. Elevation of rain-gauge (top) above ground, 30 feet; elevation of exposed thermometer above ground, 15 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.936	29.909	29.921	29.922	30.134	29.575	69.9	88.1	75.3	77.8	103.7	57.7	81.9	46.5	70.0	66.1	4.5	4.4	3.8	4.2	5.06	2.36	22
August	29.946	29.923	29.931	29.933	30.120	29.752	69.2	90.7	75.9	78.6	101.6	62.3	79.2	39.5	67.5	62.1	3.1	3.3	2.6	3.0	2.36	1.19	20
September	29.937	29.910	29.928	29.925	30.231	29.504	59.1	79.0	65.0	67.7	99.3	38.9	72.5	37.3	60.9	56.9	3.7	3.0	2.3	3.0	3.13	2.24	6
October	30.118	30.081	30.103	30.101	30.465	29.551	49.6	65.4	54.5	56.5	89.0	29.3	90.4	55.7	82.3	76.1	5.7	4.0	3.5	4.4	2.19	0.78	13
November	30.233	30.203	30.245	30.227	30.657	29.665	29.9	47.7	35.6	37.7	68.7	13.3	79.6	49.3	72.2	67.1	3.0	3.4	2.3	2.9	.85	0.53	10
December	30.289	30.236	30.298	30.274	30.548	29.756	30.2	46.1	34.6	36.9	72.0	17.0	79.3	55.3	74.2	69.6	5.1	6.3	4.1	5.2	.61	0.42	21
Year 1881	29.912	29.854	29.890	29.888	.....	.....	45.3	62.6	51.0	53.0	.....	.....	76.1	47.9	67.6	63.9	4.3	4.4	3.5	5.1	33.55	.....	....
1882.																							
January	30.165	30.122	30.159	30.149	30.722	29.691	24.0	40.4	29.1	31.2	67.0	Zero.	82.8	57.6	80.3	73.6	4.6	4.5	3.7	4.3	.52	0.31	16
February	30.117	30.094	30.129	30.113	30.384	29.576	28.3	50.8	35.3	38.1	68.5	6.5	78.6	38.8	68.6	62.0	3.0	3.7	2.5	3.1	.22	0.18	20
March	30.134	30.109	30.126	30.123	30.604	29.557	35.9	59.1	45.5	46.8	81.0	13.5	73.2	35.7	59.3	56.1	4.0	4.5	3.2	3.9	.24	0.24	8
April	29.962	29.931	29.956	29.950	30.446	29.500	42.8	63.8	50.9	52.5	86.7	26.0	75.5	41.3	62.6	59.8	3.7	5.3	3.7	4.2	.68	0.24	17
May	29.898	29.853	29.872	29.874	30.202	29.298	49.1	65.4	55.1	56.5	87.1	38.5	83.4	54.3	77.8	71.8	6.4	6.9	3.9	5.7	3.87	1.26	7
June	29.831	29.810	29.821	29.821	30.198	29.579	64.4	83.1	71.8	73.1	100.0	43.0	82.0	44.3	69.6	65.3	4.3	4.6	4.2	4.4	1.51	0.59	12

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.27 a. m., 1.27 p. m., and 9.27 p. m., local time.

E. A. THOMAS,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

DODGE CITY, KANS.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	7,791	NW.	46	6	1	7	8	38	20	7	0	0	12	13	12	6	11	0	6	0	0	0	
August	8,039	NE.	34	6	1	9	5	26	41	8	1	1	1	17	10	4	5	0	8	0	0	0	
September	10,137	N.	50	10	12	6	2	3	43	15	0	7	2	18	8	4	4	0	4	0	0	0	First light frost, 16th.
October	9,824	N.	40	17	11	14	1	15	26	12	1	8	5	12	11	8	10	0	4	0	0	2	First killing frost, 18th.
November	8,402	N.	42	7	23	11	3	3	14	15	8	10	3	16	12	2	2	2	0	0	0	24	
December	8,778	N.	37	6	19	7	3	3	19	12	14	14	2	9	14	8	2	5	0	0	2	28	
Year 1881	110,525	.....	....	.....	183	130	42	175	249	122	51	112	32	152	139	74	73	26	38	0	32	134	
1882.																							
January	8,500	N.	44	15	20	3	0	8	30	14	6	10	2	14	11	6	0	3	0	0	4	26	
February	6,819	NE. / N.	36	18 / 28	15	11	1	7	16	12	8	9	5	16	8	4	2	2	1	0	3	20	
March	10,031	NW.	48	20	14	16	8	10	22	10	5	7	1	15	11	5	0	1	0	0	2	12	Light frost, 13th.
April	11,109	S.	52	17	20	7	7	8	26	7	4	8	3	13	11	6	4	1	1	1	0	5	Aurora, 16th.
May	11,276	NW.	62	19	22	14	4	19	15	4	2	8	0	5	20	5	9	0	1	0	0	0	
June	8,249	NW.	56	30	8	9	7	8	39	12	4	3	0	11	12	7	9	0	3	0	0	0	

Location of office on June 30, 1882, corner of Walnut street and Swan avenue.

E. A. THOMAS,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

DUBUQUE, IOWA.

[Latitude, 42° 30′; longitude west of Greenwich, 90° 44′. Elevation of barometer above sea-level, 665 feet. Elevation of rain-gauge (top) above ground, 43 feet. Elevation of exposed thermometer above ground, 32 feet.]

	Barometer (to sea): Washington time.				Barometer (to sea): Extremes.		Temperature. Washington time.				Temperature. Self-registering thermometer.		Relative humidity. Washington time.				Average cloudiness, amount of, 0–10. Washington time.				Rainfall and melted snow.	Rainfall and melted snow. Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.	Amount in inches.	Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.023	29.990	29.978	29.997	30.242	29.618	69.0	82.6	74.0	75.2	93.2	57.2	78.5	53.9	79.1	70.5	5	4	2	4	10.53	3.42	10
August	30.021	29.988	29.991	30.000	30.214	29.714	67.5	82.6	73.4	74.5	97.3	51.0	75.5	52.5	72.3	66.8	5	6	3	5	2.46	.86	25
September	29.934	29.909	29.926	29.923	30.225	29.542	60.4	74.2	64.4	66.3	94.2	42.5	81.2	54.5	74.9	70.2	6	5	5	5	10.26	4.01	26
October	30.079	30.075	30.089	30.081	30.536	29.462	48.6	58.5	52.6	53.2	80.0	35.5	83.1	64.5	79.4	75.7	7	6	6	6	6.70	1.75	17
November	30.097	30.078	30.107	30.094	30.756	29.526	32.5	40.1	35.9	36.2	62.2	5.5	72.9	58.1	68.7	66.6	7	6	6	6	3.19	1.21	11
December	30.161	30.128	30.173	30.154	30.539	29.645	30.9	39.1	34.0	34.7	49.2	7.8	74.8	61.9	70.8	69.2	6	7	5	6	1.55	.44	12
Year 1881	30.047	30.004	30.030	30.027	.....	.....	42.8	55.0	47.9	48.6	.....	.....	77.0	58.7	73.8	70.0	6.2	6.1	4.3	5.5	55.15	.....	.....
1882.																							
January	30.181	30.133	30.167	30.160	30.815	29.475	18.6	28.6	25.0	24.1	52.2	—5.2	69.0	65.2	68.5	67.6	5.2	6.0	4.2	5.1	.84	.30	10, 11
February	30.045	30.014	30.054	30.038	30.595	29.471	29.0	42.5	35.6	35.7	67.2	1.8	69.9	54.2	66.1	63.4	3.9	4.3	3.2	3.8	.59	.19	20
March	30.066	30.040	30.075	30.060	30.639	29.366	31.1	42.7	37.4	37.0	61.8	15.3	74.6	57.3	67.6	66.5	7.6	6.6	6.2	6.8	1.49	.34	17, 18
April	30.033	30.018	30.030	30.027	30.286	29.249	41.8	55.6	48.0	48.5	81.3	25.3	70.5	47.1	62.0	59.9	5.7	6.7	4.6	5.7	4.47	2.60	18, 19
May	29.972	29.957	29.974	29.968	30.350	29.573	49.7	60.5	53.1	54.4	81.8	31	72.4	50.9	68.7	64.0	6.6	6.8	5.2	6.2	4.16	.84	5
June	29.883	29.864	29.875	29.874	30.123	29.399	61.6	73.7	66.2	67.2	91.2	40.5	76.1	56.4	75.4	69.3	6.2	6.8	5.4	6.1	6.29	1.46	16, 17

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.05 a. m., 2.05 p. m., and 10.05 p. m., local time.

JAMES HARVEY SMITH,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

DUBUQUE, IOWA.

	Wind.				Winds at 7 a.m., 3 and 11 p.m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurorus.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	2,984	W.	18	6	7	3	6	15	15	11	9	18	9	10	16	5	11	0	11	0	0	0	
August	3,236	S.	22	30	9	6	12	23	14	8	5	10	6	10	15	6	11	0	5	0	0	0	
September	3,779	W.	18	10	2	8	1	15	32	7	9	12	4	6	17	7	17	0	11	2	0	0	
October	3,737	NW.	16	15	15	6	6	18	19	3	7	15	4	4	11	16	18	0	3	0	0	0	First light frost, 5th; first heavy frost, 19th.
November	4,773	NW. / S.	17	14 / 20	7	4	3	7	19	12	18	19	1	5	15	10	7	5	0	2	3	16	
December	3,953	NW.	21	6	5	6	0	6	27	14	9	22	4	7	13	11	8	3	1	0	2	21	
Year 1881	47,098	.....	...	.....	86	78	93	156	187	103	115	212	65	66	173	126	109	49	49	7	54	134	
1882.																							
January	3,798	NW.	18	26	4	6	4	11	25	11	15	16	1	8	13	10	4	5	0	1	13	31	
February	4,246	NE.	18	20	2	4	3	9	24	10	18	14	0	12	11	5	3	4	0	0	4	20	
March	5,387	W.	23	21	3	4	11	12	8	9	14	31	1	2	14	15	8	4	3	0	1	19	
April	4,786	E.	26	22	4	18	24	7	8	9	6	11	3	8	12	10	12	0	5	3	0	4	
May	5,190	NE. / NE. / NE. / W.	17	5 / 6 / 11 / 22	14	16	8	10	24	3	10	6	2	6	12	13	15	0	2	0	0	1	Frosts on 2d, 16th, 21st, 22d, 23d, 25th.
June	3,990	W.	21	18	6	6	17	15	7	13	16	9	1	5	14	11	13	0	8	2	0	0	Frost on 1st.

Location of office on June 30, 1882, corner Sixth and Main streets.

JAMES HARVEY SMITH,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

FORM No. 132—A.

DULUTH, MINN.

[Latitude, 46° 48′; longitude west of Greenwich, 92° 6′. Elevation of barometer above sea-level, 614 feet. Elevation of rain-gauge (top) above ground, 28 feet. Elevation of exposed thermometer above ground, 19 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.994	29.958	29.962	29.971	30.251	29.640	65.8	77.8	68.7	70.8	95	54	73.9	52.4	64.4	63.6	4.3	4.9	3.2	4.1	1.84	.83	15
August	29.984	29.952	29.963	29.966	30.254	29.510	63.4	71.4	66.1	67.0	93	52	83.5	74.3	78.2	78.7	7.0	7.0	4.0	6.0	7.36	2.18	3
September	29.894	29.879	29.896	29.889	30.291	29.246	53.5	59.3	54.9	55.9	76	41	84.8	73.2	81.5	79.8	7.1	7.9	6.4	7.1	11.52	2.92	29
October	30.091	30.063	30.077	30.077	30.587	29.418	41.5	49.6	44.7	45.3	72	26	80.5	66.3	73.0	73.4	6.3	5.8	5.1	5.7	3.77	1.30	11
November	30.006	30.006	30.031	30.014	30.732	29.414	24.5	30.2	26.6	27.1	54	—2	87.1	69.8	81.9	79.6	7.5	8.1	4.9	6.8	2.58	.79	12
December	30.070	30.032	30.074	30.059	30.516	29.443	20.8	30.8	25.4	25.7	47	—6	81.7	63.6	75.2	73.5	4.4	5.0	3.4	4.3	.20	.06	29
Year 1881	30.037	30.001	30.011	30.016	.....	.....	36.3	45.2	39.7	40.4	.....	.....	83.1	66.3	77.4	75.6	5.9	6.2	4.5	5.5	37.56	.....	.....
1882.																							
January	30.116	30.061	30.076	30.084	30.908	29.560	10.6	18.5	16.5	15.2	47	—24	81.6	69.9	76.2	75.9	6.6	6.9	5.5	6.3	.57	.14	13
February	30.007	29.979	30.006	29.997	30.806	29.450	21.8	29.7	25.3	25.6	53	Zero.	79.0	65.2	73.0	72.4	7.2	6.3	4.6	6.1	2.02	.50	17
March	30.073	30.055	30.082	30.070	30.730	29.381	23.4	31.9	28.0	27.8	50	—5	79.3	68.9	74.1	74.1	6.3	7.6	5.5	6.5	3.05	1.20	20, 21
April	30.118	30.092	30.111	30.107	30.436	29.585	33.9	41.1	37.6	37.5	67	20	73.3	63.7	64.4	67.1	4.6	6.3	4.0	4.9	2.51	1.56	6
May	30.042	30.015	30.018	30.025	30.295	29.725	42.3	50.4	45.6	46.1	74	27	69.5	58.8	64.8	64.4	4.4	5.9	3.9	4.9	7.14	2.58	30
June	29.914	29.893	29.892	29.900	30.172	29.407	54.2	62.7	56.8	57.9	86	42	72.5	58.1	67.3	66.0	4.6	5.1	3.8	4.5	6.72	2.54	18

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6 a. m., 2 p. m., and 10 p. m., local time.

NORMAN B. CONGER,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM 132—B.]

DULUTH, MINN.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurorns.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,876	NW.	22	17	2	31	0	0	1	19	14	23	3	14	10	7	8	0	3	1	0	0	
August	4,317	NW.	24	2	2	48	2	1	3	11	2	19	5	4	14	13	18	0	6	2	0	0	
September	6,216	NE.	78	16	5	33	1	1	1	22	12	15	0	4	11	15	20	0	3	2	0	0	First frost on 28th; very heavy wind on the 16th.
October	4,738	W.	30	29	5	22	4	6	1	18	14	18	5	9	10	12	12	1	1	0	0	2	
November	5,339	W.	36	23	1	11	1	2	1	20	27	16	1	5	10	15	5	16	0	1	9	24	
December	4,158	W.	35	30	2	7	1	1	0	46	22	9	5	13	10	8	0	6	0	2	10	29	
Year 1881	60,189	.....	.....	...	44	404	16	14	16	237	139	176	49	101	127	137	106	65	18	15	86	159	
1882.																							
January	4,366	NW.	38	21	0	8	1	1	0	46	21	12	3	8	9	14	1	9	0	0	23	31	
February	5,661	NE.	36	17	4	26	0	1	0	27	15	8	3	5	14	9	2	5	0	0	11	25	
March	6,564	NE.	36	20	2	37	0	0	1	25	12	15	1	4	16	11	2	13	0	0	8	28	
April	7,589	NE.	38	9	5	52	5	0	0	8	4	14	2	12	10	8	7	2	1	4	1	9	
May	6,233	NE.	32	10	4	51	3	3	0	14	6	4	8	11	14	6	11	0	2	1	0	2	Last frost.
June	4,671	NE.	35	18	3	42	2	2	0	6	12	15	9	15	5	10	14	0	3	1	0	0	

Location of office on June 30, 1882, corner Lake avenue and Superior street.

NORMAN B. CONGER,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

EAGLE PASS, TEX.

[Latitude, 28° 44′; longitude west of Greenwich, 100° 29′. Elevation of barometer above sea-level, 780 feet. Elevation of rain-gauge (top) above ground, 2 feet. Elevation of exposed thermometer above ground, 6 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.008	29.968	29.958	29.978	30.105	29.851	78.6	99.6	88.3	88.8	112.0	73.0	71.9	33.7	47.7	51.1	2	4	1	2	1.74	.81	17
August	29.997	29.951	29.961	29.970	30.105	29.851	78.0	98.5	86.5	87.7	108.1	72.1	76.7	37.0	53.0	55.6	3	5	1	3	1.64	.72	9
September	30.014	29.967	29.986	29.989	30.174	29.762	72.9	93.5	80.1	82.2	103.5	59.0	82.7	39.5	61.1	61.1	4	4	3	4	4.99	2.87	11
October	30.104	30.072	30.099	30.092	30.252	29.766	68.4	80.2	71.6	73.4	91.0	53.0	90.1	64.6	82.0	78.9	6	8	5	6	6.54	3.18	1
November	30.202	30.172	30.210	30.195	30.667	29.757	51.6	66.0	56.3	58.0	82.7	35.0	83.6	57.2	77.8	72.9	6	5	3	5	1.57	1.36	5
December	30.253	30.228	30.257	30.246	30.639	29.877	48.5	61.8	53.2	54.5	78.4	28.1	87.0	61.9	78.6	75.8	5	5	5	5	.72	.47	18
Year 1881	30.038	29.991	30.011	30.014	.....	.....	61.8	80.4	69.6	70.6	.....	.....	78.9	44.3	62.7	62.0	3.7	4.1	3.0	3.6	28.04	.....	.....
1882.																							
January	30.152	30.124	30.153	30.143	30.586	29.897	48.9	60.0	54.1	54.3	76.5	30.1	90.2	67.7	80.6	79.5	7.3	8.2	7.8	7.8	1.39	.74	14
February	30.131	30.112	30.125	30.123	30.421	29.732	54.7	69.2	60.2	61.4	87.4	40.0	85.8	53.9	74.1	71.3	5.5	5.1	3.6	4.7	1.60	1.21	3
March	30.102	30.089	30.101	30.097	30.615	29.733	57.8	73.8	64.1	65.2	90.4	30.6	86.6	53.7	73.6	71.3	6.7	5.8	4.4	5.6	.77	.39	7
April	29.974	29.947	29.946	29.956	30.353	29.563	64.0	85.3	72.6	74.0	102.6	40.0	77.3	35.7	56.4	56.5	6.2	4.1	3.1	4.5	1.25	.76	29, 30
May	29.936	29.910	29.906	29.917	30.212	29.380	68.8	87.5	75.9	77.4	104.5	57.4	79.4	44.2	63.9	62.5	6.5	5.6	5.4	5.8	4.98	1.32	16
June	29.959	29.924	29.917	29.933	30.165	29.731	75.2	97.0	83.9	85.4	110.2	66.0	82.8	39.2	59.8	60.6	5.1	4.5	2.6	4.1	1.02	.57	5

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.26 a. m., 1.26 p. m., and 9.26 p. m., local time.

FRED. BELFORD,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

EAGLE PASS, TEX.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	5,431	NE.	32	16	0	0	2	82	4	0	0	2	3	22	6	3	3	0	2	0	0	0	Comet visible in northern sky through the month.
August	4,995	SE.	25	1	0	2	4	65	15	1	0	1	5	18	11	2	6	0	2	0	0	0	Comet visible on 1st; another comet from 19th to 31st.
September	5,193	SE. E.	21	5 7	1	3	2	53	15	2	0	9	5	14	11	5	5	0	5	0	0	0	Comet visble on 1st.
October	3,862	E. NE.	16	8 18	5	14	4	45	4	2	0	12	7	8	10	13	13	0	2	0	0	0	Solar halo on 5th.
November	3,421	NW.	28	8	5	15	1	26	4	4	2	20	13	12	12	6	3	0	0	0	0	0	First light frost of season on 25th; solar halos, 2d, 3d, and 13th.
December	2,833	NW.	27	20	5	7	1	28	4	7	3	23	15	10	9	12	7	0	1	0	0	1	First heavy frost of season on 15th; thunder-storm on 19th.
Year 1881	54,779	.....	.....	.....	67	69	27	578	91	34	15	126	88	177	115	73	59	0	22	0	0	14	
1882.																							
January	3,421	NW.	30	16	5	16	1	39	1	1	1	21	8	5	3	23	12	0	0	0	0	1	Ice formed on 17th.
February	4,384	NW.	42	8	1	11	1	38	3	2	0	16	12	8	14	6	3	0	1	0	0	0	
March	4,027	NW.	24	27	5	11	1	53	3	5	0	9	6	8	14	9	6	0	0	0	0	1	Frost on 9th and 10th.
April	5,474	NW.	28	22	3	15	1	48	4	3	0	8	8	9	15	6	3	0	0	0	0	0	
May	5,442	SE. NW.	30	7 20	0	8	8	55	8	6	0	4	4	6	14	11	7	0	10	0	0	0	
June	5,318	S.	20	27	0	2	1	69	10	2	0	2	4	15	9	6	4	0	3	0	0	0	

Location of office on June 30, 1882, corner of Jefferson and Ford streets.

FRED. BELFORD,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

EAGLE ROCK, IDAHO.

[Latitude, 43° 32′; longitude west of Greenwich, 111° 55′. Elevation of barometer above sea-level, 4,650 feet. Elevation of rain-gauge (top) above ground, 1 foot. Elevation of exposed thermometer above ground, 13 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.000	29.980	29.960	29.980	30.224	29.679	53.1	81.5	68.5	67.7	96	35	50.4	28.2	31.2	36.6	2.7	4.1	4.0	3.6	1.21	1.16	19
August	30.022	30.003	29.978	30.001	30.145	29.786	48.4	79.5	65.5	64.5	101	35	42.0	26.3	27.4	31.9	3.0	3.5	3.4	3.3	.95	.35	9
September	30.104	30.059	30.051	30.071	30.392	29.808	39.0	65.5	53.1	52.5	86	17	51.0	27.3	32.4	36.9	5.1	4.1	3.4	4.2	.00	1.02	0
October	30.258	30.219	30.231	30.236	30.457	29.916	28.2	52.1	39.6	40.0	78	9	74.4	48.9	54.3	59.2	3.7	5.1	2.4	3.7	1.71	1.02	31
November	39.454	30.424	30.432	30.437	30.743	30.016	17.1	33.5	24.2	24.9	52	— 1	79.8	61.5	74.7	72.0	4.3	5.6	3.4	4.4	1.91	.70	29
December	30.520	30.491	30.496	30.502	30.863	30.012	13.8	28.7	21.8	21.4	40	—10	78.9	65.2	75.5	73.2	3.1	5.0	3.4	3.8	.80	.32	5
Year 1881	30.085	30.041	30.034	30.053	.....	.....	31.7	53.0	42.4	42.4	.....	.....	61.8	44.9	51.5	52.7	3.8	3.8	3.2	3.6	21.31	.....	.....
1882.																							
January	30.227	30.189	30.213	30.210	30.531	29.788	2.0	18.0	9.5	9.9	39	—30	75.5	67.1	75.2	72.6	6.0	6.8	3.0	5.3	4.41	.71	10
February	30.183	30.161	30.164	30.169	30.516	29.677	5.9	22.7	15.7	14.8	43	—29	78.1	66.3	75.4	73.3	6.0	6.7	4.1	5 6	1.25	.91	17
March	30.177	30.159	30.153	30.163	30.575	29.715	16.0	32.5	23.3	23.9	59	—16	77.8	68.4	75.9	74.0	4.5	4.4	3.5	4.1	3.45	1.88	3
April	29.945	29.893	29.904	29.914	30.327	29.552	32.3	49.4	39.7	40.5	67	21	80.2	50.6	70.9	67.2	4.5	5.3	4.5	4.8	3.35	.84	6
May	29.922	29.884	29.881	29.896	30.156	29.668	38.7	62.3	49.5	50.2	80	24	67.3	32.3	50.1	49.9	2.6	4.5	2.5	3.2	.30	.22	28
June	29.826	29.787	29.790	29.801	29.975	29.548	46.9	74.8	60.4	60.7	88	34	61.2	28.2	45.9	45.1	1.3	3.4	1.5	2.1	.52	.30	13

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.40 a. m., 12.40 p. m., and 8.40 p. m., local time.

J. M. CLIFFORD.
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

EAGLE ROCK, IDAHO.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	8,175	SW.	47	7	23	0	0	4	2	45	6	5	8	13	16	2	2	0	0	0	0	0	
August	8,123	SW.	40	26	20	1	1	0	4	51	6	3	7	13	14	3	4	0	0	0	0	0	Ice formed one-eighth inch during night of 31st
September	8,968	SW.	55	24	27	0	0	1	11	42	2	4	3	13	14	3	0	0	0	0	0	3	Killing frost, 6th, 7th, 11th, 26th, and 30th.
October	6,957	SW.	46	30	22	2	0	0	8	45	2	0	14	14	12	5	7	2	0	0	0	19	
November	6,689	SW.	44	6	18	2	0	0	0	43	8	4	15	10	15	5	0	9	0	0	13	28	
December	7,158	SW.	40	11	54	0	0	1	2	26	1	3	6	13	14	4	0	3	0	0	20	30	
Year 1881	89,771	.....	.....	.....	222	22	3	11	73	573	67	27	97	137	159	69	51	37	2	0	57	155	
1882.																							
January	6,249	SW.	36	29	37	1	0	0	4	25	11	4	11	8	11	12	0	12	0	0	27	31	
February	7,414	SW.	38	28	32	1	0	0	2	38	4	0	7	7	10	11	0	6	0	0	17	28	
March	8,609	SW.	46	28	28	0	0	0	1	52	2	0	10	13	11	7	1	8	0	0	11	29	
April	8,702	SW.	55	19	24	2	1	2	2	49	5	2	3	10	12	8	5	6	0	0	0	17	
May	8,088	N.	42	18	24	1	0	0	25	21	15	4	3	13	15	3	3	0	0	0	0	3	Ice one-eight inch, 6th.
June	7,482	S.	34	16	20	0	0	0	44	10	10	1	5	18	12	0	4	0	0	0	0	0	

Location of office on June 30, 1882, building owned by J. C. Anderson.

J. M. CLIFFORD,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

EASTPORT, MAINE.

[Latitude, 44° 54′; longitude west of Greenwich, 66° 59′. Elevation of barometer above sea-level, 61 feet. Elevation of rain-gauge (top) above ground, 58 feet. Elevation of exposed thermometer above ground, 33 feet.]

	Barometer (to sea.)						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.886	29.862	29.874	29.874	30.363	29.395	59.9	64.8	55.9	60.2	77	49	79.7	68.8	86.9	78.5	6	7	6	6.3	3.73	.85	21
August	29.972	29.932	29.947	29.950	30.277	29.449	58.0	64.5	57.2	59.9	82	51	88.1	77.3	88.9	84.8	7	6	6	6.3	3.64	1.61	21
September	30.116	30.062	30.092	30.090	30.544	29.701	55.2	61.0	55.0	57.1	81	41	85.8	73.9	84.1	81.3	6	5	5	5.3	2.80	1.71	12
October	30.075	30.020	30.040	30.045	30.486	29.257	43.7	49.8	44.5	46.0	70	24	79.9	67.3	77.5	75.0	6	6	5	5.7	4.31	2.76	18
November	30.072	30.039	30.056	30.056	30.641	29.053	34.9	39.4	36.7	37.0	56	3	75.0	66.5	75.9	72.5	7	7	6	6.7	3.37	1.46	4
December	30.092	30.034	30.050	30.059	30.605	29.096	30.6	34.2	31.2	32.0	52	Zero.	77.6	73.7	77.7	76.3	8	7	5	6.7	6.25	1.55	1
Year 1882	29.970	29.927	29.950	29.949	.....	.....	40.0	45.9	40.3	42.1	.....	.....	76.9	67.5	80.2	74.8	6.2	5.9	5.2	5.8	55.98	.....	....
1881.																							
January	29.979	29.963	30.007	29.983	30.685	29.124	17.6	23.7	19.7	20.3	43	−14	76.7	68.7	76.2	73.8	6.4	5.9	4.9	5.7	3.70	.50	7
February	30.019	29.999	30.072	30.030	30.647	29.154	20.6	27.3	22.7	23.5	44	−4.5	78.8	66.9	73.9	73.2	5.9	5.8	5.1	5.6	4.94	1.39	17
March	30.011	29.962	29.999	29.991	30.583	29.232	27.0	32.6	28.0	29.2	45	9.5	75.1	68.5	74.6	72.7	5.9	6.2	5.2	5.8	7.54	3.18	2
April	29.966	29.900	29.939	29.935	30.608	29.209	32.7	39.0	33.2	35.0	53	9	72.0	63.9	72.9	69.6	5.2	5.8	4.9	5.3	3.03	1.14	20
May	30.009	29.952	30.001	29.987	30.553	29.528	43.3	50.8	41.9	45.3	65	29	70.6	56.9	76.5	68.0	4.7	5.3	4.7	4.9	3.30	.73	29
June	29.829	29.778	29.809	29.805	30.231	29.490	55.0	62.1	51.5	56.2	79	42.0	73.8	60.2	78.5	70.8	4.8	5.3	3.9	4.7	6.53	2.30	1, 2

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.40 a. m., 3.40 p. m., and 11.40 p. m., local time.

D. C. MURPHY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

EASTPORT, MAINE.

	Wind.				Winds at 7 a.m., 3 and 11 p.m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,902	SE.	30	26	8	5	2	3	47	11	8	9	0	6	13	12	15	0	4	2	0	0	An unusual frequency of fog.
August	5,011	NE.	24	16, 21	7	21	3	1	40	11	4	5	1	2	14	15	11	0	9	1	0	0	Noted for foggy and cool weather.
September	4,193	NW.	20	8	10	18	4	6	23	10	0	16	3	10	7	13	9	0	0	6	0	0	Numerous auroral displays.
October	7,562	E.	40	18	8	2	4	4	16	22	9	27	1	7	12	12	14	1	1	3	0	5	First frost of the season occurred on the 7th.
November	7,887	NW.	36	28	6	4	1	4	13	25	10	27	0	5	11	14	6	5	0	0	1	15	
December	7,424	S.	35	30	12	4	2	2	19	25	14	15	0	5	14	12	11	3	0	3	3	21	
Year 1881	86,814	.....	....	.....	110	120	57	38	256	141	113	243	17	74	139	152	114	30	7	24	45	131	
1882.																							
January	9,386	NW.	45	27	9	3	4	5	13	9	16	33	1	3	21	7	6	11	0	3	14	30	
February	10,314	NE.	60	22	15	9	3	2	8	20	5	22	0	5	14	9	2	12	0	2	12	26	The heaviest gale in past 3 years occurred on 22d.
March	9,794	NE.	38	17	16	12	1	3	20	6	9	26	0	7	15	9	6	10	0	2	8	28	A remarkably grand and brilliant auroral display on the 8th.
April	7,472	E.	41	20	21	3	7	1	14	16	3	25	0	10	8	12	7	6	0	3	0	18	
May	7,533	NE.	36	14, 15	9	17	8	1	27	10	11	9	1	11	11	9	12	0	0	1	0	2	
June	5,062	E.	25	4	8	3	3	1	40	10	8	13	4	10	14	6	14	0	4	3	0	0	Brilliant aurora on the 23d; mean temp. 8° 6 higher than June 1881.

Location of office on June 30, 1882. U. S. Custom-house, corner of Water and Washington streets.

D. C. MURPHY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[Form No. 132—A.]

EL PASO, TEX.

[Latitude, 31° 47′; longitude west of Greenwich, 106° 30′. Elevation of barometer above sea-level, 3,760 feet. Elevation of rain-gauge (top) above ground, 14 feet. Elevation of exposed thermometer above ground, 17 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.903	29.869	29.869	29.880	29.970	29.737	70.5	91.5	78.8	80.3	104.3	60.0	66.3	42.4	60.2	56.3	4.5	4.7	4.6	4.6	8.18	6.50	9
August	29.930	29.891	29.904	29.908	30.027	29.831	70.7	88.4	76.0	78.4	98.3	58.0	79.8	42.7	67.4	63.3	3.1	3.3	3.2	3.2	3.15	.70	24, 25
September	29.972	29.926	29.931	29.943	30.157	29.638	63.0	85.3	70.0	72.8	99.1	48.2	70.7	35.9	59.4	55.3	3.4	3.0	2.3	2.9	1.44	1.23	5
October	30.107	30.045	30.065	30.072	30.303	29.867	55.4	79.0	64.1	66.2	93.1	34.2	69.5	38.9	65.4	57.9	4.1	3.6	2.8	3.5	1.45	.57	20
November	30.255	30.183	30.211	30.216	30.537	29.829	36.3	58.6	46.2	47.0	76.1	21.4	69.7	33.8	50.6	51.4	3.7	3.0	2.3	3.0	.50	.46	10
December	30.324	30.263	30.292	30.293	30.581	29.993	35.0	57.1	43.6	45.2	74.8	17.7	67.2	41.7	59.3	56.1	2.9	3.6	2.2	2.9	.78	.62	18
Year 1881	30.045	29.995	30.008	30.016	.....	.....	51.8	74.9	61.9	62.9	.....	.....	69.3	37.6	58.7	55.2	3.7	3.4	3.4	3.5	18.17	.....	.....
1882.																							
January	30.164	30.106	30.129	30.133	30.508	29.897	35.1	53.3	43.7	44.0	68.2	20.2	62.4	40.6	59.7	54.2	4.0	4.4	3.1	3.8	.64	.42	29
February	30.183	30.157	30.179	30.173	30.339	29.883	37.8	56.2	47.3	47.1	71.0	21.0	75.7	46.3	59.6	60.5	2.5	4.6	2.4	3.2	.78	.37	15
March	30.084	30.065	30.073	30.074	30.351	29.828	43.3	67.0	55.4	55.2	88.0	26.0	56.1	28.1	38.6	40.9	2.0	3.3	2.0	2.4	.38	.21	25
April	29.957	29.919	29.921	29.932	30.166	29.681	49.1	75.2	60.7	61.7	94.0	29.0	46.1	20.0	33.3	33.1	1.9	2.0	1.3	1.7	.00	.00	0
May	29.839	29.799	29.786	29.808	29.993	29.504	55.3	83.8	70.2	69.8	99.0	42.0	52.7	17.9	27.6	32.7	0.7	2.0	1.4	1.4	.10	.10	8
June	29.817	29.783	29.768	29.789	29.981	29.633	65.8	93.3	77.8	79.0	110.0	52.0	52.3	21.0	37.8	37.0	2.4	2.8	4.0	3.3	.43	.14	7

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.02 a. m., 1.02 p. m., and 9.02 p. m., local time.

JAS. F. MARSHALL,
Manager.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

EL PASO, TEX.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	3,142	N.	24	9	8	23	30	26	5	4	10	32	17	5	23	3	9	0	0	0	0	0	
August	2,568	E.	17	28	4	17	17	11	6	1	5	19	13	16	12	3	15	0	0	0	0	0	
September	2,834	NW. NE.	14	5 10	7	12	7	8	2	6	12	16	20	19	7	4	5	0	0	0	0	0	First frost, 7th.
October	3,109	W.	20	27	5	23	14	9	1	8	3	20	10	13	18	0	10	0	0	0	0	0	
November	4,536	NE.	30	19	1	17	13	2	0	3	13	27	14	19	9	2	2	0	0	0	0	14	First killing frost, 11th; first snow, 10th.
December	3,762	W.	20	27	6	7	6	3	1	3	21	29	17	19	11	1	3	0	0	0	0	17	
Year 1881	43,793	.....	....	.....	116	189	160	143	47	67	230	469	185	208	137	20	63	0	0	0	0	78	
1882.																							
January	4,303	SW. W.	21	25 30	4	12	10	7	2	10	24	15	9	15	12	4	4	0	0	0	0	15	
February	4,298	W.	36	27	1	1	11	0	3	9	34	9	16	16	7	5	5	0	0	0	0	9	
March	5,791	W. NW.	36	26	2	7	16	1	1	6	28	28	4	21	6	4	4	0	0	0	0	5	
April	6,437	W.	34	21	2	6	16	1	2	7	27	28	1	23	5	2	0	0	0	1	0	1	Aurora, 16th.
May	5,811	W.	32	7	5	8	9	3	1	8	21	35	3	27	3	1	1	0	0	0	0	0	
June	4,323	E. SW.	22	18 19	2	21	6	5	4	9	10	27	6	16	13	1	7	0	0	0	0	0	

Location of office on June 30, 1882, north side of San Francisco street.

JAS. F. MARSHALL,
Manager.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

ERIE, PA.

(Latitude, 42° 7′; longitude west of Greenwich, 80° 5′. Elevation of barometer above sea-level, 681 feet. Elevation of rain-gauge (top) above ground, 59 feet. Elevation of exposed thermometer above ground, 32 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	8 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.953	29.927	29.940	29.940	30.222	29.703	70.3	76.5	71.8	72.9	92	60	76.5	64.2	74.6	71.8	4.0	3.1	2.8	3.5	1.39	.60	16
August	30.055	30.026	30.028	30.036	30.279	29.705	69.2	77.6	70.9	72.6	93	57	70.0	57.0	69.2	65.4	3.7	2.3	2.3	2.8	1.02	.70	10
September	30.058	30.024	30.028	30.037	30.258	29.796	68.8	75.7	70.7	71.7	92	53	77.2	65.9	72.2	71.8	4.8	5.0	3.0	4.3	1.35	.39	17
October	30.148	30.120	30.139	30.136	30.515	29.631	54.7	61.4	56.5	57.6	81	36	78.4	64.5	75.0	72.6	7.6	6.8	5.9	6.8	5.75	1.56	15
November	30.154	30.121	30.132	30.136	30.646	29.579	40.3	46.5	42.5	43.1	72	17	79.9	67.2	74.1	73.7	8.6	8.4	7.3	8.1	5.46	1.35	18
December	30.147	30.136	30.157	30.147	30.612	29.592	37.7	40.9	38.7	39.1	61	19	82.3	75.1	77.1	78.2	7.9	8.0	6.6	7.5	6.44	1.26	23
Year 1881	30.041	30.014	30.025	30.027	.....	.....	47.3	53.5	49.3	50.0	.....	.....	78.7	67.8	76.2	74.2	6.3	5.6	4.8	5.6	37.62	.....	.....
1882.																							
January	30.145	30.132	30.137	30.138	30.775	29.559	27.3	31.5	29.6	29.5	59	−2	82.2	77.7	78.8	79.6	9.0	8.7	7.5	8.4	4.00	1.26	26
February	30.121	30.088	30.097	30.102	30.659	29.373	34.4	38.6	36.5	36.5	57	20	80.9	73.7	78.2	77.6	6.9	6.6	5.4	6.3	3.12	1.12	21
March	30.096	30.078	30.097	30.090	30.684	29.403	35.3	39.5	38.0	37.6	65	21	81.4	72.8	76.4	76.9	8.1	6.4	5.8	6.8	4.27	.98	9
April	30.053	30.027	30.052	30.044	30.389	29.275	42.4	48.7	42.6	43.9	74	21	73.9	67.3	74.1	71.8	6.1	5.4	4.6	5.4	3.31	.81	19
May	30.018	29.978	29.975	29.990	30.349	29.519	49.3	54.0	50.5	51.3	75	32	73.9	66.8	74.5	71.7	4.4	4.8	4.2	4.5	5.63	.92	22
June	29.918	29.896	29.894	29.903	30.202	29.543	63.2	68.9	63.1	65.1	89	45	73.0	60.5	76.1	69.9	4.9	5.1	3.4	4.5	3.43	.67	30

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.47 a. m., 2.47 p. m., and 10.47 p. m., local time.

PETER WOOD,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

ERIE, PA.

	Wind.				Winds at 7 a. m., 3 and 11 p.m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroræ.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	5,959	W.	24	25	9	13	3	3	12	14	24	15	0	14	13	4	8	0	1	0	0	0	
August	5,109	NW. W.NE.	20	6 12 14	9	16	3	15	21	8	10	8	3	17	11	3	6	0	1	0	0	0	
September	5,753	SE.	37	16	7	6	2	7	26	15	11	10	6	11	13	6	9	0	1	1	0	0	
October	5,675	S.	29	12	9	10	3	7	19	13	9	11	12	5	12	14	18	0	0	1	0	0	Frost, 6th, 11th, and 27th.
November	10,538	W.	44	14 15	3	3	2	8	29	17	14	11	3	1	9	20	11	7	0	0	1	8	
December	8,175	NW.	40	7	6	6	0	2	27	20	9	15	8	4	9	18	15	2	0	1	1	12	
Year 1881	81,404	.....	....	.....	65	172	29	71	206	193	207	119	33	102	134	129	117	59	5	3	39	106	
1882.																							
January	8,908	W.	43	27	5	5	3	6	20	17	14	17	6	2	8	21	8	11	0	0	9	22	
February	7,631	SE.	40	28	6	6	0	6	21	15	16	10	4	5	11	12	10	3	0	0	2	17	
March	8,950	SE.	37	18	9	6	4	5	18	12	15	19	5	6	8	17	14	5	2	0	0	17	
April	7,603	W.	36	20	2	25	2	3	7	11	17	12	11	5	16	9	11	2	0	2	1	3	
May	5,566	NE.	27	5	4	29	5	2	15	11	11	6	10	10	14	7	15	0	0	0	0	0	
June	5,567	S.	29	30	5	9	2	6	16	20	11	5	16	7	19	4	18	0	3	0	0	0	Effects of tidal wave felt, 23d.

Location of office on June 30, 1882, Fifth and State streets.

PETER WOOD,
Private, Signal Corps, U.S.A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

ESCANABA, MICH.

[Latitude, 45° 48′; longitude west of Greenwich, 87° 15′. Elevation of barometer above sea-level, 608 feet. Elevation of rain-gauge (top) above ground, 38 feet. Elevation of exposed thermometer above ground, 25 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.984	29.949	29.949	29.961	30.269	29.626	65.5	75.8	68.4	69.9	90	53	73.0	56.4	71.4	67.9	3.0	3.3	3.4	3.2	1.10	.41	24
August	30.025	29.982	29.991	29.999	30.265	29.619	63.6	71.8	65.4	66.9	85	42	83.9	69.3	82.9	78.7	4.4	5.6	4.8	5.0	6.87	1.55	2
September	29.929	29.909	29.913	29.917	30.252	29.405	56.6	63.5	58.1	59.4	79	43	88.0	73.3	85.0	82.1	7.5	7.7	6.0	7.1	9.48	1.97	26
October	30.087	30.063	30.072	30.075	30.547	29.475	42.3	49.6	44.6	45.5	70	25	86.3	70.4	80.4	79.0	6.6	6.1	6.2	6.3	6.13	1.80	11
November	30.001	29.973	30.003	29.992	30.656	29.284	30.6	33.9	31.4	32.0	52	9	87.4	77.9	81.5	82.2	8.4	8.0	7.7	8.0	3.72	1.18	2
December	30.070	30.033	30.054	30.052	30.551	29.382	26.4	31.7	28.4	28.8	43	4	85.4	78.4	83.1	82.3	6.4	6.9	4.9	6.0	1.53	.45	21
Year 1881	30.034	29.996	30.014	30.015	.....	.....	37.3	46.2	39.8	41.1	.....	.....	82.4	68.8	79.4	76.9	5.5	5.8	4.8	5.4	48.49	.....	.....
1882.																							
January	30.101	30.055	30.091	30.082	30.771	29.582	15.4	23.0	18.4	18.9	42	−10	83.5	74.8	81.7	80.0	6.0	7.2	6.3	6.5	2.60	.62	13
February	30.025	29.980	30.017	30.007	30.775	29.441	23.2	30.8	26.2	26.8	43	2	82.1	76.5	81.7	80.1	6.7	8.3	6.3	7.1	2.30	1.05	21
March	30.073	30.054	30.081	30.069	30.704	29.428	25.0	32.1	27.2	28.1	47	6	83.0	72.5	79.7	78.4	7.5	7.8	5.8	7.0	2.73	.90	21
April	30.109	30.076	30.074	30.086	30.375	29.331	33.5	41.2	35.1	36.6	58	18	76.0	59.8	71.1	69.0	6.2	5.6	4.6	5.5	1.30	.34	6
May	30.035	30.007	30.010	30.017	30.318	29.603	43.8	52.0	43.9	46.6	61	20	72.3	54.6	69.8	65.6	5.9	5.8	4.0	5.2	4.94	1.05	30
June	29.884	29.847	29.865	29.865	30.189	29.291	56.0	65.8	56.7	59.5	85.5	37	76.0	56.6	73.6	68.7	5.2	5.8	4.3	5.1	6.15	2.02	18

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.20 a. m., 2.29 p. m., and 10.20 p. m., local time.

CHARLES DILL,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

ESCANABA, MICH.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	5,195	N.	20	5	20	6	1	8	25	4	9	8	12	15	14	2	3	0	0	0	0	0	First light frost, August 15th.
August	4,875	S.	25	30	29	0	1	11	30	5	3	2	12	10	11	10	11	0	3	0	0	0	
September	5,561	S.	29	29	16	8	6	16	23	8	8	3	2	3	12	15	17	0	2	3	0	0	First heavy frost, October 5th.
October	5,817	N.	31	17	18	2	4	8	19	14	9	15	4	6	12	13	13	0	1	2	0	5	
November	7,896	E. / S.	27 / 27	12 / 22	12	3	4	6	20	14	16	15	0	0	14	16	5	11	0	1	5	22	Last heavy frost, May 2d.
December	6,936	NW.	36	6 & 7	14	4	1	2	27	15	14	15	1	4	18	9	3	9	0	2	5	26	
Year 1881	71,899	.....	....	.....	305	49	42	98	262	75	89	106	66	93	150	120	89	52	12	13	72	167	Last light frost, May 16th.
1882.																							
January	6,348	N.	26	26	11	4	3	6	24	12	19	14	0	4	15	12	1	14	0	0	22	31	
February	6,252	NE.	29	21	10	4	3	10	23	5	13	15	1	3	9	16	1	10	0	0	9	24	
March	7,052	NE.	32	21	25	9	10	7	16	3	9	9	5	2	14	15	4	16	1	0	9	29	
April	7,535	N.	41	4	33	9	7	3	14	3	2	15	4	6	14	10	7	1	2	3	2	19	
May	7,307	N.	37	31	26	10	10	9	15	3	4	6	10	9	12	10	14	1	1	1	0	4	
June	5,486	N.	34	4	26	3	4	10	12	2	4	11	18	7	18	5	11	0	5	0	0	0	

Location of office on June 30, 1882, S. Adler's building, corner of Ludington and Dousman streets.

CHARLES DILL,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

FLORENCE, ARIZ.

[Latitude, 33° 3′; longitude west of Greenwich, 111° 19′. Elevation of barometer above sea-level, 1,480 feet. Elevation of rain-gauge (top) above ground, 4 feet. Elevation of exposed thermometer above ground, 5 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.009	29.959	29.949	29.972	30.126	29.846	76.9	100.8	86.2	87.9	112.0	64.0	47.4	30.7	51.1	43.1	2.6	2.5	2.0	2.4	2.25	1.16	19, 20
August	29.996	29.967	29.940	29.968	30.088	29.831	76.4	94.7	82.5	84.5	110.0	62	69.3	44.2	68.6	60.7	3.7	3.2	2.9	3.3	4.28	1.27	13
September	29.978	29.935	29.909	29.941	30.171	29.709	66.1	91.4	75.0	77.5	103.9	50.2	66.7	30.8	53.1	50.0	1.8	2.1	1.7	1.9	1.00	.69	12
October	30.029	29.992	29.989	30.003	30.207	29.885	55.9	82.2	64.0	67.4	98.4	36.7	68.4	32.8	54.2	51.8	3.2	3.2	1.8	2.7	1.13	.70	5
November	30.118	30.075	30.093	30.095	30.292	29.824	40.6	68.5	48.2	52.4	80.3	26.8	67.6	26.5	54.9	49.7	1.0	2.6	0.8	1.5	.34	.33	9, 10
December	30.181	30.146	30.160	30.163	30.366	29.935	41.5	66.7	48.5	52.2	81.6	28.8	65.2	30.2	54.5	50.0	4.1	4.4	2.6	3.7	.14	.13	17, 18
Year 1881	30.051	29.998	29.996	30.015	.....	.....	54.8	81.7	64.2	66.9	.....	.....	57.4	29.9	50.2	45.9	2.3	2.8	1.6	2.2	12.14	.....	.....
1882.																							
January	30.074	30.056	30.060	30.063	30.311	29.698	36.1	57.5	43.6	46.4	79.4	23.7	77.5	45.0	70.2	64.2	4.5	5.5	4.0	4.7	2.28	1.16	13, 14
February	30.126	30.131	30.124	30.127	30.355	29.868	41.0	59.8	47.6	49.5	72.7	27.2	83.4	43.7	72.1	66.4	5.2	5.8	3.3	4.8	1.11	.38	15
March	30.079	30.062	30.049	30.063	30.226	29.797	44.3	71.9	55.7	57.3	92.0	25.7	59.1	19.4	39.9	39.5	2.8	3.2	2.0	2.7	(*)	(*)	18, 24, 25
April	29.918	29.888	29.876	29.894	30.060	29.709	47.4	78.0	60.8	62.1	100.6	32.5	53.2	19.3	34.9	35.8	1.2	2.0	1.4	1.5	(*)	(*)	12, 13
May	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
June	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

Station discontinued April 30, 1882.

* Precipitation inappreciable.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.43 a. m., 12.43 p. m., and 8.43 p. m., local time.

R. R. HERMAN,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

FLORENCE, ARIZ.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	2,351	E.	12	8	1	3	18	1	3	16	26	1	24	21	8	2	5	0	3	0	0	0	
August	1,729	SW.	10	10	0	1	15	2	2	10	24	1	38	15	13	3	10	0	4	0	0	0	
September	2,021	E.	16	8	10	5	14	3	10	7	28	2	11	23	2	5	2	0	0	0	0	0	
October	1,778	E.	20	9	3	10	9	6	2	13	29	4	17	18	9	4	4	0	0	0	0	0	October 16, first light frost of the season.
November	2,934	NE.	28	20 24	7	29	7	4	5	13	12	6	7	24	6	0	2	0	0	0	0	6	November 11, first killing frost of the season.
December	2,939	E.	29	15	7	22	15	3	7	4	9	15	11	12	17	2	2	0	0	0	0	8	
Year 1881	26,037				55	191	105	31	46	134	238	48	247	248	89	28	36	0	7	0	0	38	
1882.																							
January	2,177	S.	23	13	6	11	7	7	7	16	23	8	8	11	13	7	8	0	0	0	0	12	
February	2,379	S.	30	17	3	20	9	8	6	8	10	14	6	7	19	2	9	0	0	0	0	5	
March	2,848	NE.	27	22	3	10	5	4	5	24	24	14	4	19	7	5	0	0	0	0	0	5	
April	2,947	SW.	28	16	7	10	2	2	2	32	23	3	9	24	5	1	0	0	1	0	0	0	April 18, frost injuring vegetation.
May																							
June																							

Location of office on April 30, 1882, Drake's Block, Main street.

R. R. HERMAN,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 129—A.]

FORT APACHE, ARIZ.

[Latitude, 33° 48′; longitude west of Greenwich, 109° 57′. Elevation of barometer above sea-level, 5,050 feet. Elevation of rain-gauge (top) above ground, 1 foot. Elevation of exposed thermometer above ground, 5 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.865	29.820	29.837	29.841	29.984	29.726	61.9	84.1	71.9	72.6	102.5	55	78.4	46.5	67.7	64.1	4.7	6.6	5.0	5.5	5.63	1.24	20
August	29.908	29.868	29.890	29.889	30.021	29.770	59.5	77.9	67.4	68.3	89.5	48	87.5	61.6	84.8	77.9	5.5	6.5	4.8	5.6	8.31	1.19	1
September	*29.930	†29.901	†29.919	‡29.917	30.093	29.626	*47.8	†76.0	†58.9	‡60.9	87.0	38	*83.5	†38.9	†74.2	64.9	*1.9	†2.7	†1.6	‡1.4	5.41	2.62	11
October	30.084	30.041	30.067	30.064	30.241	29.851	42.1	67.1	51.8	53.7	83.0	26	83.5	49.9	75.3	69.6	2.8	4.4	1.9	1.6	4.68	1.18	4
November	30.198	30.134	30.193	30.175	30.467	29.834	23.5	53.8	34.7	37.4	68.0	13	64.0	41.6	70.4	58.7	2.0	1.0	1.0	1.3	.85	.82	10
December	30.301	30.241	30.281	30.274	30.558	29.974	26.1	52.6	36.3	38.3	70.0	13	67.3	45.9	67.3	60.2	3.1	3.9	2.9	3.3	.54	.42	18
Year 1881	30.196	30.155	30.183	30,178	.....	.....	39.3	66.9	51.2	52.4	.....	.....	66.9	35.7	58.0	53.4	2.8	4.2	2.7	3.2	31.12	.....	.....
1882.																							
January	30.114	30.063	30.097	30.091	30.340	29.851	25.3	44.6	33.6	34.5	67.0	Zero.	70.5	57.7	72.0	66.7	5.2	4.3	3.0	4.2	2.82	.73	15
February	30.158	30.110	30.143	30.137	30.330	29.865	27.6	47.6	37.2	37.5	62.0	11	67.6	53.0	70.4	63.7	4.9	5.4	3.4	4.6	2.85	.55	1, 2
March	30.080	30.019	30.049	30.049	30.263	29.816	30.7	58.7	42.6	44.0	78.0	13	67.9	35.9	62.1	55.3	2.4	3.6	2.2	2.7	1.09	.66	26
April	29.920	29.854	29.866	29.880	30.007	29.650	32.7	65.3	47.7	48.6	86.0	21	69.1	29.4	54.8	51.1	2.0	3.2	1.9	2.4	.91	.52	13
May	29.796	29.760	29.770	29.775	29.911	29.471	39.3	73.2	55.0	55.8	85.0	32	60.9	31.3	50.7	47.6	1.7	3.1	1.4	2.1	.94	.69	6
June	29.765	29.745	29.746	29.752	29.858	29.562	48.5	81.6	64.4	64.8	95.0	36	58.8	32.8	57.8	49.8	2.6	5.1	2.7	3.5	3.27	1.73	28, 29

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.49 a. m., 12.49 p. m., and 8.49 p. m., local time.

* Six observations missed. † Four observations missed. ‡ For 23 days only.

WILL. C. BARNES,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

FORT APACHE, ARIZ.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,718	E.	32	{1 3	1	6	44	5	6	18	9	1	3	8	14	9	21	0	4	0	0	0	
August	3,400	S.	36	7	0	16	32	4	9	11	11	0	10	7	16	8	18	0	6	0	0	0	
September	*3,784	SW.	28	28	1	3	41	2	2	12	13	0	2	14	8	2	7	0	1	0	0	0	First frost, light, on 24th.
October	4,336	SW.	26	23	2	19	35	2	9	18	7	0	1	18	9	4	8	0	3	0	0	6	First heavy frost on 15th.
November	3,405	SW.	32	17	0	51	4	2	5	15	9	1	3	24	5	1	0	2	0	0	0	30	
December	3,759	SW.	30	12	3	45	6	5	6	17	10	0	1	13	14	4	2	1	0	0	0	27	
Year 1881	55,320				42	297	296	37	56	193	119	8	33	183	127	50	65	28	18	0	0	142	
1882.																							
January	4,342	SW.	26	11	1	17	22	8	8	18	15	1	3	13	9	9	3	8	0	0	0	28	
February	4,400	W.	36	17	2	32	6	3	3	19	15	1	3	11	10	7	6	7	0	0	0	21	
March	5,656	SW.	36	3	0	45	8	5	5	22	6	1	1	23	3	5	4	0	0	0	0	23	
April	6,160	SW.	42	6	0	26	25	1	1	19	16	1	1	19	10	1	5	0	1	1	0	15	April 16th, aurora.
May	5,735	SW.	28	25	0	32	28	1	0	11	20	0	1	21	8	2	3	0	0	0	0	0	
June	5,045	W.	30	2	0	21	37	1	0	11	16	0	4	17	7	6	8	0	2	0	0	0	

Location of office on June 30, 1882, northeast part of garrison.

*For 28 days only.

WILL. C. BARNES,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

FORT ASSINNIBOINE, MONT.

[Latitude, 48° 32 ; longitude west of Greenwich, 109° 42′. Elevation of barometer above sea-level, 2,710 feet. Elevation of rain-gauge (top) above ground, 21 feet. Elevation of exposed thermometer above ground, 5 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.834	29.816	29.821	29.824	30.111	29.587	59.2	75.2	66.7	67.0	94	35	63.0	40.9	57.2	53.7	1.6	3.6	4.3	3.2	3.45	1.85	20
August	29.864	29.838	29.840	29.847	30.133	29.485	54.0	75.5	63.9	64.5	95	37	61.3	32.8	49.1	47.8	3.2	2.6	2.6	2.8	1.45	1.08	30
September	29.926	29.897	29.925	29.916	30.348	29.435	43.2	59.1	49.8	50.7	79	31	75.2	43.8	61.4	60.1	4.7	5.3	4.2	4.7	1.64	.89	1
October	30.168	30.166	30.180	30.171	30.613	29.744	26.2	34.4	30.1	30.2	58	—16	79.8	73.7	77.9	77.1	5.1	6.2	5.9	5.7	.75	.21	1
November	30.197	30.196	30.183	30.192	30.779	29.558	25.8	31.2	26.9	28.0	53	—18	70.1	65.5	68.5	68.0	6.1	7.7	6.5	6.7	.60	.32	8
December	30.142	30.127	30.130	30.133	30.693	29.448	27.8	36.6	29.6	31.3	56	— 3	55.1	48.4	54.0	52.5	4.2	5.9	4.8	5.0	.08	.04	1, 8
Year 1881																							
1882.																							
January	30.111	30.112	30.125	30.116	30.567	29.551	14.9	21.5	16.0	17.5	46	—28	58.4	54.1	55.9	56.1	5.8	5.5	4.9	5.4	.20	.05	7
February	30.073	30.072	30.056	30.067	30.735	29.593	19.9	29.4	24.0	24.4	56	—30	55.6	50.0	55.2	53.6	4.6	4.9	4.1	4.5	.24	.08	28
March	30.148	30.153	30.161	30.154	30.675	29.561	21.1	32.2	25.7	26.3	67	—13	58.0	50.0	57.5	55.2	6.3	5.6	5.7	5.9	.55	.14	28, 29
April	30.032	30.016	30.025	30.024	30.581	26 511	33.6	48.6	40.7	41.0	72	24	71.3	47.1	64.5	61.0	6.5	5.9	4.8	5.7	2.68	1.67	25
May	29.972	29.953	29.956	29.960	30.331	29.746	42.7	60.3	51.2	51.4	76	29	75.3	42.1	64.2	60.5	3.6	6.3	4.2	4.7	1.35	.61	15
June	29.887	29.873	29.871	29.877	30.181	29.584	53.5	72.1	61.9	62.5	86	40	73.2	38.5	59.6	57.1	3.6	5.5	4.4	4.5	1.06	.84	13

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.49 a. m., 12.49 p. m., and 8.49 p. m., local time.

B. O. LENOIR,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

FORT ASSINNIBOINE, MONT.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,440	SW.	38	29	1	20	5	6	3	17	6	4	13	8	16	1	6	0	0	0	0	0	
August	7,210	SW.	48	10	3	14	7	12	13	26	8	8	2	18	11	2	7	0	0	0	0	0	Brilliant meteor 11th.
September	6,696	W.	50	24	3	12	4	9	9	29	18	1	5	9	13	8	4	1	0	0	0	2	Solar halo 17th; lunar halo 2d, 3d, 10th; frost 5th, 6th, 30th.
October	5,918	SW.	39	30	5	18	1	4	4	36	6	2	17	7	11	13	3	6	0	0	10	22	Lunar halo 6th.
November	7,479	SW.	38	6	2	7	0	0	1	48	14	4	14	2	14	14	1	9	0	3	7	21	Auroras 23d, 26th, 27th; mock sun 16th.
December	9,661	SW.	50	26	2	5	1	0	1	68	5	0	11	7	18	6	0	2	0	7	5	28	Auroras 11th, 12th, 19th, 20th, 22d, 23d, 24th.
Year 1881																							
1882.																							
January	8,040	SW.	48	14, 17	3	11	0	1	5	50	12	1	10	8	15	8	0	11	0	2	18	31	Auroras 14th, 19th; mock suns 23d, 26th.
February	9,446	SW.	48	2	2	9	2	1	4	54	5	5	2	7	16	5	0	7	0	2	7	25	Auroras 20th.
March	8,768	W.	56	28	4	23	2	3	4	32	13	7	5	6	13	12	3	10	0	0	10	29	Mock suns 13th; aerolite 8th.
April	7,817	W.	36	25	3	31	8	2	12	20	9	3	2	6	13	11	6	3	0	4	0	13	Auroras 5th, 13th, 16th, 18th; corona 16th; frost 14th.
May	7,224	SW.	36	27	4	14	8	4	13	24	16	7	3	7	19	5	6	1	4	0	0	2	
June	6,107	SW.	39	21	6	12	7	10	5	34	10	4	2	10	14	6	7	0	3	1	0	0	Auroral beams night of 12th.

Location of office on June 30, 1882, rear of post headquarters.

B. O. LENOIR,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

FORT BENNETT, DAK.

(Latitude, 44° 43′; longitude west of Greenwich, 100° 39′. Elevation of barometer above sea-level, 1,510 feet. Elevation of rain-gauge (top) above ground, 17 feet. Elevation of exposed thermometer above ground, 12 feet.)

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.808	29.778	29.772	29.788	30.074	29.356	66.2	82.9	72.8	74.0	101	50	79.3	52.4	70.5	67.4	5.4	4.7	3.7	4.6	1.45	1.43	9
August	29.796	29.776	29.784	29.785	30.183	29.384	64.8	84.5	74.0	74.4	104	49	77.4	44.8	62.7	61.6	5.2	4.4	3.8	4.5	2.24	1.35	29
September	29.858	29.818	29.843	29.840	30.241	29.379	49.7	66.4	55.6	57.2	91	34	84.5	49.5	72.6	68.9	5.3	4.2	3.5	4.3	2.74	.74	6
October	30.125	30.083	30.118	30.109	30.557	29.691	36.1	52.3	43.0	43.8	72	24	84.1	59.2	76.6	73.3	5.1	5.6	4.7	5.1	1.00	.31	5
November	30.082	30.055	30.101	30.079	30.640	29.389	24.1	38.1	29.0	30.4	65	−3	81.8	67.9	74.3	74.7	4.6	6.5	5.6	5.6	.70	.50	11
December	30.093	30.076	30.108	30.092	30.562	29.456	23.2	40.1	29.4	30.9	62	4	80.2	59.7	75.2	71.7	3.9	4.8	2.3	3.7	(*)	(*)	30
Year 1881	.....	.....	.....	.....	.....	.....	36.2	51.8	43.1	43.8	.....	.....	77.9	56.4	71.4	68.6	4.9	4.7	4.1	4.6	19.80	.....	.....
1882.																							
January	30.154	30.114	30.141	30.137	30.738	29.609	10.2	26.7	18.7	18.5	55	−18	76.0	65.5	73.1	71.5	4.1	6.6	3.5	4.7	2.01	.80	13
February	30.088	30.067	30.077	30.077	30.700	29 512	18.9	38.1	29.6	28.9	63	−18	71.3	52.1	64.8	62.7	3.6	5.3	3.3	4.1	.83	.43	17
March	30.111	30.082	30.125	30.106	30.716	29.511	24.5	39.7	31.5	31.9	78	−6	77.2	63.3	73.2	71.2	6.4	5.4	4.3	5.4	1.63	1.00	4
April	30.033	30.002	30.033	30.023	30.443	29.596	37.9	53.3	44.1	45.1	86	27	82.0	55.7	71.9	69.9	6.8	7.8	5.7	6.8	3.04	1.42	8
May	29.411	29.907	29.910	29.919	30.354	29.329	46.5	61.9	53.1	53.8	82	31	81.3	53.2	75.9	70.1	5.6	7.5	5.4	6.2	1.35	.50	4,5
June	29.861	29.840	29.843	29.848	30.287	29.489	58.0	74.4	64.3	65.6	90	33	87.9	56.4	75.7	73.3	5.5	6.4	5.2	5.7	4.06	1.13	28

* Precipitation inappreciable.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.36 a. m., 1.36 p. m., and 9.36 p. m., local time.

A. PRITCHARD,
Corporal, Signal Corps, U. S. A.

Annual metcorological summary—Continued.

[FORM No. 132—B.]

FORT BENNETT, DAK.

	Wind.			Winds at 7 a.m., 3 and 11 p.m., Washington time: Number of times observed blowing from—									Number of days with—								Remarks.
	Total movement.	Maximum velocity.														.01 inch or more of water.		Thunder storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	Rain.	Snow.				
1881.																						
July	4,555	NW.	40	8	1	0	8	23	1	0	3	6	0	6	7	17	3	0	0	0	0	0	
August	7,241	SE.	42	24	16	5	16	31	1	0	2	20	2	7	9	5	6	0	3	0	0	0	
September	6,326	N.	36	16	16	3	8	21	6	1	12	18	5	10	16	4	11	0	1	2	0	0	September, first aurora, 12, 14; halo, 16; frost, 30.
October	4,442	N.	24	11	17	13	4	18	0	0	11	9	5	10	7	9	6	1	0	0	0	11	October, halo 6; light frost 13, 16, 18, 20, 25; light aurora 22.
November	5,343	NW.	39	4	16	5	5	13	5	4	8	29	4	6	13	11	1	7	0	2	6	25	November, light snow 2, 3, 8, 10, 11, 16, 18; aurora 9, 23.
December	3,740	NW.	42	29	20	3	2	20	3	4	8	24	9	13	14	4	0	0	0	1	2	31	
Year 1881	65,636	.....	.....	.....	186	68	64	275	33	19	74	213	80	105	151	96	58	30	14	6	62	166	
1882.																							
January	4,239	N.	36	18	15	4	1	16	4	2	16	19	16	6	20	5	5	3	0	0	12	31	January, faint parhelia 6; hoar frost 7, 8, 29, 30. Heavy frost 9; light frost 16 and 29; brilliant corona, 22.
February	3,611	NW.	30	6, 7	6	6	5	11	4	3	15	22	12	11	12	5	2	3	0	0	5	27	Feb., light frost 7, 10, 17, 23, 24, 27, 28; hoar frost 16.
March	6,975	NW.	44	20	13	4	4	27	2	1	8	20	14	7	16	8	4	5	0	0	5	25	March, light frost 3, 4, 5, 16, 17, 21; hoar frost 18.
April	8,095	E.	36	7	14	16	12	25	2	1	4	12	4	6	8	16	11	2	2	2	0	8	April, light frost 19.
May	8,195	NW.	36	10	6	9	8	38	1	4	5	19	3	6	12	13	11	0	4	0	0	1	
June	5,763	SE.	38	20	12	12	4	33	2	3	5	18	1	5	14	11	15	0	4	0	0	0	

Location of office on June 30, 1882, room formerly occupied by the adjutant.

A. PRITCHARD,
Corporal, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[Form No. 132—A.]

FORT BENTON, MONT.

[Latitude, 47° 50′; longitude west of Greenwich, 110° 40′. Elevation of barometer above sea-level, 2,700 feet. Elevation of rain-gauge (top) above ground, 51 feet. Elevation of exposed thermometer above ground, 24 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–4.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.920	29.892	29.885	29.897	30.182	29.618	59.5	82.0	68.8	70 0	107	47	60.1	34.3	54.1	49.5	2.0	2.5	4.0	2.8	2.28	.87	20
August	29.915	29.886	29.885	29.895	30.214	29.595	55.3	78.9	65.5	67.2	108	34	50.4	30.6	51.1	44.0	0.8	2.0	2.6	1.8	1.18	.75	30
September	30.002	29.975	30.001	29.993	30.436	29.569	44.0	62.4	51.1	52.5	95	32	69.5	45.6	62.0	59.0	2.6	5.5	4.2	4.0	1.32	.40	30
October	30.232	30.216	30.240	30.229	30.668	29.811	25.6	39.3	31.4	32.1	61	— 6	75.9	63.9	72.1	70 6	5.8	6.6	6.0	6.1	1.94	.80	11
November	30.288	30.279	30.275	30.281	30.851	29.632	26.5	36.2	29.3	30.7	63	—14	68.5	58.2	67.7	64.8	5.6	7.1	5.2	6.6	1.73	.48	16
December	30.240	30.210	30.209	30.220	30.773	29.548	29.2	42.7	33.7	35.2	67	— 3	63.0	44.6	56.0	54.5	3.9	6.6	3.8	4.8	.07	.07	1
Year 1881	.....	.....	.....	.....	.....	.....	36.0	52.4	42.3	43.6	.....	.....	66.9	50.1	64.5	60.5	4.1	5.3	4.5	4.7	16.81	.....	.....
1882.																							
January	30.107	30.084	30.095	30.095	30.561	29.545	15.5	27.0	18.2	20.2	52	—35	66.3	61.8	66.7	64.9	4.8	6.7	4.4	5.3	.75	.15	22, 23
February	30.079	30.062	30.056	30.066	30.711	29.594	20.3	34.1	25.1	26.5	62	—33	64.3	53.7	62.4	60.1	5.0	5.9	4.0	5.0	.38	.18	16
March	30.157	30.147	30.165	30.156	30.673	29.674	23.0	39.0	28.8	30.3	74	—14	71.6	56.1	68.5	65.4	6.1	5.6	5.8	5.8	1.09	.35	4
April	30.024	29.992	30.002	30.006	30.576	29.470	34.4	51.0	41.9	42.4	79	29	70.6	49.8	62.0	60.8	6.2	7.1	5.6	6.3	1.22	.36	15, 16
May	29.954	29.909	29.910	29.924	30.307	29.695	43.1	64.4	54.0	53.8	84	29	76.4	40.6	53.0	56.7	4.3	6.6	4.0	5.0	.35	.18	14
June*	29.896	29.867	29.874	29.879	30.166	29.565	53.3	73.9	63.8	63.7	90	43	80.2	47.4	59.6	62.4	2.8	5.1	5.0	4.3	.13	.05	19

* Twenty days only.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.45 a. m., 12.45 p. m., and 84.5 p. m., local time.

GEORGE W. DAVIS,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

FORT BENTON, MONT.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.	Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain and snow.					
1881.																						
July	4,436	W.	40	28	4	13	4	8	3	16	4	5	35	17	12	2	11	0	0	0	0	First frost September 6.
August	4,843	NW.	36	1	1	7	10	13	1	10	8	7	36	23	6	2	6	0	0	0	0	
September	5,775	W.	38	24	4	7	5	8	1	13	16	9	27	10	14	6	9	0	1	0	0	
October	4,389	SW.	40	7	2	16	1	6	3	24	5	1	35	8	10	13	11	0	0	8	29	
November	7,962	SW.	44	3 and 4	1	9	4	0	0	43	4	4	25	5	15	10	17	0	2	6	23	
December	10,118	NW.	52	7	1	2	3	0	1	44	10	7	25	4	21	6	2	0	0	24	0	
Year 1881	65,185				47	95	66	52	15	177	163	83	320	105	139	96	114	0	11	73	134	
1882.																						
January	7,204	W.	48	14	1	16	4	1	0	19	22	1	29	5	16	10	10	0	0	12	28	
February	9,134	SW.	48	14	0	8	2	0	0	46	3	0	25	6	15	7	3	0	1	5	23	
March	8,429	W.	50	1	6	20	3	3	0	29	9	4	19	6	14	11	12	0	0	8	24	
April	7,256	SW.	46	19	5	21	10	3	0	22	3	5	21	5	14	11	9	0	0	0	13	
May	6,906	NE.	60	12	1	16	8	3	2	7	23	11	22	8	17	6	8	0	0	0	2	
June*	3,272	W.	64	20	4	1	3	4	2	7	24	6	9	7	11	2	6	0	0	0	0	

*Twenty days only.

Location of office on June 30, 1882, Record building, corner Main and Baker streets.

GEORGE W. DAVIS,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

FORT BUFORD, DAK.

[Latitude, 48° 3′; longitude west of Greenwich, 103° 56′. Elevation of barometer above sea-level, 1,900 feet. Elevation of rain-gauge (top) on ground. Elevation of exposed thermometer above ground, 8 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.					Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.	Amount in inches.	Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.911	29.897	29.905	29.904	30.150	29.524	60.9	79.9	69.0	69.9	104	43	83.5	53.7	70.5	69.2	3	4	3	3	1.32	.45	11
August	29.879	29.874	29.864	29.872	30.206	29.488	57.4	79.8	67.0	68.1	102	43	80.0	42.1	62.8	61.6	4	3	3	3	1.10	.43	29
September	29.984	29.934	29.944	29.954	30.326	29.451	42.1	61.6	50.4	51.4	87	28	83.0	57.0	68.2	69.4	4	5	4	4	.58	.23	1
October	30.192	30.166	30.184	30.181	30.677	29.667	30.5	47.2	38.1	38.6	70	9	81.5	57.2	74.0	70.9	5	6	6	6	.39	.10	14
November	30.177	30.181	30.186	30.182	30.784	29.528	18.8	28.5	22.0	23.1	58	−20	76.9	64.2	78.5	73.2	4	6	6	5	.39	.11	13
December	30.164	30.165	30.161	30.163	30.736	29.507	17.8	32.0	22.1	24.0	51	−20	74.7	65.8	75.9	72.1	2	5	5	4	.09	.04	12
Year 1881	30.033	29.955	29.985	29.981	....	.....	31.7	48.2	38.3	39.4	.....	.....	81.7	61.7	74.1	72.5	4.5	5.3	4.6	4.7	13.90	.....	.....
1882.																							
January	30.159	30.138	30.174	30.157	30.767	29.596	7.3	20.1	11.3	12.9	45	−27	65.4	63.0	70.2	66.2	4.2	5.1	3.3	4.2	.26	.09	17
February	30.095	30.092	30.098	30.095	30.852	29.575	13.2	30.9	20.0	21.4	57	−24	62.4	55.9	66.0	61.4	2.6	6.2	4.0	4.3	.29	.12	18
March	30.146	30.141	30.174	30.154	30.726	29.453	17.5	31.2	20.8	23.2	70	−19	72.5	64.2	71.6	69.4	8.5	6.4	3.6	6.2	.69	.23	5
April	30.099	30.078	30.098	30.092	30.555	29.635	34.5	48.2	38.5	40.4	75	20	77.9	60.8	72.5	70.4	7.2	6.7	4.5	6.1	.94	.23	20, 21
May	29.966	29.946	29.952	29.955	30.281	29.665	43.3	60.5	50.9	51.6	79	22	74.3	56.4	72.0	67.6	5.2	5.4	5.1	5.2	1.61	.33	20
June	29.896	29.874	29.879	29.883	30.193	29.503	53.0	72.0	60.9	62.0	91	38	74.8	56.0	71.1	67.3	5.6	5.8	3.7	5.0	1.87	.36	26

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.12 a. m., 1.12 p. m., and 9.12 p. m., local time.

A. H. BELL,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

FORT BUFORD, DAK.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.91 inch or more of water.		Thunder-storms.	Aurorus.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	7,018	NW. W.	36	8 31	6	17	24	12	4	6	9	9	6	17	9	5	11	0	4	0	0	0	First light frost 16th September.
August	8,217	W.	46	11	8	13	21	21	1	3	14	9	3	18	7	6	6	0	1	0	0	0	First heavy frost 17th September.
September	6,054	W.	40	13	6	9	8	7	5	3	21	25	6	14	9	7	4	0	0	0	0	3	Last frost observed May 1.
October	4,751	W.	26	7	10	13	11	6	11	2	18	12	10	9	11	11	0	6	0	0	1	20	
November	5,649	W.	50	13	5	3	2	0	11	2	29	21	17	8	14	8	2	10	0	0	9	26	
December	5,265	W.	44	28	2	3	6	1	33	5	26	8	9	17	10	4	0	4	0	1	8	31	
Year 1881	70,630				73	110	157	82	106	53	184	160	170	138	141	86	52	55	15	5	75	190	
1882.																							
January	5,426	W.	46	17	7	5	10	2	12	10	25	9	13	16	10	5	0	6	0	0	22	31	
February	5,848	W.	38	4	5	7	10	1	20	7	28	4	2	12	13	3	0	5	0	0	7	28	
March	8,013	W.	41	17	15	9	18	4	9	5	18	12	3	9	10	12	1	12	0	0	12	30	
April	8,880	E.	42	10	9	22	26	12	2	2	8	7	2	5	14	11	6	3	0	1	0	16	
May	8,458	NW.	41	29	10	17	18	9	10	3	9	12	5	9	12	10	12	2	1	0	0	4	
June	5,029	E.	30	19	11	18	21	6	5	5	8	9	7	8	19	3	10	0	4	0	0	0	

Location of office on June 30, 1882, west end of garrison.

A. H. BELL,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

FORT CUSTER, MONT.

[Latitude, 45° 42′; longitude west of Greenwich, 107° 34′. Elevation of barometer above sea-level, 3,040 feet. Elevation of rain-gauge (top) above ground, 24 feet. Elevation of exposed thermometer above ground, 4 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0-10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.896	29.859	29.882	29.879	30.130	29.554	64.2	82.7	75.3	74.1	103	45	60.1	32.0	42.3	44.8	2.7	2.3	3.9	2.9	1.41	1.04	20
August	29.937	29.888	29.877	29.900	30.191	29.614	59.6	81.2	74.0	71.6	100	41	47.6	34.2	27.3	34.3	1.8	2.3	1.8	1.9	.03	.01	7, 16, 19
September	30.030	30.000	30.015	30.015	30.421	29.662	44.0	64.5	54.9	54.5	88	33	70.4	34.1	45.7	50.0	5.7	3.7	4.7	4.7	1.09	.51	9
October	30.258	30.219	30.250	30.242	30.638	29.865	33.9	51.7	41.8	42.5	68	12	71.5	45.2	58.4	58.4	6.0	3.7	5.3	5.0	.80	.43	31
November	30.353	30.330	30.342	30.342	30.909	29.785	24.7	40.6	30.2	31.8	60	— 7	84.7	59.0	76.4	73.4	5.7	4.7	5.0	5.1	.66	.27	2
December	30.355	30.337	30.349	30.347	30.876	29.734	23.8	42.2	30.9	32.3	61	Zero.	82.9	54.5	75.0	70.8	5.8	3.8	4.8	4.8	.22	.13	25
Year 1881	30.093	30.058	30.074	30.075	.....	.....	36.3	54.3	45.3	45.3	.....	.....	64.4	47.3	59.6	57.6	3.3	2.9	3.0	3.0	11.88	.....	.....
1882.																							
January	30.150	30.143	30.170	30.154	30.656	29.658	12.3	25.3	17.3	18.3	57	−20	81.0	69.4	75.6	75.3	4.3	5.0	3.7	4.3	.40	.34	6
February	30.095	30.111	30.092	30.099	30.696	29.648	19.7	34.3	26.3	26.8	60	−14	67.4	65.2	71.1	67.9	4.3	6.7	4.5	5.2	.02	.01	17, 18
March	30.138	30.133	30.155	30.142	30.650	29.699	26.7	41.0	33.9	33.9	76	1	73.1	54.2	68.5	65.3	6.5	5.5	5.1	5.7	.07	.05	5, 6
April	29.953	29.949	29.956	29.953	30.627	29.460	36.2	51.7	44.0	44.0	80	25	80.5	52.6	65.8	66.3	7.1	7.2	5.7	6.7	1.12	.37	17
May	29.889	29.867	29.879	29.878	30.247	29.640	43.9	61.3	53.1	52.8	84	33	83.7	53.7	70.1	69.2	5.4	6.9	6.0	6.1	4.45	1.24	8, 9
June	29.836	29.812	29.810	29.819	30.102	29.432	55.6	70.4	62.8	62.9	93	43	87.2	60.5	76.8	74.8	5.3	5.9	5.8	5.7	2.43	.54	9

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.58 a. m., 12.58 p. m., and 8.58 p. m., local time.

VIRGIL VERGÉ,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

FORT CUSTER, MONT.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	5,674	NE.	47	24	27	10	8	12	10	10	1	8	6	17	10	4	7	0	0	0	0	0	First frost September 7.
August	6,000	S.	32	13	20	9	7	21	15	3	3	11	4	23	5	3	3	0	0	0	0	0	
September	5,622	NW.	40	24	24	6	7	11	10	9	5	14	4	9	14	7	5	1	0	0	0	0	First killing frost October 8.
October	4,827	NW.	32	7	37	9	6	0	9	11	3	10	8	8	14	9	2	5	0	0	0	15	Lunar halo October 8.
November	(*)	NW.	53	12	21	7	3	3	13	13	13	10	7	8	13	9	4	6	0	0	3	22	
December	5,916	W.	52	11	3	6	0	11	10	31	9	17	6	9	13.	9	0	2	0	0	1	30	
Year 1881					214	86	64	161	122	149	73	152	74	119	169	77	48	33	0	0	40	151	
1882.																							
January	4,009	SW.	44	17	8	4	10	26	8	10	0	17	10	11	15	5	0	3	0	0	15	30	Lunar halos February 2, 22, 28, and April 22 and 25.
February	5,693	NW.	48	15	2	1	6	17	16	14	8	12	8	7	14	7	0	2	0	0	5	25	Late (heavy) frost May 23.
March	7,455	W.	64	28	15	5	2	6	8	11	17	18	11	4	18	9	0	3	0	0	4	23	
April	6,951	NW.	42	25	12	7	16	18	8	8	11	9	1	2	17	11	5	2	1	0	0	9	Auroras June 20 and 23.
May	6,396	NW.	44	16	10	7	9	20	8	11	11	15	2	5	14	12	13	1	2	0	0	1	
June	4,697	W.	52	28	11	6	14	9	8	7	19	13	3	6	16	8	12	0	0	2	0	0	

* Wind movement for November incomplete.

VIRGIL VERGÉ,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

FORT DAVIS, TEXAS.

[Latitude, 30° 38′; longitude west of Greenwich, 103° 56′. Elevation of barometer above sea-level, 4,940 feet. Elevation of rain-gauge (top) above ground, 20 feet. Elevation of exposed thermometer above ground, 4 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.208	30.182	30.197	30.196	30.272	30.108	67.5	88.5	73.2	79.7	110	53	61.5	34.1	50.1	48.6	2.5	5.0	2.5	3.3	4.27	.93	31
August	30.197	30.175	30.192	30.188	30.284	30.119	63.8	84.7	70.9	73.1	97	56	61.9	35.4	51.0	49.4	2.5	7.5	5.0	5.0	6.32	2.16	23
September*																							
October	29.975	29.932	29.968	29.958	30.135	29.665	54.6	73.0	61.3	63.0	90	36	66.2	25.7	60.1	50.7	5.0	7.5	5.0	5.8	4.47	1.21	18
November*																							
December	30.174	30.151	30.190	30.172	30.474	29.945	36.6	56.6	42.5	45.2	80	16	75.2	38.7	72.4	62.1	5.0	7.5	5.0	5.8	1.15	.88	19
Year 1881																							
1882.																							
January	30.177	30.130	30.165	30.157	30.492	29.903	38.1	54.8	42.8	45.2	72	9	79.0	44.6	63.0	62.2	4.1	5.2	3.4	4.2	.87	.80	19
February	30.181	30.140	30.175	30.165	30.302	29.881	39.5	60.1	47.9	49.2	73	22	80.7	37.8	52.8	57.1	3.7	6.3	3.3	4.4	.36	.22	14
March	30.123	30.078	30.099	30.100	30.389	29.819	42.9	67.2	54.2	54.8	83	19	69.9	26.7	42.6	46.4	3.8	5.5	2.7	4.0	.03	.02	7, 8
April	29.956	29.932	29.930	29.939	30.168	29.714	47.1	72.8	58.3	59.4	93	25	56.8	25.4	35.4	39.2	2.4	4.4	3.2	3.3	.26	.22	1
May	29.885	29.884	29.852	29.870	30.053	29.522	55.6	79.2	65.2	66.7	91	44	60.9	23.5	42.4	42.3	2.0	3.1	2.5	2.5	.04	.02	1, 29
June	29.831	29.797	29.804	29.811	29.935	29.634	66.6	85.4	71.4	74.5	98	53	62.7	31.2	55.4	49.8	1.5	5.0	2.6	3.0	3.19	1.40	4, 5

*Record incomplete.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.13 a. m., 1.13 p. m., and 9.13 p. m. local time.

JEROME WILLIAMS,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

FORT DAVIS, TEX.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calms.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	3,859	NE.	21	15	8	7	19	11	9	3	13	3	20	15	13	3	13	0	3	0	0	0	
August	3,851	NE.	24	8	10	11	13	12	13	0	19	6	9	9	18	4	10	0	5	0	0	0	
September*																							
October	4,567	W.	25	28	4	19	12	13	19	8	12	2	4	15	10	6	7	0	0	0	0	0	
November*																							
December	†	†	†	†	14	5	2	3	12	13	8	5	15	13	8	5	3	0	0	0	0	9	First frost November 2.
Year 1881																							
1882.																							
January	†	†	†	†	13	8	5	5	29	16	0	8	9	15	11	5	3	0	0	0	0	14	
February	3,917	S. / W.	32	20 / 27	7	6	2	18	26	9	2	5	9	12	12	4	2	1	0	0	0	7	
March	4,468	W.	28	27	8	9	6	5	25	19	8	1	12	14	11	6	2	1	0	0	0	5	
April	4,786	W.	28	7	12	2	5	15	22	14	11	2	7	17	8	5	2	1	0	0	0	3	Last frost April 13.
May	4,600	S. / E. / S.	28	3 / 16 / 29	16	1	10	3	19	25	2	3	14	18	12	1	2	0	1	0	0	0	
June	4,084	NW.	32	2	8	3	13	5	18	19	2	5	17	17	12	1	8	0	5	0	0	0	

* Record incomplete.

† Self-register to anemometer broken.

Location of office, June 30, 1882, inside the post.

JEROME WILLIAMS,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

FORT ELLIOTT, TEX.

[Latitude, 35° 30′; longitude west of Greenwich, 100° 21′. Elevation of barometer above sea-level, 2,650 feet. Elevation of rain-gauge (top) above ground, 22 feet. Elevation of exposed thermometer above ground, 7 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.354	30.330	30.332	30.338	30.472	30.118	68.8	87.3	77.5	77.9	102	55	73.2	48.8	64.2	62.1	4	4	2	3	3.28	.86	23
August	30.375	30.358	30.348	30.360	30.463	30.238	67.2	90.4	77.9	78.5	101	63	77.7	37.4	56.5	57.2	2	4	1	2	.49	.41	21
September	30.428	30.407	30.406	30.414	30.649	30.134	59.5	78.5	66.5	68.2	98	42	71.1	48.1	60.0	59.7	5	4	2	4	3.18	.95	6–7
October	30.597	30.564	30.571	30.577	30.799	30.099	52.5	68.9	58.3	59.9	87	33	72.5	59.0	71.4	67.6	6	6	4	5	.69	.25	13
November	30.548	30.503	30.526	30.525	30.933	30.097	31.6	52.1	37.7	40.5	71	13	52.9	41.1	53.9	49.3	2	4	2	3	.42	.41	10
December	30.266	30.235	30.270	30.257	30.681	29.769	29.3	50.0	37.3	38.9	68	18	51.2	45.1	45.5	47.3	4	6	2	4	.26	.12	18
Year 1881	30.054	30.004	30.002	30.020	.....	.....	46.1	64.9	53.7	54.9	.....	.....	62.8	44.3	55.9	54.3	3.8	4.6	2.8	3.7	16.16	.....	.....
1882.																							
January	30.195	30.163	30.161	30.173	30.647	29.837	25.1	43.8	33.1	34.0	74	4	53.8	39.4	46.2	46.5	3.8	4.6	2.4	3.6	.33	.20	29
February	30.128	30.109	30.122	30.120	30.373	29.674	31.0	53.4	40.4	41.6	72	13	52.8	40.6	47.0	46.8	3.1	3.6	2.0	2.9	.16	.16	19
March	30.067	30.062	30.060	30.063	30.407	29.627	40.5	60.7	48.3	49.8	85	18	55.1	35.6	46.0	45.6	4.1	4.1	1.8	3.3	.53	.22	25
April	29.942	29.928	29.927	29.932	30.308	29.582	44.0	66.9	54.8	55.2	92	24	53.4	34.6	45.3	44.4	3.8	3.6	3.3	3.6	.66	.56	5
May	29.864	29.843	29.834	29.847	30.139	29.416	50.2	68.4	58.7	59.1	90	38	65.6	50.1	62.9	59.5	5.1	5.3	2.9	4.4	7.48	2.16	19
June	29.844	29.833	29.825	29.834	30.147	29.593	63.2	81.7	72.5	72.5	99	44	69.1	47.2	61.4	59.2	3.7	3.7	3.3	3.6	1.54	1.14	12

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.28 a. m., 1.28 p. m., and 9.28 p. m., local time.

W. J. CUNDALL
Corporal, Signal Corps, U.S.A.

Annual meteorological summary—Continued.

[FORM No. 132—B.] FORT ELLIOTT, TEX.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurorae.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	7,278	NW.	26	21	2	15	3	45	14	0	1	6	7	17	4	10	9	0	0	0	0	0	First light frost November 2.
August	6,482	SE. S. NE.	24	1 2 11 15 16 21	3	12	2	43	13	4	1	2	13	26	4	1	3	0	0	0	0	0	First killing frost November 12.
September	9,165	NW.	40	10	7	13	2	30	18	8	2	3	7	22	3	5	6	0	0	0	0	0	
October	8,498	N.	36	29	9	5	1	36	10	9	3	7	12	16	6	9	7	0	0	0	0	0	
November	7,546	N. & S.	36	23, 28	18	15	0	9	13	6	0	14	15	21	6	3	2	0	0	0	0	19	
December	7,206	N.	40	20	13	11	0	14	15	2	1	25	12	18	7	6	3	0	0	0	0	24	
Year 1881	93,601	.....	...	.....	110	148	22	293	154	59	20	161	89	198	77	80	63	0	0	0	20	105	
1882.																							
January	8,301	N. NE.	40	16 18	18	5	1	22	17	12	0	8	10	18	9	4	1	3	0	0	4	26	
February	7,117	N. S. NE. S. SW.	32	7 11 16 18 27	9	11	2	8	23	7	1	17	6	20	5	3	0	1	0	0	1	16	
March	9,839	S	44	25	14	22	4	13	21	11	1	7	0	15	14	2	3	2	0	0	2	6	
April	10,712	N.	40	26	3	17	5	22	20	8	0	11	4	19	3	8	3	0	0	0	0	4	
May	9,411	S. N. NE.	40	8 20 24	13	15	7	29	10	3	2	13	1	11	16	4	11	0	0	0	0	0	
June	8,749	NE.	60	12	2	14	1	41	17	7	1	2	5	16	10	4	3	0	0	0	0	0	

Location of office, June 30, 1882, southeast corner of the post.

W. J. CUNDALL, Corporal, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

FORT GIBSON, IND. T.

[Latitude, 35° 50′; longitude west of Greenwich, 95° 20′. Elevation of barometer above sea-level, 540 feet. Elevation of rain-gauge (top) above ground, 35 feet. Elevation of exposed thermometer above ground, 19 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.996	29.959	29.954	29.970	30.142	29.709	76.3	93.1	79.7	83.0	105.0	63.0	76.2	45.8	69.6	63.9	3.1	4.7	3.0	3.6	.76	.64	27
August	29.949	29.894	29.902	29.915	30.083	29.763	78.1	98.5	84.0	86.9	105.6	64.6	67.3	31.9	54.1	51.1	1.7	4.8	2.5	3.0	(*)	(*)	20
September	29.969	29.919	29.931	29.939	30.216	29.707	68.2	88.6	75.2	77.3	104.5	32.0	68.1	35.9	53.4	52.5	3.4	4.3	1.8	3.2	2.79	2.50	30
October	30.066	30.032	30.046	30.048	30.336	29.569	60.6	72.5	64.0	65.7	88.4	38.1	87.1	64.1	81.2	77.5	6.2	7.2	3.5	5.6	6.67	3.74	1
November	30.148	30.124	30.156	30.143	30.635	29.595	41.3	54.8	44.9	47.0	74.1	18.5	83.2	57.2	74.5	71.6	4.3	4.8	3.9	4.3	3.13	1.10	10
December	30.182	30.148	30.174	30.168	30.590	29.743	39.9	52.5	44.6	45.7	72.8	25.1	79.0	58.6	73.2	70.3	4.7	5.0	4.9	4.9	2.92	1.82	20
Year 1881	30.029	29.987	30.005	30.007	.....	.....	54.4	69.1	59.0	60.8	.....	.....	77.5	52.4	69.9	66.6	4.6	5.1	3.4	4.3	37.85	.....	.....
1882.																							
January	30.161	30.137	30.156	30.151	30.784	29.758	36.8	45.3	40.3	40.8	73.5	13.0	85.1	63.5	79.4	76.0	6.8	6.7	5.8	6.4	2.23	.97	12
February	30.084	30.064	30.079	30.076	30.426	29.442	44.0	56.6	49.6	50.1	70.5	22.3	81.9	60.9	72.6	71.8	6.0	6.2	4.9	5.7	3.45	1.09	20
March	30.077	30.049	30.073	30.066	30.604	29.464	49.3	63.9	56.4	56.5	80.4	32.3	76.3	53.9	61.0	63.7	5.4	5.2	3.6	4.7	2.99	.98	8-9
April	29.994	29.951	29.962	29.969	30.335	29.532	55.7	71.8	59.8	62.4	85.0	34.4	78.0	44.1	68.2	63.4	4.7	4.4	3.2	4.1	1.24	.69	8
†May	29.828	29.811	29.816	29.818	30.215	29.393	60.9	72.2	63.8	65.6	88.7	41.0	84.7	63.2	81.9	76.6	5.5	8.7	9.0	7.7	3.93	1.05	6-7
‡June	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* Precipitation inappreciable. † Observations from the 1st to the 12th, inclusive. ‡ Observations discontinued May 12, 1882.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.48 a. m., 1.48 p. m., and 9.48 p. m., local time.

J. B. CAMPBELL,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

FORT GIBSON, IND. T.

	Wind.			Winds at 7 a.m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.															.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	Rain.	Snow.					
1881.																							
July	3,884	NE.	28	10	4	0	27	24	17	3	1	0	17	17	7	7	4	0	2	0	0	0	A severe and destructive drought during July, August, and September.
August	3,012	NE.	28	1	4	3	16	18	7	4	1	0	40	19	10	2	0	0	3	0	0	0	
September	6,179	N.	32	10	5	3	3	12	41	4	3	5	14	17	9	4	5	0	3	0	0	0	Killing frost September 16.
October	5,525	SW.	22	28	6	1	13	22	26	2	7	6	10	5	15	11	11	0	2	0	0	0	
November	5,904	N.	26	2	23	6	8	8	19	2	4	5	15	11	12	7	10	0	3	0	0	7	
December	4,965	N.	45	29	12	2	6	12	17	0	7	13	24	11	11	9	4	0	1	0	0	7	
Year 1881	63,054	.....	...	.....	150	31	120	219	198	40	46	69	222	146	132	87	84	0	18	0	8	72	
1882.																							
January	5,703	N.	28	16	19	2	11	23	15	1	5	4	13	4	12	15	6	0	1	0	1	15	
February	5,881	S.	28	6	23	0	8	20	17	4	4	4	4	10	5	13	9	0	4	0	0	6	
March	7,185	N. W. S.	28	20 21 26	21	6	6	15	27	5	2	4	7	12	9	10	7	0	3	0	0	0	
April	6,854	S.	32	18	18	5	5	18	24	0	5	4	11	10	15	5	3	0	5	3	0	0	Light frost April 30; three auroras observed in April.
*May	3,108	SW.	36	5	3	0	6	11	6	1	2	4	3	0	6	6	7	0	7	0	0	0	A destructive tornado at McAllister, Ind. T., May 8.
†June	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	

*Observations from the 1st to the 12th, inclusive. †Observations discontinued May 12, 1882.

J. B. CAMPBELL,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

FORT GRANT, ARIZ.

[Latitude, 32° 39′ ongitude west of Greenwich, 109° 57′. Elevation of barometer above sea-level, 4,860 feet. Elevation of rain-gauge (top) above ground, 1 foot. Elevation of exposed thermometer above ground, 6 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	.....	.....	.....	.....	.....	.....	67.4	85.0	75.1	75.8	(*)	62.	77.7	44.1	60.6	60.8	5	7	7	6	5.53	1.59	26
August	.....	.....	.....	.....	.....	.....	65.2	78.9	71.1	71.7	.....	58.	82.5	58.3	72.4	71.1	6	7	5	6	5.47	.78	11
September	.....	.....	.....	.....	.....	.....	59.6	76.3	66.2	67.4	.....	47.	68.5	47.3	55.9	57.2	1	2	1	1	3.84	1.97	5
October†	30.077	30.023	30.066	30.055	30.193	29.913	53.3	71.0	60.3	61.6	.....	33.	67.4	38.7	50.9	52.0	1	2	1	1	1.02	.43	4
November	30.085	30.062	30.081	30.076	30.289	29.747	34.2	57.0	45.7	45.6	.....	23.	64.7	33.1	40.0	45.9	1	1	1	1	.08	.07	10
December	30.120	30.074	30.116	30.103	30.355	29.841	35.6	55.4	45.8	45.6	....	25.	52.6	36.9	42.6	44.0	2	2	1	2	.65	.38	17
Year 1881	.....	.....	.....	.....	.....	.....	51.0	69.1	59.2	59.8	.....	.....	53.2	31.2	40.9	41.7	2.6	4.2	2.6	3.1	18.96	.....	.....
1882.																							
January	30.117	30.071	30.093	30.094	30.305	29.882	32.8	49.8	42.2	41.6	68.	21.	57.1	46.8	49.8	51.7	4.8	4.8	3.4	4.3	.86	.43	29
February	30.108	30.087	30.108	30.101	30.278	29.854	37.0	50.5	43.5	43.7	62.8	23.	71.2	50.3	61.0	60.8	4.5	4.8	3.0	4.1	1.26	.81	15
March	30.081	30.039	30.064	30.061	30.253	29.847	41.8	61.6	50.7	51.4	79.	21.	44.2	28.8	41.4	38.1	2.5	3.1	1.8	2.5	1.84	1.24	18
April	29.917	29.880	29.882	29.893	30.042	29.687	44.9	68.5	55.7	56.4	85.	32.	36.0	23.9	33.3	31.1	1.9	3.0	1.9	2.3	.07	.05	13
May	29.766	29.731	29.729	29.742	29.906	28.606	55.0	76.3	64.2	65.2	86.	37.	27.4	27.6	33.4	29.5	2.2	4.2	2.1	2.8	.81	.72	7, 8
June	29.755	29.744	29.734	29.744	29.866	29.585	63.5	82.5	71.4	72.5	94.9	51.	42.9	29.4	41.1	37.8	2.7	4.6	3.2	3.5	1.47	.75	27, 28

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.49 a. m., 12.49 p. m., and 8.49 p. m., local time.

* Readings of maximum thermometer began January 1.

† Barometer readings began October 27, record for 5 days only.

ROBT. C. LORD,
Corporal, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

FORT GRANT, ARIZ.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,381	NW.	33	3	10	16	9	13	22	5	7	6	5	5	16	10	17	0	10	0	0	0	
August	3,825	E.	37	6	15	19	18	10	12	4	4	2	9	7	12	12	16	0	10	0	0	0	
September	4,275	SW.	24	11	15	30	6	6	12	11	3	2	5	20	7	3	5	0	2	0	0	0	
October	4,784	E.	24	9	10	24	6	8	13	10	7	8	3	18	8	3	9	0	3	0	0	0	
November	4,631	NW.	48	19	5	26	0	12	4	17	4	18	4	22	7	1	1	1	0	0	0	0	
December	5,536	NE.	40	15	0	43	6	12	0	23	2	4	3	16	11	4	2	0	0	0	0	3	
Year 1881	62,774	.....	...	.....	172	240	93	90	116	91	96	146	45	183	128	52	63	9	29	0	0	37	
1882.																							
January	4,724	SE.	29	22	1	26	5	17	3	23	8	8	2	13	12	6	4	1	0	0	0	13	
February	4,022	N. / SE.	25	7 / 17	7	20	15	12	3	11	6	9	1	11	12	5	7	1	0	0	0	10	
March	5,189	W.	34	26	3	11	21	6	1	21	15	11	4	22	5	4	4	0	0	0	0	5	
April	5,774	E.	40	30	2	12	15	10	2	28	5	11	5	23	7	0	2	0	0	0	0	0	
May	5,302	NW.	32	8	1	8	10	18	0	20	10	26	3	18	11	2	3	0	0	0	0	0	
June	5,316	W.	24	4	18	9	10	7	8	9	5	23	1	13	14	3	8	0	8	0	0	0	

Location of office on June 30, 1882, adobe building, northwest side of post.

ROBT. C. LORD,
Corporal, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

FORT KEOGH, MONT.

[Latitude, 46° 22′; longitude west of Greenwich, 105° 56′. Elevation of barometer above sea-level, 2,372 feet. Elevation of rain-gauge (top) above ground, 33 feet. Elevation of exposed thermometer above ground, 9 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.848	29.829	29.827	29.835	30.116	29.508	64.1	82.9	75.3	74.1	109	48	72.1	38.4	50.5	53.7	4.0	3.0	3.8	3.6	.39	.14	19
August	29.881	29.843	29.825	29.850	30.142	29.539	60.3	82.2	75.3	72.6	103	47	59.8	30.2	37.7	42.6	2.2	2.5	3.3	2.7	.93	.35	19
September	29.988	29.942	29.960	29.963	30.361	29.524	44.5	64.5	55.9	54.9	93	32	76.4	36.9	52.2	55.0	4.5	5.4	4.4	4.8	.55	.23	19
October	30.206	30.170	30.202	30.193	30.665	29.757	34.1	50.4	41.9	42.1	73	13	76.8	50.9	67.1	64.9	4.7	5.1	5.2	5.0	.46	.25	30
November	30.253	30.246	30.269	30.256	30.845	29.634	26.5	37.7	30.2	31.5	60	−3	74.1	64.8	69.7	69.5	4.8	6.3	4.2	5.1	.44	.16	12
December	30.268	30.247	30.259	30.258	30.822	29.617	21.0	37.5	29.2	29.2	57	1	67.6	55.0	62.3	61.6	3.4	4.1	3.3	3.6	.10	.05	12, 25
Year 1881	....	.....	.....	.....	.....	.....	36.1	52.8	45.4	44.8	.....	.....	74.8	48.2	61.0	61.3	4.4	5.0	4.2	4.5	11.44	.....	....
1882.																							
January	30.110	30.096	30.131	30.112	30.580	29.624	12.6	25.9	17.6	18.6	50	−20	66.4	62.3	63.7	64.1	4.9	5.0	3.7	4.5	.18	.07	6
February	30.086	30.069	30.069	30.075	30.640	29.612	17.2	33.1	24.2	24.8	59	−27	66.6	58.2	64.5	63.2	3.8	6.5	3.1	4.5	.18	.06	16
March	30.120	30.095	30.132	30.116	30.668	29.498	24.7	40.6	32.8	32.7	76	Zero.	65.1	50.4	58.5	58.0	5.4	6.6	4.6	5.5	.41	.16	5
April	29.989	29.975	29.986	29.983	30.511	29.498	36.7	50.6	44.1	43.8	84	26	71.7	49.8	61.0	60.8	7.4	7.2	6.0	6.9	2.06	.73	7
May	29.891	29.862	29.876	29.876	30.236	29.642	44.7	61.7	53.5	53.3	85	30	74.0	44.1	62.1	60.1	6.5	6.3	5.4	6.1	2.57	1.18	8
June	29.833	29.812	29.810	29.818	30.094	29.421	55.4	73.0	65.3	64.6	96	45	77.8	43.3	61.0	60.7	4.1	5.9	5.1	5.0	1.76	.35	17

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.05 a. m., 1.05 p. m., and 9.05 p. m., local time.

W. B. STOCKMAN,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

FORT KEOGH, MONT.

	Wind.				Winds at 7 a. m., 3 and 11 p.m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	7,985	NW.	49	7, 8	7	21	13	22	1	7	6	15	1	12	16	3	7	0	1	1	0	0	Comet 1st, 2d, 3d, 4th, 5th, 6th, 11th, 16th, 18th, 21st, 22d, and 23d.
August	8,381	SE.	40	11, 27	10	22	5	20	1	10	7	15	3	18	12	1	3	0	1	0	0	0	Last boat down, steamer, 23d.
September	6,195	NW.	40	13	10	15	5	11	1	6	19	20	3	9	18	3	7	0	2	0	0	0	
October	5,660	W.	38	7	10	12	9	11	3	10	16	15	7	10	14	7	3	3	0	0	1	12	
November	5,743	NW.	40	12	8	2	2	5	5	17	22	23	6	6	18	6	3	7	0	0	4	19	Tongue River closed 18th.
December	4,777	W.	38	27	3	3	2	23	6	28	16	9	3	18	9	4	0	2	0	0	3	30	
Year 1881	67,661	.....	.....	.....	89	143	50	137	22	151	137	201	165	116	175	74	55	42	11	2	49	149	
1882.																							
January	5,009	NW.	41	31	3	9	3	9	6	35	11	13	4	8	19	4	0	5	0	0	13	30	Yellowstone River closed on 5th.
February	5,392	SW.	36	28	6	13	3	10	5	26	9	10	2	10	14	4	0	6	0	0	7	24	
March	7,783	W.	50	28	6	7	9	12	1	14	15	28	1	6	20	5	1	6	0	0	5	25	Tongue River opened 25th; Yellowstone 28th.
April	9,163	W.	50	26	6	17	9	26	2	7	7	15	1	5	12	13	3	5	0	3	0	4	
May	9,211	NW.	36	20	7	12	11	23	0	10	7	21	1	4	17	10	12	0	2	0	0	1	Last frost 24th. First boat up, 13th.
June	5,704	NW.	38	1	3	13	10	19	5	14	7	17	2	7	18	5	12	0	3	0	0	0	

Location of office June 30, 1882, southeastern portion of garrison.

W. B. STOCKMAN,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

FORT MACON, N. C.

[Latitude, 34° 42′; longitude west of Greenwich, 76° 40′. Elevation of barometer above sea-level, 11 feet. Elevation of rain-gauge (top) above ground 5 feet. Elevation of exposed thermometer above ground, 8 feet.]

	Barometer (to sea).				Temperature.								Relative humidity.				Average cloudiness, amount of, 0-10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.985	29.968	29.990	29.981	30.226	29.640	76.5	82.3	76.4	78.4	88	65	85.6	74.7	85.7	82.0	5.1	3.8	3.9	4.3	9.70	2.44	30
August	30.031	30.005	30.026	30.020	30.230	29.761	75.8	82.4	75.7	78.0	87	63	84.4	71.6	85.8	80.6	5.3	5.2	4.8	5.1	6.75	1.76	28
September	30.118	30.073	30.101	30.097	30.337	29.824	76.0	82.1	76.4	78.2	87	64	86.6	73.3	83.0	81.0	4.6	4.7	2.8	4.0	4.85	2.68	14
October	30.194	30.144	30.149	30.162	30.444	29.621	66.7	74.6	68.3	69.8	87	53	86.1	70.6	83.0	79.9	4.7	5.0	3.0	4.2	3.75	1.37	31
November	30.217	30.178	30.190	30.195	30.643	29.630	55.2	64.2	56.9	58.8	77	28	84.8	70.7	86.7	80.7	5.5	6.6	4.9	5.7	2.69	1.25	23, 24
December	30.209	30.160	30.190	30.186	30.568	29.619	48.1	56.3	49.1	51.2	69	30	86.6	72.7	85.5	81.6	5.9	6.0	4.1	5.3	5.56	1.20	14
Year 1881	39.122	30.079	30.106	30.102	.....	.....	59.5	67.0	60.5	62.4	.....	.....	84.8	71.2	85.1	80.3	5.2	5.5	4.3	5.0	62.35	.....	.....
1882.																							
January	30.204	30.158	30.209	30.190	30.723	29.497	46.6	51.6	46.1	48.1	63	24	90.7	79.7	88.3	86.2	6.6	7.4	5.0	6.3	3.69	1.55	30, 31
February	30.221	30.169	30.195	30.195	30.669	29.313	47.0	57.3	50.2	51.5	70	31	85.2	70.0	82.7	79.3	5.3	6.5	3.8	5.2	2.85	.98	14
March	30.164	30.102	30.152	30.139	30.535	29.655	50.9	59.9	52.4	54.4	68	33	78.4	67.8	82.4	76.2	6.1	5.2	4.4	5.2	9.30	3.66	28
April	30.076	30.022	30.047	30.048	30.402	29.540	56.8	63.9	57.7	59.5	71	41	86.2	75.0	90.0	83.7	5.2	5.8	5.2	5.4	5.55	1.30	23
May	30.051	30.008	30.038	30.032	30.340	29.598	64.0	72.0	64.0	66.7	83	48	85.0	70.3	85.4	80.3	4.4	4.8	3.9	4.4	2.11	.75	17
June	29.996	29.964	29.990	29.983	30.212	29.731	73.2	79.9	73.2	75.4	87	57	82.5	71.5	86.3	80.1	5.7	6.7	4.6	5.7	1.52	.55	26

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.01 a. m., 3.01 p. m., and 11.01 p. m., local time.

W. W. THOMAS,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

FORT MACON, N. C.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time; Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	7,547	NW.	34	22	10	7	8	6	3	31	13	10	0	11	10	10	8	0	0	0	0	0	
August	8,377	E.	38	27	14	22	10	12	4	22	4	5	0	8	18	5	9	0	3	0	0	0	
September	7,369	SE.	50	9	7	9	6	28	12	14	1	8	0	10	15	5	4	0	0	0	0	0	
October	8,988	N.	40	5	26	10	6	14	6	19	5	5	0	7	19	5	8	0	0	0	0	0	
November	7,936	NW.	36	4	26	12	5	7	7	14	2	16	1	5	13	12	14	0	0	0	0	1	
December	9,376	NW.	48	15	27	13	2	8	5	16	8	13	0	4	20	7	10	0	0	0	0	1	
Year 1881	103,975	.....	.....	.....	211	143	73	116	71	252	74	116	2	82	176	103	110	0	23	1	0	9	
1882.																							
January	9,068	NW.	35	22	15	15	4	2	3	26	3	24	1	3	17	11	18	0	0	0	0	6	
February	7,995	SW.	46	4	15	11	3	5	5	22	10	12	1	7	14	7	12	0	1	0	0	1	
March	10,517	SE. S. SW.	36	1 27 28	11	23	4	6	5	23	11	10	0	7	15	9	13	0	1	0	0	0	A brilliant aurora on 16th.
April	9,204	NW.	46	10	14	19	7	7	9	21	6	7	0	10	9	11	15	0	4	1	0	0	
May		E.	32	3	12	15	14	6	9	28	7	2	0	8	17	6	8	0	5	0	0	0	
June	9,793 / 9,610	S. SW.	36	1 18	4	11	3	15	6	38	8	5	0	6	15	9	11	0	9	0	0	0	

Location of office on June 30, 1882, officers' quarters, inside the fort.

W. W. THOMAS,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

FORT McKAVETT, TEX.

[Latitude, 30° 48′; longitude west of Greenwich, 100° 7′. Elevation of barometer above sea-level, 2,240 feet. Elevation of rain-gauge (top) above ground, 21 feet. Elevation of exposed thermometer above ground, 4 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July*	29.641	29.545	29.575	29.589	29.738	29.454	73.7	92.1	81.4	82.4	103.8	68.5	79.0	38.5	59.7	59.1	2.3	4.4	1.8	2.8	2.05	.60	17
August†	29.620	29.515	29.554	29.562	29.759	29.408	72.7	90.9	80.5	81.4	103.0	65.8	74.0	40.7	58.6	57.8	2.4	4.7	1.8	3.0	1.78	.82	22
September‡	29.623	29.515	29.588	29.575	29.835	29.302	67.2	84.7	73.9	75.3	96.7	48.5	79.0	45.4	61.4	62.0	3.3	3.6	2.0	3.0	1.15	.40	30
October§	29.748	29.655	29.720	29.708	29.880	29.284	63.4	74.5	67.1	68.3	86.8	42.2	83.7	69.1	81.0	77.6	5.3	5.9	3.2	4.8	7.21	4.29	1
November‖	29.917	29.827	29.921	29.888	30.374	29.493	45.0	59.2	48.5	50.9	78.0	22.7	82.6	53.2	69.9	66.6	4.8	3.8	1.6	3.4	.52	.52	18
December	29.901	29.790	29.877	29.856	30.356	29.483	43.2	58.4	48.2	49.9	74.2	20.0	74.3	51.5	67.5	64.5	4.8	4.9	3.4	4.4	.59	.22	19
Year 1881	29.701	29.599	29.664	29.655	.....	.....	55.8	73.3	62.6	63.9	.....	.....	76.7	46.1	62.6	61.8	2.8	3.0	1.7	2.5	21.72	.....	.....
1882.																							
January	30.220	30.195	30.236	30.217	30.614	29.954	43.0	54.0	46.4	47.8	74.2	18.3	80.6	63.7	75.7	73.3	6.3	7.0	6.0	6.4	1.42	.34	14
February	30.188	30.181	30.213	30.194	30.375	29.838	48.3	63.0	53.8	55.0	75.8	29.9	77.8	56.6	69.6	68.0	5.0	5.3	3.6	4.6	2.19	1.15	3
March	30.166	30.127	30.153	30.149	30.569	29.768	53.0	68.6	58.3	60.0	88.0	24.6	77.9	50.1	67.6	65.2	4.9	4.1	3.4	4.1	.39	.28	5,8
April	29.997	29.970	29.982	29.983	30.256	29.615	57.6	76.3	65.2	66.4	96.0	29.0	70.6	41.7	66.3	59.5	3.3	3.6	3.3	3.4	.70	.52	8
May	29.957	29.932	29.947	29.945	30.150	29.527	63.4	78.4	69.0	70.3	92.0	45.0	74.6	50.8	64.8	63.4	5.2	4.3	3.4	4.3	3.96	1.26	20
June	29.962	29.926	29.951	29.946	30.164	29.728	70.5	87.8	77.9	78.7	103.0	58.0	74.8	44.0	60.7	59.8	3.9	2.8	2.5	3.1	1.90	1.12	5,6

*July data for 13 days only. †August data for 24 days only. ‡September data for 27 days only. §October data for 25 days only. ‖November data for 16 days only.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.28 a. m., 1.28 p. m., and 9.28 p. m., local time.

J. E. THATCHER,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

FORT McKAVETT, TEX.

	Wind.				Winds at 7 a. m., 3 and 11 p.m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	6,243	NE.	34	2	1	13	22	37	9	6	1	0	4	18	13	0	6	0	4	0	0	0	
August	5,766	E., NE.	27	1, 7	1	15	21	23	13	12	4	0	4	17	14	0	4	0	3	0	0	0	
September	6,853	SE.	28	1, 5	1	9	14	20	22	7	0	5	7	16	10	3	6	0	2	0	0	0	
October	.....	SW.	24	29	1	7	17	22	17	10	3	2	2	7	11	7	9	0	1	0	0	0	
November	.....	N.	23	19	7	10	5	5	14	6	0	1	2	6	8	2	1	0	0	0	0	4	
December	5,740	E.	24	19	11	5	13	5	21	23	5	6	4	13	10	8	5	0	0	0	0	9	
Year 1881	.....	.....	...	.....	55	115	159	179	218	146	58	52	31	162	130	52	60	0	23	0	0	51	
1882.																							
January	6,397	S.	22	1	7	19	13	3	19	17	4	5	6	6	9	16	10	0	0	0	0	9	
February	5,983	W.	40	20	7	1	6	6	13	37	6	3	5	10	11	7	9	0	1	0	0	2	
March	6,753	E.	34	21	6	2	14	10	31	22	2	3	3	11	14	6	5	0	0	0	0	4	
April	7,468	S.	34	22	4	11	10	17	25	16	4	2	1	15	11	4	2	0	2	0	0	1	
May	7,748	W.	30	7	5	8	11	29	18	15	2	4	1	12	12	7	10	0	3	0	0	0	
June	7,008	SE.	34	13	1	6	12	24	24	20	1	0	2	19	8	3	6	0	0	0	0	0	

Location of office, on June 30, 1882, northwest corner Headquarters building.

J. E. THATCHER,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

FORT MISSOULA, MONT.

[Latitude, 46° 50′; longitude west of Greenwich, 114° 7′. Elevation of barometer above sea-level, 3,140 feet. Elevation of rain-gauge (top) above ground, 19 feet. Elevation of exposed thermometer above ground, 7 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.108	30.064	30.063	30.079	30.381	29.755	53.6	76.8	66.8	65.7	95	38	73.3	40.2	56.1	56.5	3.3	3.6	4.4	3.8	.71	.32	20
August	30.145	30.087	30.088	30.106	30.336	29.757	48.7	73.9	63.8	62.1	100	33	98.7	30.9	48.2	49.3	2.9	3.1	2.2	2.7	.18	.13	31
September	30.221	30.200	30.200	30.207	30.602	29.862	41.5	58.6	50.6	50.2	80	23	82.7	50.6	65.8	66.4	4.2	6.2	4.0	4.8	1.05	.23	4
October	30.387	30.380	30.384	30.384	30.660	30.039	31.2	43.5	38.3	38.7	61	7	89.4	67.0	80.0	78.8	7.6	7.8	5.9	7.1	1.06	.24	30
November	30.556	30.536	30.535	30.542	30.955	30.018	24.3	32.5	27.9	28.2	53	0	92.0	78.3	84.7	85.0	5.9	7.2	6.8	6.6	.80	.22	6
December	30.566	30.543	30.526	30.545	30.989	29.852	19.4	27.1	22.0	22.8	45	−10	90.9	78.7	89.3	86.3	5.1	7.2	6.3	6.2	1.25	.45	11
Year 1881	30.202	30.174	30,183	30.186	.....	.....	35.9	48.9	42.2	42.3	.....	.....	83.1	59.8	70.7	71.2	5.2	6.0	4.9	5.4	20.56	.....	....
1882.																							
January	30.158	30.135	30.142	30.145	30.557	29.553	15.3	23.9	18.4	19.2	42	−31	88.5	79.2	84.0	83.9	6.4	8.3	6.9	7.2	1.18	.28	23
February	30.087	30.079	30.073	30.080	30.474	29.608	20.0	28.3	23.5	23.9	50	−28	87.5	84.1	83.9	85.2	7.0	7.5	6.8	7.1	.80	.29	28
March	30.100	30.095	30.075	30.090	30.511	29.502	23.5	35.6	28.2	29.1	70	− 8	82.7	74.2	79.7	78.9	4.8	6 3	5.2	5.4	.71	.16	1
April	29.985	29.931	29.958	29.958	30.489	29.356	34.3	50.8	42.6	42.6	68	19	86.2	61.6	77.1	75.0	5.2	6.5	5.6	5.8	.65	.42	5,6
May	30.011	29.965	29.966	29.981	30.350	29.541	40.9	61.1	52.3	51.4	88	25	84.2	48.2	64.7	65.7	3.9	6.2	4.3	4.8	.96	.24	16
June	29.938	29.898	29.900	29.912	30.150	29.696	52.5	71.9	62.9	62.4	91	32	77.0	45.2	63.9	62.0	4.1	5.4	5.1	4.8	1.51	.47	{16 17

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.32 a. m., 12.32 p. m., and 8.32 p. m., local time.

J. H. JONES,
Corporal, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

FORT MISSOULA, MONT.

	Wind.				Winds at 7 a.m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	3,520	NW.	48	6	9	6	1	3	5	28	10	28	3	12	16	3	5	0	1	0	0	0	
August	3,540	SW.	30	26	4	2	0	8	2	18	7	46	6	18	9	4	3	0	3	0	0	0	August: 6th, excessive heat; highest ever recorded at this station; 100° in shade while 127° in the sun. Heavy prairie fire 21st; mountain fire 24th. September: Heavy frost on 20th, first of the season. October: 1st, birds going south; heavy frosts 1st, 24th, 25th, and 26th. November: Lunar halos 14th, 26th, 29th. December: Lunar halos 27th, 28th, 29th.
September	2,433	SW.	21	13	2	14	1	2	6	25	6	27	7	9	13	8	10	2	0	0	0	7	
October	2,677	E.	28	3	6	23	6	5	4	11	5	24	9	3	14	14	6	6	1	0	2	20	
November	935	N. / SW. / NW.	11	1 / 5 / 14	8	15	6	9	4	16	4	11	17	4	11	15	2	9	0	0	12	29	
December	1,359	SW. / NW.	13	7 / 15 / 27	11	16	5	8	1	14	6	17	15	4	15	12	2	11	0	0	14	31	
Year 1881	32,846	.....	.....	.....	87	151	58	75	69	195	76	255	129	97	149	119	69	52	10	0	65	192	
1882.																							
January	1,800	SW.	16	15 / 27	7	21	5	7	3	23	3	15	9	2	10	19	2	14	0	0	18	31	January: Lunar halo 31st. February: Lunar halos 22d, 23d. March: Lunar halo 30th. April: Large flocks of geese observed going south. May: Lunar halo 25th.
February	2,818	NE.	29	16	7	22	3	5	4	23	4	15	1	3	11	14	2	11	0	0	8	28	
March	3,208	NE.	25	28	7	34	2	5	2	17	5	21	0	6	14	11	4	8	0	0	9	30	
April	3,308	SE.	24	19	6	14	2	5	4	29	9	21	0	6	13	11	7	0	0	0	0	25	
May	3,101	NW.	20	13	7	19	5	8	4	16	14	20	0	8	15	8	9	0	1	0	0	10	
June	2,733	NW.	20	6	7	7	2	10	9	31	7	16	1	11	10	9	13	0	3	0	0	0	

Location of office on June 30, 1882, in laundress' quarters.

J. H. JONES,
Corporal, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

FORT SHAW, MONT.

[Latitude, 47° 31′; longitude west of Greenwich, 111° 48′. Elevation of barometer above sea-level, 3,550 feet. Elevation of rain-gauge (top) above ground, 24 feet. Elevation of exposed thermometer above ground, 7 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.830	29.804	29.805	29.813	30.099	29.545	52.9	76.7	64.9	64.8	96	39	79.2	35.7	56.9	57.3	2.2	3.5	3.8	3.2	1.67	.92	20
August	29.870	29.831	29.838	29.846	30.099	29.515	48.4	74.2	62.2	61.6	99	40	68.0	28.6	48.6	48.4	1.6	2.7	3.4	2.6	1.23	.72	30
September	29.948	29.918	29.946	29.937	30.371	29.526	42.6	59.3	47.5	49.8	81	30	78.2	42.4	69.2	63.3	4.5	4.4	3.0	4.0	.96	.50	1
October	30.144	30.139	30.160	30.148	30.507	29.757	29.2	39.5	31.8	33.5	59	— 2	82.5	68.4	78.9	76.6	6.2	6.4	5.5	6.0	1.57	.65	11
November	30.220	30.215	30.211	30.215	30.749	29.615	27.2	34.6	29.7	30.5	57.5	—17.5	72.0	59.5	67.1	66.2	5.9	6.3	5.2	5.8	.59	.21	15
December	30.196	30.177	30.171	30.182	30.691	29.536	31.5	38.7	34.1	34.8	53	3	59.2	45.7	55.3	53.4	3.3	5.0	4.7	4.3	.04	.02	12
Year 1881	29.994	29.973	29.981	29.983	.....	.....	34.9	49.9	41.5	42.1	.....	.....	74.2	48.4	63.0	61.9	4.4	5.0	4.4	4.6	14.77	.....	.....
1882.																							
January	30.117	30.104	30.128	30.116	30.536	29.562	17.7	24.8	17.5	20.0	50	—29	67.8	59.3	70.2	65.8	4.2	5.7	4.0	4.6	.78	.16	24
February	30.081	30.062	30.063	30.069	30.597	29.621	22.2	31.0	25.0	26.1	56	—24.5	70.6	54.9	66.5	64.0	4.2	5.7	3.4	4.4	.23	.10	16
March	30.129	30.122	30.132	30.128	30.561	29.667	22.2	35.9	26.8	28.3	71	—18	69.8	54.6	65.1	63.2	6 4	5.8	4.3	5.5	.62	.17	3, 4
April	29.994	29.971	29.982	29.982	30.546	29.429	31.6	46.6	37.9	38.7	74	14	74.7	50.6	64.8	63.4	4.8	5.5	4.5	4.9	.97	.45	6, 7
May	29.939	29.918	29.928	29.928	30.339	29.672	39.0	59.8	49.8	49.5	81	23	79.2	40.8	66.4	62.1	4.1	5.6	5.0	4.9	1.45	.59	6
June	29.887	29.875	29.876	29.879	30.167	29.584	49.4	68.1	59.9	59.1	88	38	78.4	45.8	61.8	62.0	3.6	5.4	4.5	4.5	1.69	.92	12, 13

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.41 a. m., 12.41 p. m., and 8.41 p. m., local time.

A. L. MATHEWS,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

FORT SHAW, MONT.

	Wind.				Winds at 7 a. m., 3 p. m., and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	5,610	SW.	44	2	1	6	19	1	5	8	46	2	5	15	14	2	9	0	7	0	0	0	
August	5,785	W.	43	10	0	11	12	1	4	5	52	8	0	19	10	2	6	0	0	0	0	0	First and killing frost September 6.
September	5,902	W.	43	24	2	17	2	1	2	9	48	8	1	10	17	3	5	0	1	2	0	1	Aurora September 12 and 13.
October	5,239	W.	36	7	5	18	4	0	1	18	29	13	5	7	11	13	5	5	0	0	7	20	
November	8,984	SW.	48	4	6	8	1	2	4	31	28	6	4	8	11	11	1	6	0	0	6	22	
December	13,651	SW.	48	7, 27	1	2	3	4	0	57	25	0	1	10	16	5	0	2	0	0	3	21	
Year 1881	89,666	.....	....	.....	64	100	85	20	30	195	478	78	45	121	157	87	42	41	8	2	59	152	
1882.																							
January	10,039	SW.	50	14	3	5	2	0	1	31	36	4	11	7	20	4	0	10	0	0	18	28	Aurora April 18, 19, and 20.
February	12,189	SW.	62	14	5	0	1	3	1	50	18	2	4	10	14	4	0	5	0	0	5	25	
March	9,857	SW.	57	28	6	12	1	5	0	30	31	6	2	8	13	10	1	9	0	0	8	23	
April	6,887	SW.	45	19	6	9	6	1	3	16	36	10	3	11	11	8	2	9	0	3	0	23	
May	6,024	W.	37	18	5	7	12	1	5	4	51	8	0	7	20	4	17	1	4	0	0	5	
June	5,147	SW.	32	21	5	3	14	1	7	14	39	5	2	8	17	5	10	0	1	0	0	0	

Location of office on June 30, 1882, north wing of post headquarters.

A. L. MATHEWS,
Sergeant, Signal Corps U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

FORT SILL, IND. T.

[Latitude, 34° 40′; longitude west of Greenwich, 98° 23′. Elevation of barometer above sea-level, 1,200 feet. Elevation of rain-gauge (top) above ground, 6 feet. Elevation of exposed thermometer above ground, 6 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.					Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.	Amount in inches.	Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.998	29.952	29.964	29.971	30.129	29.753	76.2	94.9	83.2	84.8	106	64	71.1	35.5	54.2	53.6	4.0	5.0	2.0	3.7	1.97	1.17	26, 27
August	29.867	29.706	29.747	29.757	29.915	29.579	77.2	98.7	85.5	87.1	105	67	66.9	30.5	47.9	48.4	2.0	6.0	0.0	2.7	.84	.50	4
September	29.994	29.952	29.963	29.970	30.246	29.648	67.0	84.8	75.3	75.7	100	45.5	75.0	41.9	57.0	58.0	3.6	4.0	3.7	3.8	4.46	2.63	12, 13
October	30.109	30.073	30.087	30.090	30.321	29.622	59.5	71.9	63.8	65.1	88	41	91.2	64.5	80.8	78.9	6.7	6.1	4.6	5.8	1.74	.49	9, 10
November	30.189	30.161	30.198	30.183	30.619	29.635	39.1	56.2	45.2	46.8	75.5	22	83.8	50.0	71.5	68.4	4.3	2.7	3.7	3.6	1.38	1.00	10, 11
December	30.241	30.199	30.235	30.225	30.592	29.793	38.6	55.6	45.0	46.4	71.5	27.8	80.0	43.7	69.1	64.3	3.5	6.3	4.3	4.7	2.30	1.92	19, 20
Year 1881	29.994	29.943	29.972	29.970	.....	.....	53.2	70.5	60.1	61.2	.....	.....	78.5	46.6	65.8	63.6	4.2	4.8	3.2	4.1	28.22	.....	.....
1882.																							
January	30.196	30.164	30.194	30.185	30.737	29.802	33.6	46.1	39.2	39.6	73	8	86.6	56.4	72.5	71.8	5.2	6.7	4.2	5.4	.80	.36	12
February	30.112	30.094	30.110	30.105	30.387	29.538	40.6	51.6	47.0	47.4	72.5	21.5	80.7	56.8	72.5	70.0	5.9	6.2	4.4	5.5	1.66	1.07	19, 20
March*	30.077	30.045	30.083	30.068	30.563	29.567	46.3	64.6	54.2	55.0	86	23	82.9	49.6	69.6	67.4	5.2	5.4	3.6	4.7	1.53	.47	8, 9
April	29.963	29.931	29.942	29.945	30.212	29.527	51.6	71.7	60.1	61.1	94	37.5	79.2	38.5	63.7	60.5	4.1	4.5	3.3	4.0	1.61	1.61	27, 28
May	29.936	29.897	29.910	29.914	30.251	29.423	57.9	74.7	63.7	65.4	96	44	81.7	48.6	69.8	66.7	4.9	5.4	3.7	4.7	4.40	1.13	30
June	29.915	29.885	29.888	29.896	30.254	29.572	69.9	88.3	75.2	77.8	102	52.5	81.4	44.1	60.7	65.1	4.4	4.6	3.0	4.0	3.25	2.14	12, 13

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.34 a. m., 1.34 p. m., and 9.34 p. m., local time.
*March data for 29 days only.

THOS. CLEARY,
Corporal, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

FORT SILL, IND. T.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurora.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	8,904	SE.	30	8, 10	12	7	16	27	26	1	0	3	1	16	12	3	4	0	2	0	0	0	
August	6,504	S.	34	30	11	8	7	17	39	1	0	1	9	20	11	0	4	0	4	0	0	0	
September	10,565	S.	43	29	15	2	4	3	40	5	2	2	8	17	6	7	7	0	2	0	0	0	
October	9,084	S.	35	14	19	5	1	10	46	5	1	4	2	5	14	12	10	0	0	0	0	0	
November	8,434	N.	38	23	27	9	2	1	30	3	4	11	3	13	13	4	4	0	0	0	0	5	First frost of season November 3.
December	7,400	N.	43	20	28	1	2	3	26	7	3	17	6	8	16	7	4	0	0	0	0	5	
Year 1881	98,729	.....	....	.....	228	58	73	106	376	41	22	96	95	149	147	69	61	10	22	0	13	62	
1882.																							
January	8,097	N.	41	16	35	7	5	7	29	3	2	1	4	6	16	9	5	3	0	0	1	15	First snow of season January 16.
February	7,950	N.	36	7, 19	23	0	1	8	24	6	2	7	13	9	7	12	7	0	2	0	0	7	
March*	10,018	SW.	42	26	24	7	2	3	33	3	0	8	9	11	7	11	6	1	3	0	0	5	Last snow March 9; last frost of season March 10.
April	10,753	S.	44	5	22	6	1	9	33	4	3	7	5	13	11	6	7	0	4	1	0	0	Aurora on 16th.
May	9,482	S.	44	30	19	5	8	11	27	2	2	12	7	7	18	6	10	0	8	0	0	0	
June	8,670	W.	40	12	7	3	6	17	46	5	0	1	5	10	15	5	6	0	4	0	0	0	

Location of office on June 30, 1882, southeast side of post.

* Record for 29 days only.

THOS. CLEARY,
Corporal, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[Form No. 132—A.]

FORT SMITH, ARK.

[Latitude, 35° 22′; longitude west of Greenwich, 94° 24′. Elevation of barometer above sea-level, 449 feet. Elevation of rain-gauge (top) above ground, 29 feet. Elevation of exposed thermometer above ground, 17 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–4.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...
August	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...
September	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...
October	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...
November	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...
December	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...
Year 1881	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...
1882.																							
January	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...
February	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...
March	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...
April	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...
May	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...
June	29.966	29.926	29.920	29.937	30.273	29.605	70.8	88.0	76.1	78.3	101.0	50.0	85.6	52.1	78.0	71.9	3.9	4.9	2.4	3.7	2.10	1.14	13

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.50 a. m., 1.50 p. m., and 9.50 p. m., local time.
Observations commenced June 1, 1882.

J. B. CAMPBELL,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

FORT SMITH, ARK.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water		Thunder storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July																							
August																							
September																							
October																							
November																							
December																							
Year 1881																							
1882.																							
January																							
February																							
March																							
April																							
May																							
June	2,965	N.	32	15	2	3	15	12	22	7	2	4	23	15	11	4	4	0	3	0	0	0	

Observations commenced June 1, 1882.

J. B. CAMPBELL,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

FORT STEVENSON, DAK.

[Latitude, 47° 35′; longitude west of Greenwich, 101° 28′. Elevation of barometer above sea-level, 1,750 feet. Elevation of rain-gauge (top) above ground, 4 feet. Elevation of exposed thermometer above ground, 8 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Highest.	Lowest.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.902	29.870	29.880	29.884	30.172	29.494	63.2	79.2	68.3	70.2	101	44	84.1	54.7	74.5	71.1	2.8	4.8	4.0	3.9	2.01	.75	19, 20
August	29.903	29.900	29.905	29.902	30.254	29.487	58.2	76.5	64.9	66.5	95	45	85.6	48.3	71.4	68.4	4.3	3.3	2.9	3.5	3.12	.65	29, 30
September	29.949	29.918	29.927	29.931	30.309	29.430	44.2	59.8	49.2	51.1	89	28	80.4	56.4	74.4	70.4	5.3	5.4	4.3	5.0	2.10	.72	23
October	30.180	30.145	30.167	30.164	30.656	29.557	32.1	46.6	35.7	38.1	66	16	83.5	60.2	79.8	74.5	5.3	5.5	6.0	5.2	1.26	1.13	31
November	30.126	30.131	30.153	30.137	30.730	29.426	18.6	26.9	20.0	21.9	56	−21	82.2	70.2	81.0	78.8	5.6	6.9	5.0	5.7	1.00	.24	16, 17
December	30.142	30.150	30.149	30.147	30.729	29.481	15.8	28.0	18.7	20.8	51	−13	77.4	71.7	75.0	74.7	2.7	4.2	3.1	3.3	.18	.08	6
Year 1881	.....	.....	.....	.....	.....	.....	31.7	45.5	36.5	37.9	.....	.....	3.2	63.5	77.6	74.8	4.6	5.2	4.3	4.7	19.83	.....	...
1882.																							
January	30.142	30.128	30.167	30.145	30.882	29.576	4.6	15.0	5.4	8.4	36	−32	73.4	73.6	76.0	74.3	6.0	6.0	2.7	4.9	.43	.07	3
February	30.063	30.064	30.077	30.068	30.863	29.545	10.9	26.5	15.2	17.6	52	−35	80.2	76.0	77.5	77.9	4.5	4.9	1.4	3.6	.54	.34	18
March	30.100	30.079	30.103	30.094	30.726	29.404	15.1	27.3	18.9	20.4	57	−23	79.7	76.8	80.4	79.0	6.6	7.0	4.2	5.9	2.05	.95	4, 5
April	29.982	30.002	30.009	29.998	30.494	29.703	33.1	45.2	37.3	38.5	63	10	89.1	68.9	81.7	79.9	6.0	5.6	4.9	5.5	.....	2.47	20, 21
May	29.947	29.929	29.929	29.935	30.283	29.527	42.9	58.1	47.5	49.5	80	24	85.9	59.6	78.4	74.6	4.9	5.4	3.7	4.7	2.49	1.15	9, 10
June	29.861	29.845	29.845	29.850	30.184	29.454	55.3	71.7	59.3	62.1	89	33	86.1	56.3	78.0	73.5	4.2	5.8	4.1	4.7	5.61	2.83	17, 18

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.22 a. m., 1.22 p. m., and 9.22 p. m., local time.

WILLIAM BURROWS,
Private, Company "I," Seventh Infantry, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

FORT STEVENSON, DAK.

	Wind.				Winds at 7 a. m., 3 and 11 p.m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	6,374	SW.	46	18	8	6	21	20	11	3	16	7	1	14	14	3	8	0	1	1	0	0	Aurora on 7th; heavy thunder-storm on 18th.
August	6,139	W.	42	11	12	3	17	21	7	3	15	8	1	11	14	5	11	0	1	1	0	0	Aurora on 20th.
September	5,995	W.	32	9, 14, 16	10	0	9	10	5	4	24	21	7	7	10	13	7	0	0	2	0	2	Aurora 11th and 13th; frost 7th.
October	5,393	NW.	31	31	11	14	8	18	7	1	11	20	3	13	5	13	3	1	0	0	1	22	
November	8,378	NW.	47	22	9	1	2	10	9	6	10	41	2	2	19	9	3	9	0	1	13	27	Lunar halo, 5th; solar halo, 18th; aurora, 23d.
December	5,755	NW.	49	28	6	9	3	8	11	9	16	25	6	13	16	2	1	5	0	4	12	31	Auroras 10th, 11th, 22d, and 23d.
Year 1881	71,915	.....	.....	.....	112	58	133	154	87	36	177	195	51	122	142	94	63	34	7	13	95	186	
1882.																							
January	6,021	NW.	56	17	7	7	0	13	2	11	11	36	6	7	19	5	0	10	0	0	24	31	
February	5,722	NW.	36	3, 4, 6, 15	5	11	3	8	6	5	9	33	4	14	12	2	0	5	0	1	8	27	Aurora on the 12th.
March	8,262	N.	50	5	7	10	10	8	3	5	6	22	2	4	12	8	3	9	0	0	9	25	
April	6,454	NW.	46	3	5	12	10	10	2	0	6	10	2	7	7	6	7	1	0	3	0	7	Auroras 15th, 16th, and 17th.
May	7,507	NW.	48	20	3	23	19	13	3	2	1	16	5	13	11	7	11	1	0	1	0	6	Aurora on 21st.
June	5,062	NE.	40	30	3	23	10	21	1	9	5	15	3	10	12	8	15	0	3	0	0	0	

Location of office, June 20, 1882, in northwest part of garrison.

WILLIAM BURROWS,
Private, Company "I," Seventh Infantry, U. S. A.

Annual meteorological summary—Continued.

[Form No. 132—A.]

FORT SAINT MICHAEL'S, ALASKA.

[Latitude, 63° 28′; longitude west of Greenwich, 162° 50′. Elevation of barometer above sea-level, 30 feet. Elevation of rain-gauge (top) above ground, 1 foot. Elevation of exposed thermometer above ground, 8 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.915	29.927	29.903	29.915	30.285	29.531	52.3	55.2	57.9	55.1	74	33	74.9	81.4	72.9	76.4	6.0	6.3	5.9	6.0	0.89	.67	20
August	29.942	29.932	29.922	29.932	30.384	29.484	51.5	53.9	54.4	53.3	65	43	89.0	77.7	97.3	88.0	7.8	9.4	9.1	8.8	4.43	.49	24
September	29.778	29.788	29.781	29.782	30.117	29.422	44.8	47.4	47.7	46.6	62	33	96.7	78.6	84.8	86.7	8.6	8.0	8.2	8.2	3.40	.57	28
October	29.880	29.887	29.871	29.879	30.554	28.999	37.3	40.6	40.5	39.5	60	20	91.3	69.7	92.8	84.6	7.2	6.4	7.3	7.0	2.14	.80	12
November	29.703	29.715	29.700	29.706	30.608	29.085	23.3	26.4	26.0	25.2	40	−3	89.4	71.6	94.6	85.2	6.9	7.1	6.3	6.8	1.75	.37	29
December	29.779	29.777	29.762	29.773	30.576	29.159	−6.0	−2.6	−2.9	−3.8	35	−35	92.3	80.7	89.5	87.5	4.8	6.2	4.0	5.0	0.23	.12	5
Year 1881	29.873	29.877	29.861	29.871	.....	.....	25.6	29.0	30.2	28.3	.....	.....	91.9	86.0	93.1	90.3	6.4	6.5	6.0	6.3	16.61	.....	.....
1882.																							
January	29.622	29.607	29.626	29.618	30.713	28.712	8.3	10.6	10.5	9.8	38	−16	96.6	92.9	93.4	94.3	7.5	8.2	7.5	7.6	1.88	.51	27
February	29.842	29.872	29.866	29.860	30.559	28.756	−16.5	−14.3	−12.8	−14.5	36	−38	99.5	100.0	99.0	99.5	4.2	4.5	4.2	4.2	0.40	.13	10
March	30.175	30.194	30.173	30.181	30.841	29.550	10.9	12.3	16.2	13.1	41	−20	96.4	94.6	93.1	94.7	5.7	5.7	6.4	5.9	0.28	.19	10
April	30.068	30.067	30.048	30.061	30.661	29.452	13.7	19.4	22.2	18.4	44	−18	96.5	92.2	91.6	93.4	4.2	5.8	5.0	5.0	0.04	.04	22
May	29.982	29.967	29.945	29.965	30.524	29.073	31.0	35.7	37.1	34.5	52	12	94.3	93.4	93.3	93.7	6.3	7.0	6.9	6.9	0.18	.07	11
June	29.879	29.863	29.848	29.863	33.361	29.453	46.0	50.3	53.1	49.8	66	32	90.1	89.1	95.0	88.1	7.0	8.1	6.4	7.3	0.25	.09	10

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 1.21 a. m., 9.21 a. m., and 5.21 p. m., local time.

A. P. LEAVITT,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

FORT SAINT MICHAEL'S, ALASKA.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—						Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	.01 inch or more of water.		Thunder-storms.	Aurora.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.										Rain.	Snow.					
1881.																				
July	5,049	SW.	70	11	17	18	8	3	5	23	6	9	4	5	0	0	0	0	0	
August	6,687	SW.	72	20	6	7	4	5	23	39	7	2	0	24	0	0	0	0	0	
September	5,208	S.	29	1, 2, 30	3	10	18	5	32	12	3	6	1	18	0	0	1	0	0	
October	5,842	N.	46	26	10	18	18	16	21	5	1	3	1	10	2	0	3	2	8	
November	7,689	S.	53	19	10	6	19	9	31	6	5	4	0	2	13	0	4	15	28	
December	5,359	S.	70	2	12	10	6	7	18	15	7	6	3	1	3	0	4	28	31	
Year 1881	79,821	.....	.....	.....	250	181	124	62	200	146	55	47	30	52	54	0	29	†44	220	
1882.																				
January	10,767	SW.	90	19	8	32	11	7	12	17	1	2	3	0	13	0	2	28	31	
February	5,122	S.	60	16	5	14	6	8	14	24	6	1	6	0	7	0	6	25	28	
March	6,617	S.	35	11	18	4	10	14	12	17	6	3	0	0	4	0	2	25	31	
April	4,899	S.	40	7, 21	15	4	5	5	28	13	2	5	13	0	1	0	3	15	30	
May	5,152	S.	23	10	28	16	2	7	10	16	1	3	10	2	3	0	0	5	17	
June	5,031	S.	24	29	14	23	2	6	7	12	10	12	4	5	0	0	0	0	0	

†For six months only; maximum thermometer broken.

A. P. LEAVITT,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

FORT VERDE, ARIZ.

[Latitude, 34° 33′; longitude west of Greenwich, 111° 52′. Elevation of rain-gauge (top) above ground, 4 feet. Elevation of exposed thermometer above ground, 6 feet.]

	*Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	1 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July							71.3	94.7	83.3	83.1	114.0	61.0	54.6	31.3	46.7	44.2	3.5	4.8	4.4	4.2	1.41	.35	27
August							69.0	88.3	78.5	78.6	104.1	52.3	70.9	44.1	59.0	58.0	4.4	4.4	3.7	4.2	7.53	2.07	14 and 15
September							56.3	81.9	70.3	69.5	95.2	34.0	66.4	31.1	46.4	47.9	1.4	1.9	1.5	1.6	1.88	1.15	4
October							46.2	73.5	61.0	60.2	95.0	27.3	65.2	29.3	43.5	45.6	2.5	3.4	1.5	2.5	.20	.13	10
November							29.8	56.3	44.8	43.6	73.1	14.9	60.7	29.4	39.0	43.0	1.4	1.4	0.8	1.2	.21	.20	10
December							31.3	53.5	43.4	42.7	68.8	17.7	61.8	37.0	50.7	49.8	2.7	3.8	3.3	3.3	.27	.21	16 and 17
Year 1881							46.6	72.3	61.8	60.3	.....	.....	58.0	28.7	41.2	42.6	2.4	3.2	2.1	2.5	15.37	.....	.....
1882.																							
January							27.1	42.6	35.6	35.1	63.2	6.0	70.1	52.6	62.6	61.8	3.7	3.9	3.6	3.7	2.72	.89	13
February							32.1	51.8	43.1	42.3	68.3	18.1	72.2	42.1	58.6	57.6	4.2	4.2	2.4	3.6	.93	.41	26 and 27
March							38.0	64.1	53.3	51.8	84.9	23.9	54.9	20.3	34.1	36.4	1.7	2.5	2.4	2.2	.01	.01	13 and 14
April							43.1	70.2	59.2	57.5	92.0	29.9	49.1	19.1	32.6	33.6	2.0	3.5	0.7	2.1	.03	.02	14
May							51.2	80.5	70.3	67.3	93.8	40.1	47.8	18.2	28.4	31.5	1.6	3.0	2.0	2.2	.19	.16	6
June							61.9	88.2	78.1	76.1	101.6	48.8	43.1	24.4	33.7	35.4	1.9	3.4	2.2	2.5	1.35	.84	18

*No barometer at this station.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.38 a. m., 12.38 p. m., and 8.38 p. m., local time.

DUDLEY BROOKS,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

FORT VERDE, ARIZ.

	Wind.*				Winds at 7 a. m., 3, and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July					2	1	2	18	16	31	16	7	0	12	14	5	10	0	9	0	0	0	Comet visible throughout the month; heavy rainfall.
August					6	2	0	15	23	26	8	13	0	12	12	7	12	0	7	0	0	0	Comet visible throughout the month.
September					12	3	0	10	14	17	14	20	0	24	4	2	4	0	0	0	0	0	Frost 24th; heavy rainstorm 4th.
October					9	1	1	11	27	15	16	11	0	21	7	3	4	0	0	0	0	4	Frost 29th.
November					19	1	3	11	5	8	15	28	0	25	4	1	1	1	0	0	0	24	Light frost 12th, 13th, and 14th.
December					14	3	1	6	4	12	29	24	0	16	13	2	3	0	0	0	0	21	Frost 19th and 28th; lunar halo 4th, 10th, and 31st.
Year 1881					118	24	27	144	187	228	187	178	0	236	97	32	46	6	16	0	0	106	
1882.																							
January					5	8	2	7	11	16	30	14	0	16	8	7	3	3	0	0	1	28	Frost 27th, 28th, and 31st; sand storm 11th.
February					15	1	4	11	18	8	10	17	0	12	12	4	7	2	0	0	0	18	Lunar halo 23d.
March					19	1	2	15	17	10	15	14	0	23	5	3	1	0	0	0	0	13	
April					10	5	3	13	22	20	11	6	0	19	9	2	2	0	0	0	0	4	Lunar halo 1st; frost 5th; sand storm 6th.
May					7	1	1	11	14	35	12	12	0	19	11	1	2	0	1	0	0	0	
June					0	1	0	9	32	32	5	11	0	19	9	2	6	0	3	0	0	0	Sand storm 15th.

* No anemometer at this station.

Location of office June 30, 1882, Laundress' Row.

DUDLEY BROOKS,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

FORT WASHAKIE, WYO.

[Latitude 43° 1′; longitude west of Greenwich, 108° 54′. Elevation of barometer above sea-level 5,580 feet. Elevation of rain-gauge (top) above ground, 1 foot. Elevation of exposed thermometer above ground, 5 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 a. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July																							
August																							
September																							
October																							
November																							
December																							
Year 1881																							
January*																							
February	30.097	30.086	30.091	30.091	30.281	29.797	7.5	31.3	15.6	18.1	56.1	−25.7	76.5	51.1	65.5	64.4	2.4	5.6	3.6	3.9		.07	17
March	30.111	30.090	30.126	30.109	30.498	29.706	22.0	44.3	29.4	31.9	74.3	− 3.4	66.8	45.5	59.5	57.3	3.1	6.6	3.4	4.4	.15	.07	9, 10
April	29.922	29.897	29.924	29.914	30.421	29.530	31.3	49.3	38.4	39.7	74.0	18.8	79.1	58.0	75.2	70.8	6.0	6.8	5.1	6.0	1.81	.72	4, 5
May	29.903	29.875	29.898	29.892	30.188	29.599	37.9	56.7	46.1	46.9	77.2	25.0	81.7	51.8	72.0	68.5	6.0	7.1	6.1	6.4	5.77	.93	7
June	29.838	29.806	29.820	29.821	30.031	29.505	47.4	70.7	57.2	58.4	90.0	32.9	79.9	39.6	60.3	59.9	5.0	6.0	5.5	5.5	1.51	.70	13, 14

*Station opened February 15, 1882.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.52 a. m., 12.52 p. m., and 8.52 p. m., local time.

T. M. AMBLER,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

FORT WASHAKIE, WYO.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days with—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurora.	Minimum below 32°	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July																							
August																							
September																							
October																							
November																							
December																							
Year 1881*																							
1882.																							
January																							
February	1,869	SW.	40	28	5	7	2	5	4	5	11	3	0	7	6	1	0	*3	0	0	6	14	Station opened February 15, 1882.
March	6,041	W.	60	28	14	4	10	10	6	13	24	11	1	11	16	4	0	5	0	0	6	31	
April	5,283	W.	48	20	3	8	7	18	9	11	16	14	4	5	13	12	*5	*17	1	0	0	24	Three days rain and snow.
May	4,494	W.	32	4	2	8	11	11	8	15	18	12	8	6	10	15	*13	*2	6	0	0	10	Two days rain and snow.
June	4,343	NW.	34	17	4	10	8	10	0	16	20	17	5	5	14	11	9	0	4	0	0	0	Killing frost, June 22, 1882.

*One day sleet.

Location of office on June 30, 1882, in old adjutant office.

T. M. AMBLER,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

FREDERICKSBURG, TEX.

[Latitude 30°17′; longitude west of Greenwich, 98° 52′. Elevation of barometer above sea-level, 1,700 feet. Elevation of rain-gauge (top) above ground, 24 feet. Elevation of exposed thermometer above ground, 16 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.791	29.726	29.733	29.751	29.898	29.597	75.2	88.4	80.3	81.4	98	68	84.5	50.6	69.8	68.3	3.6	4.8	1.7	3.4	4.28	2.60	17
August	29.759	29.671	29.712	29.713	29.870	29.576	75.3	89.5	80.2	81.7	100	68	79.3	46.0	67.4	64.2	3.2	5.2	1.3	3.2	1.53	42	9
September	29.773	29.676	29.741	29.730	29.955	29.500	69.3	85.1	74.9	76.5	93	52	85.0	52.7	73.4	70.4	6.2	3.8	3.0	4.3	2.14	68	10
October	29.846	29.774	29.836	29.819	30.027	29.408	64.7	76.7	67.5	69.6	89	43	92.4	65.8	86.4	81.5	6.4	6.6	4.8	5.9	3.38	1.74	1
November	29.957	29.854	29.944	29.918	30.490	29.448	48.8	65.0	54.4	56.1	80	28	86.4	62.4	80.1	76.3	5.4	4.5	5.2	5.0	1.68	50	5
December	30.012	29.910	29.995	29.972	30.427	29.544	47.1	62.6	52.4	54.0	79	27	86 4	63.9	79.2	76.2	4.6	5.5	5.4	5.2	72	45	19
Year 1881	29.825	29.753	29.816	29.798	.....	.....	58.5	74.5	64.6	65.9	.....	.....	82.1	51.7	71.4	68.4	4.9	4.4	3.3	4.2	24.11	.....	.....
1882.																							
January	30.136	30.116	30.149	30.133	30.565	29.912	48.7	57.4	51.7	52.7	75	35	89.5	76.7	86.4	84.2	7.5	8.0	7.5	7.7	3.54	1.48	12
February	30.105	30.090	30.119	30.105	30.333	29.736	52.6	65.4	57.2	58.4	76	35	84.1	64.4	80.2	76.2	6.1	6.4	6.2	6.2	3.20	2.15	3
March	30.075	30.058	30.085	30.073	30.320	29.732	55.5	68.5	60.1	61.4	86	33	86.1	66.0	81.4	77.8	6.9	6.6	4.8	6.1	2.01	1.79	6,7
April	29.937	29.922	29.940	29.933	30.201	29.587	59.6	75.2	64.9	66.6	90	39	88.2	61.4	80.6	76.7	7.4	5.3	4.9	5.9	.78	.31	28,29
May	29.943	29.942	29.945	29.943	30.153	29.500	63.4	75.8	68.5	69.2	87	54	88.4	65.4	80.3	78.0	6.9	6.1	5.6	6.2	5.57	3.68	6,7
June	29.930	29.908	29.915	29.918	30.115	29.731	70.2	85.4	76.4	77.3	93	58	87.1	52.3	72.6	70.7	4.1	3.7	2.6	3.5	.30	.28	7

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.33 a. m., 1.33 p. m., and 9.33 p. m., local time.

H. S. MILES,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

FREDERICKSBURG, TEX.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	2,837	SE.	22	2	0	1	5	11	18	9	0	0	39	11	14	1	7	0	2	0	0	0	
August	2,316	N.	23	22	1	8	4	8	11	13	1	1	44	15	14	1	6	0	1	0	0	0	
September	5,174	S.	24	29	7	7	0	7	26	24	3	2	11	10	12	6	6	0	0	0	0	0	Light frost 17th.
October	4,237	SW.	21	15	5	6	11	19	18	17	3	8	6	6	11	14	10	0	1	0	0	0	
November	5,405	SW.	28	17	26	5	4	5	5	24	6	11	4	8	11	11	11	0	0	0	0	1	
December	3,869	SW.	28	12	19	6	8	6	2	16	9	8	13	10	9	10	6	0	0	0	0	1	
Year 1881	56,533	.....	....	.....	185	78	56	79	177	266	106	94	188	126	137	83	75	2	11	...	....	30	
1882.																							
January	3,512	N.	26	16	12	11	4	4	13	1	4	4	19	2	4	17	15	0	0	0	0	0	
February	5,246	N.	34	28	7	5	3	2	15	18	8	8	18	5	8	15	14	0	1	0	0	0	
March	5,618	NW.	30	27	7	7	0	4	20	34	2	5	14	6	11	14	6	0	0	0	0	0	Light frost 9th.
April	5,589	N.	26	22	7	13	3	10	11	28	4	5	9	6	11	13	5	0	2	0	0	0	
May	4,813	N.	32	5	7	4	11	8	12	19	2	3	15	3	12	11	9	0	4	0	0	0	
June	5,744	SW.	21	2, 21	1	5	5	6	21	42	1	0	9	15	12	3	3	0	0	0	0	0	

Location of office on June 30, 1882, Nimitz Hotel.

H. S. MILES,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

GALVESTON, TEX.

[Latitude, 29° 18′; longitude west of Greenwich, 94° 47′. Elevation of barometer above sea-level, 48 feet. Elevation of rain-gauge (top) above ground, 94 feet. Elevation of exposed thermometer above ground, 50 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.					Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.	Amount in inches.	Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.016	30.008	29.984	30.003	30.131	29.875	81.7	89.0	83.9	84.9	92	70	80.5	62.5	71.4	71.5	4.7	4.5	1.5	3.6	4.92	1.88	14
August	29.975	29.963	29.952	29.963	30.117	29.722	81.6	88.3	83.8	84.6	93	73.5	80.8	62.2	73.0	72.0	4.5	4.5	2.1	3.7	5.98	1.57	12
September	29.994	29.980	29.984	29.986	30.165	29.714	78.6	84.6	80.5	81.2	91	66	77.6	62.4	73.4	71.1	3.0	2.9	1.9	2.6	3.66	2.18	14
October	30.050	30.039	30.041	30.043	30.279	29.680	74.6	79.5	76.8	77.0	87	59	82.5	70.7	78.9	77.4	5.8	4.8	3.8	4.8	10.38	2.96	23
November	30.140	30.124	30.135	30.133	30.598	29.838	59.3	63.9	61.8	61.7	79.4	36	83.9	73.4	80.1	79.1	6.7	5.0	3.4	5.0	2.85	.84	9
December	30.178	30.156	30.175	30.170	30.479	29.883	55.7	61.9	58.8	58.8	75	42	83.7	72.3	79.6	78.5	5.0	5.4	4.1	4.8	3.50	2.21	20
Year 1881	30.046	30.030	30.037	30.038	.....	.....	67.2	73.4	69.7	70.1	.....	.....	81.4	67.2	76.9	75.2	5.0	4 5	2.8	4.1	53.28	.....	.....
1882.																							
January	30.103	30.091	30.110	30.101	30.526	29.899	56.3	61.1	58.3	58.6	75	37.5	93.6	85.0	91.9	90.2	7.2	7.2	6.6	7.0	8.15	3.13	23, 24
February	30.110	30.098	30.109	30.106	30.371	29.689	60.5	66.0	62.9	63.1	75	46	87.5	75.2	82.7	81.8	6.5	6.5	8.4	7.1	5.57	1.85	25
March	30.101	30.100	30.104	30.102	30.581	29.747	65.1	71.2	67.2	67.8	79	44	82.9	71.2	83.2	79.1	7.2	6.3	4.8	6.1	1.58	.48	8, 9
April	29.976	29.983	29.978	29.979	30.224	29.606	69.6	76.3	71.6	72.5	82.5	53	87.5	69.7	81.1	79.4	7.3	5.7	6.1	6.4	.83	.23	17 18
May	29.963	29.964	29.951	29.959	30.239	29.537	72.2	78.2	75.2	75.2	87	62	79.1	65.3	77.3	73.9	6.5	5.1	4.6	5.4	3.75	2.42	7
June	29.994	30.004	29.985	29.994	30.177	29.800	78.7	84.5	80.6	81.3	91.5	70	83.4	71.4	81.5	78.8	5.6	3.6	2.7	4.0	6.16	3.77	6, 7

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.49 a. m., 1.49 p. m., and 9.49 p. m., local time.

E. O'C. MACINERNEY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

GALVESTON, TEX.

	Wind.				Winds at 7 a.m., 3 and 11 p.m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	6,697	NE.	36	1	0	7	5	13	28	26	10	1	8	17	12	2	12	0	2	0	0	0	
August	6,150	{SE. W.}	28	{5 7}	2	2	2	23	36	13	8	4	3	17	10	4	10	0	1	0	0	0	
September	7,332	N.	28	15	9	2	3	41	25	1	2	4	3	23	5	2	10	0	0	0	0	0	
October	8,575	SW.	30	27	10	7	8	40	18	4	0	4	2	12	10	9	20	0	0	0	0	0	
November	9,171	N.	48	2	24	11	14	15	18	5	0	2	1	13	6	11	10	0	0	0	0	0	
December	6,916	N.	38	29	19	13	17	13	6	13	3	8	1	13	3	15	10	0	0	1	0	0	
Year 1881	87,938				124	77	74	236	328	124	43	67	19	170	117	76	121	0	19	0	0	2	
1882.																							
January	8,597	N.	37	17	11	20	12	6	34	4	0	6	0	5	4	22	20	0	0	0	0	0	
February	7,804	NW.	40	3	3	3	12	14	29	7	4	11	1	5	14	9	13	0	0	0	0	0	
March	8,668	N.	39	21	8	6	7	25	37	3	3	4	0	6	12	13	13	0	1	0	0	0	
April	9,351	NW.	44	12	9	5	6	23	33	10	0	4	0	2	14	14	14	0	0	0	0	0	
May	10,216	NW.	60	31	12	9	3	43	19	4	1	2	0	3	20	8	8	0	2	0	0	0	
June	9,329	SE.	32	8	2	5	8	9	47	16	3	0	0	16	10	4	4	0	0	0	0	0	

Location of office June 30, 1882, corner Strand and Twenty-fifth streets.

E. O'C. MACINERNEY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

GRAND HAVEN, MICH.

[Latitude, 43° 5′; longitude west of Greenwich, 86° 18′. Elevation of barometer above sea-level, 620 feet. Elevation of rain-guage (top) above ground, 74 feet. Elevation of exposed thermometer above ground, 22 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.011	29.991	29.986	29.996	30.270	29.710	69.0	74.6	69.7	71.1	87.0	56.5	79.2	65.5	79.3	73.6	3.9	2.7	2.1	2.9	4.78	1.20	7
August	30.047	30.022	30.010	30.026	30.271	29.752	66.5	75.8	70.6	71.1	92.0	53.0	82.4	63.9	74.3	73.5	3.6	3.4	3.0	3.3	1.91	.63	18
September	29.979	29.955	29.950	29.962	30.238	29.444	63.7	72.3	66.4	67.4	85.0	50.0	83.8	68.1	77.5	76.5	5.2	4.1	3.4	4.2	6.71	2.70	15
October	30.121	30.098	30.109	30.109	30.355	29.592	49.4	56.5	51.7	52.5	71.5	35.0	86.9	74.3	85.0	82.1	6.9	6.2	6.4	6.5	7.87	3.07	17
November	30.068	30.054	30.084	30.069	30.684	29.511	38.8	41.9	39.0	39.9	58.0	20.0	78.4	72.0	78.6	76.3	8.6	8.1	8.2	8.3	4.19	.65	2, 30
December	30.118	30.111	30.124	30.118	30.591	29.596	35.5	38.8	36.4	36.9	49.0	21.0	82.4	74.1	79.7	78.7	5.7	7.1	6.6	6.5	3.77	1.26	13
Year 1881	30.036	30.012	30.022	30.024	.....	.....	45.2	51.7	47.2	48.1	.....	.....	81.0	69.4	78.7	76.3	6.0	5.7	4.8	5.5	47.89	.....	.....
1882.																							
January	30.132	30.109	30.127	30.123	30.738	29.456	25.9	30.0	27.8	27.9	49.0	3.0	85.1	78.9	82.4	82.1	6.6	7.4	7.1	7.0	3.59	.75	22
February	30.048	30.022	30.043	30.038	30.611	29.237	32.7	39.2	35.8	35.9	56.5	17.0	84.5	74.8	77.9	79.1	5.6	6.0	4.6	5.4	3.09	1.25	28
March	30.059	30.053	30.064	30.059	30.659	29.290	33.3	37.2	35.4	35.3	52.0	18.5	80.5	77.2	80.0	79.2	7.7	6.8	6.4	7.0	5.85	1.59	26
April	30.068	30.049	30.058	30.058	30.303	29.208	40.3	47.1	43.4	43.6	71.0	21.5	72.5	61.8	68.0	67.4	5.1	5.0	4.3	4.8	2.17	.69	19
May	30.003	29.977	29.988	29.989	30.368	29.517	49.1	56.0	50.7	51.9	76.0	29.0	66.2	59.6	69.9	65.2	5.4	5.3	3.8	4.8	4.04	1.54	10
June	29.880	29.865	29.860	29.868	30.175	29.405	60.7	66.8	61.1	62.9	83.0	43.0	75.2	65.1	78.3	72.9	6.2	5.2	4.1	5.2	6.05	1.96	3

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.23 a. m., 2.23 p. m., and 10.23 p. m., local time.

W. A. REID,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

GRAND HAVEN, MICH.

	Wind.			Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.		North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles. Date.													Rain.	Snow.					
1881.																						
July	5,437	W.	32 16	6	6	8	1	11	11	18	17	15	19	9	8	9	0	4	2	0	0	Aurora 2d, 3d.
August	5,211	S. S. NW.	28 9 12 13	9	14	16	4	16	9	11	10	4	17	8	6	6	0	4	0	0	0	Solar halo 13th; mirage 20th.
September	7,262	SW.	54 4	3	6	14	20	17	4	10	8	8	15	10	5	13	0	4	1	0	0	Aurora 12th.
October	6,777	S.	36 12	5	8	18	11	17	3	11	14	6	7	8	16	16	0	1	0	0	0	Solar halo 8th, 11th, 19th; lunar halo 6th; first frost 5th.
November	11,044	SW.	45 13	3	3	9	14	14	16	19	11	1	3	5	22	9	7	0	0	1	9	
December	8,728	NW.	48 7	6	9	6	11	18	9	9	16	9	5	12	14	8	4	0	3	2	14	Aurora 23d, 24th, 25th; solar halo 16th, 27th; lunar halo 8th, 26th.
Year 1881	82,912			75	131	159	99	143	130	141	151	66	113	116	136	97	50	19	7	52	118	
1882.																						
January	10,292	NW.	50 26	7	4	14	9	15	12	21	11	0	3	15	13	5	15	1	1	11	25	Aurora 11th, 12th; solar halo 4th, 12th, 24th; lunar halo 5th, 27th.
February	9,447	W.	40 21	3	5	15	14	15	12	11	9	0	10	8	10	5	4	0	1	2	17	Aurora 17th; solar halo 6th, 11th, 12th, 17th.
March	10,182	SW.	40 21	5	7	20	7	11	7	12	24	0	4	12	15	11	10	3	6	2	20	Solar halo 16th, 19th, 28th, 31st; lunar halo 1st, 28th; mock suns 28th.
April	9,580	NW.	44 19	4	23	12	0	15	6	5	25	0	9	16	5	7	2	3	5	1	6	Aurora 14th, 15th, 16th, 17th, 21st; solar halo 18th, 21st, 22d, 23d, 25th, 26th; lunar halo 8th.
May	8,478	SW.	31 1	5	24	13	5	16	14	5	9	2	9	14	8	10	0	1	0	0	1	Solar halo 2d, 5th, 7th, 24th; lunar halo 25th.
June	7,094	W.	40 4	3	8	15	5	18	18	19	4	0	8	15	7	11	0	5	0	0	0	Solar halo 20th, 28th; meteor 20th.

Location of office on June 30, 1882, Cutler House, corner of Third and Washington streets.

W. A. REID,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

HATTERAS, N. C.

[Latitude, 35° 15′; longitude west of Greenwich, 75° 40′. Elevation of barometer above sea-level, 19 feet. Elevation of rain-gauge (top) above ground, 1 foot. Elevation of exposed thermometer above ground, 6 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date
1881.							°	°	°	°	°	°											
July	29.988	29.972	29.980	29.980	30.223	29.654	76.9	83.0	75.8	78.6	92	63	82.0	72.2	83.5	79.2	5.4	4.6	3.9	4.6	6.16	2.15	30
August	30.042	30.022	30.032	30.032	30.246	29.779	76.1	82.5	75.3	78.0	92	64	83.2	68.0	83.0	78.1	5.4	4.9	3.7	4.7	1.06	.67	8
September	30.124	30.090	30.110	30.108	30.357	29.882	76.3	83.5	76.3	78.7	90	67	84.4	69.1	84.8	79.4	3.9	4.4	2.3	3.5	4.45	1.84	12
October	30.195	30.150	30.158	30.168	30.447	29.559	68.7	73.9	69.2	70.6	90	54	78.8	69.5	79.7	76.0	5.2	4.4	3.6	4.4	6.26	2.22	31
November	30.241	30.198	30.211	30.217	30.665	29.583	58.3	62.0	59.5	59.9	78	32	79.1	75.4	85.0	79.8	5.9	5.3	4.9	5.4	4.77	1.92	24
December	30.208	30.160	30.194	30.187	30.573	29.600	50.7	54.4	51.3	52.1	68	30	85.7	78.2	85.0	83.0	5.1	5.8	5.1	5.3	3.93	1.36	15
Year 1881	30.133	30.098	30.114	30.115	.....	.....	60.0	65.5	60.1	61.9	.....	.....	83.0	73.8	84.3	80.3	5.0	4.8	4.3	4.6	58.81	.....	.....
1882.																							
January	30.192	30.153	30.210	30.185	30.757	29.417	48.0	49.9	46.3	48.1	64	28	89.4	84.7	85.6	86.6	6.5	6.5	4.8	6.0	3.89	1.25	30, 31
February	30.211	30.167	30.193	30.190	30.679	29.280	48.5	54.3	50.3	51.0	69	33	81.1	73.0	79.2	77.8	5.5	5.8	4.0	5.1	5.26	2.11	4
March	30.151	30.108	30.153	30.137	30.545	29.599	50.2	53.9	50.5	51.5	69	36	79.6	75.9	80.0	78.5	6.0	5.6	5.3	5.6	9.67	3.71	1
April	30.073	30.024	30.046	30.048	30.472	29.538	55.6	60.0	55.6	57.1	74	40	81.4	76.0	85.0	80.8	5.5	5.4	5.3	5.4	4.07	1.40	22, 23
May	30.051	30.016	30.045	30.037	30.363	29.563	62.4	68.8	61.6	64.3	81	47	83.2	70.1	83.9	79.1	4.2	3.4	4.8	4.1	1.02	.29	14
June	29.999	29.967	29.990	29.985	30.231	29.712	73.1	78.6	71.8	74.5	91	60	80.2	72.0	85.2	79.1	4.4	4.7	4.1	4.4	.63	.28	30

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.06 a. m., 3.06 p. m., and 11.06 p. m., local time.

R. M. CRAWFORD,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

HATTERAS, N. C.

	Wind.				Winds at 7 a.m., 3 and 11 p.m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	10,543	SW.	48	17	8	17	14	6	11	30	5	1	1	10	10	11	10	0	0	0	0	0	
August	10,081	SW.	36	10	13	26	16	3	4	25	6	0	0	12	10	9	8	0	0	0	0	0	
September	8,336	SW.	42	10	13	10	6	18	17	18	0	0	8	9	12	9	0	6	0	0	0	0	
October	11,199	NE.	52	5	18	23	20	15	15	17	1	1	1	8	18	5	0	8	0	0	0	0	
November	9,611	NW.	43	4	17	17	2	12	2	19	2	15	4	6	14	10	0	14	0	0	0	0	
December	12,035	NE.	48	15	19	27	5	2	11	12	3	9	5	9	12	10	0	10	0	0	0	1	
Year 1881	133,446				179	220	81	102	119	219	52	97	26	106	149	110	120	0	0	0	0	23	
1882.																							
January	11,501	SW.	44	17	5	26	2	3	3	27	2	23	2	3	18	10	0	19	0	0	0	2	Light frost 4th; heavy frost 15th.
February	11,285	SW.	64	21	8	25	4	2	4	22	0	10	6	7	15	6	0	11	0	0	0	0	
March	13,356	SW.	48	28	14	30	8	7	1	22	5	6	0	8	12	11	0	14	0	0	0	0	
April	12,935	NE.	56	10	13	33	9	3	5	17	4	6	0	5	16	9	0	17	0	0	0	0	
May	11,972	NE.	44	2	8	27	9	4	13	28	1	3	1	0	16	5	0	8	0	0	0	0	
June	12,409	SW.	52	1	2	16	4	13	7	36	4	7	1	7	22	1	0	7	0	0	0	0	

Location of office on June 30, 1882, in Life-Saving Station No. 23.

R. M. CRAWFORD,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

HELENA, MONT.

[Latitude, 46° 34′; longitude west of Greenwich, 112° 4′. Elevation of barometer above sea-level, 4,100 feet. Elevation of rain-gauge (top) above ground, 29 feet. Elevation of exposed thermometer above ground, 6 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 1–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.013	29.985	29.994	29.997	30.268	29.719	62.5	72.5	70.0	68.3	89	45	59.1	49.9	47.9	52.3	2	3	4	3	1.95	.97	20
August	30.059	30.010	30.026	30.030	30.272	29.717	59.9	70.0	68.3	66.1	93	42	46.7	38.0	29.7	38.1	1	2	3	2	1.78	1.13	30
September	30.162	30.137	30.159	30.153	30.568	29.797	49.9	58.5	55.3	54.6	78	35	68.2	50.4	56.9	58.5	3	3	3	3	2.49	1.04	4
October	30.391	30.384	30.403	30.393	30.678	30.062	33.3	42.7	37.7	37.9	61	10	84.6	72.6	78.9	78.7	5	5	4	5	2.04	1.25	11
November	30.544	30.542	30.541	30.542	30.995	30.032	26.2	32.3	27.8	28.8	55	—17	69.6	68.8	72.0	70.1	7	7	6	7	1.27	1.04	15
December	30.556	30.558	30.549	30.554	31.003	29.963	27.7	34.1	30.6	30.8	47	3	63.1	61.2	63.6	62.6	4	6	5	5	.38	.12	27
Year 1881	.....	.....	.....	.....	.....	.....	39.2	48.1	44.2	43.8	.....	....	66.0	56.5	60.5	61.1	3.5	4.4	3.8	3.9	19.94	.....	.....
1882.																							
January	30.124	30.121	30.137	30.127	30.462	29.639	17.3	23.0	19.7	20.0	45	—15	66.0	64.2	63.6	64.6	7.0	7.4	4.5	6.3	1.08	.25	20
February	30.092	30.076	30.079	30.082	30.445	29.671	20.2	28.4	24.7	24.4	52	—23	61.9	60.9	62.5	61.8	6.6	7.2	5.6	6.5	.37	.13	15,16
March	30.117	30.116	30.133	30.122	30.520	29.710	26.0	36.3	30.9	31.1	65	— 2	63.5	46.9	52.2	54.2	6.4	6.6	5.4	6.1	.31	.09	19
April	30.000	29.968	29.979	29.982	30.527	29.478	34.5	46.6	40.5	40.5	65	26	67.3	54.0	63.0	61.4	6.0	5.6	3.9	5.2	.94	.19	6
May	29.941	29.907	29.923	29.924	30.305	29.662	42.7	58.0	50.6	50.4	77	31	66.3	42.8	58.0	55.7	5.1	6.3	5.1	5.5	.54	.10	3
June	29.885	29.852	29.870	29.869	30.132	29.577	53.6	68.0	60.5	60.7	82	41	66.3	40.2	56.0	54.2	4.4	5.8	6.0	5.4	1.18	.50	8

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.40 a. m., 12.40 p.m., and 8.40 p. m., local time.

SHERWOOD WHEATON,
Private, Signal Corps, U. S. A.

Annual meteorological summary.

[FORM No. 132—B.]

HELENA, MONT.

	Wind.				Winds at 7 a.m., 3 and 11 p.m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,936	S.	27	31	5	2	0	2	68	7	0	3	6	10	19	2	5	0	0	0	0	0	
August	4,708	S.	24	10	5	2	0	3	55	16	0	4	8	19	11	1	4	0	0	0	0	0	First frost September 6. Auroras November 28 and December 24.
September	4,964	S.	27	8	6	0	0	5	52	10	0	10	7	13	14	3	5	2	0	0	0	0	
October	3,835	W.	24	7	2	0	0	7	44	0	1	29	10	10	17	4	3	3	0	0	2	10	Meteor December 11th. Unusually large number of shooting stars same date.
November	4,636	S. W. SW.	25	4 6 13	4	0	0	2	10	13	26	22	13	2	19	9	1	5	0	1	7	24	
December	4,606	SW.	32	7	2	0	0	3	2	18	30	14	24	8	17	6	2	3	0	1	8	28	
Year 1881	53,444	.....	....	....	137	16	3	30	367	146	88	139	149	106	184	75	40	40	0	2	40	140	
1882.																							
January	3,806	NW.	28	20	4	0	0	0	0	10	28	31	20	1	23	7	0	11	0	0	20	31	Auroras April 21 and 22d and June 15.
February	4,860	SW.	28	1 15	1	4	0	1	2	38	16	6	16	1	21	6	0	7	0	0	9	22	
March	5,805	SW.	56	28	3	7	0	3	0	37	26	14	3	5	15	11	0	11	0	0	9	22	
April	4,752	SW.	36	19	0	5	0	0	2	25	40	16	2	9	11	10	4	8	0	2	0	7	
May	4,901	S. W.	32	16 19	0	0	0	5	8	38	25	7	10	5	17	9	8	3	4	0	0	1	
June	4,625	SW.	28	21	0	0	0	0	4	42	32	7	5	8	13	9	13	0	1	1	0	0	

Location of office on June 30, 1882, corner Warren and Breckenridge streets.

SHERWOOD WHEATON,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

HENRIETTA, TEX.

[Latitude, 33° 46′; longitude west of Greenwich, 98° 12′. Elevation of barometer above sea-level, 915 feet. Elevation of rain-gauge (top) above ground, 22 feet. Elevation of exposed thermometer above ground, 4 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.847	29.773	29.806	29.808	29.990	29.618	79.5	94.7	83.6	85.9	104	70	69.2	41.5	58.7	56.5	4	6	2	4	1.86	.91	28
August	29.822	29.731	29.771	29.777	29.939	29.614	80.1	97.2	85.2	87.5	105	72	63.1	36.4	58.6	52.7	2	7	1	3	.94	.46	22
September	29.846	29.771	29.785	29.782	30.151	29.512	73.2	86.5	78.3	79.3	100	56	57.2	42.1	54.8	53.8	2	4	2	3	2.43	2.33	30
October	29.959	29.915	29.936	29.937	30.214	29.439	64.0	76.0	66.0	67.9	92	42	77.4	58.0	71.0	68.8	4	5	2	4	2.38	1.33	9
November	30.122	30.028	30.027	30.068	30.667	29.469	39.0	61.0	48.0	49.3	77	23	80.9	53.3	73.1	69.1	4	3	3	3	2.13	1.61	11
December	30.159	30.089	30.139	30.099	30.565	29.646	41.1	55.2	46.9	47.7	75	28	82.7	55.6	71.4	68.7	5	5	4	5	1.41	.95	20
Year 1881	.....	.....	.....	.....	.....	.....	56.3	71.6	61.9	63.2	.....	.....	72.8	49.8	66.4	63.3	3.8	4.9	3.1	4.0	22.73	.....	.....
1882.																							
January	30.221	30.185	30.206	30.204	30.735	29.830	36.2	47.6	41.0	41.6	74	14	86.0	63.3	81.2	76.8	4.6	6.6	5.6	5.6	2.73	1.76	12
February*	30.132	30.104	30.120	30.119	30.446	29.552	45.0	57.8	50.3	51.0	70	25	84.7	62.7	77.7	75.0	5.8	6.3	5.7	5.9	1.91	.91	9
March†	30.144	30.089	30.116	30.116	30.607	29.648	49.9	65.9	56.0	57.3	83	24	82.1	52.9	72.7	69.2	5.8	5.3	3.2	4.8	1.84	.53	8
April	30.031	29.993	29.999	30.008	30.384	29.598	56.0	73.4	62.0	63.8	90	34	78.8	49.0	71.4	66.4	3.4	4.1	4.0	3.8	.80	.19	28
May‡	29.960	29.914	29.932	29.935	30.264	29.439	61.0	77.8	66.5	68.3	97	44	77.4	44.8	71.1	64.4	3.8	5.0	3.8	4.2	2.73	.77	7
June‡	29.967	29.922	29.926	29.938	30.290	29.617	74.2	89.9	78.5	80.9	104	57	74.6	44.3	66.2	61.7	3.7	4.4	5.2	4.4	2.13	.99	12, 13

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.36 a. m., 1.36 p. m., and 9.36 p. m., local time.
*For 23 days only. †For 27 days only. ‡For 28 days only,

J. W. BYRAM,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

HENRIETTA, TEX.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	6,114	S.	29	26	0	10	4	50	4	5	1	3	5	8	17	3	6	0	3	0	0	0	Frost November 23d and April 15th.
August	6,029	SW.	25	5	0	12	2	49	15	7	0	4	2	14	16	1	4	0	1	0	0	0	
September	9,661	N.	35	10	7	4	2	30	30	5	1	6	0	21	0	8	3	0	0	0	0	0	
October	6,793	N.	32	29	14	6	0	14	48	6	0	3	2	12	11	8	7	0	0	0	0	0	
November	6,653	S.	32	28 and 29	23	3	1	5	33	1	19	5	3	17	5	8	7	0	0	0	0	7	
December	6,467	N.	34	20	24	3	4	14	24	7	6	8	3	11	9	11	4	0	0	0	0	5	
Year 1881	84,159				107	101	27	340	294	71	22	108	33	154	122	75	57	4	7	0	9	55	
1882.																							
January	6,876	N.	39	16	23	7	11	7	25	5	4	5	6	9	11	11	9	2	0	0	1	12	
February*	§6,041	N.	49	8	11	2	0	17	24	1	5	4	11	3	8	12	9	0	0	0	0	5	
March†	7,132	N.	38	27	18	5	4	5	32	9	4	2	8	9	12	6	10	0	1	0	1	3	
April	9,016	NW.	43	22	18	5	1	13	34	5	0	11	3	14	9	7	7	0	2	2	0	0	
May‡	8,217	NW.	42	30	14	9	2	26	19	3	4	6	6	10	11	7	11	0	2	0	0	0	
June‡	7,323	NW.	52	12	3	3	4	16	48	2	2	4	5	10	14	4	7	0	2	0	0	0	

Location of office on June 30, 1882, corner Bridge and Gilbert streets.
* For 23 days only. † For 27 days only. ‡ For 28 days only. § For 25⅝ days only.

J. W. BYRAM,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

HURON, DAK.

[Latitude, 44° 21′; longitude west of Greenwich, 98° 19′. Elevation of barometer above sea-level, 1,305 feet. Elevation of rain-gauge (top) above ground, 36 feet. Elevation of exposed thermometer above ground, 18 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.951	29.930	29.926	29.936	30.152	29.538	64.4	79.2	70.2	71.5	91.2	53.8	86.8	64.0	83.5	79.1	4.5	4.7	3.0	4.1	3.58	1.45	20
August	29.893	29.880	29.883	29.885	30.223	29.511	64.2	80.1	70.8	71.7	95.6	49.0	88.1	63.3	83.6	78.3	4.8	4.5	3.4	4.2	6.31	1.84	17
September	29.905	29.879	29.904	29.896	30.297	29.376	48.8	64.7	52.9	55.5	88.0	33.8	88.7	60.9	83.0	77.5	6.0	4.6	3.5	4.7	3.11	1.37	6
October	30.114	30.082	30.099	30.098	30.641	29.466	37.0	54.0	43.3	44.8	74.0	21.0	83.8	56.3	79.3	73.1	4.1	5.8	4.5	4.8	2.10	.78	28
November	30.128	30.113	30.142	30.128	30.739	29.486	23.7	34.3	26.6	28.2	64.9	− 6.0	78.8	65.5	77.5	74.0	5.6	5.6	4.5	5.2	.45	.24	11
December	30.149	30.139	30.173	30.154	30.607	29.533	21.4	36.3	25.9	27.9	58.0	− 3.2	71.5	52.9	69.4	64.6	3.3	4.6	3.3	3.7	.06	.05	31
Year 1881*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1882.																							
January	30.176	30.141	30.170	30.162	30.805	29.636	11.4	24.3	17.1	17.6	45.5	−16.2	64.6	62.8	64.9	64.1	4.2	5.7	4.1	4.7	.14	.05	12, 23
February	30.090	30.076	30.096	30.087	30.690	29.573	17.8	32.5	23.7	24.7	57.2	−17.8	71.0	55.4	67.3	64.6	4.6	4.7	3.3	4.2	.25	.09	17
March	30.106	30.085	30.111	30.101	30.722	29.501	24.7	35.6	29.7	30.0	74.8	− 6.0	73.2	63.7	71.8	69.6	7.7	6.7	5.3	6.6	.80	.46	4
April	30.034	30.014	30.044	30.031	30.489	29.618	36.8	52.4	43.4	44.2	81.2	19.2	78.5	55.7	75.1	69.8	6.1	6.5	4.7	5.8	4.18	1.70	22
May	29.928	29.910	29.917	29.918	30.204	29.377	45.5	58.7	51.2	51.8	76.8	28.0	81.0	56.8	78.1	72.0	5.3	6.5	5.1	5.6	4.50	1.44	18
June	29.853	29.847	29.846	29.849	30.215	29.415	57.5	72.7	63.8	64.7	89.2	37.0	84.3	58.9	80.7	74.6	5.7	6.1	3.3	5.0	5.86	2.13	22

* Station opened July 1, 1881.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.35 a. m., 1.35 p. m., and 9.35 p. m., local time.

SAMUEL W. GLENN,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

HURON, DAK.

	Wind.				Winds at 7 a. m., 3 and 11 p.m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurora.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	8,856	NW.	46	19	12	6	2	26	28	0	1	17	1	13	11	7	11	0	4	0	0	0	Meteor, 25; solar halo, 29.
August	8,838	NW.	37	11	12	12	4	41	7	6	1	10	0	10	17	4	14	0	7	0	0	0	
September	8,039	NW.	36	10	12	12	1	24	3	12	3	23	1	8	14	8	13	0	2	4	0	0	First light frost, 15; lunar corona, 8.
October	7,931	SE.	42	11	14	14	5	22	5	4	7	21	1	9	12	10	11	2	2	0	0	14	Prairie fires, 1, 9, 10, 11, 16, 17, 19, 20, 24, 27, 30; lunar halo, 4; lunar corona, 4, 9; first killing frost, 9; first snow, sleet, and ice, 12.
November	8,499	NW.	38	14	9	2	3	15	8	8	9	36	0	9	14	7	0	11	3	3	7	25	Mock sun, 23; prairie fires, 2, 3, 5, 6; lunar halo, 5, 28, 29.
December	7,954	NW.	48	6, 29	13	0	1	25	12	8	9	24	1	13	13	5	0	2	0	0	2	31	Lunar halo, 7, 25; lunar corona, 4, 28; mock sun, 31.
Year 1881*																							
1882.																							
January	8,829	NW.	44	17	5	2	3	32	10	4	9	28	0	9	18	4	0	3	0	1	11	31	Solar halo, 2, 13; lunar halo, 10; mirage, 11, 31; mock moon, 13; prairie fire, 9; mock sun, 2, 13, 16.
February	7,679	NW.	39	4, 12	7	4	2	20	7	5	13	26	0	10	14	4	0	3	0	0	8	27	Lunar halo, 1, 6; mock sun, 10; mock moon, 1; mirage, 23; prairie fire, 6, 7, 8, 10, 15, 16.
March	11,300	NW.	66	20	17	4	5	27	6	1	7	25	1	2	18	11	6	1	1	1	6	26	Hail, 4.
April	10,010	NE.	40	8	12	16	15	22	5	0	5	15	0	9	9	12	12	1	3	3	0	8	Mock sun, 3, 26; hail, 8; frost, 14, 20, 28, 29; aurora, 16, 19, 28; sleet, 22; solar halo, 21.
May	8,966	E. SE.	45	7, 8	15	10	9	21	15	4	2	17	0	8	13	10	14	0	4	1	0	2	Frost, 21, 22; aurora, 27; sleet, 20, 21; snow, 20, 21; lunar halo, 27, 28.
June	6,646	NW.	34	28	10	11	10	22	11	3	4	19	0	8	18	4	12	0	8	0	0	0	Solar halo, 1, 2.

*Station opened July 1, 1881.

Location of office on June 30, 1882, "Parker Block," Third street, near Dakota avenue.

SAMUEL W. GLENN,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

INDIANAPOLIS, IND

[Latitude, 39° 46′; longitude west of Greenwich, 86° 10′. Elevation of barometer above sea-level, 753 feet. Elevation of rain-gauge (top) above ground, 74 feet. Elevation of exposed thermometer above ground, 52 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.					Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.	Amount in inches.	Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.009	29.972	29.974	29.985	30.217	29.629	73.7	86.4	78.1	79.4	101	57	70.6	45.4	64.5	60.2	3.1	4.4	1.2	2.9	.82	.71	14
August	30.027	29.969	29.989	29.995	30.212	29.771	71.5	87.8	77.6	79.0	101	55.5	64.6	36.0	54.1	51.6	2.6	4.7	1.1	2.8	.97	.42	31
September	30.043	29.978	30.000	30.007	30.259	29.419	67.1	81.5	72.0	73.5	94.5	48	78.3	49.5	67.6	65.1	3.4	5.3	1.8	3.5	3.25	2.21	15
October	30.144	30.096	30.121	30.120	30.472	29.694	55.9	65.9	58.7	60.2	81	39	84.4	67.0	80.7	77.4	5.7	6.6	4.7	5.7	6.11	1.86	1
November	30.184	30.128	30.146	30.153	30.665	29.737	38.5	47.7	42.2	42.8	63	10	80.4	68.1	74.1	74.2	5.3	6.1	5.3	5.6	9.35	4.30	18
December	30.172	30.144	30.163	30.160	30.597	29.717	36.8	43.9	39.8	40.2	63	14	82.3	68.6	77.0	76.0	6.7	6.5	5.8	6.3	5.40	1.73	13
Year 1881	30.050	30.001	30.021	30.024	.....	.....	49.8	60.4	53.7	54.7	.....	.....	75.0	58.2	71.4	68.2	5.0	6.3	4.0	5.1	48.74	.....	.....
1882.																							
January	30.167	30.127	30.153	30.149	30.633	29.661	28.8	34.8	31.2	31.6	61.5	7	79.6	73.0	77.5	76.7	7.3	7.2	6.2	6.9	3.74	0.97	26
February	30.110	30.071	30.091	30.091	30.553	29.372	37.3	46.8	42.5	42.2	65	15	78.4	62.8	74.6	71.9	6.1	5.8	4.6	5.5	7.28	3.02	20
March	30.100	30.056	30.077	30.078	30.548	29.450	39.5	50.6	44.3	44.8	70.5	24	76.3	55.4	69.2	67.0	5.8	6.2	5.9	6.0	6.11	2.13	20
April	30.035	30.005	30.012	30.017	30.300	29.451	47.8	59.4	52.5	53.2	80	24	71.9	52.6	65.7	63.4	5.4	5.4	5.0	5.3	3.68	1.85	22
May	29.969	29.934	29.933	29.945	30.342	29.557	53.7	64.9	56.9	58.5	80.5	37	71.7	55.7	70.6	66.0	5.6	6.4	4.8	5.6	7.65	2.34	4, 5
June	29.917	29.884	29.889	29.897	30.131	29.565	67.6	77.2	70.0	71.6	94	45	74.7	57.4	76.0	69.4	5.8	6.7	4.2	5.6	9.35	2.32	13, 14

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.24 a. m., 2.24 p. m., and 10.24 p. m., local time.

OTTO SCHÜTZE,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

INDIANAPOLIS, IND.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	3,276	NW.	20	14	20	13	7	1	5	7	18	11	11	15	15	1	4	0	5	0	0	0	July 10th and August 12th maximum temperature, 101°, the highest since establishment of station.
August	3,313	S.	26	31	16	21	23	6	13	4	2	6	2	16	12	3	4	0	3	0	0	0	August 9th, very hot wind from SW. and W.
September	3,759	SE. SW.	21	15 24	3	5	4	8	22	33	2	3	10	12	12	6	8	0	4	1	0	0	September 13, a. m., faint aurora.
October	3,940	N.	17	4	14	5	7	17	21	16	3	3	7	7	13	11	15	0	0	0	0	0	October 20th, a. m., first light frost.
November	5,181	N.	20	23	13	4	3	9	19	21	10	10	1	7	11	12	9	2	1	0	1	10	November 14th, first heavy frost.
December	4,591	NW.	18	1 30	8	10	1	6	27	20	7	13	1	7	9	15	11	1	0	0	1	12	
Year 1881	49,407	.....	...	.....	154	115	106	101	156	154	150	103	56	100	140	125	98	14	27	1	28	96	
1882.																							
January	4,863	N.	28	26	7	9	4	12	16	15	12	18	0	5	10	16	10	4	0	0	10	23	
February	4,651	SW.	26	21	10	2	5	18	16	17	10	6	0	11	5	12	10	1	0	0	2	8	
March	5,734	SW. W. SW.	26	1 21 26	10	3	10	12	13	9	15	19	2	5	11	12	14	0	6	0	0	11	
April	4,386	SW.	24	19	21	11	14	8	9	12	4	6	5	8	13	9	9	1	3	2	0	4	
May	4,148	S.	24	9	15	7	12	15	14	9	10	8	3	8	11	12	20	0	4	0	0	0	May 17th, the last light frost.
June	3,787	W.	60	25	2	5	9	8	13	20	16	12	5	6	16	8	16	0	11	0	0	0	June 25th, 6.05 p. m., very heavy wind storm; duration, one minute; velocity, 60 miles per hour.

Location of office on June 30, 1882, Fletcher & Sharpe's Block, corner of Washington and Pennsylvania streets.

OTTO SCHÜTZE,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

INDIANOLA, TEX.

[Latitude, 28° 32′; longitude west of Greenwich, 96° 38′. Elevation of barometer above sea-level, 26 feet. Elevation of rain-gauge (top) above ground, 40 feet. Elevation of exposed thermometer above ground, 29 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Highest.	Lowest.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.007	30.004	29.999	30.003	30.125	29.878	80.8	90.0	82.9	84.6	96.1	75.8	85.1	61.8	78.2	75.0	4.9	5.4	2.3	4.2	1.30	.63	16, 17
August	29.966	29.964	29.963	29.964	30.118	29.673	79.8	87.2	81.9	83.0	93.8	72.1	85.6	66.8	80.9	77.8	4.4	5.0	2.1	3.8	6.30	1.79	7, 8
September	29.975	29.967	29.979	29.974	30.164	29.778	77.4	84.2	79.7	80.4	92.5	64.0	85.4	66.9	79.5	77.3	3.5	4.1	2.6	3.4	6.51	2.02	14
October	30.036	30.024	30.050	30.037	30.281	29.673	74.1	80.7	76.6	77.1	88.0	55.3	85.9	72.9	82.1	80.3	5.3	5.0	4.1	4.8	5.04	1.16	27, 28
November	30.125	30.104	30.145	30.125	30.583	29.782	59.8	65.7	61.6	62.4	82.1	36.6	85.5	73.1	82.9	80.5	5.7	5.2	4.3	5.1	4.18	1.15	5
December	30.178	30.158	30.191	30.176	30.579	29.858	56.3	63.2	59.4	59.6	77.8	40.4	87.8	72.8	84.6	81.7	5.4	5.5	4.4	5.1	1.49	.44	19, 20
Year 1881	30.036	30.023	30.040	30.033	.....	.....	66.7	74.3	69.3	70.1	.....	.....	84.8	67.1	80.6	77.5	5.0	4.9	3.5	4.5	37.70	.....	.....
1882.																							
January	30.093	30.082	30.115	30.097	30.518	29.892	56.2	62.1	58.2	58.8	76.6	32.1	92.9	84.6	92.1	89.9	7.5	7.3	6.9	7.2	3.39	.72	12, 13
February	30.086	30.086	30.111	30.094	30.363	29.624	62.5	69.2	64.3	65.3	78.7	43.5	87.0	70.7	84.3	80.7	6.2	5.9	4.1	5.4	1.01	.48	3
March	30.084	30.086	30.107	30.092	30.573	29.764	64.9	71.2	67.0	67.7	81.1	38.9	87.8	72.1	86.9	82.3	5.9	6.2	5.7	5.9	2.30	1.02	25, 26
April	29.957	29.966	29.975	29.966	30.237	29.579	70.1	77.5	71.8	73.1	86.8	48.6	89.9	70.4	84.7	81.7	6.2	6.3	4.5	5.7	1.26	1.01	29
May	29.945	29.947	29.946	29.946	30.214	29.544	72.3	79.8	75.4	75.8	90.0	60.0	84.5	69.1	81.0	78.2	5.7	4.7	4.4	4.9	6.58	2.33	20, 21
June	29.977	29.992	29.985	29.985	30.166	29.781	77.8	86.0	79.6	81.1	93.0	68.7	87.6	68.3	82.8	79.6	4.2	5.1	1.9	3.7	1.77	1.46	7

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, corresponds with 5.42 a. m., 1.42 p. m., and 9.42 p. m., local time.

ISAAC A. REED,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

INDIANOLA, TEX.

	Wind.			Winds at 7 a.m., 3 and 11 p.m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.		North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.													Rain.	Snow.					
1881.																						
July	8,173	NE.	33	2	1	4	6	30	39	11	0	1	1	12	15	4	7	0	0	0	0	0	Ground cracked; absolutely dangerous to travel at night.
August	7,420	N.	56	6	3	3	21	30	29	3	1	1	2	15	13	3	10	0	5	0	0	0	
September	8,306	N.	40	15	13	11	14	32	14	2	1	4	2	13	16	1	13	0	0	0	0	0	
October	9,809	NW.	42	30	6	6	13	42	15	2	2	4	0	8	16	7	16	0	0	0	0	0	
November	10,886	N.	55	2	29	16	13	7	23	0	0	1	1	8	16	6	13	0	0	0	0	0	
December	9,621	N.	48	29	22	17	20	3	9	11	4	6	1	8	17	6	11	0	0	0	0	0	
Year 1881	111,391	.....	.....	.....	136	96	131	280	296	49	30	58	19	124	175	66	107	0	12	0	0	6	
1882.																						
January	10,135	N.	53	16	19	19	6	5	30	4	1	9	0	3	11	17	23	0	0	0	0	0	
February	9,807	S.	56	28	5	3	12	20	30	4	3	7	0	5	14	9	9	0	0	0	0	0	
March	11,616	N.	53	21	8	7	19	16	30	4	2	5	2	6	13	12	9	0	0	1	0	0	
April	11,098	N.	47	12	11	4	13	29	28	4	1	0	0	5	18	7	7	0	1	0	0	0	9 and 10, light frost.
May	11,495	N.	52	31	11	10	19	33	13	5	2	0	0	6	20	5	8	0	1	0	0	0	Aurora on 16th.
June	9,351	E.	36	6	3	10	10	36	30	1	0	0	0	13	14	3	4	0	0	0	0	0	

Location of office on June 30, 1882, corner of Main and Crockett streets, Schultz Building.

ISAAC A. REED,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

JACKSBOROUGH, TEX.

[Latitude, 33° 12′; longitude west of Greenwich, 98° 10′. Elevation of barometer above sea-level, 1,120 feet. Elevation of rain-gauge (top) above ground, 17 feet. Elevation of exposed thermometer above ground, 6 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.928	29.858	29.873	29.886	30.054	29.656	76.9	95.4	83.5	85.3	107	67	75.4	38.7	57.6	57.2	4.0	6.0	3.0	4.3	.12	.05	23, 31
August	29.893	29.804	29.842	29.846	30.005	29.600	77.5	97.4	85.5	86.8	106	69	66.4	32.4	49.5	49.4	2.0	6.0	1.0	3.3	.58	.51	28
September	29.906	29.842	29.876	29.875	30.088	29.607	69.2	86.3	76.0	77.2	101	53	76.3	44.4	61.8	60.8	3.0	5.0	3.0	3.7	6.32	3.53	30
October	30.003	29.954	29.975	29.977	30.220	29.489	62.5	74.9	67.5	68.3	91	45	88.9	65.1	77.7	77.2	5.0	6.0	4.0	5.0	3.17	.88	9
November	30.116	30.065	30.112	30.098	30.249	29.498	44.7	58.3	50.6	51.2	80	27	80.7	54.4	68.8	68.0	4.0	4.0	3.0	3.7	.87	.49	11
December	30.156	30.082	30.137	30.125	30.574	29.696	44.1	57.5	50.3	50.6	77	29	76.2	58.3	70.5	68.3	5.0	6.0	3.0	4.7	1.76	1.18	19
Year 1881	29.986	29.924	29.956	29.955	.....	.....	56.9	73.6	63.7	64.7	.....	.....	74.9	48.8	64.0	62.6	4.2	5.2	3.1	4.2	23.54	.....	.....
1882.																							
January	30.176	30.149	30.172	30.166	30.686	29.819	38.5	49.9	44.9	44.4	75	13	85.2	64.5	73.8	74.5	5.4	7.0	5.9	6.1	1.96	.50	9, 10
February	30.130	30.107	30.126	30.121	30.373	29.590	45.7	61.0	51.7	52.8	74	27	84.7	61.5	73.4	73.2	5.5	6.1	5.8	5.8	4.04	1.50	8
March	30.103	30.078	30.093	30.091	30.565	29.688	51.2	67.0	57.2	58.5	86	27	79.8	54.8	71.6	68.7	5.6	5.7	3.6	5.0	.79	.26	7
April*	29.983	29.946	29.943	29.957	30.323	29.553	59.1	79.0	68.2	68.8	93	44	79.5	43.2	65.9	62.9	3.4	4.3	3.3	3.1	...	.31	22
May	29.940	29.909	29.914	29.921	30.242	29.443	61.0	77.8	67.6	68.8	95	43	83.1	49.3	72.4	68.3	5.2	5.0	4.1	4.8	2.72	1.18	30
June	29.926	29.891	29.893	29.903	30.215	29.616	72.4	90.8	78.5	80.6	109	56	78.1	40.2	65.5	61.3	3.5	4.0	2.7	3.4	2.06	1.08	10

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, corresponds with 5.35 a. m., 1.35 p. m., and 9.35 p. m., local time.

*Nineteen days only.

JAMES P. SHERRY,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

JACKSBOROUGH, TEX.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	5,849	SE. NE. E.	24	11 14 26	1	8	13	41	15	13	0	1	1	13	12	6	3	0	3	0	0	0	
August	4,872	SE. SW.	20	5 27 28	0	3	13	36	15	20	0	1	5	16	15	0	2	0	2	0	0	0	
September	7,373	SE.	26	5 29	6	7	6	38	17	11	0	5	0	17	7	6	6	0	2	0	0	0	
October	5,559	W.	22	29 30	7	8	6	24	22	12	9	4	1	6	17	8	10	0	1	0	0	0	
November	5,391	S.	26	4	23	8	2	13	15	12	4	6	7	12	12	6	5	0	1	0	0	4	First light frost 3d; first killing frost 20th.
December	4,888	SW.	22	27	19	5	9	17	17	5	10	7	4	11	12	8	4	0	1	0	0	5	
Year 1881	72,516	.....	.....	.....	118	65	89	312	171	140	44	87	66	147	126	92	67	0	27	0	3	48	
1882.																							
January	5,059	SW.	19	7 25	23	9	5	15	16	13	4	4	4	8	8	15	9	0	2	0	1	11	
February	5,585	NW.	32	20	11	1	0	21	15	17	3	14	2	7	11	10	6	0	2	0	0	3	
March	6,867	SW.	32	26	19	2	9	11	20	22	3	6	1	11	12	8	6	0	1	0	0	3	Last frost of the season occurred on the 9th.
April	4,886	NW.	27	22	3	7	2	21	12	6	0	6	0	10	5	4	2	0	3	1	0	0	April data for 19 days only.
May	7,226	N.	25	21	14	3	17	22	16	9	6	5	1	9	15	7	9	0	6	0	0	0	
June	6,677	W.	44	10	5	1	10	29	27	16	1	0	1	13	14	3	5	0	7	0	0	0	

Location of office on June 30, 1882, corner of public square and Archer street.

JAMES P. SHERRY,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

JACKSONVILLE, FLA.

Latitude, 30° 20′; longitude west of Greenwich, 81° 39′. Elevation of barometer above sea-level, 43 feet. Elevation of rain-guage (top) above ground, 57 feet. Elevation of exposed thermometer above ground, 37 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.					Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.	Amount in inches.	Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.026	29.985	30.019	30.010	30.167	29.775	81.8	88.8	80.6	83.7	99	70	77.7	60.1	78.8	72.2	2.0	4.6	2.4	3.0	7.61	1.40	28
August	29.993	29.969	29.999	29.989	30.169	29.569	79.4	85.7	79.5	81.5	96	70	79.9	63.0	78.3	73.6	4.5	4.7	4.2	4.5	10.23	2.00	8
September	30.056	30.017	30.059	30.044	30.212	29.751	76.4	85.6	77.7	79.9	94	69	84.4	61.3	83.6	76.4	2.7	4.7	2.6	3.3	4.58	1.13	30
October	30.132	30.089	30.126	30.116	30.353	29.867	70.9	80.8	72.5	74.7	88	54	84.1	58.5	82.2	74.9	3.1	4.2	2.7	3.3	2.87	.71	17
November	30.179	30.129	30.173	30.160	30.446	29.694	60.2	72.2	64.5	65.6	83	32	81.6	62.0	82.4	75.3	2.6	5.2	4.7	4.2	3.41	.89	11
December	30.187	30.136	30.185	30.169	30.457	29.841	57.7	66.7	59.7	61.4	79	41	84.4	62.7	78.4	75.2	4.3	4.7	2.6	3.5	2.86	1.21	25, 26
Year 1881	30.084	30.035	30.077	30.066	.....	.....	66.5	76.0	68.1	70.2	.....	.....	78.0	56.2	76.4	70.2	2.4	3.2	2.2	2.6	54.69	.....	.....
1882.																							
January	30.222	30.176	30.231	30.210	30.499	29.714	57.4	69.9	60.2	62.5	78	32	85.8	58.9	79.7	74.8	4.7	4.8	2.7	4.1	2.58	.77	25
February	30.239	30.190	30.241	30.223	30.499	29.658	55.6	69.2	60.2	61.7	79	38	80.9	54.0	75.6	70.2	2.6	5.0	2.5	3.4	1.09	1.00	9
March	30.194	30.136	30.194	30.175	30.503	29.884	60.1	75.0	64.8	66.6	88	47	78.2	46.2	72.9	65.8	4.1	3.6	2.4	3.4	.89	.61	1
April	30.060	30.016	30.053	30.043	30.364	29.716	67.6	76.5	68.5	70.9	85	56	84.9	59.8	82.0	75.6	4.8	6.1	3.8	4.9	5.23	1.70	12
May	30.052	30.008	30.039	30.033	30.252	29.777	72.4	79.4	71.8	74.5	89.5	54	76.6	55.6	75.4	69.2	3.1	5.9	3.2	4.1	2.20	.64	11
June	30.060	30.007	30.054	30.040	30.228	29.830	79.2	86.2	77.8	81.1	95.5	65	75.5	57.6	78.2	70.4	4.8	6.8	5.0	5.5	5.14	.99	30

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.42 a. m., 2.42 p. m., 10.42 p. m., local time.

J. W. SMITH,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

JACKSONVILLE, FLA.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurora.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	5,340	SW.	28	18	0	25	6	8	11	40	1	2	0	16	12	3	15	0	16	0	0	0	
August	6,423	SW.	37	28	2	32	8	13	4	27	4	3	0	10	16	5	16	0	7	0	0	0	
September	4,888	S.	29	15	0	40	27	8	6	7	1	1	0	15	12	3	16	0	2	0	0	0	
October	5,835	NE.	28	5	6	51	11	10	6	5	1	3	0	16	11	4	13	0	1	0	0	0	
November	5,181	W.	24	3	13	42	11	11	2	2	4	5	0	10	15	5	11	0	0	0	0	0	First light frost 4th; first killing frost 25th.
December	6,259	SW.	30	30	15	29	7	11	2	16	12	1	0	6	19	6	9	0	0	0	0	0	
Year 1881	71,843	.....	.....	.....	65	350	119	102	75	230	111	43	0	153	146	66	124	0	44	0	0	0	
1882.																							
January	4,921	SW.	26	1	4	10	12	12	19	21	4	8	3	6	22	3	8	0	0	0	0	0	
February	5,163	S.	42	4	2	24	13	12	5	10	13	2	3	13	10	5	3	0	0	0	0	0	Last frost 6th, white and killing.
March	6,050	SW.	32	27, 28	4	19	7	6	14	26	6	7	4	14	13	4	4	0	1	0	0	0	
April	5,400	SW.	32	23	4	29	18	7	8	17	2	5	0	12	12	6	9	0	4	0	0	0	
May	5,120	S.	32	31	1	15	23	10	16	13	8	2	5	10	18	3	9	0	6	0	0	0	
June	3,775	SW.	28	4	3	10	5	9	14	40	2	2	5	7	17	6	15	0	13	0	0	0	

Location of office, June 30, 1882, Astor Building, corner of Bay and Hogan streets.

J. W. SMITH,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

KEOKUK, IOWA.

[Latitude, 40° 22′; longitude west of Greenwich, 91°, 26′. Elevation of barometer above sea-level, 617 feet. Elevation of rain-gauge (top) above ground, 59 feet. Elevation of exposed thermometer above ground, 46 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.026	29.999	29.992	30.006	30.246	29.661	73.1	86.5	77.5	79.0	97.5	59.4	78.3	51.5	73.3	67.8	4	4	1	3.0	3.08	2.05	14
August	29.996	29.966	29.961	29.974	30.150	29.764	71.0	89.2	77.4	79.2	100.2	55.5	69.7	41.9	62.7	58.1	4	3	2	3.0	.86	.56	24
September	29.944	29.913	29.929	29.929	30.210	29.643	66.2	80.6	70.3	72.4	97.0	47.0	76.1	48.0	66.0	63.4	4	4	3	3.7	4.10	1.88	30
October	30.082	30.063	30.072	30.072	30.479	29.438	53.1	62.3	55.7	57.0	79.4	38.5	89.0	68.6	82.1	79.9	7	6	5	6.0	8.01	1.86	4
November	30.122	30.098	30.132	30.117	30.675	29.630	35.8	43.8	39.2	39.6	65.3	9.5	81.9	64.3	71.4	73.5	5	6	4	5.0	2.59	1.84	11
December	30.158	30.133	30.165	30.152	30.569	29.698	34.2	41.7	37.0	37.6	59.5	14.5	84.1	72.3	79.4	78.6	4	7	5	5.3	1.70	.62	19, 20
Year 1881	30.038	30.001	30.025	30.022	.....	.....	47.5	58.8	51.6	52.6	.....	.....	78.8	58.7	74.1	70.5	5.7	5.6	3.9	5.1	39.01	.....	.....
1882.																							
January	30.178	30.136	30.167	30.160	30.738	29.580	24.5	32.1	27.8	28.1	60.0	4.5	81.4	73.8	79.3	78.2	5.6	6.2	4.0	5.3	1.07	.30	7, 8
February	30.068	30.031	30.076	30.058	30.466	29.463	34.5	45.2	38.9	39.5	69.0	11.5	78.2	59.8	70.6	69.5	3.1	4.5	3.1	3.6	1.54	.93	20
March	30.075	30.031	30.071	30.059	30.616	29.375	36.0	47.8	41.4	41.7	70.0	19.0	74.3	59.0	71.3	68.2	6.0	6.0	4.0	5.3	2.30	1.40	8, 9
April	30.000	29.975	29.975	29.983	30.274	29.376	47.3	60.8	53.0	53.7	81.5	27.0	76.1	52.6	69.6	66.1	4.3	5.7	4.2	4.7	3.22	1.35	22
May	29.953	29.931	29.933	29.939	30.358	29.528	52.4	62.2	55.7	56.8	80.5	36.0	80.1	61.2	76.2	72.5	5.6	5.9	5.1	5.6	7.11	1.88	5
June	29.894	29.871	29.864	29.876	30.173	29.473	66.7	77.2	69.5	71.1	92.0	49.5	80.2	62.9	79.3	74.1	6.0	6.1	5.3	5.8	9.45	2.65	10, 11

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.02 a. m., 2.02 p. m., and 10.02 p. m., local time.

FRED. Z. GOSEWISCH,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

KEOKUK, IOWA.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water		Thunder-storms.	Aurora.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,469	SE.	21	14	11	9	20	9	12	16	3	5	8	17	13	1	5	0	3	0	0	0	Floods from 12th to 20th.
August	5,664	SW.	32	30	5	14	24	19	15	9	3	4	0	16	12	3	4	0	1	0	0	0	
September	6,939	S.	35	29	5	1	7	9	29	19	5	10	5	13	11	6	12	0	7	0	0	0	
October	6,111	S.	30	15	9	8	13	19	16	9	9	8	2	6	13	12	14	0	2	0	0	0	First light frost October 19th; first killing frost November 3d; disastrous floods from October 12th to November 21st.
November	7,334	E.	40	11	4	4	2	11	19	10	20	20	0	8	13	9	7	0	1	0	3	11	
December	6,133	NW.	30	6	11	6	2	10	18	18	10	16	2	8	13	10	9	2	0	0	2	11	
Year 1881	74,571	.....	...	.....	111	104	149	139	177	128	96	154	37	81	149	135	91	28	20	0	45	110	
1882.																							
January	6,457	SW.	39	26	5	6	13	11	14	11	19	13	1	8	15	8	7	5	0	0	9	27	Navigation closed 1st to 12th only.
February	5,492	SW.	28	12	2	5	6	11	11	15	11	18	5	14	10	4	6	1	1	0	2	13	Hail-storm, March 17th; ice formed April 10th and 11th; light frosts, April 11th, 15th, and 30th; aurora continued from evening of April 16th to morning of 19th; light frost, May 22d; snow in vicinity, 23d; floods from April 22d to June 6th; flood June 27th; unusual number of thunder-storms.
March	6,214	N. / E. / W.	24	9 / 14 / 21	6	7	10	11	11	9	7	27	5	5	17	9	8	1	3	0	0	13	
April	5,686	E.	40	22	5	15	21	7	8	12	5	12	5	9	15	6	9	0	4	1	0	2	
May	6,044	E.	44	5	16	7	14	17	10	4	1	13	11	8	13	10	16	0	10	0	0	0	
June	5,100	SW. / NW.	32	25 / 27	6	7	13	13	5	18	15	7	6	8	10	12	17	0	13	0	0	0	

Location of office on June 30, 1882, State National Bank, corner of Second and Main streets.

FRED. Z. GOSEWISCH,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

KEY WEST, FLA.

[Latitude, 24° 34′; longitude west of Greenwich, 81° 49′. Elevation of barometer above sea-level, 20 feet. Elevation of rain-gauge (top) above ground, 41 feet. Elevation of exposed thermometer above ground, 20 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.033	30.029	30.048	30.037	30.162	29.903	83.7	90.0	84.2	86.0	96.0	76.7	73.7	61.4	71.7	68.9	5	6	4	5.0	5.97	2.41	24
August	29.980	29.967	29.990	29.979	30.120	29.670	82.1	88.3	83.2	84.5	95.4	74.0	77.1	65.9	74.3	72.4	6	6	4	5.3	6.91	2.38	16
September	29.980	29.954	29.995	29.976	30.088	29.855	80.5	86.3	81.5	82.8	94.0	73.0	82.4	70.7	79.4	77.5	6	7	6	6.3	10.71	1.32	30
October	30.039	30.005	30.044	30.029	30.222	29.862	77.8	84.0	79.1	80.3	91.3	72.9	81.1	67.0	78.3	75.5	4	5	3	4.0	1.99	.41	9
November	30.055	30.021	30.060	30.049	30.227	29.801	75.0	80.3	76.0	77.1	87.5	63.0	82.3	71.2	82.0	78.5	5	5	5	5.0	4.62	1.66	23, 24
December	30.123	30.091	30.139	30.118	30.258	29.991	70.7	76.5	71.9	73.1	83.1	61.0	81.0	69.3	79.4	76.6	5	4	4	4.3	1.97	.75	15
Year 1881	30.047	30.025	30.059	30.047	.....	.....	75.6	81.9	76.8	78.1	.....	.....	79.0	66.1	76.0	73.7	4.4	4.6	3.4	4.3	53.10	.....	.....
1882.																							
January	30.178	30.151	30.191	30.173	30.366	29.939	69.8	77.3	72.2	73.1	82.0	57.5	81.7	67.0	79.1	75.9	4.3	4.3	2.7	3.8	1.33	1.20	23, 24
February	30.193	30.163	30.206	30.188	30.363	29.940	70.4	78.1	72.6	73.4	84.8	60.4	78.8	63.7	76.3	72.9	3.3	2.8	2.7	2.9	.40	.12	1
March	30.163	30.140	30.183	30.162	30.322	30.008	72.6	79.4	73.5	75.2	86.8	68.0	76.0	58.6	71.4	68.7	3.9	3.1	2.7	3.2	.01	.01	11
April	30.041	30.027	30.056	30.041	30.191	29.829	76.4	83.1	76.1	78.5	88.4	67.6	76.8	61.8	75.8	71.5	5.1	5.0	3.3	4.5	3.93	3.23	4
May	30.011	29.992	30.022	30.008	30.163	29.876	78.9	83.7	77.5	80.0	90.8	68.8	72.8	61.0	74.2	69.3	5.0	4.3	5.1	4.8	7.46	3.53	25, 26
June	30.051	30.035	30.064	30.050	30.161	25.916	83.3	88.7	80.8	84.3	93.2	71.2	70.9	58.9	75.2	68.3	4.7	3.6	3.4	3.9	3.48	2.56	11

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.41 a. m., 2.41 p. m., and 10.41 p. m., local time.

R. H. PAXTON,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

KEY WEST, FLA.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water		Thunder-storms.	Aurora.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	3,742	W.	26	24	2	2	24	23	9	10	7	9	7	8	19	4	16	0	4	0	0	0	
August	5,463	SW.	44	17	8	6	28	11	10	8	2	13	7	7	16	8	14	0	4	0	0	0	
September	4,792	E.	28	28	2	7	46	13	4	5	3	3	7	0	20	10	22	0	10	0	0	0	
October	7,727	E.	24	6, 7	5	30	44	8	1	2	3	0	0	11	17	3	17	0	0	0	0	0	
November	8,828	N.	32	4	5	33	44	4	1	1	1	1	0	3	19	8	19	0	0	0	0	0	Northers on 4th, 24th and 25th; NE. wind storms 16th, 17th, and 26th.
December	8,286	N.	34	15	20	30	20	8	4	3	0	4	4	7	20	4	10	0	0	0	0	0	Northers on 15th, 16th, 17th, and 30th.
Year 1881	78,805	.....	.....	.....	130	189	342	147	74	56	50	71	36	89	207	69	148	0	25	0	0	0	
1882.																							
January	6,704	E.	26	23	6	14	47	16	3	3	0	2	2	12	18	1	6	0	0	0	0	0	
February	7,398	N.	32	5	13	12	33	18	2	3	0	1	2	16	12	0	10	0	0	0	0	0	Northers on 4th and 5th, and on 24th.
March	7,199	N.	27	23	11	19	40	10	4	4	1	1	3	19	10	2	1	0	0	0	0	0	Northers on 22d and 23d.
April	6,782	N., NE., N.	29	1, 2, 15	7	11	21	17	9	13	8	1	3	8	16	6	6	0	0	1	0	0	Aurora from 1 to 3.30 a. m., 17th.
May	6,607	SW., NE.	24	12, 26	8	10	25	18	11	5	4	5	7	8	21	4	12	0	3	0	0	0	
June	4,949	N.	35	11	2	4	23	35	8	7	1	3	7	12	16	2	10	0	0	1	0	0	Aurora on the 11th.

Location of office on June, 30, 1882, Front street, between Duval and Fitzpatrick.

R. H. PAXTON,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

KITTYHAWK, N. C.

[Latitude, 36° 0′; longitude west of Greenwich, 75° 42′. Elevation of barometer above sea-level, 22 feet. Elevation of rain-gauge (top) above ground 1 foot. Elevation of exposed thermometer above ground, 4 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.					Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.	Amount in inches.	Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.998	29.981	29.999	29.993	30.244	29.657	75.8	83.4	75.7	78.3	99	62	80.5	63.2	81.5	75.1	5.3	4.6	4.4	4.8	5.00	2.41	27
August	30.066	30.043	30.060	30.056	30.304	29.765	74.2	80.2	74.0	76.1	99	62	85.5	70.0	84.7	80.1	3.9	3.9	2.9	3.6	3.83	1.63	2
September	30.136	30.100	30.127	30.121	30.375	29.877	74.3	82.4	75.4	77.4	92	63	87.6	69.1	84.4	80.1	3.8	3.5	1.6	3.0	.49	.32	14, 15
October	30.209	30.165	30.177	30.184	30.495	29.569	65.8	72.7	66.5	68.3	90	50	81.9	64.2	80.3	75.5	4.7	4.9	3.5	4.4	5.55	2.53	31
November	30.235	30.196	30.214	30.215	30.687	29.633	55.1	60.7	56.0	57.3	77	27	80.9	68.1	81.4	76.8	5.5	5.8	4.8	5.4	4.17	2.14	23, 24
December	30.217	30.170	30.214	30.200	30.601	29.570	47.7	52.8	49.2	49.9	72	26	84.1	72.5	81.0	79.2	4.5	6.1	4.9	5.2	6.29	2.14	22
Year 1881	30.095	30.056	30.084	30.078	.....	.....	57.5	63.4	58.1	59.7	.....	.....	82.1	68.8	81.3	77.4	4.8	5.0	4.1	4.7	51.71	.....	.....
1882.																							
January	30.211	30.171	30.228	30.203	30.778	29.416	43.5	47.0	43.6	44.7	65.0	23.0	86.1	78.5	80.6	81.7	6.0	7.9	6.8	6.9	6.86	1.19	31
February	30.224	30.174	30.207	30.202	30.715	29.293	45.4	51.7	47.8	48.3	70.0	29.0	80.6	72.4	80.0	77.7	5.1	5.5	3.6	4.7	4.83	2.59	4
March	30.165	30.127	30.185	30.159	30.649	29.648	47.6	53.0	48.0	49.5	76.0	32.5	79.3	69.2	78.2	75.6	5.5	5.7	4.9	5.4	6.49	3.75	1
April	30.093	30.049	30.074	30.072	30.473	29.509	51.9	56.4	51.8	53.4	80.5	37.5	80.4	72.6	81.2	78.1	4.9	5.8	5.4	5.4	4.92	1.31	23
May	30.073	30.031	30.055	30.053	30.408	29.591	59.0	66.4	59.7	61.4	87.0	44.0	84.7	66.8	84.3	78.6	4.3	4.2	4.6	4.4	2.22	.98	10, 11
June	30.006	29.967	29.995	29.989	30.276	29.692	70.4	78.8	69.8	73.0	95.5	57.0	79.3	64.3	84.6	76.1	3.0	3.9	2.2	3.0	4.99	1.15	1

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.05 a. m., 3.05 p. m., and 11.05 p. m., local time.

EDWARD A. BEALS,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

KITTYHAWK, N. C.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm	Clear.	Fair.	Cloudy.	.0 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	9,082	N.	60	7	7	25	11	7	9	17	12	3	2	10	14	7	11	0	4	0	0	0	
August	9,618	N.	44	13	3	37	20	5	4	13	5	4	2	14	16	1	7	0	1	0	0	0	
September	8,553	S.	40	9	9	15	13	14	12	21	3	1	2	17	10	3	4	0	2	0	0	0	
October	11,091	NE.	60	5	3	21	14	16	12	17	4	4	2	11	15	5	11	0	1	0	0	0	
November	10,529	N.	52	4	13	25	4	8	2	16	9	12	1	10	10	10	15	0	0	0	0	3	First heavy frost on 5th; first light frost on 27th.
December	12,595	NE.	56	15	12	34	4	5	4	17	11	6	0	7	17	7	11	0	0	0	0	1	Last frost of the season 19th.
Year 1881	128,354	.....	...	.....	158	274	103	96	79	173	110	80	22	124	145	96	126	3	14	0	5	39	
1882.																							
January	11,436	N.	48	11, 17	16	22	6	2	6	16	16	9	0	3	15	13	15	2	0	0	1	8	
February	10,353	SW.	47	21	5	22	8	5	3	18	14	8	1	10	10	8	7	1	1	0	0	3	
March	12,840	N.	50	24	12	24	17	3	7	15	10	5	0	11	8	12	17	0	1	0	0	0	
April	11,854	N.	51	10	9	25	19	5	7	12	10	2	1	7	17	6	18	0	4	1	0	0	Aurora night of 16th and 17th.
May	11,354	NE.	41	2	11	23	9	6	10	21	10	1	2	11	16	4	12	0	1	0	0	0	
June	9,969	SW.	40	1	5	11	11	9	10	26	14	4	0	17	12	1	9	0	5	0	0	0	

Location of office, June 30, 1882, in the Life-saving Station.

EDWARD A. BEALS,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

KNOXVILLE, TENN.

[Latitude, 35° 56′; longitude west of Greenwich, 83° 58′. Elevation of barometer above sea-level, 980 feet. Elevation of rain-gauge (top) above ground, 77 feet. Elevation of exposed thermometer above ground, 72 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.070	30.016	30.044	30.043	30.276	29.742	72.1	87.5	75.4	78.3	98.6	59.1	79.9	44.8	75.5	66.7	3.5	4.4	2.2	3.4	4.05	1.03	13, 15
August	30.083	30.020	30.052	30.052	30.282	29.857	70.1	86.6	74.3	77.0	100.0	63.0	85.3	47.2	75.1	69.2	4.2	4.6	2.8	3.9	1.77	.97	7
September	30.165	36.094	30.129	30.129	30.319	29.711	66.1	84.1	72.1	74.1	97.1	56.0	88.5	47.8	75.1	70.4	3.6	5.1	2.7	3.8	2.31	.81	27
October	30.264	30.203	30.224	30.231	30.479	29.863	55.9	73.9	61.7	63.8	87.3	41.3	92.7	50.8	82.8	75.4	5.3	4.8	3.6	4.6	5.14	1.90	30, 31
November	30.298	30.246	30.279	30.275	30.664	29.915	41.5	55.6	47.1	48.1	80.5	15.0	90.0	57.1	79.7	75.6	5.1	5.1	4.0	4.7	5.31	1.50	22, 23
December	30.254	30.220	30.253	30.242	30.636	29.820	40.0	50.0	42.1	44.0	63.3	23.3	85.0	59.5	80.5	75.0	6.2	5.6	6.0	5.9	5.32	2.08	13, 14
Year 1881	30.129	30.064	30.101	30.098	.....	.....	52.4	66.4	57.2	58.7	.....	.....	83.9	51.7	75.7	70.4	5.6	5.8	4.4	5.2	45.67	.....	.....
1882.																							
January	30.228	30.207	30.227	30.221	30.638	29.659	39.3	45.8	42.1	42.4	63.9	18.0	87.0	74.4	86.2	82.5	8.8	8.2	7.7	8.2	16.98	2.97	28
February	30.220	30.182	30.221	30.208	30.543	29.565	41.8	55.2	48.4	48.5	72.5	24.5	85.7	54.8	70.6	70.4	6.6	6.0	5.0	5.8	6.10	1.76	28
March	30.175	30.137	30.165	30.159	30.567	29.738	45.3	59.6	51.8	52.2	83.0	28.6	80.1	50.4	68.9	66.5	4.9	4.9	3.5	4.4	4.35	1.36	27
April	30.087	30.023	30.054	30.055	30.345	29.673	53.5	68.7	58.6	60.3	84.0	36.0	77.0	45.3	64.1	62.1	5.4	5.8	4.0	5.1	3.88	.95	22, 23
May	30.045	29.988	30.011	30.015	30.309	29.634	57.5	70.9	60.7	63.0	84.4	41.2	82.9	51.9	77.2	70.7	5.4	5.9	3.9	5.1	6.77	2.23	28
June	30.036	29.986	30.012	30.011	30.244	29.764	67.5	80.6	70.3	72.8	91.4	50.0	86.4	54.0	81.8	74.1	4.9	6.2	3.7	4.9	3.56	1.00	16, 17

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.32 a. m., 2.32 p. m., and 10.32 p. m., local time.

JNO. A. CODY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

KNOXVILLE, TENN.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	3,365	SE.	36	13	15	34	5	1	4	13	3	5	13	14	16	1	7	0	8	0	0	0	
August	3,566	NE.	28	13	4	43	10	0	6	13	9	3	5	9	20	2	9	0	8	0	0	0	
September	2,629	W.	19	15	9	20	11	4	4	16	5	2	19	16	7	7	8	0	3	0	0	0	
October	3,124	NE.	20	5	10	17	5	4	8	21	5	6	17	12	12	7	11	0	0	0	0	0	First light frost of season on the 26th.
November	3,731	SW.	22	18	7	22	7	5	4	22	7	5	11	11	11	8	11	0	0	0	0	6	First killing frost of season on the 4th.
December	4,084	W.	28	30	13	24	10	2	2	22	7	3	10	7	9	15	15	0	0	0	0	8	
Year 1881	48,454	.....	.....	.....	109	283	89	27	42	233	117	73	119	107	143	115	128	12	45	0	4	62	
1882.																							
January	4,039	W.	26	28	15	18	7	1	2	21	7	15	7	2	6	23	21	3	1	0	0	10	
February	4,801	W.	36	21	5	21	4	1	2	27	15	5	4	8	7	13	11	1	1	0	0	8	
March	5,318	SW.	28	{6 / 21}	7	21	5	2	6	22	12	10	8	12	13	6	13	0	1	0	0	3	
April	4,654	SW.	36	19	22	6	3	2	3	22	13	8	11	12	9	9	9	0	4	1	0	0	
May	4,299	SW.	33	10	9	20	4	2	3	28	15	3	9	7	18	6	15	0	8	0	0	0	Last light frost of season on the 17th.
June	3,925	NW.	29	26	9	10	4	5	5	33	11	9	4	6	19	5	15	0	14	0	0	0	

Location of office, June 30, 1882, custom-house building, corner of Prince and Church streets.

JNO. A. CODY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

LA CROSSE, WIS.

[Latitude, 43° 49′; longitude west of Greenwich, 91° 15′. Elevation of barometer above sea-level, 725 feet. Elevation of rain-gauge (top) above ground, 67 feet. Elevation of exposed thermometer above ground, 40 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.					Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.	Amount in inches.	Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.079	29.049	29.041	29.057	30.207	29.615	68.7	80.7	73.9	74.4	93	58	81.2	57.5	76.2	71.6	3.9	3.7	2.4	3.2	8.86	4.61	20
August	29.982	29.944	29.950	29.959	30.169	29.637	69.0	80.5	74.0	74.5	96	55	77.8	57.6	71.9	69.1	4.1	5.6	3.9	4.5	5.01	1.87	25
September	29.879	29.866	29.876	29.874	30.185	29.450	60.1	70.0	63.6	64.6	87	46	80.5	62.9	76.5	73.3	4.8	5.7	5.8	5.4	10.87	1.84	29
October	30.082	30.062	30.067	30.070	30.534	29.416	49.1	56.5	52.9	52.8	73	32	76.2	60.6	71.4	69.4	6.5	6.2	6.5	6.4	7.56	1.30	11
November	30.036	30.032	30.059	30.043	30.752	29.429	32.9	38.4	37.1	36.1	60	5	70.4	57.6	64.0	64.0	6.6	7.5	4.8	6.3	1.17	.38	11
December	30.106	30.079	30.117	30.101	30.468	29.571	30.5	38.3	34.9	34.6	54	1	75.2	59.7	65.9	67.0	4.9	5.4	4.0	4.8	.26	.06	22
Year 1881	30.014	29.982	30.002	29.999	.....	.....	43.2	53.1	47.8	48.0	.....	.....	78.0	61.2	72.8	70.7	5.5	5.6	4.2	5.1	44.74	.....	...
1882.																							
January	30.149	30.104	30.132	30.128	30.835	29.586	16.9	26.9	25.0	22.9	45	−11	75.3	67.0	68.7	70.3	5.9	5.3	4.4	5.2	.75	.34	26
February	30.025	29.991	30.031	30.016	30.629	29.528	28.7	40.0	35.1	34.6	65	3	71.3	54.4	64.2	63.3	4.2	3.7	4.3	4.1	1.11	.45	18
March	30.046	30.028	30.061	30.045	30.684	29.448	31.3	38.8	36.4	35.5	60	10	74.7	61.4	68.1	68.1	7.2	6.6	7.3	7.0	2.37	.81	26
April	30.051	30.011	30.026	30.029	30.295	29.323	42.5	54.2	49.8	48.8	76	21	62.4	47.3	53.3	54.3	4.1	5.4	4.3	4.6	1.96	.51	3
May	29.973	29.943	29.949	29.955	30.293	29.525	50.2	60.8	56.2	55.7	80	35	57.2	43.6	57.4	52.7	5.6	5.9	4.4	5.3	2.49	1.06	30
June*	29.877	29.851	29.859	29.862	30.111	29.330	63.1	73.4	68.9	68.5	85	45	66.6	49.6	60.1	58.8	5.0	6.4	4.1	5.2	4.78	1.39	24

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.03 a. m., 2.03 p. m., and 10.03 p. m., local time.
*29 days only.

S. C. EMERY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

LA CROSSE, WIS.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,366	NW.	32	24	11	6	0	11	23	13	9	17	3	15	7	9	9	0	4	0	0	0	
August	5,273	N.	40	5	16	6	4	13	36	5	4	8	1	11	12	8	9	0	4	0	0	0	
September	6,045	S.	36	29	8	5	1	11	32	7	13	11	2	8	14	8	20	0	4	2	0	0	First light frost 28th.
October	5,619	S.	26	31	18	6	2	10	30	5	10	8	4	7	9	15	17	0	1	0	0	0	First heavy frost 5th.
November	7,238	W.	28	14	12	2	1	4	25	7	21	18	0	5	11	14	4	5	0	2	3	16	
December	5,767	SW.	36	6	10	3	0	4	37	5	6	14	14	10	12	9	5	2	0	0	4	17	
Year 1881	64,754				204	60	42	114	298	88	118	132	39	108	132	125	94	38	20	6	64	131	
1882.																							
January	5,319	NW.	28	26	10	1	2	5	38	6	13	9	9	6	18	7	2	6	0	2	11	29	
February	5,578	S.	36	12	7	2	1	9	28	9	18	8	2	10	13	5	2	3	0	0	6	21	
March	7,175	S.	35	28	12	4	7	12	13	8	13	21	3	4	10	17	9	5	2	0	2	17	
April	6,774	N.	40	19	15	13	12	8	14	5	5	16	2	12	9	9	9	0	1	5	0	4	
May	7,201	N.	25	31	12	14	5	9	28	8	9	6	2	9	13	9	9	0	2	0	0	0	Frost 2d, 15th, 16th, and 23d.
June	4,842	SW.	50	24	12	4	9	16	20	8	9	9	3	8	13	9	12	0	6	0	0	0	Light frost 5th.

Location of office June 30, 1882, Opera House block, corner Main and 4th streets.

S. C. EMERY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

LA MESILLA, N. MEX.

[Latitude, 32° 17′; longitude west of Greenwich, 106° 48′. Elevation of barometer above sea-level, 3,900 feet. Elevation of rain-gauge (top) above ground, 16 feet. Elevation of exposed thermometer above ground, 17 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.			Self-registering thermometers.			Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.279	30.235	30.251	30.255	30.346	30.130	68.7	92.6	77.3	79.5	105.2	62.2	75.2	31.9	54.1	53.7	5.3	4.3	6.3	5.3	3.90	1.91	24, 25
August	30.270	30.236	30.250	30.252	30.344	30.177	65.9	89.5	74.1	76.5	99.7	55.0	84.0	35.9	66.8	62.2	3.9	3.7	4.0	3.9	3.13	1.36	16
September	30.261	30.209	30.215	30.228	30.435	29.956	57.1	84.7	66.6	69.5	99.8	44.3	77.6	33.4	59.1	56.7	3.5	3.5	2.1	2.0	1.96	1.11	11, 12
October	30.286	30.236	30.259	30.260	30.436	30.047	52.3	77.7	61.0	63.7	91.7	33.7	83.3	36.5	67.2	62.3	3.0	4.1	2.5	3.2	2.14	.89	4, 5
November	39.341	30.281	30.304	30.309	30.602	29.945	33.4	61.3	42.2	45.6	76.3	23.5	77.0	25.5	59.1	53.9	2.0	2.8	1.7	2.2	.56	.45	10
December	39.385	30.331	30.358	30.358	30.624	30.026	32.0	59.9	41.5	44.5	79.7	17.5	73.3	30.4	53.9	52.5	2.6	4.0	2.8	3.1	.91	.64	18
Year 1881	30.265	30.225	30.235	30.241	.....	....	47.6	75.8	58.6	60.7	.....	.....	66.2	24.2	45.6	45.3	2.7	3.6	2.7	3.0	15.05	.....	.....
1882.																							
January	30.149	30.102	30.129	30.127	30.457	29.869	31.0	55.8	39.8	42.2	71.8	18.2	73.5	31.2	58.4	54.4	3.5	5.2	3.4	4.0	.63	.61	29
February	30.169	30.132	30.154	30.152	30.321	29.879	34.9	57.8	44.5	45.7	72.2	20.3	75.4	33.6	57.2	55.4	2.9	5.6	2.9	3.8	1.36	.73	2
March	30.084	30.054	30.073	30.070	30.322	29.803	38.7	68.6	52.0	53.1	87.3	19.2	61.8	18.1	36.8	39.3	2.4	3.7	2.5	2.9	.41	.24	24
April	29.937	29.900	29.900	29.912	30.129	29.654	42.9	74.2	57.7	58.3	94.5	24.5	50.9	13.0	26.7	30.2	2.5	3.0	2.1	2.5	.01	.01	13
May	29.790	29.750	29.755	29.765	29.876	29.473	49 3	82.6	65.2	65.7	94.5	39.2	53.9	11.3	25.5	30.2	2.3	3.0	2.4	2.6	.10	.10	8
June	29.795	29.754	26.758	29.769	29.948	29.607	60.7	90.9	74.4	75.3	105.3	45.5	61.0	15.0	36.2	*37.4	3.0	3.9	4.1	3.7	.72	.27	28

* 29 days only.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.01 a. m., 1.01 p. m., and 9.01 p.m., local time.

N. D. LANE,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

LA MESILLA, N. MEX.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	1,406	W.	22	7	3	1	1	16	10	5	5	5	47	4	22	5	14	0	4	0	0	0	
August	902	SW.	14	1	1	0	1	19	9	1	2	1	59	13	15	3	13	0	3	0	0	0	
September	864	S.	12	28	2	1	0	14	12	4	3	0	54	18	7	5	5	0	0	0	0	0	
October	1,217	W.	17	27	4	0	0	15	4	10	8	0	52	16	13	2	8	0	0	0	0	0	
November	1,082	W.	18	7	2	0	1	7	4	5	6	6	59	22	6	2	2	1	0	0	0	17	First light frost on 28th.
December	725	SW.	13	12	7	0	0	6	2	5	4	4	65	17	10	4	4	0	0	0	0	24	First killing frost on 11th.
Year 1881	19,420	.....	.....	.....	77	19	15	121	88	76	90	71	538	161	157	47	61	2	9	0	0	97	
1882.																							
January	1,221	W.	15	7	3	2	0	8	6	2	8	4	60	14	13	4	2	0	0	0	0	24	
February	1,900	SW.	30	19	3	6	0	4	1	7	13	4	46	14	10	4	5	0	0	0	0	16	
March	2,757	W.	26	26	5	0	2	7	6	14	16	7	36	17	13	1	5	0	1	0	0	8	
April	3,129	N. NW.	22	7 21	2	0	0	15	1	8	16	13	35	19	11	0	1	0	0	0	0	4	15th, fruit and vegetation extensively killed or injured by low temperature; 22nd, vegetation slightly injured by low temperature.
May	2,562	NW.	23	8	1	1	0	9	8	6	18	4	46	21	6	4	1	0	0	0	0	0	
June	1,967	SW.	17	12	3	1	0	13	10	12	9	7	35	13	12	5	5	0	2	0	0	0	

Location of office, June 30, 1882, Lemon building.

N. D. LANE,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

LEAVENWORTH, KANS.

[Latitude, 39° 19′; longitude west of Greenwich, 94° 58′. Elevation of barometer above sea-level, 842 feet. Elevation of rain-gauge (top) above ground, 48 feet. Elevation of exposed thermometer above ground, 35 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.033	30.000	29.996	30.010	30.230	29.645	73.9	87.6	79.2	80.2	100	60	75.6	49.2	68.8	64.5	3.5	3.7	2.8	3.3	1.72	.57	18
August	29.998	29.957	29.953	29.969	30.103	29.763	73.1	91.1	80.9	81.7	105	63	70.0	39.3	57.7	55.7	3.9	4.5	2.6	3.7	2.74	1.73	29
September	29.956	29.916	29.933	29.935	30.226	29.592	63.2	78.7	68.5	70.1	96	43	73.4	47.0	65.3	61.9	4.6	4.3	4.7	4.5	6.89	2.60	1
October	30.103	30.064	30.078	30.082	30.459	29.488	53.6	63.4	58.1	58.4	86	39	81.5	64.3	78.1	74.6	6.7	6.6	5.7	6.3	5.73	1.60	17
November	30.177	30.147	30.184	30.169	30.668	29.612	36.2	45.9	38.5	40.2	69.5	11	75.6	52.7	70.9	66.4	3.8	4.8	4.7	4.4	3.42	2.23	11
December	30.219	30.178	30.206	30.201	30.558	29.743	35.5	45.2	39.8	40.2	62	17	74.2	55.2	70.0	66.5	4.3	6.5	6.1	5.6	1.18	.74	20
Year 1881	30.060	30.025	30.044	30.043	.....	.....	48.3	60.7	53.5	54.1	.....	.....	75.7	54.2	70.7	66.9	5.1	5.1	4.6	4.9	39.95	.....	.....
1882.																							
January	30.205	30.159	30.190	30.185	30.791	29.618	28.2	36.9	32.0	32.4	62	5	74.5	61.5	75.5	70.5	5.7	6.3	5.6	5.9	.83	.25	12
February	30.110	30.065	30.098	30.091	30.459	29.561	35.6	48.9	41.5	42.0	69	11	71.3	52.9	68.6	64.3	4.4	5.1	4.5	4.7	1.17	.24	19, 20
March	30.114	30.074	30.120	30.103	30.683	29.389	39.2	52.9	45.2	45.8	77	15	70.0	46.8	63.9	60.2	4.8	4.8	4.0	4.5	1.15	.41	8
April	30.004	29.960	29.982	29.982	30.383	29.479	49.8	63.0	55.5	56.1	86	32.5	72.2	49.0	63.7	61.6	6.4	6.0	5.6	6.0	4.15	1.26	12, 22
May	29.956	29.930	29.946	29.944	30.274	29.462	53.0	64.8	58.2	58.7	88.5	40	77.1	55.1	69.8	67.3	6.9	7.3	6.3	6.8	2.53	.62	24
June	29.908	29.876	29.890	29.891	30.247	29.495	67.2	80.9	72.4	73.5	96	45	76.8	51.9	72.7	67.1	5.1	5.0	4.5	4.9	5.06	2.55	20

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.48 a. m., 1.48 p. m., and 9.48 p. m., local time.

A. W. BROWNE,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

LEAVENWORTH, KANS.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurora.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,520	NW.	24	12	16	3	11	9	43	2	1	2	6	17	13	1	5	0	2	0	0	0	Driest July on station records; rainfall less than one-third the average.
August	4,439	SW.	18	11	15	1	5	14	41	2	1	4	10	15	13	3	5	0	2	0	0	0	Hottest August on our records; crops almost totally ruined by drought.
September	6,325	SW.	36	29	5	2	0	18	36	6	1	15	7	11	11	8	13	0	6	0	0	0	Hottest September on record; greatest rainfall, more than double the average.
October	5,137	S.	30	15	13	5	9	16	25	3	4	8	10	2	18	11	12	0	1	0	0	0	Largest October rainfall ever recorded at this station.
November	6,309	NW.	32	23	10	1	2	8	27	7	7	22	6	11	13	6	4	2	1	0	0	11	
December	5,213	NW.	30	31	10	4	1	6	35	2	1	19	15	6	14	11	4	2	0	0	0	8	First killing frost on 9th; first snow on the 18th.
Year 1881	69,446	.....	.....	.....	190	41	74	157	321	36	28	178	70	109	152	104	90	25	35	0	32	107	
1882.																							
January	4,696	W.	29	26	12	3	3	11	29	0	2	10	23	6	12	13	4	4	0	0	4	24	
February	5,103	S.	28	6, 12	16	2	0	9	24	2	5	11	15	11	10	7	5	1	2	0	1	11	
March	7,696	NW., SW.	40	21, 25	18	8	1	12	21	6	2	22	3	10	15	6	4	2	1	0	1	10	Rainfall less than one-half the average.
April	6,369	S., W.	32	5, 18	14	5	9	8	28	2	3	9	12	6	11	13	8	1	5	2	0	0	Aurora from 16th to 17th and on the 20th.
May	5,378	S.	28	8	16	2	7	11	26	0	3	13	15	3	13	15	12	0	2	0	0	0	Coldest May on record; rainfall one-half the average.
June	4,254	NW.	48	17	6	2	7	7	37	5	2	9	15	7	18	5	9	0	8	0	0	0	Destructive storm on 17th.

Location of office on June 30, 1882, No. 315 Delaware street.

A. W. BROWNE,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

LEWISTON, IDAHO.

[Latitude, 46° 28′; longitude west of Greenwich, 117° 5′. Elevation of barometer above sea-level, 780 feet. Elevation of rain-gauge (top) above ground, 36 feet. Elevation of exposed thermometer above ground, 22 feet.]

	Barometer (to sea).				Temperature.								Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.961	29.944	29.896	29.934	30.300	29.572	60.8	78.5	77.5	72.3	103.0	48.0	58.3	43.7	42.9	48.3	2.9	2.0	1.8	2.2	.89	.32	29
August	29.957	29.949	29.908	29.938	30.150	29.649	56.8	76.2	73.6	68.9	100.0	47.0	57.0	38.4	42.9	46.1	2.8	3.2	2.8	2.9	.31	.10	14
September	30.010	30.004	29.970	29.995	30.386	29.668	50.4	64.7	60.1	58.4	87.0	37.0	69.2	47.3	52.3	56.3	3.9	4.2	3.5	3.9	1.17	.30	24
October	30.084	30.097	30.078	30.086	30.369	29.699	42.9	52.4	48.6	48.0	67.0	28.0	76.2	57.9	69.3	67.8	6.7	6.7	6.1	6.5	1.52	.38	30
November	30.271	30.269	30.255	30.265	30.728	29.589	36.0	42.3	39.1	39.1	61.0	18.0	81.0	68.6	75.5	75.0	7.0	7.1	6.6	6.9	1.19	.46	13
December	30.198	30.191	30.184	30.191	30.599	29.578	34.2	40.0	36.9	37.1	52.3	23.0	78.6	67.2	72.3	72.7	6.2	6.9	5.4	6.2	1.07	.27	6
Year 1881	29.996	29.985	29.960	29.980	...	.....	44.4	55.9	53.0	51.1	.....	.....	69.8	56.4	61.3	62.5	5.4	5.4	4.8	5.2	20.56	.....	...
1882.																							
January	30.141	30.144	30.158	30.148	30.687	29.487	29.6	34.6	31.6	31.9	51.0	10.3	66.6	65.5	66.4	66.2	6.9	7.5	5.9	6.8	1.46	.25	23, 24
February	30.130	30.100	30.094	30.108	30.575	29.504	29.9	37.3	33.3	33.5	54.0	2.5	66.2	57.6	59.6	61.1	5.8	7.4	5.5	6.2	.78	.38	28
March	30.119	30.111	30.095	30.108	30.623	29.550	36.8	48.2	43.5	42.8	78.5	25.0	62.2	54.8	63.8	60.3	5.2	5.8	5.3	5.4	.67	.20	18
April	30.025	30.013	29.999	30.012	30.493	29.656	41.2	55.6	50.0	48.9	78.2	32.8	66.9	56.6	62.5	62.0	5.4	6.1	4.2	5.2	.80	.39	19
May	30.023	29.999	29.964	29.995	30.366	29.617	48.0	65.5	60.4	58.0	87.9	39.0	72.4	42.5	48.9	54.6	4.9	4.2	4.6	4.6	.65	.20	16
June	29.920	29.885	29.840	29.882	30.064	29.631	58.8	77.0	72.5	69.4	95.5	46.3	63.4	34.2	44.2	47.3	3.8	4.4	4.8	4.3	.36	.17	10

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.20 a. m., 12.20 p. m., and 8.20 p. m., local time.

WM. BELL,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

LEWISTON, IDAHO.

	Wind.				Winds at 9 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	2,709	NW.	25	19	3	30	15	6	3	8	8	20	0	15	13	3	7	0	1	0	0	0	
August	2,671	NW.	24	7	3	15	20	3	2	7	15	24	4	20	10	1	6	0	1	0	0	0	
September	1,978	W.	24	24	0	21	8	3	2	18	23	3	12	12	10	8	12	0	0	0	0	0	Frost, light, 28th.
October	1,451	S.	16	11, 17	0	13	14	1	2	16	22	5	20	6	6	19	10	3	0	0	0	3	
November	2,390	SW.	30	12	0	15	24	3	3	21	11	5	8	5	3	22	13	3	0	1	0	15	Aurora 9th.
December	3,607	SW., W., SE.	20	7, 24, 28	1	26	25	6	1	25	7	1	1	10	5	16	13	3	0	0	0	14	
Year 1881	29,553				10	221	248	49	34	155	194	112	72	120	93	152	121	26	3	1	15	71	
1882.																							
January	2,649	SE.	22	30	0	16	35	16	4	1	11	8	2	4	7	20	6	9	0	0	5	23	
February	2,712	W.	25	9	0	21	22	12	4	6	13	2	4	4	11	13	5	3	0	0	3	18	
March	3,376	W.	30	28	0	10	49	9	5	3	11	3	3	9	13	9	6	7	0	0	0	13	
April	2,692	W.	24	14	0	14	20	10	6	6	23	7	4	8	14	8	12	0	0	1	0	0	Last frost 28th.
May	2,479	W.	26	11	1	12	23	7	5	5	13	12	15	11	13	7	7	0	0	0	0	0	
June	2,598	W.	19	16, 17, 20	4	11	20	6	2	4	23	11	9	12	13	5	6	0	1	0	0	0	

Location of office on June 30, 1882, corner of Montgomery and Fourth streets.

WM. BELL,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

LITTLE ROCK, ARK.

[Latitude, 34° 45′; longitude west of Greenwich, 92° 12′. Elevation of barometer above sea-level, 298 feet. Elevation of rain-gauge (top) above ground, 57 feet. Elevation of exposed thermometer above ground, 26 feet.]

	Barometer (to sea.)						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–4.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.014	29.988	29.988	29.997	30.181	29.812	75.6	90.1	81.9	82.6	100	67	83.7	53.2	74.7	70.5	2.3	4.1	1.5	2.6	1.95	.96	21
August	30.000	29.937	29.959	29.965	30.151	29.808	76.1	93.1	83.8	84.3	102	71	80.3	44.5	67.3	64.0	2.6	4.0	0.9	2.5	1.42	1.18	29
September	30.026	29.972	29.996	29.998	30.214	29.746	68.9	85.4	74.9	76.4	97	47	83.5	47.0	75.4	68.6	3.2	4.9	2.5	3.5	1.87	1.34	30
October	30.094	30.060	30.078	30.077	30.313	29.649	62.4	73.9	67.1	67.8	90	44	90.6	66.1	83.1	79.9	5.2	5.2	2.7	4.4	4.69	2.07	27
November	30.183	30.131	30.177	30.164	30.687	29.816	45.6	57.6	50.0	51.1	71	25	83.8	64.7	74.3	74.3	4.8	4.0	3.6	4.1	6.50	2.18	10, 11
December	30.181	30.137	30.174	30.164	30.639	29.781	43.8	55.0	48.8	49.2	69	34	78.2	60.5	74.1	70.9	4.1	4.7	3.8	4.2	2.34	1.49	13
Year 1881	30.060	30.012	30.038	30.030	.....	.....	56.7	69.8	62.6	63.0	.....	.....	82.9	58.6	75.0	72.2	4.3	4.9	2.9	4.0	43.03	.....	...
1882.																							
January	30.163	30.122	30.158	30.148	30.673	29.848	41.4	48.3	44.2	44.6	70	24	85.8	73.9	80.2	80.0	7.7	8.3	5.7	7.2	8.17	1.92	16
February	30.100	30.068	30.082	30.083	30.378	29.413	49.2	58.9	54.1	54.0	77	28	85.5	68.6	80.7	78.3	5.4	6.6	5.6	5.9	12.74	3.91	27
March	30.109	30.059	30.090	30.086	30.588	29.577	53.5	64.5	58.7	58.9	83	39	76.6	61.5	71.9	70.0	9.0	5.3	5.2	6.5	6.25	1.68	5
April	30.017	29.964	29.980	29.987	30.287	29.502	57.5	71.2	63.4	64.0	85	43	85.1	57.1	76.6	72.9	3.9	4.9	4.0	4.3	5.59	1.70	5, 6
May	29.972	29.938	29.943	29.951	30.285	29.601	60.9	71.8	65.5	66.1	87	49	87.0	62.7	81.4	77.0	6.3	6.3	5.3	6.0	15.91	6.33	9
June	29.980	29.946	29.938	29.955	30.284	29.618	72.5	86.0	78.3	78.9	98	55	87.8	55.4	77.9	73.7	3.7	5.1	2.1	3.6	1.96	.68	13

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.59 a. m., 1.59 p. m., and 9.59 p. m., local time.

W. U. SIMONS,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

LITTLE ROCK, ARK.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	3,037	NW.	19	19	5	15	16	10	10	8	2	6	21	17	13	1	3	0	1	0	0	0	
August	3,061	E. SE. NE S. NE	13	26 27 28 30 31	4	11	22	11	8	10	2	5	20	21	10	0	3	0	0	0	0	0	
September	3,427	NW.	20	15	5	8	5	21	19	3	4	3	22	17	7	6	5	0	2	0	0	0	
October	3,459	SE.	23	27	5	11	6	12	21	6	2	8	22	11	14	6	10	0	0	0	0	0	
November	4,528	SW.	40	18	11	10	6	11	20	8	3	9	12	14	8	8	9	0	0	0	0	3	
December	4,331	N.	29	31	12	12	15	7	9	6	8	12	12	13	10	8	5	0	1	0	0	0	
Year 1881	48,731	.....	.....	..	86	117	143	127	157	97	53	130	185	163	119	83	96	0	4	0	2	31	
1882.																							
January	4,096	N.	26	1	11	15	13	9	10	9	1	13	12	4	10	17	16	1	0	0	0	7	
February	4,047	N.	25	8	4	6	7	15	18	7	5	11	11	8	9	11	12	1	1	0	0	1	
March	5,245	NW.	23	27	10	12	10	11	22	7	7	9	5	8	13	10	13	0	3	0	0	0	
April	4,476	SW.	23	22	7	14	5	16	20	7	3	9	9	12	12	6	12	0	7	2	0	0	Last frost April 17th.
May	4,391	N.	33	6	7	13	14	7	19	3	8	12	10	6	13	12	17	0	8	0	0	0	
June	3,470	NW.	22	19	1	0	6	7	18	22	6	9	21	9	19	2	6	0	3	1	0	0	

Location of office on June 30, 1882, Merchant's National Bank Building, Main and Markham streets.

W. U. SIMONS,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[Form No. 132—A.]

LOS ANGELES, CAL.

[Latitude, 34° 3′; longitude west of Greenwich, 118° 15′. Elevation of barometer above sea-level, 371 feet. Elevation of rain-gauge (top) above ground, 107 feet. Elevation of exposed thermometer above ground, 58 feet.]

	Barometer (to sea.)						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.956	29.952	29.934	29.948	30.081	29.830	59.3	82.9	64.3	68.6	96.1	51.2	80.9	42.0	79.4	67.4	5.8	1.5	2.1	3.3	0.0	.....	.....
August	29.919	29.911	28.897	29.909	30.055	29.772	59.6	83.1	65.6	69.4	99.8	52.1	82.6	43.4	80.5	68.6	5.5	3.1	2.0	3.5	(*)	(*)	14
September	29.919	29.894	29.883	29.900	30.050	29.713	57.9	81.3	64.5	67.9	102.0	50.0	80.9	42.9	76.5	66.8	3.6	2.2	1.1	2.3	(*)	(*)	23
October	29.993	29.990	29.985	29.989	30.138	29.850	51.7	72.1	58.8	60.9	82.3	43.0	80.9	50.8	79.5	70.4	3.2	3.3	2.1	2.9	0.82	0.59	25
November	30.076	30.058	30.058	30.064	30.244	29.896	47.5	70.0	55.0	57.5	80.8	34.2	71.6	29.8	52.3	51.2	1.1	0.9	2.7	1.6	0.27	0.21	16
December	30.143	30.124	30.126	30.131	30.280	29.983	46.4	64.7	53.1	54.7	79.3	35.3	76.6	48.7	69.0	64.8	2.7	4.5	2.6	3.3	0.52	0.34	16
Year 1881	30.004	29.991	29.995	29.996	.....	.....	52.5	72.5	58.6	61.1	.....	.....	79.0	45.7	73.3	66.0	2.8	2.1	1.6	2.3	5.53	.....	.....
1882.																							
January	30.113	30.096	30.088	30.099	30.345	29.649	42.5	56.7	48.9	49.4	74.2	33.0	79.2	56.4	73.2	69.6	3.5	4.5	3.7	3.9	1.01	0.53	24
February	30.166	30.167	30.156	30.163	30.358	29.908	42.2	59.7	48.9	50.3	76.7	32.0	76.5	43.4	70.7	63.5	2.9	3.9	2.5	3.1	2.66	1.02	26
March	30.141	30.138	30.124	30.134	30.261	29.919	47.5	64.1	54.4	55.3	87.8	35.3	74.4	48.8	72.2	65.1	3.4	5.4	3.3	4.0	2.66	1.24	15
April	30.070	30.070	30.056	30.065	30.194	29.874	49.2	66.8	54.1	56.4	80.0	40.2	80.8	54.9	80.0	71.9	3.4	4.0	2.9	3.4	1.83	1.18	3
May	30.000	29.997	29.991	29.996	30.158	29.776	52.6	73.6	58.8	61.7	86.1	42.1	81.7	43.9	71.8	65.8	3.8	3.5	4.1	3.8	63	.42	24, 25
June	29.975	29.974	29.957	29.969	30.088	29.872	56.3	75.6	61.2	64.4	87.1	49.6	81.8	47.8	75.8	68.5	6.3	3.8	3.4	4.5	(*)	(*)	9, 10, 14

*Inappreciable.

NOTE.—7 a. m., 3 p. m. and 11 p. m., Washington time, correspond with 4.15 a. m., 12.15 p. m., and 8.15 p. m., local time.

E. F. KUBEL,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

LOS ANGELES, CAL.

	Wind.			Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—										Number of days—							Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,242	SW.	19	1	0	2	0	3	12	28	43	4	1	11	19	1	0	0	0	0	0	0	Earthquake on 22d.
August	3,992	W.	21	24	0	0	0	5	13	33	39	2	1	12	18	1	0	0	0	0	0	0	Dense fogs; brilliant meteor on 23d.
September	3,938	W.	24	22	1	0	3	8	8	32	35	3	0	17	11	2	0	0	0	0	0	0	First rain of season 22d; frequent fogs.
October	3,846	NW.	24	31	0	1	1	8	20	33	30	0	0	19	9	3	3	0	0	0	0	0	First frost of season in vicinity on 19th; ice formed in city on same date.
November	5,260	NE.	43	9	12	17	6	10	7	18	14	6	0	25	5	0	2	0	0	0	0	0	First frost of season in city on 18th; no damage.
December	4,090	S.	26	16	6	16	10	13	6	10	21	11	0	15	14	2	2	0	0	0	0	0	Season very backward; stock dying and grass parching; great need of rain.
Year 1881	49,651				57	105	61	97	111	243	292	70	59	172	154	39	24	0	0	0	0	0	
1882.																							
January	4,714	NE.	48	8	11	18	11	12	8	7	4	18	4	18	6	7	4	1	0	0	0	0	Severe gales on 8th and 12th; frost on 31st; ice on 27th.
February	3,897	N. NW.	30	6	11	13	7	8	11	2	9	13	10	16	9	3	6	0	0	0	0	0	Frost on 12th and 13th.
March	4,431	E.	30	7	5	11	8	7	12	10	14	15	11	15	5	11	10	0	0	0	0	0	
April	2,786	N.	30	6	7	6	2	3	4	10	28	14	16	16	9	5	5	0	0	0	0	0	
May	3,877	W.	26	5	8	4	6	5	6	14	34	10	6	12	11	8	3	0	0	0	0	0	Frequent dust-haze during month; very few fogs.
June	4,125	W.	18	6	7	3	5	2	8	26	31	8	0	11	14	5	0	0	0	0	0	0	Lightning on 15th; a phenomenon at this station.

Location of office on June 30, 1882, Baker Block, Main street.

E. F. KUBEL,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

LOUISVILLE, KY.

[Latitude, 38° 15′; longitude west of Greenwich, 85° 45′. Elevation of barometer above sea-level, 530 feet. Elevation of rain-gauge (top) above ground, 102 feet. Elevation of exposed thermometer above ground, 89 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.008	29.971	29.982	29.987	30.208	29.687	75.2	88.3	79.3	80.9	101.0	62.5	72.5	42.8	65.3	60.2	3.0	4.0	1.7	2.9	2.18	1.18	14
August	30.005	29.947	29.968	29.973	30.176	29.777	73.3	90.3	79.7	81.1	104.6	63.0	69.7	38.9	57.6	55.4	2.1	4.2	1.7	2.7	.15	.09	7
September	30.055	29.990	30.018	30.021	30.238	29.484	69.0	84.5	74.1	75.9	99.0	54.0	79.6	47.0	70.2	65.6	4.0	4.9	2.7	3.9	2.70	2.04	15
October	30.137	30.092	30.110	30.113	30.392	29.730	59.5	70.0	62.3	63.9	86.5	43.0	83.5	61.0	78.9	74.4	6.1	6.0	5.0	5.7	3.44	.75	23
November	30.205	30.142	30.172	30.173	30.643	29.751	42.6	54.0	46.8	47.8	74.0	19.0	75.0	54.5	70.5	66.6	5.7	5.4	3.8	5.0	2.79	.66	8
December	30.172	30.141	30.166	30.160	30.612	29.769	41.4	48.6	44.4	44.8	67.0	19.0	78.5	63.4	74.1	72.0	6.9	6.7	5.4	6.3	6.00	1.33	20
Year 1881	30.058	30.008	30.031	30.032	.....	.....	53.2	64.3	57.2	58.2	.....	.....	77.0	54.6	70.6	67.4	5.3	6.0	4.4	5.2	36.59	.....	.....
1882.																							
January	30.180	30.142	30.163	30.162	30.618	29.616	35.7	40.6	38.5	38.3	65.0	16.0	79.4	72.6	74.7	75.6	8.3	7.9	7.6	7.9	6.29	1.03	10
February	30.108	30.072	30.110	30.097	29.534	29.445	43.7	52.1	47.9	47.9	67.0	20.0	77.5	59.6	69.1	68.7	6.3	6.5	5.6	6.1	9.69	2.97	20
March	30.107	30.065	30.093	30.088	30.524	29.574	44.8	56.0	49.3	50.0	74.6	30.5	73.9	50.6	63.9	62.8	5.7	6.2	6.2	6.0	5.85	1.18	9
April	30.025	29.989	29.999	30.004	30.301	29.508	51.8	64.0	56.0	57.3	84.5	31.0	70.8	43.9	61.7	58.8	7.3	5.6	4.0	5.6	2.17	.52	26
May*	29.964	29.924	29.941	29.943	30.295	29.557	57.3	68.7	61.4	62.5	85.0	44.0	78.7	51.7	69.4	66.6	5.7	7.1	5.5	6.1	7.46	2.05	28
June	29.937	29.961	29.919	29.919	30.168	29.597	69.3	79.7	71.1	73.4	95.0	50.0	78.1	57.5	78.0	71.2	5.3	7.2	4.6	5.7	5.23	.78	12

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.25 a. m., 2.25 p. m., and 10.25 p. m., local time.
*Thirty days only.

HILL C. SMYTH,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

LOUISVILLE, KY.

	Wind.			Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—								Number of days.										Remarks.
	Total movement.	Maximum velocity.		North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.				Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles. Date.													Rain.	Snow.	Thunder-storms.	Aurora.			
1881.																						
July	3,471	NE.	48 13	14	9	5	1	9	23	11	7	14	18	12	1	5	0	3	0	0	0	
August	4,221	W.	38 12	20	20	10	10	7	7	2	3	14	18	11	2	3	0	2	0	0	0	
September	4,671	SW.	28 26	4	6	4	8	33	19	7	2	7	13	12	5	7	0	1	0	0	0	
October	5,395	N. NE. SW.	24 4 5 15	16	11	3	7	29	12	6	1	8	8	10	13	14	0	2	0	0	0	
November	6,738	SW.	31 12	7	9	6	11	20	17	12	7	1	8	16	6	13	0	0	0	1	6	First frost November 4.
December	5,721	W.	30 1 30	13	5	18	11	17	16	4	8	1	5	13	13	13	1	0	0	0	4	
Year 1881	67,082			150	134	102	79	179	187	144	69	51	110	136	119	105	20	27	0	14	66	
1882.																						
January	6,276	W.	30 26	13	13	9	5	18	13	16	6	0	3	9	19	3	14	0	0	0	16	
February	6,648	SW.	39 21	8	8	6	12	24	14	8	3	1	7	9	12	11	0	0	0	0	5	High water; flood.
March	8,128	SW.	41 21	6	8	11	9	18	11	13	16	1	8	11	12	12	0	4	0	0	1	
April	6,036	SW.	36 19	23	17	6	3	20	11	4	4	2	5	16	9	9	0	4	2	0	1	Last frost April 17.
May	5,269	SW.	36 5	16	12	6	4	19	17	10	6	3	7	11	13	16	0	5	0	0	0	
June	5,568	NE.	32 13	6	7	5	8	24	23	9	5	3	4	18	8	19	0	10	0	0	0	

Location of office June 30, 1882, corner of Fourth and Green streets.

HILL C. SMYTH,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

LYNCHBURG, VA.

[Latitude, 37° 30′; longitude west of Greenwich, 79° 2′. Elevation of barometer above sea-level, 652 feet. Elevation of rain-gauge (top) above ground, 50 feet. Elevation of exposed thermometer above ground, 30 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.008	29.941	29.979	29.976	30.226	29.625	76.9	89.0	78.9	81.6	101.8	62.0	65.4	39.3	62.5	55.7	4.2	3.4	3.0	3.5	3.88	1.98	14
August	30.072	29.996	30.041	30.036	30.296	29.739	74.1	88.1	78.4	80.2	100.0	62.0	66.7	35.3	59.5	53.8	3.3	2.9	3.0	3.1	.30	.25	7
September	30.118	30.046	30.099	30.088	30.323	29.853	72.9	86.2	76.1	78.4	98.3	63.2	75.3	45.6	72.1	64.3	2.9	3.8	2.3	3.0	2.07	.52	3
October	30.215	30.139	30.173	30.176	30.567	29.667	59.1	72.6	64.0	65.2	87.3	43.0	76.4	49.7	70.3	65.5	3.5	4.5	3.3	3.8	4.09	1.32	30
November	30.260	30.197	30.237	30.231	30.746	29.752	45.9	56.5	48.9	50.4	76.5	23.5	73.3	51.1	73.6	66.0	2.9	5.2	4.0	4.0	3.59	1.47	23
December	30.213	30.165	30.216	30.198	30.631	29.539	41.7	50.9	43.8	45.5	69.8	22.0	76.7	53.6	70.8	67.0	2.7	2.8	2.2	2.6	6.22	1.39	22
Year 1881	30.091	30.022	30.072	30.062	.....	.....	54.8	66.7	58.0	59.8	.....	.....	71.4	46.5	64.5	61.8	3.9	4.6	3.7	4.1	35.57	.....	....
1882.																							
January	30.198	30.162	30.201	30.187	30.793	29.483	36.9	42.4	38.7	39.0	62.2	17.0	75.7	60.0	72.2	69.3	6.3	6.5	6.4	6.4	5.34	.93	21
February	30.197	30.127	30.171	30.165	30.633	29.479	49.9	51.8	44.3	45.7	66.0	25.7	69.4	48.2	66.2	61.3	4.5	5.4	4.4	4.8	3.66	1.07	4
March	30.144	30.093	30.151	30.129	30.646	29.624	41.1	55.8	47.6	49.2	74.8	30.5	67.1	45.3	60.9	57.8	5.7	5.9	4.7	5.4	4.33	1.13	27
*April	30.108	30.009	30.048	30.055	30.443	29.520	50.8	63.6	55.0	56.5	84.6	30.0	69.5	44.3	65.4	59.7	5.2	5.3	4.5	5.0	2.30	.83	23
May	30.050	29.981	30.005	30.012	30.417	29.594	58.2	69.9	60.3	62.8	85.5	39.5	69.6	48.1	71.1	62.9	5.9	7.0	5.7	6.2	3.15	.52	28
June	29.969	29.918	29.954	29.947	30.244	29.589	72.0	81.9	72.3	75.4	95.0	52.0	67.5	46.8	69.8	61.4	6.1	6.3	6.0	6.1	4.06	.97	10

* 29 days only.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.52 a. m., 2.52 p. m., and 10.52 p. m., local time.

WM. R. BUSHBY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM NO. 132—B.]

LYNCHBURG, VA.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurora.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	2,526	NE.	20	11	1	17	10	3	5	11	20	13	13	13	15	3	7	0	6	0	0	0	
August	1,793	NW.	14	13	2	9	18	1	4	6	4	5	44	17	10	4	3	0	2	0	0	0	
September	1,351	NE.	19	3	2	6	8	5	10	8	4	1	46	13	16	1	9	0	4	0	0	0	
October	1,457	NE.	15	5	0	8	2	2	11	6	5	5	54	16	9	6	11	0	1	0	0	0	First light frost of the season on the 6th.
November	1,378	W.	20	19	0	6	2	3	6	10	6	9	48	16	7	7	12	0	0	0	0	6	First killing frost of the season on the 16th.
December	1,365	W.	17	23	4	2	0	1	6	8	10	6	56	10	11	10	14	1	0	0	0	7	
Year 1881	24,034	.....	....	.....	20	133	68	25	93	92	115	111	438	148	137	80	114	8	22	0	2	66	
1882.																							
January	2,338	NW.	24	29	2	8	9	2	7	19	11	13	22	6	12	13	20	2	0	0	2	13	
February	2,600	W.	24	10	1	8	3	3	11	17	8	11	22	13	5	10	10	1	0	0	0	8	
March	3,370	S.	30	26	4	12	7	1	13	11	17	13	15	11	7	13	14	1	1	0	0	2	
April	2,604	W.	20	20	0	10	5	2	12	13	4	7	28	9	12	9	13	0	4	0	0	1	Ice over one-eighth inch thick on 12th; zodiacal light 16th, 17th; killing frost, 24th.
May	2,695	S. SW.	16	31	6	18	4	1	12	17	6	8	21	5	13	13	16	0	5	0	0	0	Killing frost on the 3d.
June	2,447	W.	20	28	2	9	5	2	14	23	17	4	14	3	15	12	18	0	12	0	0	0	

Location of office on June 30, 1882, First National Bank, No. 135 Main street.

WM. R. BUSHBY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[Form No. 132—A.]

MADISON, WIS.

[Latitude, 43° 3′; longitude west of Greenwich, 89° 24′. Elevation of barometer above sea-level, 949 feet. Elevation of rain-gauge (top) above ground, 56.8 feet. Elevation of exposed thermometer above ground, 32.5 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Minimum.	Maximum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.013	29.995	29.981	29.996	30.238	29.642	67.2	79.0	73.3	73.2	92	56	85.0	62.3	76.5	74.7	3.5	4.5	2.7	3.6	9.47	4.32	21
August	30.029	29.999	29.998	30.009	30.223	29.703	66.9	80.3	72.5	73.2	95	52	81.5	54.8	72.8	69.7	4.8	5.7	3.2	4.6	.56	.31	6
September	29.950	29.928	29.935	29.938	30.234	29.426	59.7	70.8	63.8	64.8	92	46	86.8	65.1	79.4	77.2	5.6	4.7	5.2	5.2	8.17	1.72	30
October	30.123	30.100	30.111	30.111	30.586	29.522	47.7	56.4	50.7	51.6	77	33	88.6	68.7	82.6	80.0	6.7	5.7	6.3	6.2	9.12	2.05	8
November	30.091	30.073	30.105	30.090	30.739	29.535	32.2	37.8	33.9	34.6	59	6	79.4	70.8	76.6	75.6	6.3	6.2	6.0	6.2	2.56	.85	30
December	30.149	30.133	30.155	30.146	30.584	29.636	30.0	36.9	32.4	33.1	49	6	77.7	69.5	76.1	74.4	4.9	5.9	4.8	5.2	1.32	49	13
Year 1881	30.034	30.012	30.022	30.023	.....	.....	41.6	52.3	46.1	46.7	.....	.....	80.9	65.5	76.8	74.4	5.8	5.8	4.9	5.3	52.93	.....	.....
1882.																							
January	30.157	30.129	30.148	30.142	30.769	29.397	18.0	27.0	22.2	22.4	48	−8	75.3	70.5	74.4	73.4	3.7	5.5	4.0	4.4	1.33	.64	10
February	30.061	30.025	30.057	30.048	30.695	29.422	28.3	39.0	33.2	33.5	63	4	78.5	65.0	74.6	72.7	4.5	4.0	3.6	4.0	1.74	.71	18
March	30.075	30.044	30.070	30.063	30.654	29.389	30.3	38.6	34.4	34.4	62	14	78.6	69.8	76.8	75.1	6.6	6.6	6.8	6.6	4.73	1.44	28
April	30.060	30.043	30.044	30.049	30.267	29.237	39.8	50.7	44.2	44.9	78	22	81.1	59.4	72.1	70.9	5.7	6.1	5.3	5.7	4.21	1.36	18
May	29.988	29.965	29.976	29.976	30.325	29.548	46.6	57.5	50.9	51.7	78	33	80.2	60.9	73.7	71.6	5.6	6.1	4.9	5.5	2.89	.70	30, 31
June	29.894	29.868	29.875	29.879	30.127	29.351	59.0	70.6	63.8	64.5	87	42	81.8	62.9	75.9	73.5	5.4	6.8	4.6	5.6	7.76	2.21	29, 30

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.10 a. m., 2.10 p. m., and 10.10 p. m., local time.

C. A. SHAW,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

MADISON, WIS.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	5,321	N.	32	21	10	6	12	6	9	15	13	21	1	7	18	6	9	0	6	1	0	0	
August	5,499	S.	32	30	13	14	11	18	17	10	5	5	0	10	15	6	5	0	3	0	0	0	
September	6,864	SW.	45	29	4	2	15	14	21	12	11	11	0	7	13	10	14	0	4	1	0	0	
October	7,044	NW. N. SW.	24	8 15 19	11	11	12	18	9	9	10	13	0	4	13	14	16	0	2	0	0	0	Light frost 15th, 19th, 20th.
November	9,884	W. S.	32	14 25	4	4	5	8	21	8	24	16	0	4	11	15	6	6	0	1	0	15	Heavy frost 10th.
December	8,330	NW.	40	7	9	5	1	7	29	11	10	20	1	5	16	10	8	2	0	1	2	18	
Year 1881	84,312	.....	.....	.....	114	85	152	116	188	103	141	193	3	63	164	138	90	39	27	7	58	136	
1882.																							
January	7,480	NW.	38	26	3	3	4	10	24	11	18	20	0	4	17	10	3	7	1	0	13	31	Lake closed January 2d.
February	8,008	S. NW.	30	12 31	2	4	4	12	22	7	19	14	0	7	13	8	6	3	0	0	4	22	
March	9,734	N.	34	9	15	4	14	11	6	9	13	21	0	0	18	13	4	10	2	0	2	18	Lake opened March 17th.
April	8,613	SW.	44	6	5	15	28	4	6	13	9	9	1	4	16	10	11	0	3	3	0	3	
May	8,346	N.	30	20	7	24	13	11	19	6	6	7	0	5	13	13	12	0	3	0	0	0	Last frost May 2d.
June	6,412	W.	48	22	10	6	20	11	6	12	16	9	0	7	13	10	14	0	6	1	0	0	

Location of office on June 30, 1882, Brown's Block, corner of Pinckney street and Washington avenue.

C. A. SHAW,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

MARQUETTE, MICH.

[Latitude, 46° 33′; longitude west of Greenwich, 87° 24′. Elevation of barometer above sea-level, 673 feet. Elevation of rain-gauge (top) above ground, 57 feet. Elevation of exposed thermometer above ground 36 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.979	29.957	29.963	29.966	30.300	29.615	67.2	73.8	65.9	69.0	97	45	66.5	53.0	69.2	62.9	4.1	4.7	3.0	3.9	2.49	1.11	12
August	30.029	30.001	29.992	30.008	30.274	29.576	63.7	70.2	63.7	65.9	91	41	77.6	67.1	78.1	74.4	6.4	6.0	4.6	5.7	2.80	1.35	11
September	29.924	29.901	29.919	29.915	30.250	29.347	55.2	61.6	56.1	57.6	80	42	85.8	71.7	83.3	80.3	7.8	8.0	5.3	7.3	12.71	4.44	29
October	30.097	30.074	30.089	30.087	30.571	29.481	42.4	49.1	43.2	44.9	72	27	76.9	60.8	72.8	70.2	7.2	6.4	5.2	6.8	3.71	1.79	11
November	29.988	29.965	30.003	29.985	30.651	29.228	28.6	33.5	30.4	30.8	58	8	80.7	73.7	78.5	77.6	8.6	8.1	8.8	8.5	3.43	1.01	2
December	30.056	30.018	30.046	30.040	30.532	29.348	27.5	34.4	30.4	30.8	48	8	73.0	58.4	66.6	66.0	6.4	7.2	5.9	6.5	.98	.63	30
Year 1881	30.030	30.004	30.015	30.016	.....	.....	38.4	45.1	39.4	41.0	.....	.....	73.2	62.2	72.0	69.2	6.1	6.5	4.9	5.9	42.91	.....	.....
1882.																							
January	30.065	30.037	30.057	30.053	30.763	29.589	18.2	23.8	20.3	20.8	40	—10	75.8	63.6	71.4	70.3	6.6	8.3	7.6	7.5	1.10	.23	6,7
February	30.001	29.970	29.997	29.990	30.813	29.439	25.1	31.2	27.9	28.1	52	7	75.5	65.7	74.4	71.9	7.7	8.5	7.2	7.8	3.41	1.38	21
March	30.073	30.059	30.085	30.072	30.738	29.398	25.4	30.7	26.8	27.6	51	1	77.9	67.2	74.6	73.2	7.6	7.8	5.4	6.9	2.75	1.40	21
April	30.134	30.108	30.100	30.114	30.417	29.494	34.4	39.5	35.6	36.5	66	17	69.9	59.8	71.2	67.0	6.2	6.6	5.2	6.0	2.48	1.32	19
May	30.054	30.035	30.025	30.038	30.332	29.712	45.1	49.0	43.8	46.0	75	23	62.0	50.3	62.2	58.2	4.1	4.9	3.5	4.2	2.88	1.76	30, 31
June	29.907	29.894	29.892	29.898	30.210	29.384	56.2	59.7	53.7	56.5	80	38	64.7	55.6	67.7	62.7	4.2	5.1	3.6	4.3	2.69	1.74	18

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.19 a. m., 2.19 p.m., and 10.19 p. m., local time.

J. GILLIGAN,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

MARQUETTE, MICH.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	5,186	NW.	26	9	10	5	8	9	5	6	23	17	10	13	13	5	8	0	2	0	0	0	Comet seen from 1st to 7th.
August	5,721	SW.	35	4	16	4	8	7	16	14	9	10	9	6	13	12	12	0	5	0	0	0	
September	6,241	SW.	36	25	10	4	9	11	14	15	13	9	5	2	15	13	18	0	4	3	0	0	First frost September 28; heaviest rain since the station opened on 29th.
October	6,155	NW.	28	15	14	0	6	6	17	12	19	19	0	7	12	12	11	3	0	2	0	7	
November	8,329	W. SW.	32	17 28	6	4	2	5	19	12	22	20	0	0	8	22	3	19	0	0	8	23	Lunar halos on the 7th and 8th.
December	7,745	S. SW.	40	16 25	4	2	2	2	19	19	21	21	3	5	11	15	3	9	0	3	8	26	Lunar halos on the 4th and 6th.
																							Lunar halos on the 2d and 27th.
Year 1881	74,414	.....	.....	.....	136	57	77	75	140	125	180	254	51	85	135	145	100	77	17	13	89	142	
1882.																							
January	8,134	W.	34	30	3	0	1	1	17	24	27	20	0	2	13	16	1	14	0	0	17	31	
February	7,275	W.	36	13	5	7	1	10	10	17	15	17	2	1	10	17	0	14	0	1	9	26	
March	7,695	S.	40	28	13	7	13	12	8	9	11	18	2	1	15	15	2	18	0	1	9	30	
April	6,917	S. SW.	28	3 4	15	16	7	7	5	3	5	32	0	6	14	10	8	2	1	6	2	21	
May	6,130	S. SW.	28	20 25	20	14	5	8	10	8	8	17	3	12	13	6	10	2	1	3	0	5	
June	4,908	N.	24	4 7 18	22	9	9	10	8	6	7	16	3	12	13	5	7	0	2	2	0	0	Last frost on the 20th.

Location of office on June 30, 1882, corner of Front and Spring streets.

J. GILLIGAN,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

MEMPHIS, TENN.

[Latitude, 35° 7′; longitude west of Greenwich, 90° 0′. Elevation of barometer above sea-level, 321 feet. Elevation of rain-gauge (top) above ground, 51 feet. Elevation of exposed thermometer above ground, 53 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.					Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.	Amount in inches.	Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.049	30.014	30.016	30.026	30.196	29.850	77.2	90.5	82.0	83.2	99.0	67.0	72.7	45.8	66.8	61.8	3.9	4.3	1.8	3.3	0.89	0.82	22, 23
August	30.005	29.966	29.981	29.984	30.171	29.702	77.8	90.9	82.4	83.7	102.0	68.0	73.1	45.2	67.1	61.8	2.7	4.9	1.4	3.0	1.97	0.79	29
September	30.068	30.012	30.041	30.040	30.208	29.684	70.0	85.2	75.1	76.7	98.0	52.0	77.6	46.6	73.8	66.0	3.0	4.4	3.1	3.5	3.84	2.79	14, 15
October	30.149	30.104	30.126	30.126	30.385	29.737	63.0	74.7	67.3	68.3	89.0	44.5	81.6	60.8	77.1	73.2	5.8	6.8	2.8	5.1	3.22	1.86	23
November	30.227	30.172	30.209	30.202	30.626	29.886	44.9	57.0	49.8	50.6	77.5	22.0	82.2	59.8	70.9	70.9	4.6	4.8	4.0	4.5	5.14	2.35	10
December	30.209	30.171	30.203	30.194	30.629	29.789	43.2	53.0	47.9	48.0	70.0	31.0	79.4	42.9	70.3	69.4	6.6	6.5	5.3	6.1	2.39	1.11	19, 20
Year 1881	30.088	30.044	30.067	30.066	.....	.....	57.2	68.6	61.8	62.5	.....	.....	78.5	53.9	70.6	67.9	4.8	5.4	4.2	4.5	42.84	.....	.....
1882.																							
January	30.210	30.163	30.189	30.187	30.733	29.836	40.3	46.3	43.7	43.4	71	21	88.0	76.7	79.6	81.4	8.0	8.8	7.2	8.0	12.87	2.97	16
February	30.145	30.111	30.114	30.123	30.493	29.389	44.4	56.7	53.6	52.9	76	27	82.7	64.5	71.6	72.9	5.7	6.6	5.5	5.9	9.92	2.37	27, 28
March	30.144	30.096	30.118	30.119	30.558	29.647	52.6	62.2	57.5	57.4	79	38	75.8	54.3	65.3	65.1	5.0	5.0	3.8	4.6	9.10	3.84	5, 6
April	30.045	30.009	30.009	30.021	30.297	29.478	58.3	69.6	62.5	63.5	88	41	77.0	51.9	70.6	66.5	4.4	5.5	3.3	4.4	3.56	1.00	27
May	30.000	29.970	29.964	29.978	30.295	29.660	62.7	73.0	65.7	67.1	90	49	77.0	52.9	73.4	67.8	5.6	6.9	4.4	5.6	9.14	3.22	9
June	30.004	29.970	29.975	29.983	30.277	29.663	74.6	85.6	77.2	79.1	97.5	55	78.6	53.9	73.4	67.6	3.2	5.9	1.8	3.6	4.15	1.55	18, 19

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.08 a. m., 2.08 p. m., and 10.08 p. m., local time.

D. T. FLANNERY,
Corporal, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

FORM No. 132—B.

MEMPHIS, TENN.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.				Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.	Thunder-storms.	Auroras.			
1881.																							
July	2,063	NW.	20	1, 28, 29	6	10	0	5	1	5	14	8	44	12	18	1	4	0	4	0	0	0	First light frost, October 21. First killing frost, October 20.
August	1,910	SW.	29	29	5	7	3	3	3	10	8	7	47	16	13	2	8	0	2	0	0	0	
September	1,873	SW.	29	2	1	3	2	21	8	4	6	3	42	16	9	5	6	0	2	0	0	0	
October	2,846	SE.	28	28	6	7	4	20	5	13	7	3	28	8	15	8	5	0	1	0	0	0	
November	4,229	NW.	33	23	7	8	4	20	10	3	6	14	18	15	5	10	13	0	2	0	0	3	
December	2,365	NW.	38	31	4	3	5	12	3	5	12	9	40	4	12	15	10	0	0	0	0	3	
Year 1881	34,305	.....	.....	.....	54	90	60	147	58	100	124	106	356	122	147	96	125	11	46	0	3	44	
1882.																							
January	4,969	N.	34	17	10	14	7	17	9	6	8	18	4	3	7	21	22	1	2	0	1	11	Last frost, May 17; last snow, January 31.
February	3,109	NW., SE., W.	26	16, 20, 21	5	6	4	22	5	8	9	7	18	6	9	13	14	0	5	0	0	1	
March	3,703	SW.	34	9	3	12	4	15	10	12	7	8	22	13	10	8	15	0	3	0	0	0	
April	5,042	S.	24	22	9	10	3	23	7	11	13	13	1	13	8	9	12	0	6	1	0	0	
May	4,706	SW.	25	5	5	12	11	18	11	6	17	13	0	5	17	9	11	0	9	0	0	0	
June	3,703	W.	38	12	1	3	4	17	17	10	22	10	6	10	19	1	9	0	3	0	0	0	

Location of office on June 30, 1882, No. 260 Front street, corner West Court.

D. T. FLANNERY,
Corporal, Signal Corps, U. S. A

Annual meteorological summary—Continued.

[FORM No. 132—A.]

MILWAUKEE, WIS.

[Latitude, 43° 3′; longitude west of Greenwich, 87° 54′. Elevation of barometer above sea-level, 697 feet. Elevation of rain-gauge (top) above ground, 135 feet. Elevation of exposed thermometer above ground, 105 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	8 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.019	29.907	29.991	30.002	30.279	29.694	67.0	75.5	69.5	70.7	92	55	76.0	60.1	75.8	70.6	4	5	2	3.7	5.34	1.32	10
August	30.038	30.015	30.007	30.020	30.240	29.724	67.7	75.4	70.9	71.3	94	52	78.3	65.9	74.4	72.9	5	6	3	4.7	.80	.44	6
September	29.963	29.933	29.939	29.945	30.243	29.361	60.7	68.2	64.0	64.3	92	46	84.5	71.2	70.0	78.2	5	6	3	4.7	4.28	.70	15
October	30.110	30.083	30.093	30.095	30.566	29.541	49.1	55.0	51.5	51.9	75	36	87.3	74.2	82.2	81.2	8	7	6	7.0	6.04	1.97	16, 17
November	30.072	30.047	30.087	30.069	30.709	29.491	34.3	39.4	36.2	36.6	59	7	81.7	73.2	77.7	77.5	7	7	6	6.7	1.69	.44	11
December	30.128	30.099	30.129	30.119	30.585	29.568	32.0	37.9	34.5	34.8	49	8	80.7	74.0	77.7	77.5	6	7	5	6.0	1.27	.63	12, 13
Year 1881	30.049	30.025	30.038	30.037	.....	.....	43.0	49.8	46.2	46.3	.....	.....	81.0	69.8	76.8	75.9	6.2	6.2	4.4	5.5	39.07	.....	.....
1882.																							
January	30.144	30.102	30.130	30.125	30.743	29.396	21.5	28.5	25.2	25.1	52	— 6	82.8	75.7	79.4	79.3	5.4	6.7	4.5	5.5	1.05	.41	8
February	30.046	30.002	30.038	30.029	30.614	29.287	31.2	40.0	35.4	35.5	60	9	82.6	65.8	75.0	74.5	7.0	6.2	3.3	5.5	2.11	1.06	28
March	30.065	30.036	30.063	30.055	30.647	29.386	32.6	38.0	35.4	35.3	62	16	83.8	75.0	79.0	79.3	7.5	7.5	6.7	7.2	3.90	.63	26
April	30.060	30.051	30.055	30.055	30.306	29.189	40.5	45.3	42.6	42.8	72	23	79.2	64.3	72.5	72.0	4.0	6.1	5.1	5.1	1.92	.72	18, 19
May	29.990	29.969	29.982	29.980	30.357	29.501	46.2	51.1	48.7	48.7	69	31	74.6	64.1	67.0	68.6	5.6	5.6	5.4	5.5	2.03	.71	10
June	29.888	29.872	29.875	29.878	30.161	29.381	58.5	64.8	60.9	61.4	84	40	78.7	68.9	72.7	73.4	5.0	7.2	4.7	5.6	3.77	1.38	24, 25

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.17 a. m., 2.17 p. m., and 10.17 p. m., local time.

WILLIAM LINE,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

MILWAUKEE, WIS.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	5,499	NW.	33	24	17	11	7	4	7	18	13	9	7	15	10	6	10	0	6	0	0	0	
August	6,383	S.	40	30	24	6	13	16	12	10	7	2	3	10	15	6	5	0	1	0	0	0	
September	7,383	S.	39	29, 30	12	4	9	16	21	11	8	3	6	8	15	7	14	0	7	1	0	0	
October	7,968	W.	34	15	17	11	1	18	15	10	7	9	5	2	11	18	20	0	2	0	0	0	First frost, 19th.
November	10,128	SE.	45	11	8	2	4	9	20	16	26	5	6	7	8	15	9	4	0	0	3	14	First killing frost 4th; river frozen over, 20th.
December	8,456	W.	43	6	8	7	1	3	16	24	16	16	2	7	10	14	7	3	0	0	2	15	
Year 1881	89,843				208	97	64	105	120	157	153	138	53	94	143	128	103	43	26	1	56	128	
1882.																							
January	8,962	W.	39	4, 28	2	1	4	13	15	20	23	14	1	5	17	9	4	6	1	0	13	28	
February	8,851	NE.	42	20	5	2	2	14	16	15	24	4	2	6	13	9	6	3	0	1	4	19	
March	10,641	SW.	44	21	7	11	6	17	5	13	18	16	0	5	10	16	12	6	2	0	2	18	8th, navigation opened.
April	9,646	SW.	44	6	21	22	7	4	4	13	10	9	0	8	10	12	10	1	2	1	0	6	
May	10,211	N.	32	5, 27	29	11	11	10	10	14	8	0	0	8	12	11	13	0	2	0	0	1	
June	8,178	N.	42	3	24	13	5	8	4	15	14	7	0	5	16	9	17	0	7	1	0	0	

Location of office on June 30, 1882, Mitchell's building, corner East Water and Michigan streets.

WILLIAM LINE,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

MOBILE, ALA.

[Latitude, 30° 42′; longitude west of Greenwich, 88° 2′. Elevation of barometer above sea-level, 41 feet. Elevation of rain-gauge (top) above ground, 51 feet. Elevation of exposed thermometer above ground, 36 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.032	29.989	30.008	30.009	30.180	29.832	78.3	90.1	81.6	83.3	100.8	69.2	83.5	56.9	75.3	71.9	5.0	6.3	3.5	4.9	2.77	1.45	14
August	30.001	29.966	29.984	29.984	30.150	29.753	77.1	87.7	80.4	81.7	96.0	68.1	83.1	60.2	78.6	73.0	4.6	5.5	3.5	4.5	15.22	6.20	3
September	30.039	29.998	30.034	30.024	30.142	29.626	73.4	86.2	78.2	79.3	96.0	58.0	86.4	57.4	77.4	73.7	4.3	5.7	3.6	4.5	11.71	3.27	26
October	30.121	30.070	30.100	30.097	30.374	29.841	68.0	80.2	72.2	73.5	89.0	51.0	86.5	61.0	82.6	76.7	5.0	6.2	3.3	4.8	3.23	1.22	29
November	30.174	30.116	30.166	30.152	30.509	29.811	53.4	66.0	58.0	59.1	81.0	27.0	86.4	62.3	81.5	76.7	5.1	5.4	4.1	4.9	7.36	4.50	6
December	30.183	30.121	30.163	30.156	30.499	29.696	51.8	62.4	55.7	56.6	75.0	36.8	87.3	65.5	80.3	77.7	4.6	5.5	4.6	4.9	9.15	1.82	28
Year 1881	30.077	30.032	30.063	30.058	.....	.....	62.7	74.5	66.9	68.0	.....	.....	83.4	57.7	76.5	72,6	5.3	5.5	3,9	4.9	90.97	.....	.....
1882.																							
January	30.169	30.141	30.176	30.162	30.479	29.771	55.2	62.6	57.0	58.3	78.0	32.0	87.9	73.7	85.3	82.3	7.4	7.5	6.5	7.1	6.77	1.29	8
February	30.196	30.150	30.171	30.172	30.454	29.571	53.5	65.1	58.6	59.1	76.0	35.0	84.3	62.0	80.6	75.6	6.4	6.3	3.4	5.4	4.54	1.27	26
March	30.164	30.129	30.165	30.153	30.537	29.781	59.7	71.7	63.8	65.1	82.0	46.5	85.1	59.8	80.1	75.0	4.4	5.7	2.7	4.3	5.13	3.78	26
April	30.044	30.006	30.024	30.025	30.319	29.703	64.8	77.0	68.8	70.5	89.0	49.0	84.2	56.2	78.5	73.0	4.8	5.0	4.4	4.7	9.92	7.30	18, 19
May	30.035	29.990	30.008	30.011	30.268	29.729	66.8	80.3	70.5	72.5	91.5	50.4	81.4	51.5	74.5	69.1	4.6	4.8	3.2	4.2	6.78	2.72	31
June	30.046	30.002	30.026	30.025	30.275	29.784	76.4	88.8	78.7	81.3	100.0	66.5	83.7	54.6	79.1	72.5	4.5	6.0	3.3	4.6	2.40	1.18	29

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.16 a. m., 2.16 p. m., and 10.16 p. m., local time.

CHAS. A. READ,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

MOBILE, ALA.

	Wind.			Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,875	SW.	40	9	16	3	10	9	10	10	13	18	4	8	16	7	12	0	5	0	0	0	
August	5,219	SE.	40	3	12	3	12	11	24	10	9	9	3	13	11	7	8	0	2	0	0	0	
September	4,700	SE.	28	15	20	6	11	17	14	3	11	8	0	12	13	5	12	0	2	0	0	0	
October	5,018	N.	24	23	23	8	13	17	9	2	7	13	1	11	12	8	8	0	1	0	0	0	
November	4,747	N.	28	23	35	12	7	13	6	5	1	11	0	8	12	10	8	0	1	0	0	1	First frost occurred on 25th.
December	4,780	SE.	36	25	28	11	9	6	9	6	10	11	3	10	9	12	11	0	3	0	0	0	
Year 1881	64,949				230	68	91	146	183	87	107	168	15	118	147	100	118	1	31	0	0	8	
1882.																							
January	5,031	N.	22	22	18	10	9	10	26	14	1	4	1	2	10	19	20	0	0	0	0	0	
February	3,649	S.	26	28	4	11	9	9	22	7	4	8	10	6	13	9	11	0	1	0	0	0	
March	4,085	N. SW.	21	13 26	12	8	0	5	21	14	3	7	23	9	16	6	7	0	2	0	0	0	
April	4,289	N.	23	11	15	15	3	8	21	4	9	4	11	8	16	6	10	0	6	0	0	0	7.30 inches of rain fell on 19th in 9 hours 45 minutes; cyclone at Evergreen 19th.
May	5,487	SW.	25	31	20	10	4	10	24	13	4	7	1	10	16	5	9	0	3	1	0	0	
June	3,943	SE.	22	23	7	12	7	8	16	18	16	6	0	13	11	6	11	0	2	0	0	0	

Location of office June 30, 1882, corner Government and Royal streets.

CHAS. A. READ,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

MONTGOMERY, ALA.

[Latitude, 32° 22′; longitude west of Greenwich, 86° 18′. Elevation of barometer above sea-level, 219 feet. Elevation of rain-gauge (top) above ground, 58 feet. Elevation of exposed thermometer above ground, 34 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.					Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.	Amount in inches.	Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.030	29.974	29.998	30.001	30.180	29.864	78.0	92.0	82.4	84.1	106.9	65.0	76.5	44.9	64.8	62.1	5.8	6.1	2.8	4.9	2.18	.88	25
August	30.035	29.982	30.006	30.008	30.200	29.679	75.7	88.3	79.4	81.1	96.8	67.7	82.1	51.7	74.4	69.4	4.7	6.1	3.9	4.9	5.06	1.56	4
September	30.083	30.021	30.058	30.054	30.199	29.636	70.8	86.3	76.3	77.8	96.4	56.9	87.0	51.9	76.1	71.7	3.2	5.7	3.3	4.1	4.49	1.75	14
October	30.174	30.114	30.137	30.142	30.412	29.869	64.6	78.7	70.2	71.2	92.0	48.7	84.6	54.8	77.2	72.2	4.6	6.1	3.2	4.6	2.72	1.75	30
November	30.228	30.167	30.206	30.200	30.521	29.879	50.2	63.4	55.8	56.4	79.7	24.6	87.0	59.8	80.5	75.8	5.0	5.4	4.7	5.0	4.56	.89	7
December	30.212	30.159	30.189	30.187	30.533	29.791	48.7	60.0	53.2	54.0	72.4	33.2	81.7	58.2	76.4	72.1	5.7	6.3	6.0	6.0	0.75	3.45	21
Year 1881	30.106	30.045	30.077	30.076	.....	.....	59.7	73.8	64.9	66.1	.....	.....	81.5	50.1	72.0	67.9	5.0	5.8	3.9	4.9	53.81	.....	.....
1882.																							
January	30.197	30.177	30.205	30.193	30.559	29.775	51.3	59.7	54.6	55.2	78.5	24.3	82.6	65.8	77.6	75.3	7.5	8.2	5.5	7.1	4.54	1.53	9
February	30.209	30.177	30.196	30.194	30.496	29.571	51.1	63.8	57.4	57.4	79.8	32.0	79.7	54.3	71.9	68.6	5.9	6.0	3.7	5.2	9.27	3.01	8
March	30.178	30.139	30.166	30.161	30.572	29.780	55.3	69.7	61.6	62.2	86.3	42.0	80.7	47.8	71.3	66.6	5.1	5.0	3.1	4.4	6.92	1.92	26
April	30.067	30.013	30.030	30.037	30.359	29.674	61.2	76.4	66.3	68.0	85.6	47.6	82.4	46.4	73.5	67.4	5.0	5.5	4.8	5.1	5.03	2.71	18, 19
May	30.057	29.997	30.015	30.023	30.281	29.704	64.1	78.2	69.0	70.4	90.0	47.9	79.2	46.6	68.3	64.7	4.5	6.0	3.5	4.7	2.94	1.08	8
June	30.054	30.002	30.026	30.027	30.283	29.796	74.2	87.6	77.0	79.6	97.6	60.8	82.0	47.2	75.3	68.2	4.8	6.3	2.4	4.5	3.98	2.24	28, 29

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.23 a. m., 2.23 p. m., and 10.23 p. m., local time.

JAMES B. McLAUGHLIN,
Corporal, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

MONTGOMERY, ALA.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	3,711	NW.	24	11	7	10	19	5	13	12	13	13	1	7	18	6	7	0	2	0	0	0	
August	4,086	NW.	20	20	5	5	27	13	9	13	10	10	1	9	17	5	11	0	2	0	0	0	
September	2,525	SE.	18	30	7	8	24	14	7	4	4	12	10	11	13	6	5	0	2	0	0	0	
October	3,656	NE.	20	5,6	6	6	32	13	4	2	7	20	3	13	10	8	7	0	0	0	0	0	
November	3,890	NW.	23	23	13	6	21	17	5	2	5	18	8	12	9	9	12	0	0	0	0	2	First light frost November 4, and first killing frost November 26.
December	4,963	W.	28	29	14	7	23	16	6	5	14	7	1	8	8	15	17	0	1	0	0	0	
Year 1881	51,090	.....	.....	.....	114	89	219	132	98	98	137	182	26	123	130	112	118	2	17	0	0	15	
1882.																							
January	4,619	NW.	25	22	20	4	13	5	20	10	9	9	3	3	13	15	15	0	0	0	0	5	
February	4,136	S.	34	28	8	3	12	17	14	8	6	10	6	7	14	7	11	0	2	0	0	0	Latest killing frost February 2.
March	4,311	SW.	30	27	8	2	11	11	11	17	9	17	7	9	16	6	12	0	6	0	0	0	Latest light frost March 14.
April	3,687	NW.	27	10	12	8	7	21	10	11	8	8	5	7	17	6	10	0	4	1	0	0	
May	3,875	E.	28	8	10	6	6	20	7	19	5	15	5	12	13	6	8	0	4	0	0	0	
June	3,516	SE.	30	28	2	4	3	13	8	27	14	16	3	7	20	3	9	0	7	0	0	0	

Location of office on June 30, 1882, No. 10 Market street.

JAMES B. McLAUGHLIN,
Corporal, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

MOORHEAD, MINN.

[Latitude, 46° 51′; longitude west of Greenwich, 96° 44′. Elevation of barometer above sea-level, 923 feet. Elevation of rain-gauge (top) above ground, 41 feet. Elevation of exposed thermometer above ground, 23 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.					Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	8 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.	Amount in inches.	Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.952	29.932	29.917	29.933	30.176	29.549	63.9	79.6	70.0	71.2	95.1	47.0	80.3	50.7	74.9	68.6	3.3	3.7	4.3	3.8	1.97	1.77	14, 15
August	29.909	29.907	29.905	29.907	30.253	29.429	61.9	76.2	67.2	68.4	92.5	45.0	85.2	62.3	80.4	76.0	5.4	5.4	4.3	5.0	5.89	2.19	15, 16
September	29.910	29.879	29.906	29.898	30.289	29.371	46.6	61.2	51.9	53.2	83.0	30.0	90.1	58.8	83.3	77.4	6.1	6.8	3.3	5.4	4.75	2.57	4
October	30.127	30.094	30.089	30.103	30.669	29.483	33.2	47.7	40.0	40.3	69.0	17.0	89.4	56.3	79.5	75.1	5.7	5.7	5.4	5.6	2.75	1.07	28, 29
November	30.071	30.068	30.089	30.076	30.720	29.469	16.2	25.3	18.8	20.1	48.0	—15.0	92.0	74.7	84.1	83.6	7.0	7.3	6.3	6.9	1.41	0.52	11, 12
December	30.081	30.084	30.108	30.091	30.626	29.499	16.1	25.5	19.2	20.3	43.0	— 9.0	83.8	66.9	81.2	77.3	3.7	4.0	3.7	3.8	0.20	0.06	9
Year 1881	30.024	30.001	30.015	30.013	.....	.....	31.9	44.8	37.0	37.9	.....	.....	83.0	60.4	79.3	74.2	3.6	3.9	3.2	3.6	29.48	.....	.....
1882.																							
January	30.145	30.109	30.130	30.128	30.926	29.554	—1.1	11.1	6.5	5.5	33	—36	89.1	74.7	83.4	82.4	4.2	5.9	4.9	5.0	1.34	.29	12, 13
February	30.051	30.044	30.052	30.049	30.809	29.568	11.4	22.4	17.0	16.9	49	—19	84.3	65.0	76.5	75.3	5.7	5.1	3.5	4.8	.80	.28	28
March	30.082	30.101	30.098	30.094	30.771	29.467	12.9	24.4	21.0	19.4	50	—20	84.4	76.7	83.9	81.7	6.0	7.5	5.8	6.4	2.83	.78	4, 5, 20, 21
April	30.060	30.046	30.062	30.056	30.455	29.688	33.6	44.9	39.8	39.4	63	7	84.4	63.3	79.0	75.6	4.5	6.1	3.6	4.7	1.69	.41	17, 18
May	29.966	29.945	29.946	29.952	30.240	29.530	43.6	58.6	50.3	50.8	76	26	80.4	50.7	71.5	67.5	4.6	6.0	4.7	5.1	5.32	1.66	8
June	29.879	29.868	29.862	29.870	30.156	29.411	55.5	70.4	62.2	62.7	85	35	81.9	50.6	74.4	69.0	5.5	6.1	4.3	5.3	5.43	2.29	17, 18

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.41 a. m., 1.41 p. m., and 9.41 p. m., local time.

H. BESSANT,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[Form No. 132—B.]

MOORHEAD, MINN.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	9,657	S.	42	1	15	14	2	17	28	3	5	8	1	12	13	6	4	0	3	0	0	0	
August	9,646	SE.	46	22	20	9	6	29	11	4	5	7	2	7	20	4	14	0	6	0	0	0	
September	7,095	NW.	50	4	18	11	6	16	8	3	10	15	3	6	17	7	12	0	0	1	0	2	First frost September 7.
October	8,082	SE.	48	10	25	12	3	17	14	3	9	10	0	9	11	11	11	0	1	0	0	20	
November	8,810	NW.	44	22	12	5	4	5	21	4	6	28	5	1	18	11	0	13	0	1	15	27	
December	8,231	SE.	40	27	13	7	0	5	32	6	10	12	8	10	18	3	0	6	0	0	12	31	
Year 1881	97,051	....	....	....	230	99	42	176	202	59	88	157	42	85	177	103	66	54	15	4	112	189	
1882.																							
January	7,779	S.	48	4	13	6	1	10	18	7	11	15	12	9	14	8	0	17	0	1	29	31	
February	6,668	S.	42	27	12	5	0	8	18	5	8	18	10	9	11	8	0	5	0	0	15	31	
March	10,215	SE.	52	28	27	7	5	17	12	5	3	8	9	2	17	12	2	12	0	1	17	29	
April	9,286	SE.	36	24	27	16	7	21	9	3	2	1	4	10	13	7	8	2	0	5	0	16	
May	9,202	S.	42	17	10	17	7	22	14	3	4	11	5	11	9	11	9	1	0	0	0	4	
June	6,848	SE.	40	12	20	17	2	20	8	5	5	5	8	6	18	6	9	0	3	2	0	0	Last frost June 4.

Location of office on June 30, 1882, corner of Front and Sixth streets.

H. BESSANT,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

MORGANTOWN, W. VA.

[Latitude, 39° 40′; longitude west of Greenwich, 79° 52′. Elevation of barometer above sea-level, 963 feet. Elevation of rain-gauge (top) above ground, 1 foot. Elevation of exposed thermometer above ground, 10 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometer.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.988	29.923	29.972	29.961	30.234	29.575	69.6	79.8	69.0	72.8	89.5	55.0	83.5	59.5	85.5	76.0	2.8	4.8	3.7	3.8	5.61	1.72	13
August	30.054	29.948	30.012	30.004	30.272	29.705	64.5	82.3	67.3	71.4	92.2	51.5	84.5	44.3	77.1	68.6	1.2	1.4	1.7	1.4	.41	.24	6
September	30.074	29.975	30.027	30.025	30.214	29.791	66.5	81.2	68.5	72.1	91.0	50.1	84.6	52.2	81.5	72.8	4.7	4.4	2.8	4.0	2.78	1.35	2
October	30.153	30.070	30.113	30.112	30.501	29.612	54.4	65.7	56.8	59.0	83.5	35.5	85.3	63.7	82.0	77.0	5.2	5.6	6.0	5.6	4.55	1.05	9
November	30.201	30.122	30.146	30.156	30.767	29.617	43.3	53.7	46.2	47.7	76.2	26.0	78.0	57.0	68.1	67.7	5.3	6.3	4.4	5.3	3.19	.99	9
December	30.154	30.103	30.144	30.134	30.630	29.534	40.3	48.0	41.1	43.1	68.0	21.5	76.2	58.5	75.8	70.2	6.8	7.2	6.1	6.7	5.93	1.52	14
Year 1881	30.059	29.985	30.032	30.025	.....	.....	50.5	61.3	52.3	54.7	.....	.....	78.4	57.5	75.4	70.4	5.8	5.9	5.0	5.6	41.58	.....	....
1882.																							
January	30.190	30.174	30.177	30.180	30.735	29.476	34.6	40.0	36.8	37.1	64.0	8.7	78.8	69.5	76.0	74.8	9.1	8.3	7.3	8.2	6.78	1.01	13
February	30.207	30.146	30.170	30.174	30.599	29.497	38.6	48.3	42.9	43.3	69.5	21.5	75.5	58.8	69.2	67.8	6.4	6.3	5.7	6.1	5.41	.99	13
March	30.138	30.100	30.133	30.124	30.613	29.502	41.7	50.9	44.3	45.6	72.0	21.5	75.3	53.0	67.4	65.2	7.3	5.8	5.9	6.3	7.18	1.19	1
April	30.058	30.016	30.044	30.039	30.334	29.429	47.1	58.8	49.0	51.6	77.0	23.0	72.2	50.6	69.8	64.2	5.7	6.9	4.7	5.8	3.36	.90	26
May	30.017	29.964	29.987	29.989	30.318	29.553	54.8	64.5	54.1	57.8	78.5	31.0	75.9	56.4	78.0	70.1	5.7	6.2	4.4	5.4	4.51	1.01	22
June	29.972	29.932	29.958	29.954	30.188	29.565	65.9	74.2	65.4	68.5	85.0	44.5	79.7	62.6	83.2	75.2	5.4	5.6	5.9	5.6	3.30	.62	10

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.48 a. m., 2.48 p. m., and 10.48 p. m., local time.

J. C. SPRIGG, JR.,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

MORGANTOWN, W. VA.

	Wind.				Wind at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.10 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	2,855	SE.	36	13	9	6	4	1	3	21	8	8	33	16	12	3	12	0	5	0	0	0	Comet visible during the entire month of July and the greater part of August. July 17, brilliant meteor fell in vicinity. September 12 and 15, auroras occurred. October 5, first frost—vegetation injured.
August	2,236	SW.	28	6	9	8	5	7	3	11	5	5	40	24	7	0	4	0	2	0	0	0	
September	2,590	NW.	32	2	5	3	1	3	4	35	1	8	30	14	11	5	6	0	8	2	0	0	
October	3,160	N. / SW.	20	4 / 8	14	9	2	0	1	35	4	3	25	9	10	12	13	0	0	0	0	0	
November	5,002	W.	35	14	4	5	3	3	5	35	13	7	15	8	13	9	9	2	0	0	0	5	
December	4,194	W.	38	7	11	7	2	4	2	34	5	4	24	8	7	16	11	3	0	0	0	7	
Year 1881	45,235	.....	....	.....	114	91	37	33	40	295	88	76	321	105	124	136	116	35	29	2	9	63	
1882.																							
January	5,687	NW.	44	29	5	9	6	5	4	19	9	14	22	2	9	20	14	7	0	0	6	15	
February	3,397	W.	42	21	2	5	2	2	3	23	9	9	29	7	8	13	11	3	0	0	0	10	
March	6,209	W.	47	10	10	14	6	6	1	25	14	4	13	5	15	11	13	5	4	0	0	6	
April	4,447	NW.	48	20	6	15	4	0	1	13	9	11	31	7	13	10	12	0	4	2	0	4	Brilliant aurora occurred April 16, and continued into the 17th.
May	3,942	E. / SW.	28	11 / 22	5	7	9	2	2	13	8	6	41	8	14	9	14	0	2	0	0	1	
June	3,480	W. / SW.	27	4 / 19	3	5	1	0	3	35	9	2	32	4	17	9	15	0	6	0	0	0	

Location of office, June 30, 1882, in the old college building.

J. C. SPRIGG, JR.,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

MOUNT WASHINGTON, N. H.

[Latitude, 44° 16′; longitude west of Greenwich, 71° 18′. Elevation of barometer above sea-level, 6,279 feet. Elevation of rain-gauge (top) above ground, 2 feet. Elevation of exposed thermometer above ground, 6 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.865	29.869	29.873	29.869	30.262	29.353	46.5	51.4	46.7	48.2	72.0	32.6	83.7	79.0	82.7	81.8	8	8	6	7.3	9.93	2.39	25, 26
August	30.014	30.013	30.004	30.010	30.298	29.585	48.4	52.7	48.9	50.0	67.0	35.0	84.6	80.7	82.5	82.6	8	9	7	8.0	11.96	2.54	21, 22
September	30.167	30.162	30.164	30.164	30.456	29.937	47.3	50.9	47.7	48.6	63.5	28.0	78.6	77.5	80.0	78.7	8	8	7	7.7	6.13	1.78	23, 24
October	30.128	30.115	30.113	30.119	30.629	29.372	28.0	31.0	29.0	29.3	54.0	−3.0	88.0	88.0	86.5	87.5	4	4	5	4.3	18.38	3.43	17, 18
November	30.100	30.090	30.094	30.095	30.644	29.449	17.7	20.1	19.3	19.0	47.3	−15.5	85.4	83.2	89.3	86.0	5	5	6	5.3	15.10	2.81	8
December	30.127	30.091	30.100	30.106	30.552	29.277	16.5	17.4	15.9	16.6	40.7	−20.5	81.2	85.1	86.9	84.4	6	5	6	5.7	15.95	4.74	13, 14
Year 1881	29.940	29.935	29.941	29.939	.....	.....	26.3	29.5	27.0	27.6	.....	.....	81.5	79.6	82.5	81.2	7.3	7.4	6.8	7.2	121.13	.....	.....
1882.																							
January	29.997	29.994	30.026	30.006	30.572	29.430	4.0	3.8	3.7	3.8	34.0	−39.0	86.3	85.9	86.1	86.1	5.6	4.1	6.3	5.3	7.20	.91	12
February	30.093	30.102	30.122	30.106	30.610	29.495	9.9	10.2	9.8	10.0	34.8	−20.5	79.7	83.2	81.1	81.3	4.8	5.5	5.9	5.4	5.94	1.03	21, 22
March	30.005	29.973	29.999	29.992	30.487	29.521	11.5	12.7	10.6	11.6	36.7	−19.5	81.1	86.5	86.1	84.6	5.3	4.6	5.5	5.1	14.52	5.26	1, 2
April	29.926	29.909	29.930	29.922	30.368	29.399	15.5	18.6	15.9	16.7	36.3	−13.2	84.7	86.3	88.7	86.6	4.5	7.1	6.1	5.9	11.20	2.05	7
May	29.851	29.857	29.855	29.854	30.237	29.480	24.7	29.1	26.7	26.8	45.5	4.0	87.0	85.8	88.0	86.9	4.9	5.4	4.8	5.0	8.91	1.87	28
June	29.810	29.823	29.827	29.820	30.191	29.508	39.6	45.4	40.3	41.8	63.0	21.4	83.5	77.4	85.7	82.2	3.2	5.8	3.1	4.0	11.40	2.80	1

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.22 a. m., 3.22 p. m., and 11.22 p. m., local time.

J. G. LINSLEY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

MOUNT WASHINGTON, N. H.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurora.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	*b*14,442	NW.	60	13, 14	6	10	0	4	2	7	9	49	6	2	9	20	20	1	6	0	0	0	Rain, sleet, and snow July 18th. Frost on September 12th, 13th, and 28th; unusually high temperature, there being no snow or frostwork during the month. Vivid flashes of heat-lightning during the night of October 17th. Lunar halo January 7th; rain 8th and 9th. High temperature, thaw, and rain February 13th. Heavy rainstorm March 22d; very high temperature and heavy rainstorm; first aurora 14th and 20th. Aurora 9th, 15th, and 16th of April. Solar halo May 8th; aurora 17th. Frost June 20th; ice 20th and 21st; aurora 14th, 22d, 23d, and 30th.
August	*c*18,908	NW.	90	31	9	12	5	3	1	2	7	51	3	2	11	18	21	0	2	0	0	0	
September	25,957	NW.	90	1, 22, 23	1	6	0	4	6	4	11	55	3	3	11	16	16	0	6	3	0	2	
October	*a*30,501	NW.	160	16	1	0	0	0	0	5	13	74	0	1	6	24	15	7	1	1	10	24	
November	*a*31,375	NW.	108	10	0	0	1	3	0	11	9	65	1	1	6	23	3	23	0	0	19	27	
December	*a*31,104	NW.	170	1	2	1	1	0	2	10	12	64	1	3	4	24	0	26	0	1	21	31	
Year 1881	*d*292,265				42	78	38	56	33	66	104	653	25	44	97	224	114	126	23	8	162	226	
1882.																							
January	*c*28,892	NW.	126	27	3	2	0	0	1	8	14	64	1	3	4	24	2	24	0	1	27	31	
February	*c*27,334	NW.	120	8	3	12	0	2	0	6	6	55	0	3	8	17	1	18	0	1	26	28	
March	*c*26,488	NW.	118	24	10	2	2	1	2	5	15	55	1	11	9	11	2	21	0	2	27	31	
April	*b*22,005	NW.	120	22	5	3	2	3	2	2	7	62	4	7	16	7	2	19	0	3	25	30	
May	*a*27,241	NW.	100	3	3	8	10	8	0	5	3	55	1	8	15	8	4	16	0	1	14	29	
June	*a*28,235	NW.	95	25, 26	1	0	0	2	3	10	5	67	2	11	17	2	14	3	2	4	0	13	

a Incomplete on account of frostwork. *b* Incomplete on account of cups taken off. *c* Incomplete on account of anemometer broken. *d* Incomplete.

Location of office on June 30, 1882, in Signal Corps building, northwest side of summit.

J. G. LINSLEY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM NO. 132—A.]

NASHVILLE, TENN.

[Latitude, 36° 11′; longitude west of Greenwich, 86° 53′. Elevation of barometer above sea-level, 507 feet. Elevation of rain-gauge (top) above ground, 49 feet. Elevation of exposed thermometer above ground, 34 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.					Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.	Amount in inches.	Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.037	29.984	30.006	30.009	30.226	29.783	75.2	92.1	80.5	82.6	101.2	60.4	73.8	36.6	62.2	57.5	2.6	3.9	2.4	3.0	.86	.37	12
August	30.021	29.962	29.989	29.991	30.194	29.795	76.1	92.2	81.1	83.1	103.2	64.9	70.5	38.0	60.2	56.2	3.2	5.4	2.7	3.8	1.81	1.31	7
September	30.085	30.021	30.055	30.054	30.221	29.556	68.3	84.2	74.2	75.6	98.2	49.6	83.5	48.5	72.9	68.3	3.1	5.1	2.7	3.7	6.49	4.21	15
October	30.181	30.126	30.149	30.152	30.361	29.807	60.4	74.4	64.6	66.5	89.0	42.8	82.6	55.5	77.9	72.0	5.9	5.9	3.8	5.2	4.74	1.36	30
November	30.236	30.183	30.204	30.208	30.602	29.859	43.3	56.8	49.4	49.8	74.6	21.0	81.8	54.8	73.3	70.0	5.0	5.3	5.0	5.1	4.84	1.16	9
December	30.204	30.177	30.200	30.193	30.625	29.839	42.3	51.4	46.0	46.6	67.6	26.0	81.1	58.3	74.3	71.2	5.9	7.1	6.9	6.6	4.83	1.18	26
Year 1881	30.091	30.037	30.065	30.064	.....	.....	55.4	68.5	59.9	61.2	.....	.....	77.7	57.4	71.4	66.8	5.0	6.0	4.9	5.3	47.87	.....	.....
1882.																							
January	30.202	30.170	30.190	30.187	30.658	29.649	39.7	45.3	43.1	42.7	67.6	18.8	84.1	74.3	79.4	79.3	8.8	8.6	7.9	8.4	14.49	1.88	10
February	30.147	30.126	30.149	30.141	30.533	29.515	46.8	56.9	51.3	51.7	72.3	25.2	76.9	56.1	71.5	68.2	6.2	6.9	6.7	6.6	8.58	1.55	28
March	30.148	30.115	30.131	30.131	30.573	29.693	48.9	61.1	54.5	54.8	81.7	32.5	73.6	49.8	65.9	63.1	6.1	5.5	5.0	5.5	9.36	2.27	9
April	30.045	30.002	30.029	30.023	30.302	29.523	54.9	69.7	60.2	61.6	84.1	36.5	76.2	43.8	66.2	62.1	6.1	6.7	4.7	5.8	3.55	1.25	7
May	30.004	29.964	29.974	29.981	30.314	29.616	59.2	72.4	63.4	65.0	87.4	41.5	80.4	51.2	73.7	68.4	6.2	7.1	5.3	6.2	7.34	2.33	9, 10
June	29.995	29.953	29.967	29.972	30.245	29.679	72.1	84.2	73.7	76.7	95.9	49.8	77.0	51.9	77.1	68.7	5.4	7.1	3.5	5.3	2.51	1.42	22

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.21 a. m., 2.21 p. m., and 10.21 p. m., local time.

L. N. JESUNOFSKY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

NASHVILLE, TENN.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	2,721	N. NW.	20	1 22	21	9	6	3	2	5	16	20	11	18	13	0	5	0	5	0	0	0	July, very high temperature; severe drought; rainfall smallest ever known for any one month; no cloudy days.
August	3,084	SE.	26	29	9	10	9	27	3	8	8	9	10	12	16	3	5	0	5	0	0	0	August, very high temperature; continued and destructive drought.
September	2,696	E. W.	24	14 15	6	4	9	23	15	6	4	11	12	14	11	5	8	0	2	1	0	0	September, high temperature; severe drought terminated on 15th with more rain than during three months previous; very bright aurora on 13th.
October	3,131	N.	24	5	5	6	5	23	13	4	12	8	17	7	17	7	9	0	1	0	0	0	
November	3,476	S. SE. SW. W.	20	12 17 19 30	8	5	8	16	19	7	6	12	9	10	10	10	14	0	2	0	1	3	October, high temperature; first killing frost 20th, first light frost 21st.
December	3,323	NW.	30	30	5	5	8	23	11	11	8	15	7	5	10	16	12	1	0	0	0	5	November, high temperature; frost severe on 4th, 13th, 14th, 15th, 16th, 20th, 25th, and 26th; light on 29th.
Year 1881	39,344	.....	.....	.....	94	78	97	192	122	98	160	151	103	99	150	116	138	1	39	1	4	48	January, 1882, incessant and heavy rains; largest monthly rainfall known here; great damage from flood; river above danger-line (42 feet) from 11th to 31st; suffering severe; 500 houses under water.
1882.																							
January	3,711	W.	20	10	10	6	10	16	12	5	10	23	1	2	6	23	22	2	0	0	0	10	
February	3,843	S.	38	20	3	7	7	17	21	6	14	5	4	5	8	15	12	0	1	0	0	4	
March	4,133	S.	23	9	11	2	10	16	12	11	4	17	10	9	12	10	13	0	4	0	0	0	March, large excess in rainfall; river above danger-line 9th to 15th.
April	3,329	SW.	30	19	13	5	6	15	14	6	11	13	7	6	14	10	12	0	5	2	0	0	
May	3,362	N.	28	6	7	6	5	13	16	8	14	14	10	6	11	14	14	0	4	0	0	0	
June	2,634	W.	52	18	2	2	6	12	8	13	27	6	14	6	19	6	5	0	10	0	0	0	May, last frost, 16th.

Location of office on June 30, 1882, No. 30 North College street.

L. N. JESUNOFSKY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

NEW HAVEN, CONN.

[Latitude, 41° 17′; longitude west of Greenwich, 72° 57′. Elevation of barometer above sea-level, 107 feet. Elevation of rain-guage (top) above ground, 109 feet. Elevation of exposed thermometer above ground, 112 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.					Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.	Amount in inches.	Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.936	29.899	29.934	29.923	30.279	29.539	67.5	76.7	67.3	70.5	89	54	79.2	61.0	83.0	74.4	4.8	6.3	3.9	5.0	3.53	1.28	8
August	30.027	29.980	30.012	30.006	30.332	29.595	67.7	77.7	68.3	71.2	90	53	83.4	61.5	83.4	76.1	5.2	4.1	4.3	4.5	2.51	1.81	7
September	30.120	30.063	30.104	30.096	30.455	29.846	64.9	76.7	67.3	69.6	100	47	82.8	61.8	82.5	75.7	3.6	4.0	3.4	3.7	1.45	70	12
October	30.168	30.096	30.128	30.131	30.591	29.430	51.7	62.8	53.2	55.9	86	28	76.0	59.1	74.9	70.0	5.0	5.7	4.1	4.9	2.78	.68	31
November	30.186	30.137	30.158	30.160	30.670	29.503	30.7	47.4	42.1	43.1	66	16.5	75.6	61.3	75.5	70.8	4.6	6.1	5.2	5.3	4.18	.83	1
December	30.147	30.094	30.144	30.128	30.627	29.297	34.7	42.0	36.1	37.6	57.5	12.5	79.6	66.9	76.6	74.4	6.0	6.8	4.6	5.8	4.75	.96	27
Year 1881	30.041	29.988	30.055	30.028	.....	.....	46.2	55.5	47.5	49.8	.....	.....	75.6	59.5	77.6	70.9	5.0	5.5	4.2	4.9	51.32	.....	.....
1882.																							
January	30.121	30.095	30.101	30.106	30.795	29.301	23.9	30.9	25.5	26.8	50.5	−12.5	78.5	67.2	76.1	73.9	6.1	5.6	5.4	5.7	5.91	.88	26
February	30.137	30.114	30.136	30.129	30.769	29.389	27.8	37.2	29.8	31.6	54	7	79.8	58	76.3	71.4	6.4	4.1	5.6	5.4	4.52	1.56	21
March	30.087	30.033	30.097	30.072	30.684	29.531	34.1	41.7	34.8	36.9	59	13	74.1	55.8	73.8	67.9	6.6	5.6	4.6	5.6	3.59	.88	9
April	30.044	29.961	30.020	30.008	30.559	29.310	39.2	49.4	42.0	43.5	71.5	21	68.8	50.7	67.9	62.5	5.2	6.9	3.8	5.3	1.55	.75	27
May	30.034	29.993	30.021	30.016	30.468	29.434	48.7	56.6	48.7	51.3	76	30.5	72.8	52.6	76.6	67.3	7.4	7.1	5.7	6.7	5.05	1.06	28, 29
June	29.902	29.849	29.895	29.882	30.252	29.497	62.7	73.3	62.6	66.2	90.5	46	73.8	52.7	73.6	66.7	5.3	5.5	4.2	5.0	2.74	97	1

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.16 a. m., 3.16 p. m., and 11.16 p. m., local time.

J. H. SHERMAN,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

NEW HAVEN, CONN.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 36°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,124	NE.	23	1	9	16	4	5	23	12	4	13	7	9	18	4	10	0	3	1	0	0	
August	4,334	N.	20	17	20	13	0	6	24	11	5	7	7	11	13	7	6	0	3	0	0	0	
September	4,540	E.	25	16	11	20	5	5	21	17	2	4	5	14	12	4	7	0	2	2	0	0	
October	5,208	N.	24	4 5	24	11	2	3	8	27	6	8	4	9	14	7	11	0	0	1	0	2	First frost October 6.
November	5,946	NW.	32	15	12	20	1	2	4	21	13	14	3	9	8	10	12	0	0	0	1	10	
December	5,487	SE.	26	29	21	10	1	6	6	25	11	5	8	9	8	14	11	3	0	0	3	16	
Year 1881	61,938				202	173	31	63	150	159	102	136	79	114	146	105	101	28	13	7	36	106	
1882.																							
January	*5,321	NE.	39	31	18	15	1	5	0	12	20	12	10	9	11	11	9	8	0	1	9	26	
February	5,576	NE.	33	5	15	14	3	1	2	13	8	19	9	9	10	9	7	7	0	0	3	23	
March	6,763	NW.	36	4	19	10	1	7	14	8	4	23	7	8	12	11	9	3	0	1	2	18	
April	6,194	NE.	31	27	12	11	4	8	11	15	14	13	2	6	15	9	11	2	2	3	0	8	
May	†6,846	NE.	30	12	15	23	3	7	17	17	5	6	0	4	11	16	12	0	0	1	0	1	Last frost May 26.
June	4,682	N.	24	20	14	2	2	7	19	16	7	17	6	9	15	6	10	0	3	0	0	0	

* 32 hours movement lost; anemometer broken.

† 20 miles lost; anemometer broken.

Location of office on June 30, 1882, Insurance building No. 370 Chapel street.

J. H. SHERMAN,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

NEW LONDON, CONN.

[*Latitude*, 41° 22′; longitude west of Greenwich, 72° 5′. Elevation of barometer above sea-level, 47 feet. Elevation of rain-gauge (top) above ground, 57 feet. Elevation of exposed thermometer above ground, 29 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.952	29.933	29.955	29.947	30.317	29.537	68.2	75.2	66.5	69.9	90	58	81.5	65.4	82.7	76.5	5.2	5.1	3.8	4.7	2.72	.63	26
August	30.038	30.001	30.020	30.020	30.369	29.621	68.6	74.5	67.5	70.2	85	56	83.1	70.9	84.1	79.4	5.1	4.8	3.6	4.5	2.08	1.15	18, 19
September	30.132	30.093	30.123	30.116	30.460	29.857	65.9	73.2	65.9	68.3	92	49	86.8	71.0	83.8	80.5	4.8	4.3	3.9	4.3	1.37	.63	12
October	30.183	30.115	30.140	30.146	30.598	29.445	53.9	61.9	54.7	56.8	82	31	76.4	63.5	75.5	71.8	4.1	4.1	3.4	3.9	3.56	1.21	31
November	30.194	30.150	30.166	30.170	30.701	29.480	42.1	49.2	44.6	45.3	64	20	76.1	67.7	75.9	73.2	4.0	4.2	4.5	4.3	5.16	1.28	1
December	30.165	30.110	30.154	30.143	30.663	29.265	37.0	43.0	38.0	39.3	58	14	82.7	73.2	81.4	79.1	5.5	6.4	4.4	5.4	4.03	1.20	29
Year 1881	30.049	30.094	30.038	30.033	.....	.....	47.9	54.7	48.3	50.3	.....	.....	78.7	67.6	79.4	75.1	5.0	5.1	4.2	4.8	51.64	.....	.....
1882.																							
January	30.134	30.105	30.115	30.118	30.849	29.312	26.6	32.9	28.7	29.4	50	−10	74.4	67.1	76.6	72.7	6.9	5.9	5.1	6.0	6.90	1.29	25, 26
February	30.151	30.126	30.144	30.140	30.809	29.410	30.2	38.1	31.7	33.3	55	11	76.1	67.0	71.0	71.4	5.5	3.7	3.0	4.1	5.26	1.55	4, 5
March	30.099	30.037	30.101	30.079	30.704	29.501	36.3	42.0	36.1	38.1	59	17	70.3	67.5	70.5	69.4	5.7	6.1	4.0	5.3	3.56	.91	1
April	30.045	29.970	30.024	30.013	30.589	29.334	42.9	48.7	42.4	44.7	68	27	69.8	61.7	69.7	67.1	4.4	6.9	4.6	5.3	3.40	1.34	19, 20
May	30.037	30.008	30.033	30.026	30.490	29.424	50.8	55.2	48.6	51.5	72	32	74.7	64.0	73.5	70.7	6.1	6.1	5.8	6.0	4.13	1.18	14, 15
June	29.912	29.866	29.905	29.894	30.276	29.538	64.7	70.7	62.2	65.9	87	47	77.9	64.5	72.6	71.7	5.6	4.3	2.7	4.2	4.85	1.69	24

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.19 a. m., 3.19 p. m., and 11.19 p. m., local time.

JOHN G. LYNCH,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

NEW LONDON, CONN.

	Wind.			Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	3,857	W.	20	26	10	13	6	7	9	8	16	14	10	11	11	9	10	0	7	0	0	0	
August	3,837	S. / SW.	18	2 / 7	22	7	3	0	17	17	9	6	12	4	17	10	11	0	1	0	0	0	Meteors on the 10th and 11th.
September	4,165	E.	27	15	11	17	6	4	15	12	10	3	12	12	9	9	8	0	0	2	0	0	Damaging drought.
October	5,280	SE.	30	29	21	9	8	3	4	14	23	9	2	10	14	7	11	0	0	0	0	1	First frost on the 5th.
November	5,997	W.	27	15	11	16	3	5	2	15	14	22	2	12	9	9	14	2	0	0	0	6	
December	5,588	SE.	40	29	20	13	0	7	4	9	23	9	8	9	12	10	10	2	0	0	1	12	
Year 1881	58,858				215	93	62	41	102	133	170	198	81	120	129	116	114	26	12	3	24	88	
1882.																							
January	6,322	W.	34	27	14	7	6	2	2	13	21	23	5	6	12	13	13	5	0	1	7	26	Lowest temperature since 1873.
February	5,380	NW.	28	10	14	10	2	2	4	13	11	21	7	11	12	5	7	5	1	0	4	21	
March	7,516	SE.	34	1	20	9	0	6	9	8	17	24	0	9	14	8	7	5	0	0	0	17	
April	6,440	SW.	28	1	14	8	0	11	6	13	22	12	4	7	15	8	10	0	0	1	0	5	Aurora, 16th–17th.
May	6,285	NE.	25	12	9	25	6	9	9	14	10	5	6	8	9	14	14	0	1	0	0	0	
June	4,474	SW.	28	1	1	2	2	9	16	22	11	8	19	11	14	5	11	0	5	1	0	0	Aurora, 25th.

Location of office on June 30, 1882. Custom-house Building, Bank street.

JOHN G. LYNCH,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

NEW ORLEANS, LA.

[Latitude, 29° 58′; longitude west of Greenwich, 90° 4′. Elevation of barometer above sea-level, 52 feet. Elevation of rain-gauge (top) above ground, 77 feet. Elevation of exposed thermometer above ground, 45 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.008	29.988	29.995	29.997	30.145	29.823	81.5	88.8	82.7	84.3	94.8	73.5	78	57	75	70.0	5	6	3	4.7	6.97	3.25	3
August	29.975	29.955	29.958	29.962	30.115	29.808	79.3	87.5	81.4	82.8	94.2	74.5	78	57	75	70.0	4	5	2	3.7	4.21	1.48	6
September	30.017	29.988	30.009	30.005	30.099	29.620	76.5	84.9	78.9	80.1	92.0	63.0	81	57	81	73.0	3	5	3	3.7	4.47	1.22	15
October	30.089	30.055	30.081	30.075	30.346	29.820	72.1	79.7	74.0	75.2	88.0	57.5	85	65	81	77.0	4	6	3	4.3	4.84	1.22	23
November	30.146	30.105	30.150	30.135	30.508	29.762	57.9	65.7	60.1	61.2	80.0	31.5	80	64	78	74.0	5	6	5	5.3	7.24	2.90	6
December	30.168	30.128	30.165	30.154	30.478	29.845	55.5	64.1	58.0	59.2	77.0	40.3	81	64	74	73.0	6	5	4	5.0	6.62	2.32	14
Year 1881	30.061	30.032	30.054	30.049	.....	.....	66.0	74.5	68.6	69.7	.....	.....	79	59	75	70.1	4.5	5.5	3.7	4.5	64.01	.....	.....
1882.																							
January	30.135	30.116	30.149	30.133	30.497	29.775	59.4	66.5	61.4	62.4	77.2	41.5	83.2	68.4	81.7	77.8	6.3	7.9	5.0	6.4	4.54	1.46	14
February	30.161	30.131	30.150	30.147	30.438	24.612	58.1	67.7	61.8	62.5	79.0	39.0	82.4	60.3	78.9	73.8	4.2	5.9	2.9	4.3	4.04	1.19	26
March	30.133	30.122	30.157	30.137	30.523	29.789	63.7	73.0	66.9	67.9	81.5	53.0	79.9	57.5	76.2	71.2	4.1	5.9	3.2	4.4	.92	.41	21
April	30.014	29.997	30.004	30.005	30.260	29.668	68.4	77.5	71.5	72.5	86.0	56.0	83.0	58.7	73.9	71.8	6.0	5.9	4.4	5.4	4.83	1.60	11
May	29.998	29.974	29.984	29.985	30.249	29.768	70.7	78.8	73.7	74.4	88.3	58.5	77.0	56.3	72.4	68.6	5.7	5.6	3.2	4.8	6.83	2.23	31
June	30.017	30.002	30.008	30.009	30.230	29.779	78.2	85.1	80.2	81.2	91.8	67.2	79.1	59.9	76.5	71.8	4.5	6.1	3.4	4.7	2.71	.86	8

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.08 a. m., 2.08 p. m., and 10.08 p. m., local time.

L. DUNNE,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[Form No. 132-B.]

NEW ORLEANS, LA.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,569	E.	26	31	10	9	13	8	8	15	16	6	8	6	22	3	14	0	10	....	0	0	
August	5,349	NE.	30	15	7	5	18	16	15	11	9	9	3	15	12	4	9	0	8	....	0	0	
September	5,142	E SE.	24	29 27	14	8	37	12	5	1	1	8	4	17	10	3	11	0	4	....	0	0	
October	5,636	SE.	30	6	13	17	28	19	6	2	2	5	1	13	12	6	13	0	2	....	0	0	
November	5,852	NE.	30	6	22	22	12	15	3	2	0	10	4	9	10	11	9	0	1	....	0	0	25th, first killing frost; ice formed.
December	5,946	NW.	28	29	16	14	10	8	3	8	10	21	3	7	16	8	9	0	0	....	0	0	Snow flurry 25th.
Year 1881	67,022	.....	....	.....	135	121	200	154	113	93	99	136	44	138	146	81	126	0	57	....	0	2	
1882.																							
January	6,640	SW.	24	13	16	8	11	19	19	12	2	6	0	5	16	10	13	0	1	0	0	0	
February	5,662	W. NW.	26	3 4	4	7	15	21	9	11	7	9	1	9	14	5	10	0	1	0	0	0	Heavy frost, 1st; last frost, 5th.
March	5,622	N. SE. SE.	24	21 26 27	12	7	9	22	27	6	5	5	0	12	14	5	8	0	1	0	0	0	Lower Mississippi Valley inundated.
April	6,070	SE. S.	26	8 22	9	15	21	19	12	8	3	2	1	8	12	10	16	0	6	0	0	0	Lower Mississippi Valley inundated.
May	6,256	SE.	28	7	11	9	21	13	22	4	7	6	0	8	17	6	11	0	4	0	0	0	
June	4,497	E. NE.	24	8	4	8	17	6	20	19	6	7	3	11	13	6	10	0	6	0	0	0	

Location of office on June 30, 1882, United States Custom-house.

L. DUNNE,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

NEWPORT, R. I.

[Latitude, 41° 29′; longitude west of Greenwich, 71° 19′. Elevation of barometer above sea-level, 44 feet. Elevation of rain-gauge (top) above ground, 41 feet. Elevation of exposed thermometer above ground, 19 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.						Washington time.				Self-registering thermometers.		Washington time.				Washington time.					Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Highest.	Lowest.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.	Amount in inches.	Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.940	29.913	29.939	29.931	30.320	29.530	67.5	73.5	65.5	68.8	86.9	57.5	80.9	68.7	86.1	78.8	6.9	6.3	5.2	6.1	.87	.25	1
August	30.022	29.989	30.006	30.006	30.342	29.660	66.8	73.2	66.2	68.7	85.1	53.6	85.7	71.7	88.0	81.8	5.2	5.6	4.2	5.0	.86	.27	2
September	30.123	30.086	30.115	30.108	30.447	29.836	64.5	70.8	64.9	66.7	88.3	51.0	87.7	75.1	87.7	83.5	4.1	4.2	5.8	4.7	2.65	2.41	14, 15
October	30.172	30.103	30.121	30.132	30.578	29.433	53.8	60.0	55.2	56.3	77.9	33.8	77.5	65.0	75.3	72.6	4.9	4.6	4.9	4.8	2.46	.69	29, 30
November	30.176	30.132	30.150	30.153	30.653	29.456	43.8	48.9	45.6	46.1	62.8	20.3	83.5	78.4	84.2	82.0	5.5	5.1	6.3	5.6	5.52	1.60	1
December	30.147	30.102	30.144	30.131	30.656	29.229	39.1	43.3	39.4	40.6	60.0	15.3	77.8	69.1	76.5	74.5	6.1	7.0	5.5	6.3	3.41	.73	22, 23
Year 1881	30.031	29.987	30.019	30.012	.....	.....	47.7	53.9	48.0	49.9	.....	.....	80.8	69.3	81.9	77.4	5.7	5.5	5.4	5.6	48.94	.....	.....
1882.																							
January	30.106	30.080	30.080	30.089	30.819	29.189	28.7	33.9	30.3	30.9	49.7	—7.8	76.7	67.4	76.5	73.5	6.2	5.6	4.9	5.6	6.55	1.37	25, 26
February	30.108	30.105	30.124	30.112	30.778	29.304	30.6	37.6	32.2	33.5	53.3	10.0	78.1	63.9	79.1	73.6	6.6	4.4	4.7	5.2	5.89	1.60	21
March	30.073	30.021	30.075	30.056	30.671	29.475	35.4	41.3	36.0	37.6	56.7	17.8	74.7	64.0	73.0	70.6	5.7	6.2	5.0	5.6	4.23	1.29	1, 2
April	30.024	29.952	29.987	29.988	30.573	29.319	40.5	47.5	41.4	43.1	62.4	24.0	72.5	58.6	71.5	67.5	4.8	7.1	4.7	5.5	4.54	1.65	19, 20 27, 28
May	30.026	29.994	30.020	30.013	30.455	29.453	49.0	52.9	47.6	49.8	75.4	35.3	73.2	65.8	81.8	73.6	6.4	6.4	5.9	6.2	4.55	1.56	20, 21
June	29.906	29.862	29.888	29.885	30.270	29.547	63.5	68.1	60.9	64.2	85.5	48.9	72.1	62.0	78.6	70.9	4.9	4.4	3.6	4.3	2.99	1.36	10, 11

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.23 a. m., 3.23 p. m., and 11.23 p. m., local time.

WM. McGILLIVRAY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

NEWPORT, R. I.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,955	SW.	24	16	9	6	6	8	19	29	5	10	1	4	14	10	10	0	5	1	0	0	
August	5,081	SW.	21	13	19	6	0	2	14	38	3	6	5	6	9	12	11	0	1	0	0	0	
September	4,704	SW.	23	25	17	13	11	5	11	25	1	3	4	4	12	8	9	0	2	1	0	0	
October	7,438	NW.	32	5	11	11	3	4	10	32	11	9	2	9	13	7	13	0	0	2	0	0	First light frost 5th.
November	8,099	W.	35	4	13	6	3	1	12	25	20	10	0	7	11	10	13	0	0	1	0	5	
December	7,981	W.	37	8	12	12	0	6	11	25	13	12	2	6	14	11	11	3	0	0	2	12	First snow 15th.
Year 1881	79,840				163	104	57	53	120	278	158	137	25	87	127	123	114	23	12	7	25	88	
1882.																							
January	9,612	W.	48	23	11	8	4	5	3	15	31	16	0	8	13	10	11	9	0	2	7	23	
February	7,621	NW.	47	5	9	5	6	2	4	20	18	20	0	5	16	7	7	6	1	1	4	20	
March	8,875	W.	34	10	14	4	3	3	16	11	18	23	1	6	17	8	6	7	0	1	0	18	
April	7,462	SW.	32	12	10	8	1	6	10	25	17	12	1	7	15	8	10	2	1	3	0	8	
May	7,050	W.	32	2	21	13	4	5	9	27	7	6	1	7	11	13	14	0	0	0	0	0	Frosts 1, 3, 6, 7, 8, 16, 24, and 26.
June	5,536	S.	31	1	2	8	3	3	13	42	6	12	1	10	17	3	9	0	4	0	0	0	Light frost on 2d.

Location of office on June 30, 1882, custom-house, corner Thames and Franklin streets.

WM. McGILLIVRAY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

NEW YORK CITY, N. Y.

[Latitude, 40° 43′; longitude west of Greenwich, 74° 0′. Elevation of barometer above sea-level, 164 feet. Elevation of rain-gauge (top) above ground, 145 feet. Elevation of exposed thermometer above ground, 148 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.959	29.919	29.942	29.940	30.285	29.584	68.8	78.3	70.6	72.6	91.0	57.5	80.9	61.7	78.7	73.8	4.3	5.6	5.0	5.0	1.31	.28	4
August	30.051	29.985	30.019	30.018	30.341	29.543	68.0	80.0	71.3	73.1	96.0	55.0	83.2	57.1	79.3	73.2	3.0	4.0	3.7	3.9	1.56	1.47	7
September	30.134	30.073	30.110	30.106	30.406	29.876	67.5	78.6	70.4	72.2	100.2	50.0	85.4	65.8	82.9	78.0	4.9	4.9	3.3	4.4	1.38	.80	12
October	30.191	30.114	30.142	30.149	30.589	29.487	54.8	64.8	57.6	59.1	88.3	34.0	81.4	60.5	74.5	72.1	6.1	5.8	4.7	5.5	2.10	.44	3
November	30.216	30.165	30.180	30.187	30.717	29.612	42.7	50.5	45.6	46.3	68.0	24.0	80.8	65.9	75.1	73.9	5.7	6.6	5.3	5.9	2.87	.72	12
December	30.183	30.130	30.172	30.162	30.667	29.370	37.8	44.4	39.8	40.7	66.2	22.0	86.0	72.3	80.5	79.6	5.4	6.7	5.6	5.9	4.37	.65	29
Year 1881	30.066	30.010	30.046	30.041	.....	.....	48.5	57.4	50.7	52.2	.....	.....	82.9	63.9	78.8	75.2	5.6	5.8	5.0	5.4	40.40	.....	.....
1882.																							
January	30.177	30.135	30.152	30.155	30.851	30.286	28.0	33.8	29.6	30.5	50.0	−1.0	80.7	72.8	81.6	78.4	6.5	6.4	5.4	6.1	6.15	1.32	31
February	30.171	30.135	30.150	30.152	30.765	29.423	31.9	40.2	34.8	35.6	62.4	17.5	83.3	63.7	78.8	75.3	6.3	4.7	4.4	5.1	4.36	1.31	31, 1
March	30.109	30.043	30.107	30.087	30.702	29.582	36.6	44.2	38.7	39.8	67.4	20.0	78.2	66.0	71.8	72.0	5.9	5.6	3.6	5.0	2.32	.91	28, 1
April	30.067	29.988	30.033	30.029	30.538	29.379	41.9	51.4	45.0	46.1	70.0	27.0	73.2	60.4	70.2	67.9	5.1	6.3	4.3	5.2	2.15	.90	26 27
May	30.051	30.001	30.021	30.024	30.475	29.452	50.5	58.2	51.9	53.5	78.0	36.0	78.4	60.4	78.5	72.4	6.5	6.2	5.3	6.0	4.21	1.34	14, 15
June	29.918	29.872	29.908	29.899	30.258	29.522	64.3	74.4	65.8	68.2	91.0	52.0	74.6	53.6	72.2	66.8	3.8	4.2	3.1	3.7	2.82	.94	19

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, corresponds with 7.12 a.m., 3.12 p. m., and 11.12 p. m., local time.

JOHN B. MERRILL,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

NEW YORK CITY, N. Y.

	Wind.			Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.															.01 inch or more of water.			Thunder storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	Rain.	Snow.	Rain and melted snow.					
1881.																								
July	5,984	NW.	26	4	9	15	5	14	11	18	5	16	0	8	13	10	9	0	0	2	0	0	0	Severe hail storm on 13th in vicinity; stones one inch in diameter.
August	5,512	SW.	28	7	18	11	1	9	16	23	6	9	0	13	14	4	5	0	0	1	0	0	0	
September	6,216	E.	28	15	7	20	11	8	14	25	2	3	0	7	16	7	8	0	0	1	0	0	0	Lunar corona on 6th.
October	6,770	W.	35	26	4	14	9	3	5	22	22	14	0	9	15	7	8	0	0	0	0	0	0	First frost on 6th; first "killing" frost on 27th; first ice on 27th.
November	6,970	W.	38	15	0	13	9	4	9	12	21	21	1	10	8	12	13	0	1	0	0	0	6	Lunar coronas 27th, 29th; dense fog on 30th; first snow 23d.
December	6,879	W.	28	8	8	9	6	7	8	23	23	9	1	9	9	13	13	0	3	0	0	0	11	Lunar corona 30th.
Year 1881	78,769	.....	.....	.....	105	165	76	88	99	193	179	187	3	96	144	125	113	10	4	7	0	23	94	
1882.																								
January	7,692	NE.	41	31	7	14	8	3	1	18	23	19	0	11	7	13	9	1	11	0	0	7	19	Navigation closed on the Hudson River, 3d.
February	6,835	NE.	46	21	6	16	5	2	6	20	23	6	0	11	10	7	9	5	1	1	1	1	16	Very high tides on 21st.
March	8,176	SE. W.	34	1 3	7	11	3	9	9	10	17	26	0	8	15	7	9	2	1	0	0	0	13	Navigation opened on the Hudson River, 9th.
April	6,991	NE.	32	27	14	11	6	11	1	14	20	12	1	9	12	9	11	0	1	1	2	0	4	Last frost of spring, 25th. Auroras unusually brilliant. Last snow, 11th.
May	7,018	NE.	42	12	8	26	5	10	6	15	11	9	3	9	10	12	14	0	0	0	0	0	0	Wind of 12th severest along coast in past 29 years. Unprecedented high tides.
June	5,220	NE.	24	12	4	5	3	10	17	23	14	12	1	13	14	2	10	0	0	2	0	0	0	

Location of office on June 30, 1882, Equitable Assurance Company, No. 120 Broadway.

JOHN B. MERRILL,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

NORFOLK, VA.

[Latitude, 36° 51′; longitude west of Greenwich, 76° 19′. Elevation of barometer above sea-level, 30 feet. Elevation of rain-gauge (top) above ground, 52 feet. Elevation of exposed thermometer above ground, 20 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.985	29.951	29.974	29.970	30.221	29.547	77.4	86.2	75.8	79.8	102	62	71.4	53.2	77.4	67.3	4.5	4.8	3.9	4.4	6.47	2.07	31
August	30.059	30.022	30.044	30.042	30.300	29.731	74.6	82.9	73.2	76.9	99	61	80.8	57.1	81.0	73.0	3.6	3.7	2.0	3.1	1.74	.52	13
September	30.118	30.070	30.102	30.097	30.365	29.860	73.2	84.8	74.4	77.5	92	64	86.6	55.4	85.6	75.9	4.7	5.2	2.0	4.0	2.67	1.74	14
October	30.204	30.139	30.160	30.168	30.518	29.565	62.3	73.4	64.8	66.8	89	46	85.1	56.8	79.7	73.9	4.7	5.8	2.8	4.4	2.43	1.24	31
November	30.237	30.189	30.214	30.213	30.720	29.667	51.3	60.3	53.4	55.0	78	27	80.7	61.8	77.9	73.5	4.9	5.7	4.6	5.1	6.04	1.81	23
December	30.213	30.159	30.197	30.190	30.641	29.516	44.7	54.3	47.9	49.0	71	27	79.2	59.5	73.4	70.7	4.1	6.1	3.6	4.6	1.61	.54	22
Year 1881	30.070	30.044	30.066	30.065	.....	.....	56.6	65.6	57.4	59.9	.....	.....	77.5	58.7	78.8	71.7	4.8	5.5	3.9	4.8	40.06	.....	.....
1882.																							
January	30.206	30.166	30.209	30.194	30.855	29.400	40.4	45.7	42.1	42.7	66	21	80.6	70.1	73.1	74.6	6.4	8.6	6.6	7.2	6.40	1.44	28
February	30.214	30.142	30.179	30.178	30.702	29.312	42.8	54.9	47.4	48.7	71	29	73.4	54.8	68.2	65.4	4.8	5.7	3.7	4.7	3.58	1.77	4
March	30.147	30.097	30.160	30.135	30.671	29.617	47.8	56.3	48.8	51.0	75	32	71.4	52.0	66.4	63.3	5.8	6.2	5.6	5.9	3.33	1.24	1
April	30.086	30.020	30.048	30.051	30.477	29.441	53.2	61.0	52.9	55.7	80	34	75.9	56.2	76.4	69.5	5.4	6.5	5.2	5.7	3.23	1.11	29
May	30.050	29.996	30.024	30.023	30.406	29.570	60.7	68.8	59.5	63.0	88.5	45	78.5	58.0	78.2	71.6	5.2	6.5	4.9	5.5	5.87	1.57	11
June	29.983	29.931	29.962	29.958	30.259	29.640	72.3	82.0	71.2	75.2	96	56	73.5	52.7	78.2	68.1	6.1	6.0	2.1	4.7	3.12	1.66	16

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.03 a. m., 3.03 p. m., and 11.03 p. m., local time.

J. T. EIKER,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

NORFOLK, VA.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurora.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Duto.													Rain.	Snow.					
1881.																							
July	4,374	SW.	26	14	16	13	7	4	9	21	8	13	2	12	13	6	11	0	5	0	0	0	
August	4,510	S.	24	13	6	15	19	11	12	17	3	3	7	16	12	3	6	0	1	0	0	0	
September	4,590	SE.	25	9	1	9	9	17	4	34	7	7	2	13	13	4	8	0	1	0	0	0	
October	5,249	NE.	32	5	1	21	6	3	20	25	8	8	1	11	14	6	10	0	0	0	0	0	
November	4,652	N.	24	4	25	11	9	2	4	23	8	8	0	11	8	11	14	0	0	0	0	2	
December	5,249	NE.	28	15	14	25	4	2	7	17	15	8	1	11	13	7	8	0	0	0	0	3	
Year 1881	66,597	.....	....	.....	184	175	84	77	111	218	93	123	30	124	149	92	124	5	18	0	7	46	
1882.																							
January	4,948	SW.	24	13	15	24	6	1	5	12	15	13	2	4	13	14	17	3	0	0	1	11	
February	5,336	NE.	39	4	9	14	5	10	5	18	9	12	2	9	12	7	6	0	0	0	0	5	
March	6,288	SW. NE. SW.	26	1 24 27	14	15	11	7	8	15	6	16	1	10	7	14	10	0	0	0	0	0	
April	5,525	SW.	24	26	9	23	16	9	9	13	5	5	1	7	10	13	10	0	4	2	0	0	Auroras 16th and 20th.
May	5,621	NW.	22	2	8	20	15	6	12	19	6	6	1	9	11	11	14	0	2	0	0	0	
June	5,281	NE.	29	16	6	6	11	8	13	24	12	7	3	11	14	5	7	0	4	0	0	0	

Location of office on June 30, 1882: Dalton Building, corner Main street and Roanoke ave.

J. T. ELKER,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

NORTH PLATTE, NEBR.

[Latitude, 41° 8′; longitude west of Greenwich, 100° 45′. Elevation of barometer above sea-level, 2,841 feet. Elevation of rain-gauge (top) above ground, 34 feet. Elevation of exposed thermometer above ground, 21 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.					Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.	Amount in inches.	Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.948	29.928	29.923	29.933	30.123	29.523	66.0	82.4	72.6	73.7	104.0	58.0	84.5	55.1	73.4	71.0	5.7	3.7	4.1	4.5	3.09	1.46	5
August	29.924	29.899	29.906	29.910	30.218	29.688	67.0	88.9	76.2	77.4	101.5	52.0	75.5	38.3	57.3	57.0	4.8	4.1	2.6	3.8	.75	.43	12
September	29.969	29.935	29.944	29.949	30.280	29.506	50.3	72.6	57.9	60.3	101.0	29.5	81.4	37.9	67.4	62.2	4.5	2.8	2.6	3.3	2.36	1.31	6
October	30.161	30.131	30.153	30.148	30.570	29.633	40.7	57.3	46.1	48.0	84.3	25.0	87.5	56.1	78.3	73.9	5.0	5.9	4.6	5.2	2.22	1.14	27
November	30.258	30.225	30.268	30.250	30.722	29.734	25.1	43.9	30.5	33.2	67.3	−5.0	80.6	44.7	74.3	66.5	3.5	5.9	3.9	4.4	.37	.20	11
December	30.310	30.274	30.330	30.305	30.650	29.753	24.6	43.6	29.5	32.6	59.3	9.0	81.5	43.2	73.8	66.2	3.6	5.9	3.6	4.4	.13	.12	9
Year 1881	29.928	29.880	29.906	29.898	.....	.....	39.7	57.7	46.1	47.9	.....	.....	81.7	49.2	72.2	67.7	5.0	5.4	4.2	4.8	22.93	.....	...
1882.																							
January	30.176	30.134	30.185	30.165	30.671	29.667	16.7	34.0	23.5	24.7	54.6	−7.5	76.9	62.8	77.8	72.4	3.6	5.2	3.8	4.2	.46	.21	4
February	30.159	30.122	30.144	30.147	30.464	29.686	22.7	45.2	31.8	33.2	68.3	−4.0	76.7	44.3	66.5	62.5	2.8	3.5	2.1	2.8	.13	.06	20
March	30.136	30.098	30.118	30.117	30.619	29.631	31.4	52.4	41.1	41.6	76.3	8.0	70.8	34.4	57.8	54.3	3.5	3.9	2.2	3.2	.04	.03	4
April	29.966	29.940	29.966	29.957	30.456	29.524	40.0	55.5	47.1	47.5	82.3	25.0	77.3	49.3	66.8	64.5	5.5	5.7	4.2	5.1	1.94	.93	7, 8
May	29.908	29.882	29.906	29.899	30.194	29.202	48.0	60.1	54.3	54.1	87.3	33.0	82.0	55.2	71.8	69.7	6.8	6.8	6.4	6.7	3.98	1.07	26
June	29.814	29.798	29.813	29.808	30.173	29.482	60.9	74.6	66.7	67.4	88.3	38.0	83.2	56.0	76.1	71.8	5.1	4.9	5.0	5.0	4.84	.88	23, 30

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.24 a. m., 1.24 p. m., and 9.24 p. m., local time.

EDWARD F. BRADY,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

NORTH PLATTE, NEBR.

	Wind.				Winds at 7 a. m., 3 and 11 p. m. Washington time: Number of time observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	11,319	N.	48	8	8	16	9	24	28	1	1	4	0	12	13	6	9	0	4	0	0	0	
August	11,795	S.	48	27	7	15	7	19	37	4	1	2	1	9	21	1	3	0	2	0	0	0	
September	9,645	NW.	46	29	19	12	8	16	8	6	8	12	1	13	13	4	6	0	3	0	0	1	First killing frost on September 16th.
October	9,839	S.	54	1	9	19	10	16	15	4	7	13	0	11	9	11	10	0	1	0	0	10	First light frost October 13th.
November	8,927	NW.	50	4	12	5	3	2	6	0	22	39	1	8	17	5	0	4	0	0	4	27	
December	7,417	NW.	46	29	16	7	0	1	17	4	9	37	2	9	18	4	0	2	0	0	1	30	
Year 1881	116,476	.....	...	.....	175	135	84	160	183	36	102	208	12	111	158	101	76	6	22	0	43	162	
1882.																							
January	8,046	SE.	40	11 12	3	3	8	11	11	6	35	13	3	14	9	8	0	5	0	0	5	31	
February	6,233	W.	38	8	5	4	6	7	7	4	25	19	7	17	11	0	0	3	0	0	4	26	
March	9,495	NW.	45	14	8	3	12	8	11	2	12	30	7	14	16	1	1	1	0	0	0	19	
April	9,412	SE.	50	17	10	8	9	18	3	3	8	22	9	9	15	6	6	5	3	1	0	8	Aurora on 16th.
May	9,393	S. N.	36	2 19	17	12	12	19	9	3	2	15	4	5	10	16	15	1	3	0	0	0	
June	7,109	E.	53	19	11	14	20	13	10	3	6	6	7	6	20	4	17	0	6	0	0	0	Last frost on 5th.

Location of office on June 30, 1882, corner of Fifth and Spruce streets.

EDWARD F. BRADY,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[Form No. 132—A.]

OLYMPIA, WASH.

[Latitude, 47° 2′; longitude, west of Greenwich, 122° 53′. Elevation of barometer above sea-level, 30 feet. Elevation of rain-gauge (top) above ground, 39 feet. Elevation of exposed thermometer above ground, 23 feet.]

	Barometer (at sea).						Temperature.						Relative humidity.				Average cloudiness, Amount of, 0-10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.045	30.041	30.028	30.038	30.320	29.811	50.4	65.6	62.6	59.5	87	41	87.0	61.0	62.6	70.2	5	6	5	5.3	.98	.36	30
August	29.994	29.997	29.978	29.990	30.140	29.807	51.0	65.9	62.5	59.8	84	42	90.1	62.7	71.5	74.8	5	5	5	5.0	.71	.22	14
September	30.002	30.003	29.983	29.996	30.318	29.675	48.7	60.9	55.8	55.1	78	39	90.3	71.9	81.1	81.2	4	6	2	4.0	2.47	.84	17
October	29.996	30.004	29.999	30.000	30.379	29.429	43.8	51.5	46.8	47.4	61	23	89.6	75.3	84.0	83.0	7	8	6	7.0	8.18	1.41	29
November	30.147	30.058	30.136	30.147	30.568	29.251	41.7	45.6	43.5	43.6	57	32	90.5	81.4	86.2	86.0	8	9	8	8.3	6.75	1.68	5
December	30.010	30.011	30.009	30.010	30.381	29.158	39.6	44.1	42.7	42.1	58	26	87.0	83.4	86.3	85.7	5	8	7	6.1	8.86	1.70	26
Year 1881	30.026	30.029	30.014	30.023	.....	.....	44.4	53.9	50.8	49.7	.....	.....	89.4	71.5	78.9	79.9	6.8	7.3	5.8	6.6	65.56	.....	.....
1882.																							
January	30.052	30.071	30.070	30.064	30.513	29.334	35.5	40.3	38.4	38.1	51	16	88.5	83.5	84.2	85.4	7.7	7.5	5.8	7.0	6.11	1.85	5,6
February	30.018	30.006	30.019	30.014	30.523	29.178	33.9	39.2	37.0	36.7	47	13.5	88.1	78.3	82.0	82.8	7.7	8.8	5.9	7.5	9.60	2.45	27,28
March	30.078	30.082	30.077	30.079	30.568	29.445	37.5	45.7	42.6	41.9	66	26	87.4	69.8	78.1	78.4	7.3	7.8	5.4	6.8	2.24	.63	17
April	30.012	29.999	30.001	30.004	30.372	29.482	39.1	50.2	47.4	45.6	79	30	87.2	66.4	73.9	75.8	6.5	7.9	5.2	6.5	4.57	1.24	21,22
May	30.061	30.060	30.051	30.057	30.423	29.718	44.6	59.3	55.9	53.3	83	30	86.4	56.6	65.0	69.3	6.2	6.7	4.8	5.9	2.30	.68	2
June	30.012	30.004	29.986	30.001	30.184	29.764	51.3	65.6	63.7	60.2	91	41	87.1	62.4	65.7	71.7	6.4	5.8	5.7	6.0	1.00	.40	6

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 3.56 a. m., 11.56 a. m., and 7.56 p. m., local time.

JNO. DASCOMB,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

OLYMPIA, WASH.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	3,257	W.	22	26	20	10	1	1	28	10	11	12	0	9	14	8	7	0	0	0	0	0	
August	2,624	SW.	18	21	19	6	0	1	23	14	14	12	4	8	15	8	7	0	1	0	0	0	
September	2,734	SW.	25	8	18	8	3	1	28	14	12	4	2	9	15	6	10	0	0	0	0	0	Last frost May 22.
October	3,054	S.	17	29	18	8	4	3	48	9	0	2	1	1	12	16	18	0	0	0	0	2	First frost October 3.
November	3,359	W.	26	5	13	8	7	3	43	8	4	2	2	0	7	23	16	0	0	0	0	0	
December	4,006	W.	29	26	1	2	5	1	60	7	6	6	5	1	9	21	23	2	0	0	0	5	
Year 1881	38,668				203	86	34	23	423	133	90	79	24	43	138	178	174	8	2	0	0	18	
1882.																							
January	3,174	S.	24	5&6	14	7	1	2	38	11	4	1	15	3	14	14	20	1	0	0	0	7	
February	4,458	S.	42	9	6	3	1	2	51	13	1	2	5	3	8	17	12	10	0	0	1	10	
March	3,826	S.	22	20	16	4	1	0	45	14	3	3	7	4	12	15	20	1	0	0	0	10	
April	3,866	SW.	25	20	19	4	0	0	33	19	1	4	10	4	12	14	29	1	0	2	0	1	Severe shock of earthquake, 10.50 p. m., 30th; aurora, 17th and 20th.
May	3,039	S.	28	10	22	9	1	0	21	13	10	5	12	6	13	12	8	0	0	1	0	1	Light shock of earthquake, 12.30 a. m., 1st; aurora, 23d. Last frost 20th.
June	2,775	SW.	19	18	14	11	0	0	17	10	12	16	10	5	14	11	7	0	1	0	0	0	

Location of office on June 30, 1882, Grainger Building, corner Main and Fifth streets.

JNO. DASCOMB,
Sergeant, Signal Corps, U. S. A

Annual meteorological summary—Continued.

[FORM No. 132—A.]

OMAHA, NEBR.

[Latitude, 41° 16′; longitude west of Greenwich, 95° 56′. Elevation of barometer above sea-level, 1,113 feet. Elevation of rain-gauge (top) above ground, 74 feet. Elevation of exposed thermometer above ground, 59 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0-10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.026	30.001	29.992	30.006	30.233	29.543	73.1	85.9	77.8	78.9	101.2	58.2	79.0	52.0	71.3	67.4	6.0	5.0	3.0	4.7	5.89	2.41	9
August	29.993	29.957	29.956	29.969	30.153	29.756	72.6	89.3	78.6	80.2	101.0	59.0	72.2	46.1	64.1	60.8	6.0	6.0	4.0	5.3	1.65	.63	6
September	29.940	29.906	29.927	29.924	30.238	29.419	59.3	74.0	64.7	66.0	98.8	36.0	78.6	49.7	71.0	66.4	5.0	5.0	4.0	4.7	8.36	3.67	29
October	30.139	30.096	30.109	30.115	30.373	29.454	48.7	60.7	53.9	54.4	84.6	31.5	83.1	62.9	77.4	74.5	6.0	6.0	6.0	6.0	4.84	1.20	27
November	30.182	30.158	30.190	30.177	30.731	29.651	32.1	42.0	36.5	36.9	64.3	4.8	75.7	55.9	69.1	66.9	5.0	5.0	5.0	5.0	1.29	.62	11
December	30.219	30.203	30.237	30.220	30.542	29.734	32.1	40.8	35.2	36.0	59.0	9.4	74.8	63.0	71.3	69.7	4.0	8.0	5.0	6.3	1.56	.76	19
Year 1881	30.050	30.013	30.034	30.032	.....	.....	44.3	56.0	49.0	49.7	.....	.....	79.6	59.6	74 0	71.1	6.0	6.2	4.9	5.7	45.74	.....	.....
1882.																							
January	30.195	30.165	30.199	30.186	30.719	29.569	23.0	31.9	27.8	27.5	50.0	Zero.	79.3	67.4	70.1	72.3	4.3	6.0	4.4	4.9	.74	.40	10
February	30.114	30.091	30.116	30.107	30.553	29.635	30.5	42.0	36.3	36.3	63.8	3.7	71.0	53.5	65.5	63.4	2.5	4.1	2.8	3.1	.60	.39	18
March	30.114	30.091	30.143	30.116	30.720	29.447	34.1	47.0	39.5	40.2	77.3	5.1	72.1	48.4	60.8	60.4	4.9	5.6	3.4	4.6	.79	.68	26
April	30.017	29.993	30.002	30.004	30.436	29.476	45.3	58.7	52.1	52.0	83.7	31.3	76.0	48.8	63.2	62.7	6.4	7.2	6.5	6.1	4.31	1.84	8
May	29.971	29.949	29.965	29.962	30.331	29.507	51.3	62.7	55.7	56.6	81.1	38.1	79.8	53.6	67.9	67.1	6.5	6.9	6.5	6.6	4.91	1.72	19
June	29.897	29.872	29.871	29.880	30.243	29.425	65.4	77.2	70.4	71.0	93.1	45.7	78.7	58.3	71.9	69.6	5.9	7.0	5.8	6.2	12.05	3.38	25

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.45 a. m., 1.45 p. m., and 9.45 p. m., local time.

ALEXANDER POLLAK,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

OMAHA, NEBR.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	5,596	W.	26	10	21	7	1	23	30	3	1	4	3	8	18	5	6	0	4	0	0	0	
August	6,297	S.	22	26	18	3	4	28	28	5	4	1	2	9	13	9	6	0	3	0	0	0	
September	7,579	S.	42	29	18	5	4	13	27	11	3	9	0	12	9	9	7	0	2	0	0	0	
October	6,693	NW.	30	15	20	6	5	13	24	8	4	11	2	7	9	15	14	0	3	0	0	1	First light frost 13th; lunar halo, 12th.
November	8,581	NW.	36	23	20	2	3	5	20	11	10	19	0	9	13	8	4	3	0	0	4	15	First heavy frost, 10th.
December	7,448	NW.	38	29	27	4	0	4	28	12	7	11	0	4	19	8	4	4	0	0	2	19	Lunar halo, 1st and 26th.
Year 1881	87,968				256	66	42	184	252	80	42	151	22	93	122	150	82	38	40	0	60	131	
1882.																							
January	7,684	N. NW.	36	15 26	16	2	7	11	25	14	4	14	0	14	8	9	2	6	0	0	9	29	Lunar halo, parhelic circle, and paraselenæ on 31st.
February	6,993	N.	35	16	17	2	2	9	19	14	5	14	2	14	11	3	3	3	0	0	4	16	
March	10,002	NW.	44	20 21	18	10	4	17	9	8	7	19	1	9	16	6	4	0	1	0	2	15	Lunar halo, 23d; shower of rocks, 26th.
April	8,856	S. SE.	38	3 8	13	13	13	16	12	8	1	10	4	7	8	15	12	3	6	1	0	2	
May	8,495	N.	34	11	21	13	9	14	15	4	3	8	6	5	9	17	16	0	4	0	0	0	
June	6,747	W. NE.	36	25 28	8	9	12	14	14	12	5	12	4	6	10	14	15	0	6	0	0	0	

Location of office on June 30, 1882, United States custom-house, corner Fifteenth and Dodge streets.

ALEXANDER POLLAK,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

OSWEGO, N. Y.

[Latitude, 43° 29′; longitude west of Greenwich, 76° 35′. Elevation of barometer above sea-level, 304 feet. Elevation of rain-gauge (top) above ground, 62 feet. Elevation of exposed thermometer above ground, 25 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.930	29.904	29.906	29.913	30.250	29.582	68.0	73.2	70.1	70.4	96.0	56.6	75.8	66.8	74.0	72.2	4.5	4.4	3.5	4.1	1.73	.70	20
August	30.020	29.977	29.978	29.992	30.273	29.617	67.1	75.7	70.7	71.2	96.8	56.1	79.4	61.2	73.5	71.4	3.3	3.7	2.1	3.0	1.69	1.42	6 and 7
September	30.052	30.008	30.023	30.028	30.284	29.840	66.8	74.8	69.3	70.3	93.4	49.8	78.3	62.0	70.5	70.2	5.2	4.1	2.4	3.9	.76	.19	28
October	30.133	30.084	30.105	30.107	30.587	29.533	49.4	56.3	52.1	52.6	77.2	32.0	78.9	67.2	74.0	73.4	7.8	7.5	6.0	7.1	4.61	1.41	17 and 18
November	30.109	30.080	30.095	30.095	30.632	29.569	39.0	44.0	41.0	41.3	65.6	13.0	66.2	62.2	66.1	64.8	7.6	7.7	7.2	7.5	3.13	1.29	12
December	30.096	30.064	30.102	30.087	30.572	29.400	35.7	39.8	36.1	37.2	59.0	17.2	69.1	60.6	67.0	65.6	7.7	7.7	7.3	7.6	6.78	1.91	22 and 23
Year 1881	30.022	29.990	30.003	30.005	.....	.....	45.6	51.5	47.6	48.2	.....	.....	76.2	64.7	74.0	71.6	6.0	5.7	5.0	5.6	39.25	.....	.....
1882.																							
January	30.101	30.091	30.091	30.094	30.880	29.434	24.1	28.3	27.2	26.5	52.0	—13	72.7	67.4	71.7	70.6	8.8	8.4	7.3	8.2	4.46	.72	26
February	30.100	30.079	30.078	30.086	30.831	29.456	29.3	35.4	32.5	32.4	54.0	7.7	71.8	64.5	72.2	69.5	6.2	6.2	6.0	6.1	3.33	1.31	21
March	30.065	30.035	30.050	30.050	30.714	29.318	32.4	36.8	34.7	34.6	63.0	15.2	73.5	65.4	69.1	69.3	5.8	6.2	6.8	6.3	3.28	.79	1
April	30.014	29.983	30.007	30.001	30.465	29.243	39.2	44.3	40.7	41.4	67.4	22.3	67.9	58.4	65.4	63.9	5.4	4.9	5.1	5.1	2.08	.64	19 and 20
May	30.025	29.984	29.975	29.995	30.392	29.495	47.7	53.6	49.8	50.4	76.0	32.6	69.2	55.4	69.4	64.7	4.7	5.0	4.9	4.9	4.83	1.23	11
June	29.868	29.850	29.849	29.856	30.223	29.455	60.6	66.6	61.3	62.8	90.5	46.7	75.5	60.2	73.7	69.8	4.5	4.0	3.8	4.1	3.72	1.23	3 and 4

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.01 a. m., 3.01 p. m., and 11.01 p. m., local time.

S. W. BEALL,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

OSWEGO, N. Y.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time. Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,821	NE.	21	17	8	10	0	6	13	5	26	21	4	11	18	2	11	0	5	0	0	0	First light frost, October 5.
August	4,312	N.	19	14	18	13	1	9	19	4	10	14	5	18	8	5	6	0	2	0	0	0	First killing frost, October 27.
September	5,064	SE.	24	16	10	8	2	15	27	7	8	12	1	6	20	4	6	0	5	1	0	0	
October	6,003	N.	31	4	14	10	1	11	23	7	7	18	2	3	12	16	17	0	1	0	0	0	
November	8,121	W.	28	4	7	2	0	13	31	8	10	18	1	0	13	17	12	7	0	3	1	11	
December	7,339	NE.	42	23	5	13	3	8	39	3	9	12	1	1	13	17	14	3	0	1	3	14	
Year 1881	72,776	.....	...	.....	129	142	73	105	236	96	107	177	30	93	141	131	108	58	19	8	46	108	
1882.																							
January	9,125	W.	42	27	8	6	2	21	19	7	11	19	0	0	9	22	6	17	0	1	9	25	
February	6,629	NW.	28	3	7	4	4	19	24	7	7	11	1	5	13	10	8	7	0	0	6	21	
March	8,052	NW.	27	22, 24	18	6	1	14	19	7	12	16	0	7	9	15	8	7	0	2	3	22	
April	8,267	NE.	31	9	7	19	0	11	8	4	23	16	2	9	9	12	9	3	0	3	0	5	
May	6,728	NE.	28	5	10	20	7	9	8	7	20	10	2	9	12	10	12	1	0	1	0	0	
June	5,539	SE.	24	30	7	5	1	7	14	11	35	6	4	12	11	7	13	0	15	1	0	0	

Location of office on June 30, 1882, Grant Block, West Bridge street, between Water and First.

S. W. BEALL,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

PALESTINE, TEX.

[Latitude, 31° 45′; longitude west of Greenwich, 95° 40′. Elevation of barometer above sea-level, 533 feet. Elevation of rain-gauge (top) above ground, 4 feet. Elevation of exposed thermometer above ground, 34 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July																							
August																							
September																							
October																							
November																							
December*a	30.280	30.207	30.236	30.238	30.664	29.871	45.4	59.6	53.1	53.4	76.0	34.0	70.1	45.1	56.6	60.5	4.3	3.8	3.7	3.9	1.85	.63	13
Year 1881																							
1882.																							
January b	30.144	30.129	30.173	30.149	30.460	29.879	49.0	55.9	51.2	52.3	72.0	24.0	83.6	71.1	79.0	77.9	8.5	7.6	5.1	7.1	1.65	.89	7
February c	30.102	30.104	30.110	30.105	30.403	29.604	56.9	65.4	59.8	60.7	78.0	35.0	78.8	54.6	67.3	66.2	5.9	5.8	5.0	5.6	3.68	1.68	28
March d	30.133	30.092	30.107	30.109	30.583	29.697	57.0	71.5	64.4	64.3	84.0	34.0	75.3	51.4	69.1	65.3	5.4	4.9	4.0	4.8	2.37	2.10	7
April	30.012	29.989	29.998	30.000	30.285	29.622	61.5	74.4	66.6	67.5	86.5	43.5	86.1	58.0	75.9	73.3	6.1	6.3	4.7	5.7	3.42	1.28	11
May	29.999	29.975	29.981	29.985	30.256	29.506	63.3	76.5	68.6	69.5	86.0	50.0	85.2	58.1	77.5	73.6	4.8	5.1	4.3	4.7	7.56	3.54	6,7
June	30.019	29.995	29.984	29.999	30.235	29.748	73.1	85.8	78.3	79.1	96.0	55.0	84.1	54.4	72.0	70.2	5.3	4.6	1.6	3.8	.83	.75	10

*Observations commenced December 3, 1881.

a Mean of 18 days only. b Mean of 7 days only. c Mean of 16 days only. d Mean of 23 days only.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.45 a. m., 1.45 p. m., and 9.45 p. m., local time.

L. M. PINDELL,
Corporal, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

PALESTINE, TEX.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July																							
August																							
September																							
October																							
November																							
December*					6	3	5	1	5	5	9	19	1	9	4	5	4	0	0	0	0	0	Heavy frost on 15th, 16th, and 29th of and light frost on 22d, 23d, and 26th of December.
1882.																							
January	†2,137	S.	38	3	3	4	2	2	4	1	0	4	1	0	4	3	3	0	0	0	1	3	
February	5,441	S.	40	6	3	1	0	5	22	8	2	4	3	4	6	6	6	0	0	0	0	0	
March	6,690	S.	60	18	4	2	0	4	40	4	7	7	1	9	7	7	6	0	0	0	0	0	
April	6,924	W.	50	22	10	9	4	17	27	11	5	6	1	6	17	7	12	0	8	0	0	0	
May	6,951	SW.	60	5	18	7	12	21	14	7	3	10	1	9	17	5	12	0	9	0	0	0	
June	6,715	SE.	42	10	6	3	15	4	31	29	1	0	1	9	19	2	3	0	1	0	0	0	

*Observations commenced December 3, 1881.

†22⅓ days' movement.

Location of office on June 30, 1882, International and Great Northern General Office building.

L. M. PINDELL,
Corporal, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

PENSACOLA, FLA.

[Latitude, 30° 25′; longitude west of Greenwich, 87° 12′. Elevation of barometer above sea-level, 30 feet. Elevation of rain-gauge (top) above ground, 35 feet. Elevation of exposed thermometer above ground, 20 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.019	29.996	30.007	30.008	30.171	29.814	79.5	88.2	81.0	82.9	97.0	71.0	83.3	64.2	79.4	75.6	4.5	4.8	3.9	4.4	5.59	2.24	14
August	30.000	29.972	29.990	29.987	30.164	29.752	77.6	86.1	79.6	81.1	93.0	69.0	85.6	68.2	80.3	78.0	3.9	3.9	5.5	4.4	18.52	8.67	2, 3
September	30.040	30.005	30.034	30.026	30.164	29.659	74.2	84.8	77.2	78.7	93.0	62.0	87.6	65.7	81.2	78.2	3.6	3.3	2.8	3.2	8.47	6.12	14, 15
October	30.120	30.077	30.103	30.100	30.376	29.869	68.9	79.6	72.5	73.7	89.0	51.0	88.0	68.0	83.1	79.7	3.7	3.5	1.9	3.0	4.93	2.65	23
November	30.172	30.120	30.165	30.152	30.501	29.794	56.4	67.3	59.9	61.2	79.2	28.1	86.7	67.8	80.0	78.2	5.4	5.3	3.9	4.9	7.27	3.54	6
December	30.180	30.129	30.168	30.159	30.503	29.788	54.6	62.7	58.0	58.5	74.1	38.3	84.5	71.2	81.2	79.0	5.9	5.0	4.0	5.0	10.76	4.17	20, 21
Year 1881	30.081	30.042	30.068	30.064	.....	.....	64.1	73.8	67.1	68.3	.....	.....	84.2	65.0	79.6	76.3	4.6	4.3	3.8	4.2	86.02	.....	.....
1882.																							
January	30.180	30.153	30.193	30.175	30.481	29.799	57.3	63.7	59.1	60.0	73.6	32.1	87.9	79.4	85.0	84.1	5.7	6.4	4.7	5.6	3.31	.83	{25 26
February	30.200	30.172	30.190	30.187	30.441	29.646	54.8	64.2	59.4	59.5	73.8	36.8	83.1	69.9	81.6	78.2	5.3	5.6	2.9	4.7	4.67	1.94	3
March	30.168	30.145	30.174	30.162	30.524	29.835	60.4	70.0	64.0	64.8	79.2	46.7	86.2	66.1	80.7	77.7	4.0	4.6	2.5	3.7	3.07	1.64	26
April	30.039	30.018	30.024	30.027	30.321	29.749	66.6	75.9	68.8	70.4	83.7	52.0	85.9	65.0	82.9	77.9	5.8	5.1	4.2	5.0	4.27	1.36	27
May	30.036	30.000	30.013	30.016	30.260	29.742	68.8	78.8	70.7	72.8	85.7	52.1	80.1	61.6	77.2	73.0	4.8	4.0	3.0	3.9	3.51	1.82	10, 11
June	30.040	30.017	30.034	30.030	30.284	29.776	77.1	84.2	78.1	79.8	90.9	66.0	85.2	66.9	83.6	78.6	5.6	4.3	4.0	4.6	3.95	1.48	23

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.19 a. m., 2.19 p. m., and 10.19 p. m., local time.

M. McGAURAN,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

PENSACOLA, FLA.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurorns.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain	Snow.					
1881.																							
July	5,100	NE.	30	9	3	8	2	8	28	25	7	11	1	11	13	7	12	0	8	0	0	0	
August	6,412	S.	40	3	5	11	11	12	22	22	6	4	0	16	10	5	8	0	6	0	0	0	
September	5,444	S. SE.	38	14 15	7	11	12	25	24	5	1	5	0	17	8	5	11	0	3	0	0	0	
October	5,932	S.	28	28	9	23	11	19	11	8	1	9	2	17	8	6	8	0	0	0	0	0	
November	5,625	SE.	40	6	26	22	13	13	4	5	1	6	0	11	9	10	10	0	1	0	0	1	First light frost 4th, and first killing frost 25th.
December	6,779	SE.	40	25	15	28	7	12	4	7	12	8	0	12	6	13	12	0	2	0	0	0	
Year 1881	71,688	.....	...	.....	148	140	102	163	181	169	74	107	11	169	96	100	119	0	46	0	0	5	
1882.																							
January	5,960	N. E.	24	22 25	19	10	16	16	22	5	0	3	2	4	18	9	16	0	0	0	0	0	
February	5,590	SW. S.	36	4 28	6	9	12	18	13	7	3	12	4	10	12	6	11	0	2	0	0	0	Last frost 6th.
March	5,938	S.	24	9	13	2	7	20	21	15	2	8	5	16	8	7	5	0	1	0	0	0	
April	6,306	S.	32	22	12	9	13	16	20	9	4	3	4	7	16	7	8	0	6	1	0	0	
May	7,155	SE. NW. SW.	24	7, 8, 11	15	3	1	25	27	10	4	7	1	13	12	6	7	0	4	1	0	0	
June	5,957	N.	32	23	4	4	7	11	19	31	4	7	3	13	12	5	11	0	6	0	0	0	

Location of office on June 30, 1882, corner of Palafox and Saragossa streets.

M. McGAURAN,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

PHILADELPHIA, PA.

[Latitude, 39° 57′; longitude west of Greenwich, 75° 10′. Elevation of barometer above sea-level, 92 feet. Elevation of rain-gauge (top) above ground, 106 feet. Elevation of exposed thermometer above ground, 54 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.973	29.929	29.961	29.954	30.270	29.640	71.0	82.1	73.5	75.5	94.0	60.0	75.2	51.8	73.3	66.8	3	5	5	4.3	.96	.47	16, 17
August	30.070	30.001	30.040	30.037	30.351	29.644	69.5	83.3	72.2	75.0	99.0	59.0	79.2	45.5	73.5	66.1	2	4	3	3.0	1.18	.66	7
September	30.130	30.069	30.111	30.103	30.368	29.856	69.6	82.6	72.3	74.8	101.5	54.0	83.8	51.2	78.6	71.2	4	5	5	4.7	.94	.80	10, 11
October	30.199	30.126	30.162	30.162	30.612	29.531	56.2	67.3	58.8	60.8	87.0	36.0	81.5	56.2	73.1	70.3	5	6	4	5.0	3.04	.93	30, 31
November	30.225	30.176	30.198	30.200	30.732	29.691	44.3	51.4	46.9	47.5	69.5	24.0	77.1	66.8	73.3	72.4	5	6	5	5.3	2.02	.64	23, 24
December	30.191	30.140	30.193	39.175	30.667	29.432	38.3	46.5	40.2	41.7	69.4	21.5	83.4	69.3	79.8	77.5	5	7	5	5.7	2.63	.62	29
Year 1881	30 073	30.019	30.056	30.049	.....	.....	50.0	60.2	52.4	54.2	.....	.....	79.9	58.3	75.7	71.3	4.9	5.8	4.7	5.1	30.21	.....	....
1882.																							
January	30.201	30.146	30.180	30.176	30.889	29.341	28.8	34.1	30.8	31.2	51.5	0.5	82.5	76.5	79.1	79.4	5.6	6.2	5.9	5.9	4.57	.87	10, 11
February*	30.196	30.143	30.165	30.168	30.771	29.381	35.9	44.2	38.7	39.6	59.0	18.0	76.8	61.6	73.8	70.7	5.1	5.3	3.2	4.5	4.22	1.31	4, 5
March	30.129	30.070	30.131	30.110	30.721	29.575	40.6	48.5	42.7	43.9	66.0	24.5	70.4	52.9	67.5	63.6	6.3	5.8	4.0	5.4	3.57	1.13	1
April	30.082	30.006	30.047	30.045	30.541	29.440	45.6	55.5	48.8	50.0	78.0	28.5	66.8	49.6	65.2	60.5	5.5	6.4	5.0	5.6	2.12	.76	19, 20, 26, 27
May	30.051	30.006	30.025	30.027	30.462	29.499	53.4	63.0	55.5	57.3	82.5	40.0	75.2	58.1	71.2	68.2	6.6	5.7	5.7	6.0	5.06	1.32	14, 15
June	29.943	29.890	29.929	29.921	30.278	29.518	68.6	79.6	70.4	72.9	94.0	56.0	69.3	46.0	65.3	60.2	4.5	4.9	3.2	4.2	1.90	.56	19, 25

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.07 a. m., 3.07 p. m., and 11.07 p. m., local time.

* Office moved February 1, 1882.

T. F. TOWNSEND,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

PHILADELPHIA, PA.

	Wind.				Winds at 7 a.m., 3 and 11 p.m., Washington time: Number of times observed blowing from—										Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Sn ow.					
1881.																							
July	6,973	NE.	29	1	9	9	21	3	7	2	26	16	0	13	13	5	8	0	1	0	0	0	
August	5,343	SW.	32	7	16	10	5	2	9	16	19	12	4	18	9	4	7	0	0	0	0	0	
September	5,845	W.	24	23	5	8	16	12	9	16	22	2	0	13	10	7	6	0	0	0	0	0	
October	7,031	NE.	31	10	9	7	15	4	5	14	30	8	1	8	15	8	10	0	1	0	0	0	
November	5,879	N.	38	15	14	8	11	1	1	18	19	16	2	12	2	16	12	0	0	0	0	6	Killing frost October 6.
December	4,887	N.	34	23	11	9	11	5	5	15	23	11	3	10	8	13	12	0	0	0	0	13	
Year 1881	84,873	.....	...	.....	161	131	169	48	62	119	226	163	16	118	133	114	113	12	13	0	18	86	
1882.																							
January	7,362	NW.	42	22	11	15	13	1	2	7	13	27	4	5	12	14	12	6	0	0	6	24	
February	5,589	NE.	32	5	10	7	7	4	7	17	12	20	0	12	9	7	9	2	0	0	1	12	
March	6,851	NW.	30	13	10	8	6	8	8	11	13	29	0	7	14	10	10	0	0	0	0	7	
April	5,932	W.	26	21	10	13	8	6	7	11	11	24	0	6	15	9	10	0	2	1	0	2	Frost April 24.
May	5,719	W. NE. NW.	24	2 11 29	8	20	8	7	8	22	7	13	0	7	12	12	15	0	1	0	0	0	
June	4,960	W. NW. W.	22	19 20 25	5	5	3	1	20	23	16	16	1	10	18	2	5	0	7	0	0	0	

Location of office on June 30, 1882, corner Tenth and Chestnut streets.

T. F. TOWNSEND.
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

PHŒNIX, ARIZ.

[Latitude, 33° 28′; longitude west of Greenwich, 112° 0′. Elevation of barometer above sea-level, 1,120 feet. Elevation of rain-gauge (top) above ground, 3 feet. Elevation of exposed thermometer above ground, 4 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.486	30.342	30.332	30.387	30.605	30.178	76.2	97.2	89.8	87.7	106.2	65.4	51.8	34.0	45.0	43.6	3.5	3.0	3.5	3.3	2.03	1.01	25
August	30.463	30.339	30.316	30.373	30.719	30.162	75.9	93.1	86.4	85.1	104.0	59.0	69.5	42.3	53.7	55.0	4.3	3.0	3.3	3.4	2.19	.82	15
September	30.491	30.321	30.339	30.383	30.721	30.092	64.3	88.3	78.8	77.1	97.0	48.0	63.5	31.8	45.8	47.7	1.5	2.1	1.5	1.7	1.04	.50	4
October	30.616	30.454	30.477	30.516	30.936	30.279	53.6	78.2	67.6	66.5	93.0	34.0	47.8	31.5	44.5	41.3	2.7	2.4	2.1	2.4	.25	.14	4
November	30.842	30.622	30.683	30.716	31.071	30.244	36.4	66.5	52.3	51.7	76.8	25.5	45.2	31.9	48.5	41.9	0.5	1.6	0.7	0.0	.36	.36	10
December	30.845	30.707	30.760	30.771	31.088	30.142	37.0	65.2	52.3	51.5	77.0	25.0	44.4	39.9	55.2	46 5	3.3	3.5	3.1	3.3	.16	.08	18
Year 1881	30.649	30.485	30.494	30.543	.....	.....	53.3	79.2	69.2	67.2	.....	.....	58.1	31.3	43.4	44.3	2.2	2.1	2.0	2.1	8.12	.....	.....
1882.																							
January	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	74.5	19.0	.....	.....	.....	.....	.....	.....	.....	.....	1.62	.....	.....
February	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	72.0	23.0	.....	.....	.....	.....	.....	.....	.....	.....	.17	.....	.....
March	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	89.5	32.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
April	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	104.9	36.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
May	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	102.2	50.5	.....	.....	.....	.....	.....	.....	.....	.....	.00	.....	.....
June	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	109.3	54.5	.....	.....	.....	.....	.....	.....	.....	.....	.37	.....	.....

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.40 a. m., 12.40 p. m., and 8.40 p. m., local time.

C. M. JAMESON,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

PHŒNIX, ARIZ.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	1,986	SW.	16	22, 23	0	3	23	11	3	23	14	6	10	14	13	4	4	0	1	0	0	0	
August	1,377	E.	26	6	3	3	25	10	10	13	8	3	15	10	12	9	12	0	2	0	0	0	
September	1,079	E. N.	16	4, 11	0	8	22	5	8	14	6	3	27	19	7	4	4	0	0	0	0	0	
October	1,094	SW.	8	10, 16, 25, 26, 31	0	2	22	6	4	9	8	3	39	20	6	5	3	0	0	0	0	0	
November	1,511	E.	12	24	0	10	25	9	5	10	11	10	10	27	0	3	1	0	0	0	0	11	First frost on 2d.
December	1,501	SW.	16	17	4	8	25	9	9	8	13	5	12	16	11	4	3	0	0	0	0	12	
Year 1881	19,968	.....	....	.....	36	56	306	87	83	148	174	55	161	218	100	47	34	0	3	0	0	55	
1882.																							
January	.....	.....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Observations discontinued January 1, 1882.
February	.....	.....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
March	.....	.....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
April	.....	.....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
May	.....	.....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
June	.....	.....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	

Location of office on June 30, 1882, Centre street, between Washington and Jefferson streets.

C. M. JAMESON,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

PIKE'S PEAK, COLO.

[Latitude, 38° 50′; longitude west of Greenwich, 105° 2′. Elevation of barometer above sea-level, 14,134 feet. Elevation of rain-gauge (top) above ground, 1 foot. Elevation of exposed thermometer above ground, 5 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.301	30.307	30.289	30.299	30.465	30.175	39.5	49.7	40.8	43.3	62	30	63.0	66.0	71.0	66.7	2.0	7.0	5.0	4.7	6.55	2.00	5
August	30.258	30.257	30.255	30.257	30.420	30.124	37.8	45.8	39.5	41.0	57	29	71.0	76.0	78.0	75.0	5.0	7.0	5.0	5.7	11.29	2.09	12
September	30.066	30.080	30.075	30.074	30.301	29.586	26.9	37.6	30.3	31.6	50	10	68.8	60.0	68.7	65.8	1.0	4.0	1.0	2.0	1.85	.81	6
October	29.967	29.989	29.982	29.979	30.282	29.572	19.7	28.7	21.8	23.4	44	2	71.7	73.5	80.3	75.2	1.0	3.0	2.0	2.0	1.85	.56	5
November	29.778	29.786	29.798	29.788	30.146	29.464	5.5	9.8	6.4	7.2	27	— 12	73.2	76.0	79.5	76.2	1.0	3.0	3.0	2.3	4.76	2.91	1
December	29.822	29.838	29.857	29.839	30.099	29.455	8.2	11.2	7.6	9.0	27	— 11	61.5	67.1	70.5	66.4	1.0	3.0	3.0	2.3	.56	.16	25, 26
Year 1881	29.955	29.962	29.965	29.961	.....	.....	17.4	25.1	19.5	20.7	.....	.....	63.2	66.9	70.1	66.9	2.6	5.3	3.8	4.0	44.49	.....	.....
1882.																							
January	30.102	30.118	30.132	30.117	30.493	29.824	0.6	5.0	1.3	2.3	26	— 22	76.0	77.6	78.6	77.4	2.0	4.1	2.2	2.8	1.78	.36	16, 25
February	30.211	30.221	30.240	30.224	30.455	29.826	3.8	8.5	5.0	5.8	21	— 17	73.6	69.4	75.9	73.0	3.0	2.6	4.1	3.2	.36	.12	7
March	30.155	30.191	30.199	30.182	30.852	29.849	4.3	13.0	7.3	8.2	33	—24.5	81.9	78.5	81.8	80.7	3.9	5.4	3.0	4.1	2.65	2.23	26, 27
April	29.850	29.881	29.895	29.875	30.180	29.537	9.5	18.6	12.3	13.5	36	— 5	81.4	83.5	84.7	83.2	2.8	6.3	4.2	4.4	1.79	.42	12
May	29.753	29.775	29.765	29.764	29.917	29.338	16.1	24.4	19.1	19.9	35	4	84.6	84.1	88.2	85.6	3.4	6.4	4.6	4.8	12.34	4.31	7, 8
June	29.699	29.728	29.729	29.719	29.908	29.459	26.8	34.8	29.4	30.3	47	2	83.1	74.9	87.2	81.7	2.4	6.4	4.1	4.3	3.10	.80	30

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.07 a. m., 1.07 p. m., and 9.07 p. m., local time.

L. M. DEY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

PIKE'S PEAK, COLO.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	6,884	SW.	40	10	2	20	3	6	2	40	3	5	12	9	13	9	3	*13	5	0	0	2	
August	7,075	SW.	44	27	0	23	2	0	0	54	0	2	12	4	19	8	8	*12	10	0	0	4	Heavy frost a. m. 20th; first of season.
September	14,221	SW.	68	24	3	2	0	2	0	69	2	7	5	18	9	3	0	5	0	0	3	27	
October	16,358	SW.	64	16	1	5	0	3	4	72	1	6	1	15	13	3	0	13	0	0	18	31	
November	17,519	NE. (11) SW. (16)	68	(11) (16)	1	23	0	8	0	31	3	22	2	19	7	4	0	15	0	0	30	30	
December	17,972	NW.	76	29	2	25	0	1	0	36	5	20	4	19	11	1	0	9	0	0	31	31	
Year 1881	170,297	.....	.....	.....	46	167	9	24	22	513	99	167	48	136	154	75	12	161	24	0	204	289	
1882.																							
January	19,172	NW.	62	1	3	1	0	1	1	55	10	21	1	16	14	1	0	11	0	0	31	31	
February	14,257	NW.	60	3	4	5	0	1	0	36	14	20	4	13	12	3	0	7	0	0	28	28	
March	19,552	N.	92	20	4	2	0	3	2	56	11	14	1	14	12	5	0	9	0	0	30	31	
April	16,938	SW.	64	25	2	2	0	3	3	44	9	26	1	11	17	2	0	15	0	0	28	30	
May	14,716	SW.	55	19	7	3	2	4	6	38	12	21	0	6	20	5	0	19	2	0	28	31	
June	15,023	W.	64	17	5	5	0	2	7	33	21	16	1	11	14	5	4	13	1	0	6	27	Beautiful electrical phenomenon, 7th and 9th.

*Hail, snow, and rain.

Location of office on June 30, 1882, summit of Pike's Peak.

L. M. DEY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

PIOCHE, NEV.

[Latitude, 37° 57′; longitude west of Greenwich, 114° 26′. Elevation of barometer above sea-level, 6,110 feet. Elevation of rain-gauge (top) above ground, 23 feet. Elevation of exposed thermometer above ground, 9 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.951	29.955	29.933	29.946	30.137	29.731	61.7	82.5	72.0	72.1	93	49	51.9	32.8	41.5	42.1	2.5	3.4	3.4	3.1	.23	.07	24
August	30.025	30.025	30.012	30.021	30.166	29.878	60.7	79.5	69.2	69.8	92	50	49.5	24.9	40.2	38.2	2.9	2.9	1.8	2.5	1.73	.45	14
September	30.096	30.095	30.085	30.092	30.363	29.791	51.1	72.3	61.0	61.5	88	36	34.1	15.5	25.0	24.9	0.6	1.2	0.3	0.7	.00	.00	....
October	30.258	30.247	30.246	30.250	30.483	30.018	40.7	58.1	48.0	48.9	74	25	51.3	28.8	44.1	41.4	1.7	3.2	0.9	1.9	.56	.30	26
November	30.448	30.436	30.444	30.443	30.683	30.100	28.1	44.8	34.9	35.9	60	15	50.4	30.7	39.8	40.3	1.8	2.5	1.4	1.9	.10	.08	16
December	30.528	30.531	30.539	30.533	30.866	30.167	30.1	44.8	35.2	36.7	65	16	52.3	30.7	43.1	42.0	3.7	4.8	3.5	4.0	.08	.07	1
Year 1881	29.982	30.006	30.019	30.004	.....	.....	41.9	60.0	50.5	50.8	.....	.....	47.9	26.6	37.6	37.3	2.4	4.0	2.3	2.9	5.25	.....	....
1882.																							
January	30.216	30.201	30.217	30.211	30.472	29.787	20.3	33.3	25.6	26.4	58	5	65.1	48.7	60.2	58.0	3.3	4.7	3.6	3.9	.38	.17	24, 25
February	30.204	30.212	30.217	30.211	30.540	29.707	21.5	35.9	29.0	28.8	52	6	63.9	48.7	58.1	58.6	2.3	4.8	2.6	3.2	.55	.17	26, 27
March	30.195	30.202	30.197	30.198	30.545	29.879	28.7	44.4	36.2	36.4	72	8	60.0	35.2	47.8	47.7	2.6	4.9	2.0	3.2	.30	.09	16, 17
April	29.946	29.957	29.946	29.950	30.190	29.674	35.1	51.5	44.3	43.6	76.8	18	58.0	30.6	40.5	43.0	3.6	6.4	2.8	4.3	.98	.68	15, 16
May	29.879	29.881	29.872	29.877	30.096	29.645	43.8	64.1	54.2	54.0	79	32.8	43.4	18.2	28.4	30.0	2.0	5.1	2.2	3.1	.29	.18	25
June	29.795	29.800	29.786	29.794	29.968	29.549	51.7	72.1	61.5	61.8	85	39	53.9	25.9	41.2	40.3	3.9	5.2	3.2	4.1	3.23	1.13	18, 19

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.30 a. m., 12.30 p. m., and 8.30 p. m., local time.

C. N. KITCHEL,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

PIOCHE, NEV.

	Wind.			Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.															.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	Rain.	Snow.					
1881.																							
July	5,770	SE. S.	27	26	5	1	0	7	46	21	1	9	3	15	11	5	6	0	6	0	0	0	
August	5,873	S.	31	26	4	3	0	0	62	11	4	4	5	20	6	5	7	0	0	0	0	0	
September	5,165	S.	28	22	9	3	0	6	45	5	6	11	5	26	4	0	0	0	0	0	0	0	
October	5,882	S.	38	13	15	0	0	1	46	6	2	15	8	21	9	1	3	0	1	0	0	6	Rain, hail, snow, thunder, and lightning 25th; frosts 27th, 25th, 28th, 29th, 30th, 31st; killing frost 8th; meteors 27th, 28th.
November	5,232	N.	30	9	29	1	0	1	21	3	1	29	5	21	8	1	0	2	0	0	1	24	Lunar halo 5th.
December	4,179	S.	27	5	13	5	1	0	32	7	3	19	13	14	7	10	0	2	0	0	0	23	Lunar halo 4th, 7th, 28th, 31st.
Year 1881	63,200	.....	.....	.....	155	26	6	40	465	105	55	171	72	201	103	61	25	16	10	0	7	118	
1882.																							
January	5,408	S.	26	10 18	21	0	0	1	33	10	3	19	6	13	14	4	0	7	0	0	12	29	Lunar halo 3d, 4th, 30th; solar halo 18th.
February	4,670	S.	32	16	12	1	0	4	41	5	3	15	3	15	8	5	0	6	0	0	4	27	Lunar halo 4th, 5th, 25th.
March	7,086	S.	33	15	24	0	2	3	38	4	5	16	1	16	12	3	0	5	0	0	2	20	Lunar halo 1st, 8th.
April	6,498	S.	30	9	21	4	0	5	35	6	4	13	2	11	14	5	1	4	0	0	0	15	Frosts 8th, 11th, 18th, 21st.
May	6,733	S.	28	1	22	4	0	6	27	7	7	15	5	15	13	3	1	1	1	0	0	0	Lunar halo 23d.
June	5,752	S.	28	6	6	1	2	4	52	8	3	10	4	14	11	5	8	0	2	0	0	0	

Location of office June 30, 1882, McCannon street, east side.

C. N. KITCHEL,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

PITTSBURG, PA.

[Latitude, 40° 32′; longitude west of Greenwich, 80° 2′. Elevation of barometer above sea-level, 762 feet. Elevation of rain-gauge (top) above ground, 86 feet. Elevation of exposed thermometer above ground, 88 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.014	29.960	29.990	29.988	30.244	29.734	68.7	84.4	72.6	75.2	102.7	57.0	81.7	49.6	74.3	68.5	4.7	5.8	2.0	4.2	3.86	.98	16,17
August	30.078	30.014	30.042	30.045	30.275	29.794	64.8	86.1	72.3	74.4	99.8	53.8	79.6	38.1	64.5	60.7	1.7	4.4	1.4	2.5	.88	.79	6,7
September	30.112	30.049	30.083	30.081	30.252	29.887	68.2	85.0	73.0	75.4	101.6	51.0	79.0	46.4	70.2	65.2	4.6	6.4	3.0	4.7	.76	.33	28,29
October	30.202	30.148	30.181	30.177	30.535	29.714	55.1	67.4	57.8	60.1	88.0	35.0	81.4	55.8	75.7	71.0	6.2	6.8	4.9	6.0	3.75	.69	30,31
November	30.226	30.186	30.202	30.205	30.692	29.664	41.6	50.1	44.2	45.3	75.6	17.6	74.7	57.5	70.7	67.6	6.7	7.4	4.0	6.0	2.66	1.07	18,19
December	30.197	30.174	30.210	30.194	30.641	29.631	39.1	44.1	39.9	41.0	66.7	15.3	79.3	67.4	73.6	73.4	6.8	7.7	6.4	7.0	3.94	.86	13,14
Year 1881	30.079	30.027	30.058	30.056	.....	.....	48.7	60.8	52.4	54.0	.....	.....	79.2	55.0	72.7	69.0	5.1	6.4	3.6	5.1	37.30	.....	.....
1882.																							
January	30.178	30.150	30.159	30.162	30.775	29.476	30.2	35.0	32.9	32.7	61.0	1.8	78.1	72.8	77.4	76.1	8.5	8.3	7.0	7.9	4.58	.62	13
February	30.173	30.124	30.142	30.146	30.641	29.469	36.0	44.1	39.4	39.8	60.0	19.8	75.9	62.5	74.2	70.9	5.9	7.5	5.6	6.3	3.14	.64	19
March	30.121	30.083	30.108	30.104	30.642	29.486	38.7	47.8	42.5	43.0	75.0	22.5	73.6	53.6	63.2	63.5	7.8	6.4	6.8	7.0	3.78	.91	9
April	30.061	29.991	30.042	30.031	30.325	29.403	44.9	59.2	48.5	50.9	83.3	22.5	67.6	44.4	59.8	57.3	5.2	6.8	4.9	5.6	1.39	.56	9,26,27
May	29.999	29.941	29.960	29.967	30.317	29.502	51.1	65.1	55.4	57.2	81.7	33.5	77.0	52.9	71.0	67.0	5.3	6.8	5.2	5.8	5.80	.99	5, 6
June	29.930	29.884	29.906	29.907	30.161	29.606	64.0	77.8	67.4	69.7	97.0	45.6	76.2	48.8	70.1	65.0	5.7	5.8	3.7	5.1	4.14	1.44	16

NOTE.—7 a. m., 8 p. m., and 11 p. m., Washington time, correspond with 6.48 a. m., 2.48 p. m., and 10.48 p. m., local time.

J. H. BRYCE,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

PITTSBURG, PA.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	3,538	NW.	18	17, 18	8	10	4	1	5	11	13	30	11	12	17	2	15	0	10	0	0	0	
August	2,917	NW.	20	6	11	7	9	5	5	13	8	19	16	19	12	0	3	0	1	0	0	0	
September	3,870	SE.	25	16	2	1	6	5	19	15	17	15	10	12	10	8	8	0	4	0	0	0	
October	4,258	SW.	19	15	9	12	6	3	13	19	14	13	4	6	15	10	16	0	2	0	0	0	First frost, October 5.
November	5,348	W.	30	14	0	14	7	3	19	20	19	7	1	2	19	9	8	1	0	0	1	10	First killing frost, November 4.
December	4,931	W. SW.	23	7 30	9	11	3	5	21	18	16	10	0	6	7	18	12	3	0	0	1	12	
Year 1881	51,959	.....	.....	.....	102	139	78	43	123	157	195	193	65	95	154	116	123	44	30	0	23	95	
1882.																							
January	5,012	SW.	36	26	5	18	8	2	10	19	14	16	1	2	9	20	14	10	0	0	9	21	
February	4,432	SW.	27	21	11	14	3	5	14	12	8	16	1	4	10	14	12	4	0	0	1	14	
March	6,104	SE. W.	36	10 21	11	9	10	8	10	10	12	21	2	3	14	14	12	5	1	0	0	11	
April	4,636	W.	24	19, 20	20	13	3	1	7	7	5	33	1	7	13	10	8	2	2	2	0	4	A brilliant aurora on the night of April 16.
May	4,034	S.	17	31	15	14	10	3	13	14	4	16	4	8	13	10	18	0	2	0	0	0	Last frost of the season, May 17.
June	3,870	S.	19	4	12	8	2	3	18	14	12	15	6	7	17	6	13	0	4	0	0	0	

Location of office on June 30, 1882, No. 55 Fifth avenue, corner Fifth avenue and Wood street.

J. H. BRYCE,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

PORT EADS, LA.

[Latitude, 29° 9′; longitude west of Greenwich, 89° 15′. Elevation of barometer above sea-level, 7 feet. Elevation of rain-gauge (top) above ground, 2 feet. Elevation of exposed thermometer above ground, 7 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.028	30.022	30.023	30.024	30.156	29.900	80.6	85.6	82.0	82.7	93.1	74.7	84.7	73.3	80.0	79.3	4.4	4.5	1.6	3.5	10.44	2.96	19
August	29.990	29.985	29.980	29.985	30.104	29.782	79.5	84.9	80.8	81.7	90.9	71.1	85.5	71.9	82.1	79.8	3.7	5.0	2.2	3.6	14.16	5.36	5
September	30.020	30.000	30.021	30.014	30.134	29.668	78.2	85.5	79.4	81.0	92.7	68.7	83.2	68.6	80.4	77.4	3.0	3.4	1.3	2.6	7.24	5.59	25, 26
October	30.090	30.066	30.091	30.082	30.349	29.864	74.9	81.0	75.8	77.2	89.1	58.1	84.8	73.0	82.5	80.1	5.1	4.7	2.4	3.4	4.93	1.92	23, 24
November	30.135	30.104	30.145	30.128	30.430	29.788	62.8	68.9	64.3	65.3	80.1	42.0	87.3	73.4	83.1	81.2	4.4	4.9	4.5	4.6	3.16	1.39	11, 12
December	30.163	30.125	30.171	30.153	30.434	29.686	57.3	63.5	58.8	59.9	75.7	45.0	90.2	78.1	87.3	85.2	5.8	3.7	3.3	4.3	11.28	4.85	20, 21
Year 1881																							
1882.																							
January	30.149	30.129	30.169	30.149	30.455	29.787	58.5	66.3	59.9	61.6	74.5	43.7	93.1	81.5	91.1	88.6	3.3	5.0	2.7	3.7	3.50	1.81	24, 25
February	30.179	30.159	30.178	30.172	30.435	29.692	57.7	66.6	60.4	61.5	76.7	46.3	89.4	74.6	86.0	83.3	4.4	3.5	2.0	3.3	5.14	2.27	25, 26
March	30.155	30.148	30.174	30.159	30.510	29.855	64.1	71.5	65.9	67.2	80.2	57.0	89.2	74.3	86.1	83.2	3.1	4.2	1.9	3.0	1.81	1.54	9, 10
April	30.022	30.017	30.021	30.020	30.272	29.730	69.9	76.5	71.8	72.7	83.0	60.4	90.5	73.9	83.5	82.6	3.8	4.9	3.8	4.2	3.50	2.04	12, 13
May	30.021	30.005	30.012	30.013	30.275	29.796	71.8	78.2	72.4	74.1	87.0	61.0	80.4	67.9	79.7	76.0	3.0	3.3	2.6	3.0	6.37	2.68	11
June	30.046	30.035	30.041	30.041	30.224	29.790	77.3	82.2	78.7	79.4	92.0	69.2	89.1	75.3	83.9	82.8	4.3	4.5	2.9	3.9	3.70	1.74	8, 9

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.11 a. m., 2.11 p. m., and 10.11 p. m., local time.

M. HERMAN,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

PORT EADS, LA.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.*																							
July	7,130	E. W.	29	31 1	12	8	18	10	10	12	17	5	1	15	14	2	9	0	5	0	0	0	
August	9,084	S.	38	3	4	10	20	16	12	10	16	4	1	13	13	5	10	0	6	0	0	0	Waterspout, August 24.
September	8,199	SE.	38	25	6	10	45	18	7	1	1	1	1	19	9	2	6	0	1	0	0	0	
October	10,358	W.	42	30	11	14	44	6	8	4	2	4	0	14	14	3	14	0	1	0	0	0	
November	10,320	N.	44	19	26	16	22	15	6	2	1	2	0	10	14	6	12	0	0	0	0	0	
December	9,303	E.	52	25	24	10	17	11	6	3	9	13	0	11	11	7	11	0	2	0	0	0	
Year 1881																							
1882.																							
January	7,344	NE.	36	22	13	10	15	21	26	4	3	1	0	15	13	3	10	0	0	0	0	0	
February	6,694	NE.	41	4	8	18	7	27	10	4	3	6	1	14	12	2	6	0	2	0	0	0	
March	8,248	N.	40	22	8	12	18	19	25	4	3	4	0	20	6	5	8	0	1	0	0	0	
April	9,040	S.	43	22	13	10	21	17	10	15	4	0	0	13	10	7	10	0	5	0	0	0	
May	8,739	S.	30	31	9	12	18	25	9	8	5	5	2	19	9	3	4	0	1	0	6	0	
June	6,134	E.	27	8	0	1	12	10	21	35	6	4	1	14	12	4	13	0	1	0	0	0	

*Observations began on April 10, 1881.

Location of office on June 30, 1882, Headquarters Hotel.

M. HERMAN,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

PORT HURON, MICH.

[Latitude, 43° 0′; longitude west of Greenwich, 82° 26′. Elevation of barometer above sea-level, 633 feet. Elevation of rain-gauge (top) above ground, 63 feet. Elevation of exposed thermometer above ground, 80 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29 988	29.958	29.965	29.970	30.247	29.702	66.4	75.1	66.8	69.4	93.5	52.0	78.3	59.4	78.8	72.2	6.0	6.0	4.0	5.3	1.30	.51	12
August	30.052	30.014	30.022	30.030	30.268	29.647	65.2	76.4	68.6	70.1	96.5	48.0	81.3	54.3	72.8	69.5	5.0	5.0	2.0	4.0	1.61	.57	31
September	30.033	29.991	30.000	30.008	30.271	29.720	63.4	75.2	66.5	68.4	97.0	46.3	83.9	58.1	81.5	74.5	7.0	5.0	4.0	5.3	2.86	1.17	16
October	30.138	30.102	30.117	30.119	30.515	29.660	48.6	56.7	50.8	52.0	77.8	31.2	88.7	69.3	83.7	80.6	7.0	7.0	7.0	7.0	4.14	.71	1
November	30.119	30 076	30.096	30.097	30.641	29.546	35.3	40.9	36.4	37.6	60.0	13.0	87.6	76.3	85.3	83.1	6.0	7.0	6.0	6.3	2.70	1.56	12
December	30.134	30.113	30.132	30.126	30.592	29.520	32.0	36.1	33.3	33.8	53.5	13.8	87.4	84.4	88.0	86.6	8.0	8.0	6.0	7.3	3.41	1.07	13
Year 1881	30.048	30.011	30.026	30.028	.....	.....	42.6	50.4	44.3	45.8	.....	.....	82.7	69.3	81.8	77.9	6.5	6.3	4.9	5.9	35.27	.....	....
1882.																							
January	30.149	30.118	30.119	30.129	30.777	29.475	21.5	26.8	23.5	23.9	50.5	−7.1	87.3	84.1	88.8	86.7	6.8	7.9	5.6	6.8	2.81	.90	26
February	30.091	30.047	30.068	30.069	30.652	29.213	28.9	36.6	31.8	32.4	55.0	11.0	82.5	75.9	86.4	81.6	6.8	7.0	4.8	6.2	2.23	.62	21
March	30.084	30.052	30.075	30.070	30.677	29.287	30.5	35.6	32.3	32.8	57.8	15.0	84.6	74.3	82.4	80.4	7.8	7.3	7.3	7.5	5.25	1.23	9
April	30.048	30.034	30.042	30.041	30.382	29.209	38.6	41.6	38.7	39.6	68.5	19.0	78.7	72.4	79.0	76.7	6.4	7.3	3.7	5.7	2.33	.69	19
May	30.015	29.973	29.986	29.991	30.398	29.491	45.8	51.7	45.2	47.6	70.6	26.2	76.5	65.5	78.1	73.4	5.2	6.8	4.6	5.5	4.99	1.36	27
June	29.887	29.865	29.866	29.873	30.208	29.425	59.0	66.6	58.2	61.3	87.6	41.0	79.7	63.3	78.7	73.9	6.1	7.2	4.2	5.8	6.34	1.52	8, 9

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.38 a. m., 2.38 p. m., and 10.38 p. m., local time.

W. O. BAILEY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

PORT HURON, MICH.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurora.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	5,933	W.	40	12	26	21	1	1	9	10	16	7	2	8	17	6	6	0	4	0	0	0	Serious droughts toward end of month.
August	5,723	W.	42	31	22	23	5	7	18	8	4	5	1	12	12	7	6	0	2	0	0	0	Serious drought during entire month.
September	6,694	W.	29	1	7	13	5	11	30	12	5	5	2	7	16	7	13	0	4	1	0	0	Destructive forest fires north of station from 5th to 8th.
October	6,665	SW. N.	30	13 15	9	15	4	13	19	12	3	16	2	3	13	15	18	0	1	0	0	1	First frost of season on 6th; first hard frost on 11th.
November	9,011	W.	37	19	1	3	3	10	29	20	17	7	0	2	15	13	9	3	0	1	2	18	
December	8,302	NE.	41	23	8	6	1	3	32	16	13	14	0	2	12	17	10	3	0	1	2	21	Lunar halos on 5th, 8th, and 29th; aurora on 4th.
Year 1881	82,501	.....	...	.....	195	197	35	77	232	126	120	100	13	67	160	138	92	52	15	5	64	146	
1882.																							
January	8,160	W.	43	27	1	7	5	5	27	14	22	12	0	3	14	14	5	9	0	1	13	28	Diffuse auroral light on 19th.
February	7,699	SW.	35	21	4	7	3	10	28	13	9	8	2	3	14	11	5	8	0	0	5	21	Lunar halos on 25th and 27th.
March	7,593	SW.	38	21	12	9	9	7	14	9	8	21	4	2	11	18	8	10	1	0	7	23	Lunar halos on 28th and 29th.
April	8,003	W.	36	2	25	16	4	4	7	10	14	5	5	6	14	10	7	2	3	1	2	10	
May	7,941	N.	34	14	17	30	7	3	12	10	8	4	2	9	13	9	15	0	0	0	0	2	Destructive frost (last of season) on 24th.
June	5,237	SW.	32	7	15	20	2	7	16	14	4	2	10	4	19	7	18	0	4	1	0	0	Tornadoes west and north of station on 8th and 18th.

Location of office on June 30, 1882, City Hall, corner Broad and Huron avenue.

W. O. BAILEY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

PORTLAND, ME.

[Latitude, 43° 40′; longitude west of Greenwich, 70° 16′. Elevation of barometer above sea-level, 45 feet. Elevation of rain-gauge (top) above ground, 77 feet. Elevation of exposed thermometer above ground, 28 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.905	29.871	29.893	29.890	30.362	29.444	65.6	73.9	65.8	68.4	84.5	54.0	77.9	60.5	76.5	71.6	4.0	5.0	4.0	4.3	3.94	2.41	26
August	29.985	29.942	29.965	29.963	30.365	29.492	65.8	75.9	67.2	69.6	88.5	53.0	81.5	63.6	78.1	74.4	5.0	5.0	4.0	4.7	1.42	.73	7
September	30.118	30.071	30.100	30.096	30.521	29.789	61.2	69.0	62.5	64.2	94.5	50.5	81.6	69.0	80.9	77.3	6.0	6.0	4.0	5.3	2.75	1.14	8 2
October	30.124	30.062	30.081	30.089	30.568	29.366	47.2	56.6	49.5	51.1	83.0	30.0	76.4	59.8	73.6	69.9	6.0	6.0	5.0	5.7	2.90	.95	3 17
November	30.118	30.074	30.086	30.093	30.584	29.278	37.8	45.3	40.4	41.2	61.0	14.0	76.3	65.6	72.4	71.4	6.0	6.0	6.0	6.0	3.13	1.07	18 3
December	30.094	30.052	30.072	30.072	30.624	29.050	34.9	40.1	36.0	37.0	57.0	9.0	78.7	68.6	73.6	73.6	5.0	7.0	5.0	5.7	6.79	1.23	4 1
Year 1881	30.025	29.951	29.979	29.976	.....	.....	45.0	53.5	46.7	48.4	.....	.....	75.1	62.3	72.5	70.0	5.7	5.8	4.8	5.5	46.68	.....	.....
1882.																							
January	30.021	30.024	30.043	30.029	30.759	29.259	21.2	29.4	23.3	24.6	46.5	−11.5	79.2	68.0	76.8	74.7	5.9	5.9	5.0	5.6	4.39	.69	2
February	30.056	30.055	30.091	30.067	30.764	29.335	25.0	34.9	29.1	29.7	51.0	5.0	72.9	60.7	71.8	68.5	7.0	4.9	4.8	5.6	4.58	1.51	4, 5
March	30.027	29.982	30.027	30.012	30.627	29.407	33.0	40.3	34.3	35.9	54.0	17.0	69.8	55.5	67.9	64.4	6.0	6.0	4.8	5.6	3.97	2.23	1, 2
April	29.985	29.910	29.967	29.954	30.620	29.248	39.9	48.7	41.2	43.3	61.5	20.6	60.6	50.6	63.7	58.3	5.6	7.0	4.8	6.0	1.97	1.06	19, 20
May	30.015	29.957	29.993	29.988	30.520	29.555	48.1	57.4	49.1	51.5	72.0	35.0	65.1	48.7	62.4	58.7	6.2	7.3	4.8	6.1	3.95	.81	28, 29
June	29.848	29.786	29.829	29.821	30.237	29.441	61.8	71.8	61.6	65.1	92.5	50.5	67.1	51.0	68.2	62.1	4.9	4.6	4.1	4.5	3.20	1.72	3 4

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.27 a. m., 3.27 p. m., and 11.27 p. m., local time.

W. W. EICHELBERGER,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

PORTLAND, ME.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,829	NW.	30	14	5	6	9	10	15	22	9	15	2	9	19	3	14	0	3	1	0	0	
August	4,938	NW.	20	10	8	15	3	8	17	19	11	9	3	12	12	7	13	0	1	0	0	0	
September	4,435	S.	22	22	7	15	11	14	13	13	6	6	5	8	11	11	12	0	1	0	0	0	
October	5,813	NW.	28	5	13	8	2	5	7	24	9	23	2	8	13	10	15	0	0	0	0	3	First frost, October 5.
November	6,295	NW.	28	28	11	7	3	4	2	29	11	23	0	9	8	13	13	2	0	0	1	11	
December	6,319	NE.	36	23	9	6	0	13	7	35	6	17	0	6	15	10	14	2	0	1	3	12	
Year 1881	69,822	.....	....	.....	106	136	48	98	121	199	129	235	23	97	146	122	153	10	9	2	31	95	
1882.																							
January	6,079	NW.	42	27	16	6	0	4	0	16	11	38	2	7	14	10	1	19	0	1	14	30	
February	6,772	N.	36	22	17	6	0	4	4	20	3	29	1	4	16	8	2	13	0	0	7	25	
March	7,626	NW.	33	4	14	10	7	2	14	8	6	30	2	7	14	10	4	12	0	1	0	20	
April	6,813	W. NW.	28	13 17	11	7	9	10	15	8	10	17	3	5	13	12	7	3	0	3	0	4	Last frost, April 12.
May	7,080	NE.	34	15	11	10	14	9	18	12	9	10	0	6	13	12	12	1	0	1	0	0	
June	5,820	N.	31	26	8	6	7	3	20	17	15	12	2	11	14	5	12	0	2	0	0	0	

Location of office on June 30, 1882, United States custom-house, corner of Fore and Pearl streets.

W. W. EICHELBERGER,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

PORTLAND, OREG.

[Latitude, 45° 30′; longitude west of Greenwich, 122° 43′. Elevation of barometer above sea-level, 67 feet. Elevation of rain-gauge (top) above ground, 60 feet. Elevation of exposed thermometer above ground, 45 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.074	30.071	30.048	30.064	30.332	29.811	55.3	69.7	66.0	63.7	90.5	46.3	81.1	50.8	58.3	63.4	5.3	5.5	5.0	5.2	1.16	.45	29
August	30.022	30.028	29.996	30.015	30.184	29.822	55.0	68.3	64.5	62.6	85.4	46.1	87.3	54.5	66.5	69.5	5.2	5.5	3.9	4.9	2.11	.68	13
September	30.035	30.037	30.014	30.028	30.298	29.716	52.2	65.3	60.1	59.2	84.2	40.4	87.3	58.2	71.4	72.3	3.9	5.0	4.4	4.4	2.64	.70	18
October	30.046	30.060	30.050	30.052	30.390	30.530	46.5	53.2	49.9	49.9	63.8	32.0	88.5	70.6	82.0	80.4	6.9	7.5	5.8	6.7	6.60	1.01	27
November	30.218	30.231	30.202	30.217	30.597	29.458	40.2	46.6	43.4	43.4	58.0	29.0	89.7	75.2	81.8	82.2	5.2	6.9	4.7	5.6	6.91	1.87	15
December	30.118	30.112	30.097	30.109	30.444	29.370	40.7	45.2	43.2	43.0	58.2	29.2	89.7	79.2	86.4	85.1	5.6	7.4	5.7	6.2	6.64	1.12	10
Year 1881	30.075	30.079	30.060	30.071	.....	.....	47.1	56.6	53.0	52.2	.....	.....	85.8	62.7	72.8	74.0	6.3	7.2	5.5	6.4	58.05	.....	....
1882.																							
January	30.147	30.150	30.155	30.151	30.555	29.561	37.1	41.7	39.0	39.3	55.2	26.0	87.4	76.6	84.7	82.9	7.5	7.6	5.8	7.1	5.06	.67	5
February	30.105	30.112	30.118	30.112	30.604	29.388	35.2	40.3	37.6	37.7	52.5	18.0	85.8	79.2	82.4	82.5	7.0	8.3	8.2	7.8	10.49	2.06	27
March	30.144	30.152	30.140	30.145	30.597	29.543	38.7	47.4	45.0	43.7	69.6	29.0	86.3	67.3	73.6	75.7	5.7	7.5	5.5	6.2	2.53	.61	17
April	30.073	30.061	30.055	30.063	30.346	29.570	42.6	53.1	49.9	48.5	78.0	31.0	82.2	57.5	71.2	70.3	7.0	7.4	6.0	6.8	4.60	.62	21
May	30.106	30.084	30.075	30.088	30.467	29.745	48.1	62.7	58.0	56.3	85.0	36.4	79.8	45.7	60.6	62.0	5.6	6.2	5.6	5.8	1.84	.66	3
June	30.050	30.042	30.013	30.035	30.223	29.704	55.0	68.1	65.2	62.8	94.5	48.0	83.0	56.4	61.9	67.1	6.1	6.1	4.3	5.5	1.91	.77	19

NOTE.—7 a. m., 3 p. m. and 11 p. m., Washington time, correspond with 3.57 a. m., 11.57 a. m., and 7.57 p. m., local time.

M. L. HEARNE,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

PORTLAND, OREG.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,004	S.	22	2	20	0	4	7	13	7	4	28	10	11	9	11	9	0	0	0	0	0	
August	3,696	S.	16	27	22	2	0	1	12	4	6	34	12	12	12	7	10	0	2	0	0	0	
September	3,674	S.	22	23	10	0	0	6	15	9	6	31	13	11	11	8	10	0	0	1	0	0	
October	3,890	S.	19	29	7	2	5	6	33	7	6	16	11	4	9	17	17	0	0	0	0	0	First frost, 13th.
November	3,516	S.	26	15	5	1	4	8	28	7	13	0	24	5	10	12	14	0	0	0	0	4	23d, killing frost.
December	4,275	S.	30	11	4	3	8	7	35	3	4	6	23	4	7	16	21	0	0	0	0	2	
Year 1881	47,100	.....	...	.....	100	26	68	90	276	85	63	259	128	69	109	177	176	5	3	1	0	18	
1882.																							
January	4,029	S. S. SW.	24	6 10 30	3	4	7	7	32	8	5	6	21	5	13	13	20	0	0	0	0	8	
February	4,606	S.	28	7 9	4	3	7	6	35	5	2	9	13	2	10	16	19	1	0	0	0	7	
March	4,127	NE.	24	10	5	4	0	4	33	10	7	12	18	6	11	14	19	0	0	0	0	4	
April	4,793	SE.	30	24	4	7	5	8	23	10	2	14	17	5	10	15	17	0	0	0	0	1	Earthquake, April 30th and May 1st.
May	4,094	S.	24	10	8	7	4	8	15	6	3	24	18	10	7	14	11	0	1	0	0	0	Last frost.
June	3,722	SE.	30	3	5	1	0	3	16	7	4	40	14	8	11	11	7	0	1	0	0	0	

Location of office on June 30, 1882, No. 48 Front street.

M. L. HEARNE,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

PORTSMOUTH, N. C.

[Latitude, 35° 2′; longitude west of Greenwich, 76° 4′. Elevation of rain-gauge (top) above ground, 29 feet. Elevation of exposed thermometer above ground, 3 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July							78.3	83.8	76.9	79.7	93	64	77.0	67.5	81.4	75.3	4.9	4.6	4.9	4.8	6.33	1.65	30
August							77.2	81.7	76.5	78.5	87	62	79.1	68.9	80.3	76.1	5.0	5.3	3.6	4.6	4.96	1.20	26
September							77.1	82.8	77.1	79.0	88	66	80.2	69.9	79.2	76.4	4.0	3.9	3.1	3.7	3.29	1.43	27
October							68.9	74.1	68.9	70.6	87	53	75.8	67.9	78.6	74.1	4.6	5.0	3.5	4.4	3.62	1.01	15
November							57.5	64.5	59.0	60.2	80	28	75.6	64.3	77.8	72.6	5.2	6.2	4.8	5.4	5.19	1.48	31
December							49.4	56.2	51.2	52.3	70	27	69.0	58.2	69.8	65.7	5.9	6.2	4.9	5.7	5.81	1.12	23
Year 1881							60.5	66.4	†68.3	63.0	.....	.....	78.4	71.5	†77.8	76.1	5.4	5.8	†4.1	5.4	56.25	.....	22
1882.																							.....
January							48.4	52.1	45.2	48.6	67	26	74.9	63.4	72.4	70.2	6.8	7.6	6.5	6.9	4.44	1.74	31
February							48.7	54.6	48.6	50.6	69	27	72.7	62.2	72.7	69.2	5.7	7.3	5.5	6.2	2.69	1.95	4
March							50.8	56.9	50.0	52.6	70	36	73.5	64.4	73.5	70.5	4.9	5.8	4.9	5.2	6.35	2.73	27, 28
April							57.0	62.0	55.9	58.3	74	38	73.9	61.7	78.0	71.2	5.7	6.0	5.6	5.8	5.57	1.88	22, 23
May							64.6	70.7	63.8	66.4	81	50	76.2	62.2	80.0	72.8	5.1	6.4	5.0	5.5	.58	.20	11, 12
June							‡69.9	‡77.2	‡69.3	‡72.2	‡81	‡59	§76.6	§69.5	§80.4	§75.5	§6.1	§6.8	§4.9	§5.9	‡.14	‡.10	‡2

*No barometer on station. †Mean for six months. ‡For fourteen days only. §Mean for fourteen days.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.04 a. m., 3.04 p. m., and 11.04 p. m., local time.

F. V. CHAFFEE,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

PORTSMOUTH, N. C.

	Wind.				Winds at 7 a. m. and 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurorus.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	10,175	NE.	40	22	2	30	3	6	8	37	3	4	0	13	13	5	10	...	0	0	0	0	
August	11,330	NE.	40	13, 26	5	45	9	2	6	23	0	3	0	12	14	5	12	....	0	0	0	0	
September	8,563	SE.	44	9	4	21	3	6	23	27	2	4	0	16	7	7	8	....	0	0	0	0	
October	11,881	NE.	56	5	7	38	3	9	7	24	4	1	0	18	4	9	7	....	0	0	0	0	
November	9,398	NW.	48	4	19	26	3	7	9	10	3	12	1	10	9	11	11	....	0	0	0	2	
December	9,762	SW.	45	27	19	26	3	1	5	20	9	7	3	8	14	9	8	....	0	0	0	1	
Year 1881	134,770	.....	....	.....	78	316	36	43	69	233	45	82	5	120	121	117	....	....	0	0	....	7	
1882.																							
January	9,280	SW.	40	31	19	23	1	4	6	23	3	12	2	5	11	15	17	....	0	0	0	9	
February	11,337	SW.	52	4, 21	9	27	1	2	6	20	10	8	1	7	10	11	9	....	0	0	0	2	
March	13,686	NW.	47	24	10	32	3	2	6	22	7	10	1	11	11	9	11	....	0	0	0	0	
April	12,702	NE.	66	10	6	46	2	3	7	18	5	2	1	10	8	12	16	....	0	0	0	0	Lunar halo, 16th and 17th.
May	12,313	NE.	48	2	1	30	10	2	11	27	7	3	2	6	19	6	8	....	0	0	0	0	
June	*5,459	*SW.	*48	*1	†1	†10	†1	†4	†1	†16	†1	†6	†0	†1	†8	†4	4	....	0	0	0	0	

Location of office on June 30, 1882, United States Marine Hospital.

*Thirteen days only.

†Fourteen days only.

F. V. CHAFFEE,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

PRESCOTT, ARIZ.

[Latitude, 34° 33′; longitude west of Greenwich, 112° 30′. Elevation of barometer above sea-level, 5,340 feet. Elevation of rain-gauge (top) above ground, 5 feet. Elevation of exposed thermometer above ground, 10 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.897	29.892	29.880	29.890	30.023	29.766	62.0	82.0	71.9	72.0	97.0	51	69.0	38.9	56.6	54.8	3.0	4.6	3.6	3.7	*4.28		
August	29.914	29.924	29.910	29.916	30.025	29.794	60.8	77.0	67.5	68.4	93.0	41	82.3	50.5	73.1	68.6	3.5	5.4	2.0	3.6	5.25	1.56	14
September	29.950	29.951	29.946	29.949	30.153	29.641	49.5	74.0	60.7	61.4	88.0	34	72.3	33.7	58.0	54.7	0.8	1.7	0.7	1.1	1.69	1.30	4
October	30.067	30.062	30.070	30.066	30.245	29.893	41.1	66.8	50.9	52.9	86.0	21	68.1	29.8	52.3	50.1	1.2	3.2	1.6	2.0	.33	.22	24
November	30.173	30.160	30.175	30.169	30.389	29.843	25.5	53.2	36.5	38.4	70.0	12	73.6	26.8	56.4	52.3	0.5	0.9	0.7	0.7	.30	.30	10
December	30.270	30.272	30.286	30.276	30.537	30.019	28.7	52.9	37.6	39.7	70.0	13	71.2	30.3	58.7	53.4	2.5	3.7	2.9	3.0	.33	.28	17
Year 1881	30.045	30.044	30.044	30.044	.....	.....	40.7	64.9	51.9	52.5	.....	.....	63.7	26.7	48.7	46.4	1.8	3.0	1.7	2.1	15.45	.....	.....
1882.																							
January	30.086	30.067	30.082	30.078	30.332	29.809	21.0	41.8	28.3	30.4	71	— 8	57.0	49.5	55.6	54.0	3.3	4.1	2.3	3.2	2.53	1.02	15
February	30.121	30.122	30.125	30.123	30.404	29.831	23.9	43.2	33.6	33.6	62	5	69.3	56.0	62.5	62.6	2.6	3.9	2.1	2.9	2.04	.73	27
March	30.103	30.104	30.110	3 .106	30.336	29.824	31.3	55.0	43.5	43.2	80	13	56.9	28.2	43.9	43.0	1.1	2.9	1.7	1.9	.00	.00	.....
April	29.916	29.924	29.927	29.922	30.140	29.686	36.2	60.2	48.8	48.4	85	21	49.2	24.3	35.1	36.2	1.4	3.1	1.3	1.9	.28	.17	12
May	29.804	29.805	29.796	28.802	29.976	29.484	43.4	69.9	58.5	57.3	86	33	44.8	20.4	33.6	32.9	0.6	2.8	1.2	1.5	.45	.25	5,6
June	29.774	29.787	29.774	29.778	29.892	29.562	52.1	77.8	67.8	65.9	94	36	52.2	24.9	38.5	38.5	0.8	2.0	1.7	1.5	.47	.45	18

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.38 a. m., 12.38 p. m., and 8.38 p. m., local time.

J. McN. WRIGHT,
Private, Signal Corps, U.S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

PRESCOTT, ARIZ.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,726	SE.	28	26	3	3	1	2	42	29	4	2	7	14	12	5	14	0	13	0	0	0	
August	3,470	SW.	23	10	2	3	3	4	36	25	5	0	15	13	17	1	16	0	12	0	0	0	
September	3,982	S.	28	28	2	3	10	1	52	5	12	1	4	27	2	1	2	0	2	0	0	0	First frost, September 24; killing, 29th.
October	4,346	S.	26	31	4	4	5	2	57	11	3	0	7	23	7	1	5	0	2	0	0	9	
November	3,704	S.	28	6 16	16	7	10	0	41	8	3	0	5	27	3	0	0	1	0	0	0	27	First snow, November 9.
December	3,068	E.	22	20	10	4	9	4	45	9	5	0	7	15	14	2	2	1	0	0	0	23	
Year 1881	51,680	.....	.....	.....	86	59	49	28	525	159	59	29	101	249	93	23	44	8	49	0	0	132	
1882.																							
January	3,224	S.	28	11	3	10	6	15	12	28	9	3	7	16	12	3	0	5	0	0	0	31	
February	3,810	S.	36	27	3	8	1	14	31	14	1	9	3	15	10	3	1	7	0	0	0	25	
March	5,891	S.	36	3	12	9	7	5	53	2	3	2	0	23	7	1	0	0	0	0	0	20	
April	6,341	S.	34	6	6	0	1	1	67	8	4	3	0	24	4	2	2	2	1	0	0	13	Last snow of season, April 16.
May	5,992	S.	34	13	5	0	1	1	77	5	2	1	1	25	6	0	4	0	3	0	0	0	
June	6,263	S.	30	18	1	0	1	2	64	21	0	1	0	25	4	1	3	0	3	0	0	0	

Location of office on June 30, 1882, Old Headquarters Building.

J. McN. WRIGHT,
Private, Signal Corps, U.S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

PROVINCETOWN, MASS.

[Latitude, 42° 3′; longitude west of Greenwich, 70° 11′. Elevation of barometer above sea-level, 29 feet. Elevation of rain-gauge (top) above ground, 35 feet. Elevation of exposed thermometer above ground, 23 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	8 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	8 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July																							
August																							
September																							
October																							
November																							
December																							
Year 1881																							
1882.																							
January																							
February *	30.162	30.159	30.150	30.157	30.726	29.151	30.0	34.5	31.8	32.1	47.0	14.4	84.9	71.8	79.9	78.9	5.8	5.7	6.4	6.0	1.67	.81	16, 17
March	30.046	30.006	30.048	30.033	30.670	29.419	34.6	38.0	34.5	35.7	55.0	19.0	81.8	74.0	80.1	78.6	6.3	6.9	4.8	6.0	4.55	1.74	1, 2
April	30.006	29.937	29.978	29.974	30.583	29.280	39.2	46.3	39.6	41.7	64.0	23.0	79.4	66.6	81.8	75.9	5.5	6.2	4.8	5.5	4.70	1.83	27
May	30.016	29.982	30.006	30.001	30.437	29.459	46.5	52.3	45.2	48.0	71.5	34.0	83.0	71.3	82.6	79.0	5.9	6.8	5.6	6.1	5.96	1.12	20, 21
June	29.882	29.833	29.866	29.860	30.257	29.521	61.6	71.3	59.4	64.1	90.0	45.5	77.3	56.8	81.4	71.8	5.1	4.3	2.9	4.1	2.73	.96	10, 11

* Station opened February 15, 1882.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.27 a. m., 3.27 p. m., and 11.27 p. m., local time.

P. T. JENKINS,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

PROVINCETOWN, MASS.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July																							
August																							
September																							
October																							
November																							
December																							
Year 1881																							
1882.																							
January																							
February*	3,944	NW.	40	22	9	2	4	2	2	11	1	9	2	4	4	6	2	3	0	0	2	10	Station opened February 15, 1882.
March	10,062	S.	36	27	11	13	3	8	13	9	7	29	0	5	15	11	9	9	0	0	1	18	
April	7,963	NE.	38	28	5	12	3	15	10	18	3	24	0	7	14	9	12	1	0	2	0	6	
May	7,947	N.	35	15	11	19	3	9	9	27	3	12	0	5	14	12	14	0	0	0	0	0	
June	6,296	S.	32	1	2	3	2	7	15	31	12	18	0	8	19	3	10	0	1	0	0	0	

Location of office on June 30, 1882; Center street, between Commercial and Bradford streets.

P. T. JENKINS,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

PUNTA RASSA, FLA.

[Latitude, 26° 36′; longitude west of Greenwich, 82° 10′. Elevation of barometer above sea-level, 13 feet. Elevation of rain-gauge (top) above ground, 35 feet. Elevation of exposed thermometer above ground, 14 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time..				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.008	29.995	30.019	30.007	30.135	29.865	82.3	86.2	80.2	82.9	92	73	75.3	64.6	79.4	73.1	5.0	7.6	2.9	5.2	3.60	.59	5
August	29.962	29.940	29.970	29.956	30.119	29.716	79.6	83.5	78.8	80.6	91	70	81.5	69.2	80.0	76.9	5.7	7.3	4.6	5.9	7.28	1.61	24, 25
September	29.978	29.944	29.990	29.971	30.094	29.814	77.9	83.7	78.0	79.9	91	71	85.1	67.1	82.5	78.2	4.9	7.3	4.4	5.5	7.20	2.00	16
October	30.048	29.997	30.049	30.032	30.251	29.849	74.0	82.5	75.0	77.2	89	66	82.7	59.0	80.0	73.9	3.7	4.4	1.9	3.3	1.58	.63	18
November	30.077	30.023	30.084	30.061	30.276	29.716	67.8	77.7	70.8	72.1	86	46	83.1	63.9	79.1	75.4	3.8	5.8	2.7	4.1	.80	.32	20
December	30.128	30.080	30.134	30.114	30.275	29.969	64.0	72.4	66.5	67.7	82.5	48	83.7	65.0	79.9	76.2	4.6	6.4	3.8	4.9	1.22	.54	15
Year 1881	30.039	30.004	30.046	30.030	.....	.....	70.8	77.9	71.9	73.5	.....	.....	80.1	63.9	78.1	74.0	4.8	6.0	3.4	4.7	33.60	.....	.....
1882.																							
January	30.185	30.140	30.192	30.172	30.399	29.845	63.7	73.5	66.4	67.9	80	42	84.4	64.8	79.7	76.3	4.8	4.9	3.2	4.3	.30	.08	25
February	30.197	30.150	30.205	30.184	30.382	29.867	62.5	73.9	67.3	67.9	81	49	79.6	63.4	75.8	72.9	2.9	4.0	1.7	2.9	.20	.17	4
March	30.160	30.120	30.172	30.151	30.349	29.926	65.5	77.1	69.8	70.8	83.5	57	80.0	55.3	72.9	69.4	2.4	3.3	2.8	2.8	.15	.15	30
April*	30.031	29.998	30.031	30.020	30.216	29.804	72.5	79.6	74.0	75.4	85	64	81.2	62.8	77.5	73.8	5.8	5.9	4.5	5.4	3.59	1.26	5
May	30.016	29.979	30.018	30.004	30.174	29.851	74.0	81.6	74.5	76.7	90	64	77.3	60.3	74.0	70.5	5.9	5.5	3.7	5.0	2.51	.75	8
June	30.053	30.031	30.067	30.050	30.179	29.889	79.4	84.0	78.2	80.5	91	68	77.3	65.6	78.1	73.7	5.2	6.8	3.2	5.1	8.46	6.35	10, 11

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.40 a. m., 2.40 p. m., and 10.40 p. m., local time.

*29 days only.

W. J. EVANS,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

PUNTA RASSA, FLA.

	Wind.			Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	5,985	SE. W.	24	8 28	3	10	28	7	5	16	21	3	0	4	21	6	16	0	8	0	0	0	Solar halo on 30th.
August	6,549	NE.	34	17	9	20	22	7	7	5	9	10	0	4	17	10	21	0	12	0	0	0	Lunar halo on 3d.
September	5,940	E. W.	30	5 16	2	30	40	4	4	3	3	3	1	5	18	7	18	0	9	0	0	0	Lunar halo on 9th; brilliant meteor 10.45 p.m., 19th.
October	7,674	E.	30	6	9	40	20	4	8	4	7	1	0	16	14	1	10	0	1	0	0	0	Lunar rainbow on 6th; solar rainbow on 31st.
November	8,159	W.	42	24	15	38	25	2	3	3	2	2	0	11	14	5	9	0	0	0	0	0	Solar halo on 29th.
December	7,462	NE.	40	16	15	25	18	9	9	5	2	10	0	9	15	7	7	0	0	0	0	0	Water-spout on 5th; solar halo on 24th, 25th; lunar halo on 7th.
Year 1881	90,709	.....	....	.....	108	271	249	72	91	85	115	97	3	103	187	75	123	0	47	0	0	0	
1882.																							
January	6,486	SW.	36	1	5	18	30	6	19	10	3	2	0	9	19	3	5	0	0	0	0	0	Solar halo on 10th.
February	7,314	W.	34	4	9	19	19	6	13	6	7	5	0	13	14	1	2	0	1	0	0	0	Lunar halo on 2d; polar bands on 5th.
March	7,464	S. NW. SE.	26	1 22 26	11	18	21	4	9	7	14	9	0	18	10	3	1	0	0	0	0	0	Zodiacal light on 9th; solar halo on 25th; lunar halo on 28th, 31st.
April	8,632	E. SW.	32	1 23	2	19	18	5	12	16	13	5	0	4	19	6	9	0	2	0	0	0	
May	7,505	SW.	28	12	4	19	26	7	9	11	11	5	1	7	18	6	10	0	4	0	0	0	Solar halo on 23d, 29th, 30th; lunar halo on 23d, 29th.
June	6,352	SE.	38	21	5	7	26	5	5	18	16	8	0	6	17	7	11	0	6	0	0	0	Solar halo on 3d, 18th; lunar halo on 1st; polar bands on 5th.

Location of office on June 30, 1882, International Ocean Telegraph Company's building.

W. J. EVANS,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

RED BLUFF, CAL.

[Latitude, 40° 10′; longitude west of Greenwich, 122° 16′. Elevation of barometer above sea-level, 350 feet. Elevation of rain-gauge (top) above ground, 36 feet. Elevation of exposed thermometer above ground, 20 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.898	29.897	29.831	29.875	30.139	29.614	65.6	87.9	82.5	78.7	103.0	53.0	49.0	22.2	27.3	32.8	0.6	0.7	0.9	0.7	(†)	(†)	8
August	29.871	29.868	29.810	29.849	30.093	29.659	63.4	85.8	79.9	76.4	100.0	52.0	53.4	24.3	27.7	35.1	0.4	0.4	0.2	0.3	.00	.00	0
September	29.889	29.888	29.839	29.872	30.120	29.651	61.7	79.6	73.1	71.5	100.0	50.0	55.0	28.7	37.5	40.4	0.8	1.5	0.9	1.1	1.07	.74	22
October	30.003	30.020	29.994	30.006	30.538	29.728	50.0	64.5	58.0	57.5	81.5	32.0	74.5	46.1	57.8	59.4	3.4	3.1	2.3	2.9	1.61	.68	3
November	30.162	30.152	30.141	30.152	30.477	29.786	43.8	58.2	51.3	51.1	75.5	32.5	71.6	39.0	58.0	56.2	2.0	2.3	2.1	2.1	.73	.33	14
December	30.175	30.176	30.164	30.172	30.434	29.805	41.6	49.8	46.4	45.9	65.0	31.0	92.1	74.8	85.4	84.1	5.6	6.1	4.8	5.5	5.69	2.89	4
Year 1881	30.005	30.001	29.970	29.992	.....	.....	53.6	69.0	63.7	62.1	.....	.....	65.4	44.0	55.9	55.1	3.0	3.6	2.9	3.1	24.93	.....	.....
1882.																							
January	30.159	30.167	30.149	30.158	30.481	29.748	39.3	48.2	44.8	44.1	60.1	27.0	78.8	56.0	69.6	68.1	4.4	4.5	3.1	4.0	2.81	.91	4
February	30.157	30.179	30.150	30.162	30.524	29.699	39.6	48.4	45.1	44.4	61.8	26.6	83.0	63.6	78.4	75.0	4.7	5.5	4.3	4.8	3.94	1.38	24
March	30.101	30.117	30.078	30.099	30.460	29.648	44.9	59.0	53.5	52.5	81.8	31.8	77.1	47.9	62.0	62.3	3.3	3.9	3.1	3.4	2.67	.99	10
April	30.038	30.035	30.014	30.029	30.284	29.727	47.4	64.2	58.2	56.6	86.1	34.9	76.1	43.0	58.0	59.0	3.1	4.0	3.6	3.6	2.12	1.23	8,9
May	29.964	29.964	29.914	29.947	30.171	29.913	56.4	75.8	69.9	67.4	101.4	42.4	59.0	27.1	37.5	41.2	2.3	3.7	2.0	2.7	.33	.27	3,4
June	29.888	29.862	29.8[illegible]	29.855	30.044	29.610	62.9	85.0	78.8	75.6	101.6	52.8	61.2	27.2	34.6	41.0	1.6	1.8	2.0	1.8	.15	.13	9

† Too small to measure.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 3.59 a. m., 11.59 a. m., and 7.59 p. m., local time.

J. M. FRANTZ,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

RED BLUFF, CAL.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurora.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,469	NW. N. N.	24	6 7 20	19	0	4	10	29	3	2	15	11	27	4	0	0	0	0	0	0	0	Comet observed every day during month.
August	2,679	NW.	18	26	9	1	1	21	22	4	2	12	21	30	1	0	0	0	0	0	0	0	
September	3,894	N.	28	26	30	2	1	5	9	1	0	16	26	25	4	1	3	0	1	0	0	0	
October	3,788	SE.	24	30	20	3	0	6	18	2	0	21	14	16	13	2	5	0	0	0	0	0	First light frost, 14th.
November	2,850	S.	42	14	35	4	3	3	2	2	2	19	20	19	9	2	4	0	0	0	0	0	
December	2,250	SE.	28	4	22	9	4	7	9	4	2	9	27	8	12	11	13	0	0	0	0	2	First heavy frost, 13th.
Year 1881	49,090				272	33	25	126	247	45	21	188	138	204	103	58	72	0	4	0	0	2	
1882.																							
January	4,438	N.	25	18	39	8	2	10	9	3	4	10	8	15	8	8	10	0	1	0	0	8	Hail, 23d.
February	4,632	S.	30	9	24	5	0	14	13	4	1	13	10	10	9	9	10	1	0	0	0	3	4 inches snow, 12th—greatest fall since 1863.
March	5,537	S.	28	15	36	4	1	12	16	2	0	16	6	17	8	6	9	0	0	0	0	1	
April	4,651	NW.	30	5	18	4	1	6	18	5	2	28	8	15	12	3	7	0	0	2	0	0	Aurora, 16th, and 17th; last frost, 25th.
May	5,527	N.	28	19	32	2	0	15	17	1	2	21	3	20	10	1	4	0	0	0	0	0	
June	4,244	NW.	30	20	23	2	1	10	35	3	2	10	4	23	7	0	2	0	0	0	0	0	

Location of office on June 30, 1882, Fickert building, Main street.

J. M. FRANTZ,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

RIO GRANDE CITY, TEX.

[*Latitude*, 26° 22′; longitude west of Greenwich, 98° 48′. Elevation of barometer above sea-level, 230 feet Elevation of rain-gauge (top) above ground, 2 feet. Elevation of exposed thermometer above ground, 6 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.980	29.910	29.963	29.953	30.090	29.800	77.4	98.2	83.9	86.8	106	73	68.4	47.1	67.9	61.1	3.7	4.1	3.9	4.9	1.34	.91	6
August	29.916	29.888	29.920	29.908	30.053	29.708	80.2	97.5	83.1	85.1	104	70	72.8	55.6	71.4	64.9	3.9	5.3	4.7	4.6	4.03	2.96	8,9
September	29.964	29.896	29.937	29.932	30.151	29.693	73.4	90.9	80.5	83.0	102	59	78.9	57.1	76.3	70.8	4.1	5.7	4.0	4.6	3.71	1.84	7
October	30.023	29.975	30.005	30.001	30.211	29.696	70.8	82.9	74.5	76.1	93	47	85.1	63.2	82.5	77.2	4.3	5.4	4.2	4.6	6.98	3.39	7,8
November	30.139	30.079	30.136	30.118	30.634	29.663	57.1	70.4	62.5	63.3	89	32	77.6	59.9	73.5	70.3	6.0	5.3	3.9	5.1	1.15	1.40	27
December	30.153	30.094	30.141	30.129	30.525	29.744	53.9	67.2	58.2	59.8	83	30	78.0	62.3	79.3	73.2	5.6	4.9	4.3	4.9	1.26	.83	24
Year 1881	30.028	29.970	29.934	29.996	.....	.....	65.3	82.5	71.2	73.0	.....	.....	77.4	57.1	76.6	70.4	4.7	5.4	4.3	4.8	28.13	.....	.....
1882.																							
January	30.091	30.040	30.089	30.073	30.471	29.776	55.0	65.0	58.7	59.6	83	34	85.4	72.0	86.6	81.3	7.2	7.5	6.8	7.2	.95	.22	13
February	30.075	30.023	30.063	30.054	30.354	29.631	61.5	78.0	66.6	68.7	92	38	79.3	48.5	73.1	67.0	5.4	3.8	3.5	4.2	.11	.05	25
March	30.069	30.024	30.050	30.048	30.577	29.722	64.3	78.5	67.4	70.1	96	40	82.1	55.3	78.4	71.9	5.5	5.6	4.1	5.1	1.91	.96	21,22
April	29.922	29.876	29.917	29.905	30.293	29.547	69.7	86.8	73.3	76.6	107	47	81.6	42.8	75.1	66.5	6.5	5.0	3.6	5.0	1.50	1.50	30
May	29.913	29.870	29.903	29.895	30.198	29.463	74.5	87.0	77.5	79.7	102	63	84.3	56.6	76.4	72.4	7.6	5.4	3.9	5.6	4.11	1.64	15
June	29.964	29.913	29.949	29.942	30.110	29.737	78.6	95.1	82.5	85.4	102.3	64	80.1	43.2	71.3	64.9	3.1	3.6	1.3	2.7	.46	.46	4,5

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.33 a. m., 1.33 p. m., and 9.33 p. m., local time.

P. M. WILSON,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

RIO GRANDE CITY, TEX.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	7,204	S.	25	2	1	2	11	72	1	2	0	0	4	17	13	1	6	0	0	0	0	0	
August	5,298	SE.	23	1	1	0	9	73	6	0	0	1	7	20	7	4	5	0	0	0	0	0	
September	4,504	SE.	18	27, 28	4	2	3	45	13	3	0	3	17	18	10	2	5	0	0	0	0	0	
October	4,605	SE.	18	1	9	12	10	37	4	1	1	0	11	13	10	8	6	0	0	0	0	0	
November	4,178	N.	18	19	34	4	2	35	7	0	2	2	2	15	2	13	5	0	0	0	0	0	
December	2,901	NW.	17	14	4	11	3	19	12	5	8	17	14	12	6	13	5	0	0	0	0	1	
Year 1881	66,366	.....	....	.....	113	49	103	573	63	23	16	73	104	168	119	78	51	....	.....	.....	0	4	
1882.																							
January	3,078	NW.	24	16	10	14	2	25	6	4	5	16	11	2	10	19	12	0	0	0	0	0	
February	5,054	NW.	31	3	3	2	10	43	6	2	1	13	4	13	11	4	3	0	0	0	0	0	
March	4,636	SE.	20	19	1	9	9	41	7	2	3	17	4	13	7	11	6	0	0	0	0	0	
April	5,076	E.	25	29	12	0	6	55	7	0	0	3	7	8	15	7	1	0	0	0	0	0	
May	5,410	N.	30	28	3	5	17	37	14	5	3	6	3	6	17	8	8	0	0	0	0	0	
June	6,962	SE.	21	26	2	3	8	65	5	2	0	3	2	19	9	2	2	0	0	0	0	0	

Location of office on June 30, 1882, southeast corner of post of Fort Ringgold.

P. M. WILSON,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

ROCHESTER, N. Y.

[Latitude, 43° 8′; longitude west of Greenwich, 77° 42′. Elevation of barometer above sea-level, 621 feet. Elevation of rain-gauge (top) above ground, 145 feet. Elevation of exposed thermometer above ground, 149 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0-10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.952	29.921	29.925	29.932	30.243	29.644	67.3	78.0	69.9	71.7	96	54	77.0	54.2	73.1	68.1	5.0	5.0	3.0	4.3	2.20	.79	20
August	30.039	29.994	29.995	30.010	30.276	29.606	66.4	78.7	70.2	71.8	96	53	75.3	49.8	68.4	64.5	3.0	3.0	3.0	3.0	1.44	.69	6
September	30.068	30.019	30.037	30.041	30.271	29.804	66.3	78.4	68.9	71.2	98	46	79.9	52.4	67.1	67.1	7.0	4.0	2.0	4.3	1.82	.83	1
October	30.146	30.108	30.126	30.127	30.582	29.577	48.9	57.5	51.3	52.5	80	30	80.1	61.5	78.1	73.2	8.0	7.0	6.0	7.0	3.63	.61	15
November	30.121	30.087	30.106	30.105	30.642	29.546	37.3	43.6	38.8	39.9	70	17	79.0	66.5	77.5	74.4	8.0	7.0	7.0	7.3	1.96	.67	12
December	30.117	30.091	30.129	30.112	30.590	29.472	34.6	38.9	34.9	36.1	58	16	83.5	70.5	83.3	79.1	8.0	7.0	7.0	7.3	4.11	.86	23
Year 1881	30.033	29.996	30.012	30.014	.....	.....	45.1	53.6	47.2	48.6	.....	.....	79.5	61.7	75.3	72.2	6.5	5.7	5.1	5.8	38.24	.....	.....
1882.																							
January	30.109	30.099	30.104	30.104	30.829	29.460	23.3	27.4	25.2	25.3	53	−7	82.3	75.5	84.0	80.6	9.0	8.3	7.0	8.1	2.04	.50	26
February	30.104	30.085	30.086	30.092	30.806	29.411	29.2	36.5	32.1	32.6	57	10	80.9	68.8	82.6	77.4	6.8	6.8	6.5	6.7	1.25	.49	21
March	30.082	30.047	30.071	30.067	30.721	29.372	30.8	37.1	33.0	33.6	64	16	84.4	69.2	81.7	78.4	7.3	7.3	6.6	7.1	1.74	.53	9
April	30.026	29.997	30.029	30.017	30.459	29.278	38.4	45.8	39.7	41.3	73	19	74.6	60.6	73.8	69.7	5.8	5.9	5.4	5.7	2.18	.51	28
May	30.020	29.982	29.976	29.993	30.373	29.489	46.4	55.0	49.0	50.1	73	29	70.6	54.8	72.3	65.9	5.4	6.0	5.3	5.6	5.57	1.10	11, 12
June	29.879	29.852	29.861	29.864	30.204	29.521	60.2	68.2	61.5	63.3	85	44	76.1	59.4	70.9	68.8	6.2	5.7	4.3	5.4	2.51	.88	19

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.58 a. m., 2.58 p. m., and 10.58 p. m., local time.

E. W. McGANN,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

ROCHESTER, N. Y.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	5,136	NW.	28	18	5	10	4	2	0	0	51	20	1	11	18	2	12	0	2	0	0	0	
August	5,137	W.	28	4	3	18	4	7	1	1	43	16	0	17	11	3	5	0	3	0	0	0	
September	5,967	S.	35	16	8	8	6	6	10	27	17	8	0	12	13	5	10	0	1	2	0	0	
October	7,004	SW.	34	12	8	3	4	11	7	25	11	22	2	5	12	14	16	0	1	0	0	1	First light frost 11th; first killing frost 26th.
November	10,338	SW.	38	18	2	5	1	11	7	29	28	5	2	3	9	18	6	10	0	0	1	13	
December	9,126	NW.	43	7	5	4	4	5	8	34	17	12	4	3	9	19	13	6	0	2	4	16	
Year 1881	74,964	.....	....	.....	50	99	59	113	54	163	379	162	16	97	119	149	102	70	11	8	50	119	
1882.																							
January	10,793	W.	56	27	0	1	2	15	12	15	26	18	4	1	10	20	9	14	0	3	11	28	
February	6,017	S.	56	28	2	2	4	8	9	20	23	10	6	4	11	13	7	9	0	1	7	21	
March	9,938	W.	53	21	2	3	6	14	11	6	16	28	7	3	10	18	10	9	1	2	4	24	
April	9,106	SW.	42	2	8	14	6	6	6	9	24	13	4	8	8	14	8	3	4	1	2	12	
May	8,043	W.	34	30	11	13	15	6	1	13	19	9	6	9	10	12	15	0	1	0	0	2	
June	7,703	W.	36	7	3	8	5	6	6	18	29	9	6	6	16	8	11	0	3	1	0	0	Faint aurora on the 15th.

Location of office on June 30, 1882, No. 222 Powers' block, corner Main and State streets.

E. W. McGANN,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

ROSEBURG, OREG.

[Latitude, 43° 13′; longitude west of Greenwich, 123° 20′. Elevation of barometer above sea-level, 511 feet. Elevation of rain-gauge (top) above ground, 33 feet. Elevation of exposed thermometer above ground, 20 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.086	30.076	30.066	30.078	30.338	29.847	52.7	70.1	65.2	62.7	90.7	41.5	83.5	52.5	58.2	64.7	5.4	3.9	3.2	4.2	0.79	.50	2,3
August	30.051	30.013	30.025	30.036	30.171	29.868	51.7	70.4	65.3	62.5	87.6	43.0	83.6	49.9	57.6	63.7	3.9	2.9	2.2	3.0	0.46	.26	26
September	30.073	30.065	30.050	30.063	30.268	29.795	49.9	66.3	60.3	58.8	89.0	34.6	87.7	54.0	65.0	68.9	4.7	4.3	3.4	4.1	0.72	.35	2
October	30.072	30.083	30.082	30.079	30.441	29.654	42.2	53.1	47.9	47.7	62.8	22.5	90.3	68.5	81.5	80.1	8.0	7.2	5.2	6.8	5.96	1.17	30,31
November	30.272	30.272	30.259	30.268	30.618	29.621	40.2	45.4	42.2	42.6	57.8	30.1	88.3	77.8	85.5	83.9	9.8	7.6	6.0	7.8	4.15	1.17	15,16
December	30.152	30.156	30.151	30.153	30.480	29.596	39.5	45.3	42.7	42.5	62.8	27.2	89.2	77.6	85.1	84.0	7.6	7.2	6.9	7.2	5.14	1.15	26
Year 1881	30.105	30.093	30.088	30.095	.....	.....	45.5	57.6	53.3	52.2	.....	.....	87.4	64.3	72.3	74.7	6.2	5.5	4.7	5.5	43.68	.....	.....
1882.																							
January	30.176	30.181	30.174	30.177	30.557	29.752	36.6	40.5	38.6	38.6	53.1	26.2	88.0	82.8	85.0	85.3	8.2	7.1	7.2	7.5	4.21	.75	31—1
February	30.136	30.141	30.126	30.135	30.547	29.625	35.4	42.1	39.8	39.1	57.9	15.7	87.4	75.4	81.0	81.3	7.6	6.9	7.2	7.2	6.21	1.38	8,9
March	30.138	30.115	30.125	30.136	30.542	29.593	37.9	48.2	45.6	43.9	75.0	27.0	85.8	65.1	72.3	74.4	6.3	6.2	5.5	6.0	2.83	.92	17,18
April	30.075	30.075	30.065	30.072	30.375	29.710	41.6	53.9	50.3	48.6	80.4	31.0	85.7	58.9	67.3	70.6	6.6	7.3	6.1	6.7	5.14	1.07	5
May	30.065	30.053	30.049	30.056	30.348	29.769	44.7	64.0	57.7	55.5	86.5	34.0	82.8	44.6	56.2	61.2	5.6	5.4	4.7	5.2	.85	.27	3
June	30.030	30.006	29.989	30.008	30.169	29.717	53.0	70.2	65.9	63.0	94.6	43.6	80.9	48.5	57.0	62.1	5.6	4.6	4.4	4.9	.61	.45	5,6

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 3.55 a. m., 11.55 a. m., and 7.55 p. m., local time.

J. J. NANRY,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

ROSEBURG, OREG.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurorus.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	2,688	NW.	16	5	22	8	2	1	0	6	4	31	18	11	14	6	8	0	1	0	0	0	
August	2,435	N. W.	14	(10) (13)	15	7	5	0	2	2	5	32	25	16	11	4	5	0	0	0	0	0	
September	2,246	SW.	16	23	9	4	7	0	4	8	7	21	30	12	10	8	4	0	0	0	0	0	First light frost September 30.
October	1,915	W.	18	10	4	6	8	7	6	10	7	6	39	2	17	12	18	0	0	0	0	2	First heavy frost October 13.
November	1,742	SW.	24	14	5	9	11	4	4	21	5	11	20	0	11	19	11	0	0	0	0	3	
December	1,723	S.	23	10	5	3	16	9	14	13	2	9	22	1	15	15	17	1	0	0	0	6	
Year 1881	26,626	....	....	....	132	58	87	43	70	121	72	203	305	80	142	143	139	2	2	0	0	15	
1882.																							
January	1,762	S.	16	26	3	5	16	7	6	17	6	7	26	1	11	18	14	4	0	0	0	13	One foggy day.
February	2,044	S.	25	26	3	6	5	3	14	9	1	16	27	3	8	17	12	3	0	0	1	11	
March	2,279	S.	27	17	8	3	15	0	7	9	9	24	18	8	9	14	10	6	0	0	0	10	
April	2,756	SW.	22	19	2	4	4	4	14	20	4	18	20	4	10	16	16	1	0	0	0	1	
May	2,540	NW.	19	10	14	5	9	1	9	6	6	25	17	9	9	13	11	0	0	0	0	0	Light frost May 17th and 19th.
June	2,591	N.	16	17	27	8	1	0	0	1	8	21	24	9	14	7	7	0	1	0	0	0	

Location of office June 30, 1882, Jackson street, between Oak and Washington.

J. J. NANRY,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

SACRAMENTO, CAL.

[Latitude, 38° 35′; longitude west of Greenwich, 121° 31′. Elevation of barometer above sea-level, 65 feet. Elevation of rain-gauge (top) above ground, 58 feet. Elevation of exposed thermometer above ground, 37 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.917	29.941	29.881	29.913	30.139	29.719	60.2	80.5	72.7	71.1	98.6	51.9	67.0	38.3	48.3	51.2	0.4	0.3	0.4	0.4	*	*	8
August	29.886	29.911	29.861	29.886	30.140	29.721	57.4	78.0	69.2	68.2	94.6	51.0	74.8	42.0	54.0	56.9	0.0	0.3	0.0	0.1	.00	.00	....
September	29.901	29.916	29.856	29.895	30.159	29.611	57.6	77.0	68.7	67.8	96.1	50.0	69.0	35.8	53.6	52.8	0.9	0.7	0.5	0.7	.30	.30	22
October	30.028	†30.047	30.019	†30.031	30 302	29.789	48.9	†64.7	56.9	†56.8	81.0	36.4	75.9	†45.8	65.4	†62.4	1.9	†2.4	1.3	1.9	.55	.25	28
November	30.170	30.172	30.146	30.163	30.437	29.919	43.4	57.1	52.0	50.8	71.0	32.0	73.8	51.1	60.6	61.8	0.7	2.0	1.9	1.5	1.88	1.10	15
December	30.194	30.202	30.194	30.197	30.411	29.885	42.7	49.2	46.5	46.2	62.0	31.9	90.2	78.5	87.7	85.5	4.0	5.3	3.3	4.2	3.27	1.41	4
Year 1881	30.028	30.048	30.011	30.029	.....	.....	51.8	65.8	60.1	59.2	.....	.....	79.8	54.2	66.4	66.7	1.3	1.6	1.1	1.3	20.71	.....	.....
1882.																							
January	30.140	30.148	30.128	30.139	30.418	29.747	40.2	49.1	46.1	45.1	62.0	29.0	79.4	60.4	69.2	69.7	3.2	3.6	2.9	3.2	1.89	.57	26
February	30.162	30.188	30.159	30.170	30.517	29.754	40.7	50.7	47.4	46.3	62.8	30.9	83.6	66.2	72.4	74.1	4.4	5.1	3.3	4.3	2.40	.65	26
March	30.098	30.124	30.085	30.102	30.382	29.709	46.8	58.2	54.0	53.0	80.0	34.1	77.9	49.2	65.4	64.2	4.3	4.0	3.4	3.9	3.78	1.30	15
April	30.050	30.072	30.033	30.052	30.287	29.800	49.2	61.2	57.1	55.8	82.2	40.5	79.6	50.0	62.9	64.2	2.4	3.4	3.0	2.9	1.99	.60	3
May	29.954	29.980	29.936	29.957	30.190	29.746	54.8	71.4	65.9	64.0	94.6	40.0	73.8	40.2	57.5	57.2	1.5	2.0	1.5	1.7	.35	.35	24
June	29.884	29.904	‡29.860	‡29.883	30.077	29.717	57.9	77.6	‡68.8	‡68.1	94.6	51.2	76.7	43.2	‡58.1	‡59.3	1.4	1.2	‡2.2	‡1.6	.10	.10	9

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.02 a. m., 12.02 p. m., and 8.02 p. m., local time.

* Too small to measure. † Mean for 30 days. ‡ Mean for 29 days.

JAMES A. BARWICK,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

SACRAMENTO, CAL.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurora.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	5,579	NW.	20	3, 7	7	0	0	19	35	18	5	7	2	31	0	0	0	0	0	0	0	0	First light frost October 14; first killing frost November 18.
August	5,189	SW.	19	24	8	1	0	22	41	15	1	4	1	31	0	0	0	0	0	0	0	0	
September	4,694	NW.	22	5	17	1	0	17	18	18	2	13	4	26	4	0	1	0	0	0	0	0	
October	4,538	SW. N.	19	10, 31	21	2	2	17	21	14	3	10	2	22	8	1	6	0	0	0	0	0	
November	3,761	N.	24	10	43	7	0	12	7	3	3	5	10	25	3	2	4	0	0	0	0	0	
December	3,717	SE.	24	26	25	6	1	25	10	2	5	3	16	18	6	7	11	0	0	0	0	0	
Year 1881	57,846				217	24	12	232	280	176	30	72	51	251	69	45	58	0	3	0	0	0	
1882.																							
January	5,718	N.	32	13	35	3	6	26	10	4	1	7	1	17	9	5	8	0	0	0	0	2	
February	5,176	N. SE.	27	6, 12	26	0	1	24	15	12	1	2	3	11	11	6	6	0	0	0	0	2	Aurora on April 16th and 17th.
March	6,396	SE. N.	28	10, 13, 25	29	0	1	20	14	16	1	7	5	16	6	9	10	0	0	0	0	0	Last frost May 16.
April	5,785	N.	35	16	26	0	0	13	24	14	2	6		16	9	5	8	0	0	2	0	0	
May	5,593	NW.	25	7	16	0	0	19	18	25	4	8	3	25	4	2	1	0	0	0	0	0	
June	5,529	S.	23	18	1	1	0	14	50	15	2	5	2	24	4	1	1	0	0	0	0	0	

Location of office on June 30, 1882, Arcade Building, 1009 Second street.

JAMES A. BARWICK,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

SAINT LOUIS MO.

[Latitude, 38° 37′; Longitude west of Greenwich, 90° 12′. Elevation of barometer above sea-level, 568 feet. Elevation of rain-gauge (top) above ground, 100 feet. Elevation of exposed thermometer above ground, 104 feet.]

	Barometer (to sea).						Temperature.							Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.			Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.		7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°												
July	30.048	30.012	30.013	30.024	30.226	29.740	73.7	89.4	79.9	81.0	104.0	61.6		74.5	42.0	66.5	61.0	3.4	5.1	1.2	3.2	2.13	1.55	13, 14
August	30.029	29.980	29.999	30.000	30.206	29.793	73.8	92.5	81.1	82.5	106.4	63.0		67.9	37.4	53.8	53.0	3.8	4.8	1.3	3.3	.31	.10	31
September	30.024	29.970	29.998	29.997	30.259	29.679	67.3	84.3	74.4	75.3	101.5	49.0		78.2	45.8	62.4	62.2	3.9	5.4	3.2	4.2	3.14	1.42	30
October	30.151	30.114	30.137	30.134	30.445	29.622	56.4	67.1	59.4	61.0	85.2	42.8		87.2	68.0	82.6	79.3	6.1	6.7	3.9	5.6	7.21	2.18	1
November	30.201	30.146	30.205	30.184	30.689	29.766	39.0	49.7	42.4	43.7	71.5	15.0		78.4	61.8	70.3	70.1	4.6	6.2	3.8	4.9	6.74	2.99	17, 18
December	30.211	30.178	30.208	30.199	30.645	29.733	37.0	45.6	39.8	40.8	63.5	14.8		82.6	67.6	76.6	75.6	5.6	6.7	4.5	5.6	1.40	.72	13
Year 1881	30.080	30.029	30.054	30.054	.....	.....	50.2	62.4	55.1	55.9	....	.....		79.7	57.0	72.1	69.6	5.6	6.3	3.6	5.2	37.37	.....	.....
1882.																								
January	30.215	30.183	30.217	30.205	30.791	29.712	29.2	35.4	31.7	32.1	69.0	6.2		83.4	71.3	82.8	79.1	6.5	7.5	5.1	6.4	2.80	.79	12, 13
February	30.123	30.090	30 120	30.111	30.561	29.398	38.9	49.0	43.9	43.9	73.2	19.2		80.6	65.0	76.2	73.9	5.8	6.0	5.0	5.6	8 94	4.44	19, 20
March	30.122	30.067	30.103	30 097	30.588	29.510	41.2	53.7	46.4	47.1	79.3	25.0		77.8	58.2	71.4	69.1	5.1	5.6	3.9	4.9	3.49	1.24	8, 9
April	30.038	29.992	29.999	30.010	30.310	29 436	51.4	65.0	56.3	57.6	87.2	28.7		81.2	55.0	72.0	69.4	6.3	5.6	3.7	5.2	3.58	1.77	22
May	29.968	29.960	29.965	29.971	30.369	29.555	53.5	66.2	58.8	59.5	89.0	42.0		92.3	71.1	87.2	83.5	6.5	6.9	6.7	6.7	4.55	.80	20
June	29.957	29.924	29.928	29.936	30.249	29.576	66.8	81.1	72.2	73.4	97.0	48.3		92.3	67.2	86.6	82.0	6.0	6.3	4.6	5.6	4.53	2.44	17

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.07 a. m., 2.07 p. m., and 10.07 p. m., local time.

J. H. WEBER,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B]

SAINT LOUIS, MO.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—								Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	6,090	W.	28	11	28	14	5	7	30	2	5	2	0	13	15	3	5	0	7	0	0	0	
August	5,657	SE.	34	29	16	19	15	24	13	2	2	2	0	17	11	3	4	0	4	0	0	0	12th. Highest temperature on our records.
September	6,967	S.	32	29	4	4	0	11	51	2	4	13	1	10	14	6	6	0	5	0	0	0	5th. Highest September temperature on our records.
October	7,444	S.	28	27	13	6	9	12	30	4	7	11	1	7	17	7	12	0	3	0	0	0	20th. Heavy frost in suburbs—first of season.
November	8,618	S. NW.	30	17 23	10	3	5	8	32	5	10	17	0	8	16	6	8	1	1	0	1	8	3d. Heavy frost—first observed at station; 15th, first ice; 19th, first snow.
December	7,618	NW.	32	30	12	2	6	12	30	3	8	19	1	4	19	8	6	2	1	0	1	9	
Year 1881	88,108	.....	...	.....	165	104	104	154	279	44	89	148	8	95	169	101	88	20	58	0	28	89	
1882.																							
January	7,680	W.	44	26	6	2	14	11	22	7	6	25	0	3	19	9	9	3	0	0	7	23	Enormous rainfall (6.71 in.) from morning of 19th to 8.45 p. m., of 20th. Unusual rise in river (16′ 8″) during 48 hours ending 1.07 p. m. 21st.
February	7,803	W.	44	21	11	3	4	12	29	2	9	12	2	6	13	9	11	0	2	0	0	7	
March	8,950	W.	42	21	17	6	6	12	21	3	6	22	0	11	10	10	8	0	6	0	0	6	30th. Polar bands.
April	7,817	NW.	40	22	12	9	10	15	19	5	7	11	2	8	14	8	9	0	4	2	0	2	Last frost 11th; last snow 12th; auroral display 16th and 20th.
May	7,924	S.	36	9	16	8	7	11	27	2	8	14	0	6	9	16	14	0	6	0	0	0	5th. Destructive hailstorm.
June	7,207	W.	61	17	6	6	5	9	29	13	13	9	0	6	15	9	11	0	12	0	0	0	16th and 17th, destructive wind storm.

Location of office, June 30, 1882, Equitable building, corner Sixth and Locust streets.

J. H. WEBER,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

SAINT PAUL, MINN.

[Latitude, 44° 58′; longitude west of Greenwich, 93° 5′. Elevation of barometer above sea-level, 811 feet. Elevation of rain-gauge (top) above ground, 58 feet. Elevation of exposed thermometer above ground, 32 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.989	29.971	29.960	29.973	30.194	29.634	66.1	80.1	71.5	72.6	91.0	55.0	83.7	57.8	76.2	76.6	4.1	4.0	1.1	3.1	2.60	.51	24
August	29.973	29.937	29.943	29.953	30.184	29.561	66.6	80.2	71.8	72.9	96.2	52.4	88.2	76.2	83.7	82.7	6.6	6.1	3.1	5.3	4.55	1.23	17
September	29.882	29.866	29.878	29.875	30.292	29.343	54.4	65.3	58.1	59.3	91.0	40.0	88.6	77.5	83.7	83.3	6.6	6.5	5.1	6.1	9.95	2.68	29
October	30.095	30.070	30.078	30.081	30.521	29.416	44.3	52.9	47.9	48.4	71.6	30.0	87.8	65.5	76.6	76.6	6.4	6.7	6.1	6.4	4.44	1.36	11
November	30.048	30.033	30.058	30.047	30.703	29.394	27.7	34.0	29.7	30.5	57.2	2.0	77.9	67.5	76.0	73.8	7.5	7.3	3.1	6.0	1.96	.55	7
December	30.093	30.077	30.113	30.094	30.466	29.534	25.0	34.9	28.0	29.3	52.5	Zero.	82.4	63.4	77.9	74.6	3.1	4.2	3.3	3.5	.53	.13	12
Year 1881	30.013	29.980	29.996	29.996	.....	.....	39.9	51.2	44.4	45.2	.....	.....	81.2	62.5	76.7	73.4	5.2	5.3	3.8	4.8	39.16	.....	.....
1882.																							
January	30.133	30.087	30.113	30.111	30.851	29.555	13.8	23.8	19.7	19.1	42	—11	79.3	60.8	76.7	72.3	4.7	5.0	5.1	5.0	.67	.27	26
February	30.009	29.986	30.016	30.004	30.639	29.553	23.8	35.3	28.4	29.2	57	— 5	80.2	56.0	77.0	71.1	4.8	5.5	3.3	4.5	2.35	1.42	20, 21
March	30.038	30.040	30.053	30.044	30.693	29.419	27.5	35.0	31.5	31.3	88	2	83.0	62.1	79.8	75.0	6.1	6.6	6.5	6.4	3.25	.70	20
April	30.042	30.000	30.015	30.019	30.328	29.468	38.6	52.5	45.6	45.6	52	24	75.9	54.0	68.6	66.2	4.1	5.1	3.3	4.2	1.61	.45	18, 19
May	29.965	29.928	29.945	29.946	30.276	29.508	47.7	61.2	53.1	54.0	77	32	68.2	46.0	63.1	59.1	5.8	6.6	5.0	5.8	2.44	.54	10, 11
June	29.866	29.846	29.856	29.856	30.126	29.241	60.0	73.0	65.4	66.1	88	43	77.2	48.9	69.2	65.1	5.2	5.9	4.8	5.3	2.68	.89	24

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.56 a. m., 1.56 p. m., and 9.56 p. m., local time.

P. F. LYONS,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

SAINT PAUL, MINN.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	5,079	S.	48	11	6	5	12	15	16	6	12	12	12	19	5	7	11	0	2	2	0	0	
August	6,836	N.	36	4	8	3	14	30	11	5	5	12	3	8	17	6	11	0	6	0	0	0	
September	7,416	S.	33	4	14	5	12	18	6	16	6	13	1	5	14	11	17	0	2	1	0	0	First light frost September 28.
October	6,673	SE.	36	31	15	4	6	25	6	10	5	20	2	6	9	16	13	0	1	0	0	2	First killing frost October 5.
November	7,604	SE.	30	16	2	3	4	18	8	5	23	25	2	2	20	8	2	6	0	1	5	22	
December	6,625	W.	46	6	9	3	4	21	11	18	9	18	0	12	15	4	1	18	0	0	3	27	
Year 1881	77,773	.....	.....	.....	110	48	120	226	90	101	95	229	76	95	158	112	96	45	21	6	61	148	
1882.																							
January	6,455	S.	28	17	2	1	4	29	11	12	15	15	4	9	15	7	2	8	0	1	17	31	
February	6,071	SE.	32	10	4	3	4	25	6	13	21	7	1	8	13	7	1	5	0	1	6	21	
March	7,559	E.	40	4	6	9	10	17	3	11	13	19	5	4	16	11	4	9	1	0	5	25	
April	6,131	SE.	40	3	15	11	16	13	3	5	5	14	8	11	13	6	11	0	1	3	0	4	
May	8,221	W.	28	1	23	9	12	10	9	11	7	9	3	8	13	10	11	0	2	0	0	0	May 23, last killing frost.
June	6,280	E.	31	24	8	5	7	21	4	13	8	22	2	6	15	9	10	0	5	3	0	0	

Location of office on June 30, 1882, Ingersoll Block, corner of Third and Wabasha streets.

P. F. LYONS,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

SAINT VINCENT, MINN.

[Latitude, 48° 56′; longitude west of Greenwich, 97° 14′. Elevation of barometer above sea-level, 804 feet. Elevation of rain-gauge (top) above ground, 14 feet. Elevation of exposed thermometer above ground, 9 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.938	29.909	29.895	29.914	30.222	29.437	60.7	78.1	67.1	68.6	92.5	40.0	84.3	55.4	78.8	72.8	3.5	4.9	3.7	4.0	.48	.15	1
August	29.916	29.900	29.907	29.907	30.294	29.477	58.1	74.7	65.0	65.9	88.0	36.0	87.8	62.3	81.8	77.3	5.3	4.6	5.2	5.0	1.96	1.31	22
September	29.902	29.876	29.892	29.890	30.290	29.288	44.0	58.7	49.5	50.7	78.0	23.5	90.1	62.1	84.2	78.8	6.4	7.5	5.4	6.4	1.99	.52	16
October	30.119	30.105	30.103	30.109	30.635	29.485	30.3	44.4	35.5	36.7	63.0	18.0	91.8	56.5	80.8	76.8	5.1	6.7	5.9	5.9	1.30	.81	29
November	30.060	30.059	30.079	30.066	30.724	29.439	14.3	20.2	15.1	16.5	47.0	−18.0	95.2	77.0	89.9	87.4	6.2	6.4	6.2	6.3	.48	.06	26
December	30.022	30.033	30.044	30.033	30.659	29.428	9.9	18.9	13.0	13.9	40.0	−20.0	94.4	78.0	88.9	87.1	4.0	3.9	3.6	3.8	.25	.10	29
Year 1881	30.005	29.981	29.993	29.993	.....	.....	29.5	42.7	34.3	35.5	.....	.....	89.9	68.1	84.8	80.9	5.1	5.0	5.2	5.1	15.51	.....	.....
1882.																							
January	30.120	30.085	30.105	30.103	30.991	29.438	−4.4	4.9	−1.1	−0.2	32	−42	98.2	89.3	96.8	95.1	5.4	5.4	4.8	5.2	.74	.15	12, 13
February	30.037	30.026	30.036	30.033	31.002	29.419	1.6	12.7	6.7	7.0	42	−35	95.0	78.0	89.7	87.6	5.7	4.3	4.6	4.9	.83	.25	18
March	30.098	30.106	30.110	30.105	30.757	29.240	6.2	17.5	12.7	12.1	39	−25	94.7	82.9	93.1	90.2	6.3	6.2	5.8	6.1	1.06	.31	5
April	30.111	30.099	30.122	30.111	30.510	29.615	27.0	39.4	32.9	33.1	55	− 8	81.6	70.4	80.6	77.5	4.1	4.6	3.8	4.2	.90	.50	8, 9
May	29.989	29.959	29.960	29.969	30.330	29.601	41.7	55.8	47.5	48.3	76	21	78.9	56.0	73.6	69.5	4.4	4.8	3.2	4.1	2.94	.71	19
June	29.889	29.862	29.871	29.874	30.146	29.564	52.2	68.4	56.9	59.2	83	36	82.4	49.6	74.4	68.8	4.1	5.3	3.0	4.1	3.35	1.46	29

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.40 a. m., 1.40, p. m., and 9.40 p. m., local time.

GEO. KINGSBURY,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

SAINT VINCENT, MINN.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	7,025	S.	36	31	8	2	3	17	20	8	2	30	3	11	17	3	7	0	11	1	0	0	
August	6,547	NW. SE. SW.	28	12 22 25	7	4	1	22	12	11	7	26	3	8	16	7	6	0	3	6	0	0	First frost 6th.
September	5,841	NW.	34	14	6	6	4	15	8	12	9	30	0	3	17	10	13	0	3	5	0	3	
October	6,696	N.	31	29	13	6	4	9	17	8	4	28	3	8	9	14	3	8	0	3	0	25	
November	8,722	NW.	44	14	15	1	1	14	16	2	4	35	2	5	13	12	0	17	0	2	18	29	
December	8,405	N.	36	29	16	0	0	8	35	9	3	21	1	9	17	5	0	6	0	5	19	31	
Year 1881	84,819	.....	...	.....	114	50	39	164	216	93	55	335	28	85	193	87	57	46	35	50	118	199	
1882.																							
January	7,612	N.	42	17	23	0	0	14	28	8	3	16	1	9	14	8	0	14	0	3	30	31	
February	8,335	NW.	39	12	19	4	0	11	23	6	2	18	1	7	12	9	0	12	0	4	22	28	
March	10,009	NW.	43	18	13	6	6	19	15	4	5	24	1	3	17	11	3	12	1	3	22	31	
April	8,244	NW.	46	3	24	12	13	9	9	3	3	17	0	14	11	5	5	1	0	10	2	20	
May	7,975	NW.	36	21	10	14	14	14	18	1	3	18	1	14	11	6	9	1	0	2	0	4	Last frost 20th.
June	6,323	S. W.	28	13 24	19	6	8	10	14	6	12	15	0	13	13	4	9	0	3	2	0	0	

Location of office on June 30, 1882, southwest end of village.

GEO. KINGSBURY,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

SALT LAKE CITY, UTAH.

[Latitude, 40° 46′; longitude west of Greenwich, 111° 54′. Elevation of barometer above sea-level, 4,348 feet. Elevation of rain-gauge (top) above ground, 78 feet. Elevation of exposed thermometer above ground, 52 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, Amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.850	29.846	29.807	29.834	30.071	29.526	67.0	83.3	74.4	74.9	96.0	46	38.6	23.0	31.3	31.0	3.0	4.0	4.0	3.7	.21	.12	16
August	29.846	29.853	29.810	29.836	29.999	29.630	65.9	81.0	72.3	73.1	100.0	48	39.3	28.0	32.1	33.1	3.0	3.0	2.0	2.7	1.61	.62	10
September	29.931	29.931	29.902	29.921	30.227	29.651	51.7	68.7	59.0	59.8	87.0	36	35.5	21.7	28.0	28.4	2.0	3.0	1.0	2.0	.43	.31	23
October	30.072	30.056	30.059	30.062	30.340	29.782	44.3	57.4	48.8	50.2	82.0	25	44.7	29.7	40.1	38.2	4.0	4.0	4.0	4.0	2.19	.83	28
November	30.294	30.292	30.298	30.295	30.615	29.836	29.5	38.5	32.5	33.5	56.0	13	50.8	42.7	48.2	47.2	3.0	5.0	4.0	4.0	1.44	.43	29
December	30.354	30.364	30.358	30.359	30.711	29.970	30.6	37.6	33.0	33.8	49.0	17	54.8	47.7	54.8	52.4	5.0	7.0	5.0	5.7	1.24	.43	2
Year 1881	29.992	29.994	29.979	29.988	....	.....	45.7	58.5	51.2	51.8	.....	.....	46.7	33.0	40.5	40.0	4.0	4.9	3.5	4.1	16.88	.....	...
1882.																							
January	30.213	30.192	30.221	30.209	30.530	29.731	20.6	28.6	23.4	24.2	47.0	Zero.	57.4	47.6	55.2	53.4	4.0	6.7	5.5	5.4	1.50	.46	3
February	30.224	30.233	30.235	30.231	30.634	29.733	22.9	33.1	26.8	27.6	49.5	4	55.0	41.2	53.0	49.7	4.5	6.3	4.5	5.1	.42	.12	27
March	30.181	30.199	30.189	30.190	30.640	29.751	31.8	42.2	36.5	36.8	68.0	11	56.6	44.7	48.7	50.0	4.5	5.1	4.0	4.5	1.12	.26	25
April	29.917	29.931	29.923	29.924	30.242	29.550	40.1	51.8	46.2	46.0	73.0	26	60.6	45.3	53.7	53.2	6.4	6.1	5.8	6.1	3.81	1.40	6
May	29.882	29.878	29.866	29.875	30.121	29.654	49.2	64.1	56.9	56.7	83.3	38	46.5	30.4	36.2	37.7	4.1	5.2	4.1	4.5	.26	.12	5
June	29.789	29.788	29.756	29.778	29.935	29.525	58.1	75.8	67.0	67.0	91.0	46	49.1	28.9	39.3	39.1	4.6	6.0	4.5	5.0	2.24	.82	20

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.40 a. m., 12.40 p. m., and 8.40 p. m., local time.

JOHN CRAIG,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

SALT LAKE CITY, UTAH.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,394	SE. NW.	24	1, 26 7, 10	7	6	4	26	0	1	1	23	25	13	11	7	4	0	8	0	0	0	Solar halos 5th, 8th, and 13th.
August	4,199	SE. NW.	28	6, 26 7	7	4	6	27	3	3	0	17	26	17	9	5	7	0	6	0	0	0	
September	3,916	SE. NW.	24	23 17	2	3	1	22	1	0	3	29	29	19	9	2	3	0	1	0	0	0	Sleet 23d; mountain fires 3d and 4th.
October	4,001	SE.	34	13	2	5	1	27	2	2	2	14	38	13	12	6	5	0	1	0	0	2	First snow 15th; ice formed 15th.
November	2,205	W.	36	6	2	4	2	14	1	2	5	9	51	12	10	8	2	9	0	0	1	21	
December	1,473	NW.	32	11	3	0	1	12	2	1	6	11	57	6	14	11	4	5	0	0	2	24	
Year 1881	40,371				57	50	27	246	21	22	25	215	432	141	127	97	57	38	22	0	13	101	
1882.																							
January	2,100	SE.	28	27	2	0	2	24	1	3	2	16	43	9	11	11	2	9	0	0	17	28	
February	2,952	SE.	28	11	1	0	2	23	1	6	4	14	33	10	9	9	1	4	0	0	12	24	
March	3,810	SE.	36	16	4	3	5	17	3	4	5	22	30	12	11	8	2	6	0	0	3	19	
April	5,009	SE.	32	19	6	4	7	15	3	2	8	25	20	4	14	12	4	6	0	0	0	6	
May	5,569	NW.	27	19	7	9	6	12	3	2	4	32	18	11	15	5	4	0	3	0	0	0	
June	4,713	SE. NW.	32	13 19	14	7	9	20	4	4	1	14	17	8	15	7	6	0	3	0	0	0	

Location of office on June 30, 1882, Wasatch Hotel, corner of Main and South Second streets.

JOHN CRAIG,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[Form No. 132—A.]

SAN ANTONIO, TEX.

[Latitude, 29° 25′; longitude west of Greenwich, 98° 25′. Elevation of barometer above sea-level, 673 feet. Elevation of rain-gauge (top) above ground, 7 feet. Elevation of exposed thermometer above ground, 22 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.004	29.963	29.972	29.980	30.101	29.859	76.3	93.1	84.1	84.5	101	67.0	84.0	43.9	62.9	63.6	4.6	5.4	1.3	3.8	1.37	.54	3
August	29.973	29.923	29.948	29.948	30.097	29.812	75.5	94.0	82.3	83.9	102	69.0	87.7	43.2	67.9	66.3	4.7	5.4	0.9	3.7	.95	.53	9
September	29.985	29.937	29.983	29.968	30.209	29.735	71.4	88.9	76.5	78.9	98	53.5	88.5	48.3	76.0	70.9	4.9	5.3	3.0	4.4	5.86	3.09	11
October	30.083	30.038	30.084	30.068	30.260	29.697	67.8	79.4	70.8	72.7	90	46.0	90.8	62.9	83.2	79.0	7.0	6.9	4.6	6.2	4.19	1.38	18
November	30.159	30.121	30.171	30.150	30.569	29.767	51.4	65.3	56.4	57.7	84	28.0	82.5	60.1	77.3	73.3	5.5	5.2	4.4	5.0	2.07	1.10	5
December	30.188	30.161	30.195	30.181	30.569	29.839	50.0	63.4	55.2	56.2	78	32.0	82.5	58.7	72.4	71.2	5.7	6.0	5.2	5.7	1.51	.55	20
Year 1881	.....	.....	.....	.....	.....	.....	61.0	77.2	67.3	68.5	.....	.....	83.7	50.6	70.0	68.1	5.3	4.8	3.2	4.4	26.78	.....	.....
1882.																							
January	30.103	30.083	30.123	30.103	30.586	29.864	50.4	59.7	53.5	54.5	77	27	85.4	71.5	80.8	79.2	7.4	8.0	7.1	7.5	1.91	0.42	29
February	30.089	30.076	30.094	30.086	30.375	29.592	54.5	67.1	60.4	60.7	79	36	83.8	63.1	74.5	73.8	6.3	6.9	5.6	6.3	2.18	.73	3
March	30.090	30.059	30.091	30.080	30.608	29.724	58.0	71.4	63.7	64.4	88	33	82.8	61.4	76.6	73.6	7.1	6.8	4.8	6.7	4.24	1.75	7
April	29.952	29.936	29.957	29.948	30.259	29.553	63.5	79.0	68.6	70.4	93	41	85.2	52.0	76.5	71.2	7.1	6.2	4.9	6.1	.92	.89	1, 2
May	29.939	29.913	29.934	29.929	30.200	29.456	66.6	81.7	72.2	73.5	94	57	85.5	52.8	74.7	71.0	7.9	5.7	5.7	6.4	6.79	2.32	31
June	29.958	29.922	29.943	29.941	30.184	29.683	73.8	91.8	79.0	81.5	102	62	87.9	44.5	72.8	68.4	7.0	5.2	2.4	4.9	.11	.07	13

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.34 a. m., 1.34 p. m., and 9.34 p. m., local time.

EUGENE LAUE,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

SAN ANTONIO, TEX.

	Wind.			Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	2,850	N.	16	29	1	11	14	35	6	3	0	2	21	20	10	1	4	0	0	0	0	0	
August	3,318	NE.	20	7	3	6	18	40	5	2	1	0	18	5	26	0	3	0	0	0	0	0	
September	4,239	SE.	22	5	11	7	18	37	1	3	0	0	13	10	14	6	9	0	0	0	0	0	
October	3,520	NE.	15	24	5	19	25	17	5	1	1	6	14	3	15	13	18	0	0	0	0	0	
November	3,891	S. N. SE. N.	20	2 18 19 29	26	12	7	12	14	2	2	2	13	8	12	10	14	2	0	0	0	1	First light frost, 25th; first heavy frost, 26th.
December	3,600	N.	20	14 19	13	17	16	2	12	5	11	5	12	8	10	13	7	2	0	0	0	0	
Year 1881	41,221	.....	...	.....	136	120	126	315	85	36	25	52	200	114	165	86	95	4	0	0	0	20	
1882.																							
January	3,850	N.	22	16 17	16	22	7	10	8	7	1	6	16	4	7	20	17	1	0	0	0	2	
February	4,324	NW.	26	28	5	17	8	19	10	2	0	10	13	9	5	14	12	0	0	0	0	0	
March	4,283	N.	37	21	12	9	9	32	14	2	1	4	10	7	11	13	7	0	0	0	0	0	
April	4,136	NW.	20	12	12	3	14	28	8	2	2	5	16	5	13	12	3	0	0	0	0	0	
May	4,633	SE.	24	6	12	12	25	21	7	4	3	3	6	5	12	14	9	0	0	0	0	0	
June	4,549	E. SE.	16	13 25	5	14	14	36	9	1	0	0	11	4	22	4	2	0	0	0	0	0	

Location of office on June 30, 1882, corner Navarro and Commerce streets.

EUGENE LAUE,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[Form No. 132—A]

SAN DIEGO, CAL.

[Latitude, 32° 45′; longitude west of Greenwich, 117° 8′. Elevation of barometer above sea-level, 67 feet. Elevation of rain-gauge (top) above ground, 30 feet. Elevation of exposed thermometer above ground, 19 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.					Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.	Amount in inches.	Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.903	29.914	29.901	29.906	30.057	29.814	63.4	72.1	66.1	67.2	79.5	57.1	81.5	60.6	77.4	73.2	7.0	2.0	4.0	4.3	.00	.00	.....
August	29.863	29.874	29.865	29.867	30.001	29.731	64.6	72.9	67.0	68.2	81.5	56.0	80.2	61.7	77.0	73.0	8.0	2.0	2.0	4.0	.01	.01	6
September	29.839	29.836	29.838	29.838	29.983	29.712	62.1	72.3	65.8	66.7	85.5	52.0	81.4	59.0	77.3	72.6	5.0	2.0	4.0	3.7	.04	.04	23
October	29.941	29.941	29.939	29.941	30.082	29.845	57.3	67.1	60.2	61.5	72.5	46.0	76.4	59.3	73.5	69.8	6.0	2.0	3.0	3.7	.24	.21	26
November	30.011	29.999	30.011	30.007	30.151	29.854	49.2	66.2	55.0	56.8	75.6	38.0	56.1	37.7	55.5	49.8	1.0	1.0	1.0	1.0	.12	.07	17
December	30.069	30.070	30.079	30.073	30.213	29.933	49.0	62.7	53.4	55.0	76.8	38.7	69.0	55.5	74.0	65.5	3.0	4.0	3.0	3.3	.30	.19	16
Year 1881	29.971	29.978	29.978	29.976	.....	.....	55.6	66.5	59.2	60.4	.....	.....	76.3	57.5	74.2	69.3	5.9	2.7	3.8	4.2	5.00	.....	.....
1882.																							
January	30.031	30.032	30.038	30.034	30.274	29.478	45.0	56.5	49.8	50.4	64.0	34.2	74.5	60.5	75.4	70.2	4.3	4.5	3.7	4.2	4.53	2.94	12
February	30.129	30.154	30.153	30.149	30.354	29.897	45.8	57.4	50.8	51.2	70.0	37.4	78.3	55.2	75.7	69.7	3.5	4.4	3.2	3.7	2.55	.99	26
March	30.099	30.121	30.116	30.112	30.231	29.905	49.6	61.5	54.2	55.1	78.6	39.0	80.5	58.7	76.7	72.0	4.0	3.7	3.5	3.7	1.02	.55	13
April	30.029	30.059	30.049	30.046	30.172	29.890	50.8	62.8	56.1	56.6	70.0	43.3	85.6	59.7	77.0	74.1	3.6	3.2	3.3	3.4	.45	.13	3
May	29.956	29.985	29.978	29.973	30.133	29.752	57.4	67.6	60.8	61.9	73.2	48.4	80.2	58.4	75.2	71.3	4.9	3.3	4.4	4.2	.18	.17	23
June	29.949	29.975	29.960	29.961	30.059	29.856	60.8	69 3	62.8	64.3	75.3	55.2	79.1	59.4	74.6	71.0	9.0	3.4	5.5	6.0	.07	.06	10, 11

NOTE.—7 a. m., 3 p. m., and 11 p. m.. Washington time, correspond with 4.20 a. m., 12.20 p. m., and 8.20 p. m., local time.

ASA C. DOBBINS,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

SAN DIEGO, CAL.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	5,024	NW.	30	2	4	2	0	1	4	20	25	26	11	11	14	6	0	0	0	0	0	0	
August	4,355	NW.	18	4, 8, 19, 24	10	1	3	0	12	20	18	24	5	7	21	3	1	0	0	0	0	0	
September	4,082	NW.	28	7	7	2	3	0	10	12	24	26	6	10	16	4	1	0	0	0	0	0	
October	4,329	NW.	21	11	7	9	6	2	9	11	24	16	9	13	14	4	2	0	0	0	0	0	
November	4,132	NW.	24	9	17	15	12	3	1	10	18	10	4	21	7	2	2	0	0	0	0	0	First light frost, 18th. Thin ice formed in lowlands.
December	3,689	W.	19	22	18	23	3	0	1	5	19	22	2	17	11	3	2	0	0	0	0	0	
Year 1881	52,747	.....	...	.....	108	100	54	19	73	144	276	215	106	127	166	72	30	0	0	0	0	0	
1882.																							
January	4,900	NE.	36	13	21	17	10	5	5	7	15	13	0	13	11	7	9	0	0	0	0	0	
February	4,772	W.	26	1	10	19	1	0	12	12	15	14	1	11	12	5	7	0	0	0	0	0	Last light frost 20th.
March	4,992	SE.	24	12	13	11	6	2	13	9	11	26	2	16	9	6	8	0	0	0	0	0	
April	4,767	W.	23	6	8	10	5	0	2	16	35	14	0	16	8	6	7	0	0	0	0	0	
May	4,857	W.	18	3	3	4	5	3	4	25	29	18	2	12	14	5	2	0	0	0	0	0	
June	4,559	S.	18	9	3	6	1	1	8	16	37	17	1	1	21	8	3	0	0	0	0	0	

Location of office on June 30, 1882, corner Fifth and D streets.

ASA C. DOBBINS,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

SANDUSKY, OHIO.

[Latitude, 41° 27′; longitude west of Greenwich, 82° 40′. Elevation of barometer above sea-level, 639 feet. Elevation of rain-gauge (top) above ground, 64 feet. Elevation of exposed thermometer above ground, 53 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.					Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.	Amount in inches.	Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.995	29.982	29.983	29.986	30.250	29.706	71.8	79.5	74.3	75.2	95.0	61.0	74.7	58.2	70.4	67.8	4.3	4.0	2.5	3.6	3.88	.93	20, 21
August	30.048	30.025	30.023	30.032	30.263	29.729	70.5	78.7	73.5	74.2	98.0	59.0	72.5	56.5	67.2	65.4	3.4	2.8	2.5	2.9	.96	.62	18
September	30.054	30.011	30.018	30.027	30.280	29.675	68.5	77.8	71.2	72.5	95.8	53.0	77.8	59.4	72.5	69.9	4.4	5.0	3.6	4.3	3.78	1.70	16
October	30.144	30.121	30.127	30.131	30.485	29.685	55.6	60.9	56.7	57.7	81.5	40.0	80.4	69.1	76.8	75.4	6.6	7.5	6.1	6.7	5.58	1.44	2
November	30.149	30.119	30.130	30.133	30.669	29.618	40.1	45.8	41.3	42.4	66.8	17.0	78.9	62.4	74.6	72.0	7.5	7.0	6.9	7.1	4.99	2.25	18
December	30.152	30.139	0.156	30.149	30.603	29 643	36.9	40.1	37.9	38.3	60.0	19.0	79.7	72.4	78.5	76.9	7.6	7.2	6.8	7.2	6.27	1.60	13
Year 1881	30.055	30.027	30.039	30.040	.....	.....	48.5	54.7	50.6	51.3	.....	.....	78.0	63.8	73.9	71.9	5.7	5.7	4.9	5.4	46.31	.....	.....
1882.																							
January	30.166	30.147	30.155	30.156	30.748	29.595	27.7	31.6	29.8	29.7	58.0	7.0	82.7	73.6	77.8	78.0	8.1	7.3	7.0	7.5	2.46	.63	26
February	30.119	30.077	30.096	30.097	30.597	29.344	35.9	40.4	37.8	38.0	58.3	19.0	78.3	67.8	73.3	73.1	5.9	6.2	5.3	5.8	3.79	1.01	20
March	30.097	30.076	30.095	30.089	30.662	29.395	37.0	41.8	39.3	39.4	64.9	22.3	78.4	65.7	73.6	72.6	7.5	6.3	7.0	6.9	4.02	.66	21
April	30.058	30.035	30.058	30.050	30.333	29.271	44.0	48.7	45.2	46.0	74.7	23.3	71.7	59.7	68.3	66.6	5.9	5.8	4.3	5.3	2.75	.90	5
May	29.993	29.967	29.988	29.976	30.351	29.545	50.4	55.9	52.1	52.8	75.0	24.9	76.0	62.3	74.4	70.9	6.0	6.6	4.8	5.8	7.11	1.71	27
June	29.911	29.886	29.896	29.898	30.194	29.518	64.0	71.1	65.9	67.0	90.0	47.0	73.8	58.7	72.5	68.3	6.2	6.6	4.6	5.8	3.71	.82	10

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.37 a. m., 2.37 p. m., and 10.37 p. m., local time.

M. H. PERRY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

SANDUSKY, OHIO.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	7,784	NW.	56	12	16	11	9	8	2	19	14	13	1	13	13	5	9	0	4	1	0	0	First frost October 5th.
August	7,352	NE.	33	7	24	11	10	11	12	9	6	10	0	9	16	6	6	0	1	0	0	0	
September	8,072	NW.	44	10	6	6	5	12	14	30	9	8	0	10	15	5	16	0	4	1	0	0	
October	9,257	N. NW. SW.	36	5 10 15 25	7	5	4	16	29	10	4	18	0	5	10	16	20	0	1	0	0	0	
November	11,250	W.	56	14	5	4	4	8	19	29	17	4	0	1	15	14	13	6	0	0	1	9	
December	10,339	N.	49	23	6	3	4	1	33	21	12	13	0	4	9	18	15	3	0	0	1	12	
Year 1881	110,358	....	....	....	112	139	79	89	188	200	134	149	5	83	151	131	132	44	20	3	44	103	
1882.																							
January	10,821	NW.	51	22	4	2	10	8	16	21	21	11	0	2	12	17	8	7	0	0	10	26	
February	10,029	W.	43	21	8	8	4	4	20	19	15	11	0	10	6	12	8	4	0	0	2	16	
March	12,314	W.	44	21	10	7	10	11	7	15	12	21	0	5	12	14	11	6	3	0	0	14	
April	11,093	NE. W.	44	20 23	14	18	9	3	6	10	15	14	1	7	14	9	9	1	1	1	0	3	
May	10,631	N.	40	14	20	18	20	2	8	15	8	2	0	8	14	9	18	0	2	0	0	0	
June	9,342	NW.	46	25	6	10	20	4	9	23	12	6	0	2	21	7	14	0	8	0	0	0	Last frost May 23d.

Location of office on June 30, 1882, West House, corner Columbus avenue and Water street.

M. H. PERRY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

SANDY HOOK, N. J.

[Latitude, 40° 28′; longitude west of Greenwich, 74° 1′. Elevation of barometer above sea-level, 28 feet. Elevation of rain-gauge (top) above ground, 1 foot. Elevation of exposed thermometer above ground, 16 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.951	29.919	29.943	29.938	30.250	29.594	70.6	79.4	72.1	74.0	89.2	63.2	81.7	64.2	78.7	74.9	4.6	6.0	3.9	4.8	2.43	.61	13
August	30.044	29.989	30.022	30.018	30.338	29.619	70.6	81.2	72.9	74.9	96.2	60.9	80.0	60.5	75.8	72.1	3.6	4.0	3.3	3.6	0.63	.30	7
September	30.118	30.066	30.104	30.096	30.399	29.845	70.5	79.0	72.9	74.1	101.0	58.0	84.3	66.9	80.6	77.3	4.4	3.3	2.8	3.5	3.57	1.19	12
October	30.176	30.108	30.143	30.142	30.589	29.456	58.2	65.6	60.2	61.3	87.0	39.0	71.8	62.4	71.1	68.4	5.5	5.2	4.2	5.0	2.71	1.03	31
November	30.200	30.153	30.178	30.176	30.690	29.591	46.4	52.6	48.4	49.1	73.0	26.0	71.6	61.2	68.9	67.2	4.6	5.6	3.1	4.4	3.54	.94	23
December	30.168	30.116	30.168	30.151	30.649	29.367	39.3	45.1	41.2	41.9	68.5	23.0	81.4	71.7	78.2	77.1	6.1	6.2	4.5	5.6	5.00	1.03	29
Year 1881	30.056	30.008	30.040	30.035	.....	.....	50.1	58.0	51.9	53.3	.....	.....	79.0	66.7	76.5	74.1	5.1	5.1	4.1	4.8	46.74	.....	.....
1882.																							
January	30.181	30.128	30.160	30.156	30.861	29.246	30.1	34.7	30.9	31.9	50.0	Zero.	80.3	75.7	82.6	79.5	6.0	6.8	4.1	5.6	6.47	1.14	11
February	30.163	30.131	30.153	30.150	30.773	29.402	33.8	40.4	35.5	36.6	58.5	20.0	80.4	72.3	80.5	77.7	5.2	4.9	3.5	4.5	4.85	1.82	21
March	30.113	30.061	30.124	30.099	30.724	29.588	37.9	44.1	39.5	40.5	58.0	20.0	78.4	68.9	78.7	75.3	6.2	5.3	3.3	4.9	4.00	1.57	1
April	30.069	29.998	30.048	30.038	30.549	29.393	42.9	52.2	45.2	46.8	69.0	27.0	77.5	64.4	77.2	73.0	5.3	6.5	4.5	5.4	3.19	1.93	26, 27
May	30.045	30.007	30.028	30.027	30.476	29.464	51.4	59.2	52.2	54.3	79.0	38.0	79.7	64.8	80.3	74.9	5.5	6.0	4.6	5.4	7.21	3.04	12
June	29.928	29.886	29.922	29.912	30.272	29.513	65.3	74.4	66.3	68.7	91.0	50.5	78.8	64.5	77.7	73.7	4.1	5.3	2.6	4.0	2.60	1.13	19

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.12 a. m., 3.12 p. m., and 11.12 p. m., local time.

B. A. BLUNDON,
Corporal, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

SANDY HOOK, N. J.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	7,376	E.	47	4	7	6	10	20	8	9	16	17	0	9	17	5	10	0	3	0	0	0	
August	7,433	SW.	36	13	9	10	1	6	18	18	16	14	3	14	14	3	10	0	1	0	0	0	
September	8,201	SE.	40	15	7	8	3	28	10	16	8	8	2	14	10	6	10	0	2	0	0	0	
October	9,727	NW.	48	5	6	7	6	10	11	20	9	23	1	10	13	8	8	0	1	0	0	0	
November	11,143	NW.	46	15	5	8	10	4	7	16	18	32	0	10	8	12	12	0	0	0	0	4	
December	10,791	NE.	45	23	16	12	4	6	8	17	15	13	2	8	10	13	12	0	0	0	0	8	First killing frost, November 21st; first light frost, November 29th.
Year 1881	108,471	.....	.....	.....	98	114	75	142	95	147	164	235	25	111	150	104	133	14	12	0	25	80	
1882.																							
January	11,955	E.	54	31	18	10	5	7	3	4	16	28	2	11	8	12	14	3	0	0	6	19	
February	10,829	NE.	56	5	7	10	4	10	6	11	13	23	0	11	11	6	10	1	1	0	2	16	
March	12,741	NW.	44	3	11	10	4	9	11	6	9	32	1	8	17	6	10	2	0	0	0	10	
April	10,305	NW.	40	21	9	8	4	16	11	5	15	22	0	9	11	10	11	1	1	2	0	3	Aurora April 16th, 17th.
May	10,214	E.	47	12	4	17	16	10	15	9	11	11	0	8	13	10	15	0	2	0	0	0	
June	8,044	W. NW.	34	25 26	2	5	2	13	16	17	17	18	0	10	16	4	10	0	5	0	0	0	

Location of office on June 30, 1882, building of the A. and P. Telegraph Company.

B. A. BLUNDON,
Corporal, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

SAN FRANCISCO, CAL.

[Latitude, 37° 48′; longitude west of Greenwich, 122° 26′. Elevation of barometer above sea-level, 60 feet. Elevation of rain-gauge (top) above ground, 75 feet. Elevation of exposed thermometer above ground, 48 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.972	30.005	29.959	29.978	30.176	29.806	54.5	64.2	57.4	58.7	83	49.	86.7	68.9	80.1	76.7	5.0	1.3	4.2	3.5	.00	.00	.....
August	29.937	29.966	29.922	29.943	30.183	29.763	54.2	62.6	56.8	57.9	70	52.	87.5	67.6	81.3	78.8	4.8	1.8	3.1	3.2	.00	.00	.....
September	29.924	29.941	29.902	29.922	30.146	29.667	54.5	64.0	57.2	58.6	80	50.	87.2	63.1	81.1	77.4	3.1	1.5	2.9	2.5	0.25	.25	22
October	30.047	30.072	30.041	30.053	30.352	29.801	52.4	60.1	55.2	55.9	72	45.	85.2	60.1	75.7	73.7	3.6	2.6	1.9	2.7	0.54	.21	26
November	30.161	30.161	30.143	30.155	30.451	29.920	50.6	57.5	54.5	54.2	66	44.	75.5	51.8	64.5	63.9	1.6	2.7	1.7	2.0	1.94	1.34	15
December	30.183	30.191	30.185	30.186	30.367	29.908	48.7	52.1	50.8	50.5	63	43.	89.2	81.8	83.8	85.0	5.5	7.2	4.3	5.7	3.85	1.35	4, 5
Year 1881	30.049	30.070	30.044	30.054	.....	.....	52.5	59.7	55.2	55.8	.....	.....	84.3	65.5	77.8	75.8	4.6	3.8	3.3	3.9	23.73	.....	.....
1882.																							
January	30.148	30.156	30.139	30.148	30.389	29.782	45.9	51.2	49.2	48.8	60	39.5	74.0	60.9	67.8	67.6	3.8	4.4	3.1	3.8	1.68	.57	23, 24
February	30.163	30.191	30.164	30.173	30.513	29.797	45.2	50.3	48.6	48.0	61	38.0	77.9	61.1	69.1	69.4	4.4	4.8	3.3	4.2	2.96	.82	10
March	30.105	30.135	30.107	30.116	30.382	29.714	49.4	56.7	52.5	52.9	73	41.0	75.6	55.4	69.5	66.8	4.5	4.1	3.9	4.2	3.45	.86	9, 10
April	30.094	30.112	30.084	30.097	30.303	29.790	48.6	56.7	51.7	52.3	74	44.0	81.4	62.6	73.9	72.6	3.5	4.8	3.5	3.9	1.22	.44	9
May	30.004	30.039	30.006	30.016	30.229	29.816	52.4	61.2	55.0	56.2	74	45.0	81.2	59.5	76.0	72.2	3.9	3.2	3.4	3.5	.21	.15	2, 3
June	29.954	29.988	29.957	29.966	30.120	29.824	53.7	61.4	55.8	57.0	68	49.0	87.2	66.4	82.0	78.5	6.8	2.6	5.4	4.9	.04	.02	6, 18

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 3.58 a. m., 11.58 a. m., and 7.58 p. m., local time.

NELSON GOROM,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

SAN FRANCISCO, CAL.

	Wind.			Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.													.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	Rain.	Snow.					
1881.																					
July	9,384	W.	35	17	0	0	0	0	2	25	63	1	2	9	17	5	0	0	0	0	0	0	Two shocks of earthquake 9th; highest maximum temperature for July on record.
August	9,409	W.	34	18	0	1	0	0	1	34	57	0	0	15	9	7	0	0	0	0	0	0	
September	7,104	W.	32	5, 6, 8	1	0	0	1	3	27	50	1	7	18	7	5	1	0	0	0	0	0	Earthquake shock 18th; solar halos 27th, 28th.
October	6,249	NW.	31	13	3	0	4	3	7	22	34	12	8	17	11	3	5	0	0	0	0	0	First light frost 14th; solar halos 11th, 17th, and 30th; lunar halo 11th.
November	4,771	N.	29	8	16	8	3	2	6	7	16	29	3	23	3	4	4	0	0	0	0	0	Light shocks of earthquake 11th and 13th; first killing frost 18th.
December	4,371	SE.	24	4	7	11	4	15	5	14	13	23	1	6	14	11	12	0	0	0	0	0	Solar and lunar halos frequent.
Year 1881	83,105	.....	...	.....	72	40	19	59	57	226	439	138	41	150	126	89	65	0	1	0	0	0	
1882.																					
January	6,358	N.	36	13	16	5	4	17	8	11	13	19	0	14	11	6	10	0	1	0	0	0	Thunder storm with hail 24th; 5 solar and 4 lunar halos.
February	5,944	N.	33	1	14	4	4	15	6	11	20	10	0	11	11	6	11	0	0	0	0	0	Eight solar and 4 lunar halos.
March	7,042	W.	36	27	12	6	4	8	8	17	26	9	3	13	12	6	12	0	1	0	0	0	Seven solar and 3 lunar halos; earthquake 6th; last frost 23d.
April	7,652	NW.	32	6	0	1	1	0	6	23	47	7	4	17	4	9	8	8	0	1	0	0	Twelve solar and 4 lunar halos; earthquake 13th; aurora 16th.
May	8,300	W.	32	20	0	1	0	0	5	31	48	7	1	16	10	5	4	0	0	0	0	0	One lunar and 6 solar halos.
June	9,739	W.	32	8, 23	0	0	0	0	4	43	39	4	0	7	17	6	2	0	1	0	0	0	Eight solar halos; severe earthquake shocks.

Location of office on June 30, 1882, Merchants' Exchange building, California street.

NELSON GOROM,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

SANTA FÈ, N. MEX.

[Latitude, 35° 41′; longitude west of Greenwich, 105° 57′. Elevation of barometer above sea-level, 7,106 feet. Elevation of rain-gauge (top) above ground, 68 feet. Elevation of exposed thermometer above ground, 52 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
							°	°	°	°	°	°											
1881.																							
July	29.929	29.894	29.904	29.909	30.041	29.740	60.8	77.8	67.0	68.5	93.7	53	63.8	41.5	59.7	55.0	5.0	6.8	5.1	5.6	4.72	1.17	23
August	29.971	29.941	29.957	29.957	30.077	29.815	58.3	73.7	64.4	65.5	83.5	51	75.9	51.8	69.1	65.6	4.8	5.2	5.5	5.2	6.28	1.36	2
September	30.107	30.080	30.091	30.093	30.282	29.787	49.0	69.7	57.7	58.8	81.0	35	66.4	32.8	53.4	50.9	3.1	3.2	2.3	2.9	.91	.72	5
October	30.306	30.277	30.287	30.290	30.481	29.908	41.6	59.1	48.8	49.8	78.0	27	73.7	51.9	69.9	65.2	4.9	4.4	3.8	4.4	4.19	.84	13
November*	30.360	30.350	30.372	30.361	30.604	30.040	25.1	41.8	33.4	33.6	56.0	12	74.8	55.5	71.0	67.1	2.4	3.4	2.4	2.7	1.11	.97	10
December†	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Year 1881	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1882.																							
January	30.188	30.165	30.183	30.179	30.515	29.840	22.4	37.8	27.8	29.3	50.8	6.8	77.8	52.2	73.6	67.9	3.7	4.1	3.3	3.7	.47	.34	29
February	30.235	30.229	30.253	30.239	30.414	29.930	24.6	41.9	31.0	32.5	55.0	11.3	67.5	32.3	58.9	52.9	2.4	5.1	1.5	3.0	.06	.03	6,7
March	30.169	30.163	30.168	30.167	30.474	29.848	34.6	48.1	41.6	41.4	69.3	9.0	48.3	26.6	37.1	37.3	3.1	4.6	3.6	3.8	.23	.11	25,26
April	29.899	29.884	29.892	29.892	30.175	29.584	38.3	53.6	46.4	46.1	75.2	18.0	50.0	25.1	34.8	36.6	3.5	4.2	2.8	3.5	.26	.18	21
May	29.776	29.760	29.765	29.767	29.947	29.347	44.3	62.8	53.8	53.6	77.4	32.0	48.4	22.5	34.4	35.1	2.5	4.9	2.2	3.2	1.06	.81	20,21
June	29.780	29.761	29.768	29.770	29.941	29.554	54.3	73.2	63.2	63.6	90.2	42.0	51.5	25.8	39.6	39.0	3.1	5.0	3.7	3.9	1.36	.86	5

*20 days only. †No records for December.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.04 a. m., 1.04 p. m., and 9.04 p. m., local time.

H. U. JONES,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

SANTA FÈ, N. MEX.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,160	SW.	23	3	8	10	13	21	7	15	4	6	9	7	13	11	18	0	3	0	0	0	First frost October 17.
August	3,495	NE.	24	6	8	9	13	17	9	21	2	5	9	6	18	7	14	0	4	0	0	0	
September	3,318	SE.	20	27	4	3	13	16	7	17	2	13	15	18	9	3	4	0	2	0	0	0	
October	1,873	SW.	27	14	5	6	10	17	11	16	2	11	15	11	15	5	13	1	2	0	0	4	
November*	.....	E.	20	9	5	4	6	7	1	12	4	15	6	12	6	2	0	3	0	0	3	17	
December†	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Year 1881	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
1882.																							
January	‡2,208	SW.	22	25	11	10	4	10	5	14	5	10	24	17	8	6	0	5	0	0	6	30	
February	4,410	S.	35	19	17	7	4	15	10	13	6	11	1	15	11	2	0	4	0	0	0	28	
March	7,250	N.	33	7	28	12	7	4	9	23	5	5	0	16	7	8	1	2	1	0	2	13	
April	8,068	SE.	35	13	12	8	7	12	15	13	7	14	2	14	13	3	0	3	1	0	0	9	
May	7,373	SW.	32	26	9	13	14	12	11	23	2	4	5	16	14	1	8	0	4	0	0	0	
June	6,925	W. SW.	36	12 15	4	8	16	13	21	13	6	7	2	12	14	4	9	0	6	0	0	0	Last frost June 13.

*20 days only. †No records of any kind on file during this month. ‡20 days only.

Location of office on June 30, 1882, Palace Hotel, Washington avenue.

H. U. JONES,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

SAVANNAH, GA.

Latitude, 32° 5′; longitude west of Greenwich, 81° 8′. Elevation of barometer above sea-level, 87 feet. Elevation of rain-gauge (top) above ground, 58 feet. Elevation of exposed thermometer above ground, 41 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.024	29.983	30.010	30.006	30.187	29.786	81.5	90.2	82.4	84.7	101.5	71.0	73.3	54.8	75.2	67.8	3.9	5.9	2.4	4.1	1.25	.29	31
August	30.016	29.985	30.001	30.001	30.217	29.170	77.4	85.0	78.5	80.3	96.5	66.0	84.4	65.9	81.4	77.2	5.2	7.2	4.2	5.5	*9.63	4.33	27
September	30.085	30.049	30.081	30.072	30.271	29.843	76.3	85.0	78.6	80.0	92.0	67.0	88.6	62.5	84.0	78.4	4.6	6.3	2.2	4.4	3.09	2.08	16
October	30.166	30.127	30.152	30.148	30.410	29.814	68.5	77.6	71.1	72.4	86.0	53.0	86.3	64.3	82.5	77.4	5.1	6.3	3.8	5.1	2.72	1.18	23
November	30.212	30.168	30.203	30.194	30.568	29.722	56.2	67.6	60.4	61.4	80.5	28.5	80.3	60.5	75.6	72.1	4.3	6.6	4.5	5.1	2.45	.91	17
December	30.217	30.170	30.298	30.198	30.586	29.752	51.7	63.1	55.7	56.8	77.0	33.0	79.1	59.9	71.8	70.3	5.8	6.0	3.6	5.1	3.08	.94	22
Year 1881	30.098	30.050	30.082	30.069	.....	.....	63.5	73.6	68.3	67.8	.....	.....	78.4	56.4	74.6	69.8	4.7	5.8	3.3	4.6	38.00	.....	.....
1882.																							
January	30.226	30.194	30.240	30.220	30.555	29.698	52.5	63.2	56.3	57.3	76.5	27.0	82.4	64.6	78.1	75.0	4.1	6.2	4.9	5.1	1.90	1.69	31
February	30.239	30.187	30.233	30.220	30.573	29.541	52.2	65.2	58.0	58.5	78.0	32.5	75.0	53.8	69.5	66.1	4.5	5.6	4.2	4.8	.78	.27	8
March	30.175	30.129	30.173	30.159	30.565	29.786	57.4	70.6	63.0	63.7	87.0	41.0	72.2	45.2	64.8	60.7	3.7	4.2	3.6	3.8	4.19	1.75	13
April	30.077	30.033	30.054	30.055	30.411	29.620	63.8	73.5	66.7	68.0	87.0	49.0	80.6	57.3	77.4	71.8	5.6	6.2	4.6	5.5	2.94	1.19	23
May†	30.072	30.029	30.057	30.053	30.302	29.720	68.9	78.6	70.9	72.8	91.0	50.0	75.8	52.0	76.3	68.0	3.6	5.4	3.6	4.2	1.60	.62	10, 11
June	30.040	30.000	30.041	30.027	30.238	29.804	77.7	85.7	77.4	80.3	96.5	62.0	74.5	57.9	76.6	69.7	6.1	6.9	3.8	5.6	7.95	1.92	30

*Approximated; rain-gauge overflowed. †Twenty nine days only.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.44 a. m., 2.44 p. m., and 10.44 p. m., local time.

H. W. FORD,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

SAVANNAH, GA.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	5,513	E.	23	31	10	6	13	11	17	23	12	0	1	11	17	3	9	0	1	0	0	0	
August	*5,461	NE.	*80	27	10	13	23	7	10	15	8	3	4	10	11	10	11	0	1	0	0	0	
September	4,010	S.	22	15	6	13	23	20	14	4	4	4	2	11	10	9	11	0	2	0	0	0	
October	5,763	NE.	27	6, 11	25	38	30	10	24	10	8	10	0	8	16	7	9	0	0	0	0	0	
November	4,937	N.	22	23	37	25	21	15	13	6	8	34	1	7	10	13	9	0	0	0	0	1	Frost on the 26th and 27th.
December	5,860	W.	29	30	24	12	8	11	8	6	18	6	0	5	20	6	9	0	0	0	0	0	
Year 1881	67,845				149	169	199	111	156	154	167	103	9	120	154	91	110	0	16	0	0	5	
1882.																							
January	5,372	NE.	32	24	11	10	7	8	20	12	10	14	1	8	15	8	6	0	0	0	0	1	
February	5,422	W.	30	4	7	6	17	9	20	5	12	8	0	7	14	7	9	0	0	0	0	0	Frost, 1st and 2d.
March	6,366	NW. NW. SW.	26	13, 22, 28	6	3	12	7	23	9	21	11	1	12	14	5	9	0	3	0	0	0	
April	4,947	NW.	29	23	11	11	15	14	17	5	11	2	4	8	13	9	10	0	3	1	0	0	
May†	5,385	N.	24	28	10	4	13	16	22	11	8	5	0	†11	13	5	6	0	1	0	0	0	
June	5,147	NW.	32	29	6	3	10	3	25	22	20	1	0	6	16	8	15	0	7	0	0	0	

*Approximated. Instruments carried away by cyclone of 27th.

†Twenty-nine days only.

Location of office on June 30, 1882, corner Bay and Drayton streets.

H. W. FORD,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

SHREVEPORT, LA.

[Latitude, 32° 30′; longitude west of Greenwich, 93° 40′. Elevation of barometer above sea-level, 227 feet. Elevation of rain-gauge (top) above ground, 44 feet. Elevation of exposed thermometer above ground, 33 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0-10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.033	29.988	29.996	30.005	30.149	29.819	77.8	94.2	83.3	85.1	105	66.5	81.8	44.5	69.5	65.9	3.0	5.0	1.0	3.0	3.17	1.36	15
August	29.996	29.935	29.950	29.960	30.127	29.794	76.7	96.7	84.3	85.9	105	68.0	79.7	38.4	65.1	61.1	2.0	5.0	1.0	2.7	.45	.29	23
September	30.028	29.966	29.997	29.997	30.197	29.771	69.4	87.9	75.8	77.7	101	47.0	84.4	47.5	72.4	68.1	3.0	4.0	1.0	2.7	5.90	4.06	14
October	30.092	30.042	30.070	30.068	30.304	29.663	64.8	78.5	68.9	70.7	94	47.0	90.5	63.4	83.3	79.1	5.0	6.0	4.0	5.0	8.28	3.80	27
November	30.166	30.114	30.157	30.146	30.542	29.784	47.4	61.2	51.9	53.5	79	23.0	89.4	62.5	81.0	77.7	6.0	5.0	3.0	4.7	5.96	2.50	8
December	30.199	30.133	30.164	30.166	30.635	29.759	46.9	59.1	51.0	52.3	75	31.0	84.4	64.3	76.0	74.9	4.0	4.0	4.0	4.0	7.59	2.31	19
Year 1881	30.074	30.021	30.044	30.046	.....	.....	59.4	74.6	65.1	66.4	.....	.....	83.7	53.5	73.7	70.3	4.2	5.2	2.7	4.0	53.72	.....	....
1882.																							
January	30.152	30.116	30.149	30.139	30.585	29.881	47.4	54.0	49.9	50.4	74	30	88.6	77.6	85.8	84.0	8.2	8.3	7.5	8.0	9.08	1.54	16
February	30.121	30.084	30.117	30.107	30.436	29.526	51.8	63.1	57.1	57.3	78	33	87.8	64.3	78.3	76.8	5.6	6.7	5.6	6.0	8.71	2.98	3
March	30.121	30.078	30.102	30.100	30.623	29.637	56.7	71.4	63.6	63.9	90	41	85.0	50.2	70.7	68.6	5.7	5.9	4.5	5.4	3.16	.87	7
April	30.010	29.969	29.981	29.987	30.295	29.612	60.7	76.2	67.0	68.0	93	47	87.2	53.1	73.0	71.1	6.6	6.6	4.8	6.0	5.44	1.49	18
May	29.983	29.948	29.959	29.963	30.266	29.528	63.6	78.4	69.2	70.4	93	49	84.5	52.5	75.5	70.8	5.5	6.3	4.6	5.5	4.59	1.88	6,7
June	30.009	29.977	29.965	29.984	30.249	29.713	72.9	88.6	79.7	80.4	101	59	84.4	49.1	69.6	67.7	3.7	6.4	1.5	3.9	.65	.63	10

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.54 a. m., 1.54 p. m., and 9.54 p. m., local time.

EDWARD N. MEEKINS,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

SHREVEPORT, LA.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	3,475	N.	17	24	6	12	15	6	16	10	8	8	12	10	19	2	6	0	4	0	0	0	
August	3,141	NE.	24	6	6	13	14	8	21	12	5	1	13	21	10	0	3	0	2	0	0	0	
September	3,318	S.	22	27	5	5	6	20	24	3	4	6	17	19	9	2	7	0	2	0	0	0	
October	3,513	S.	22	27	7	12	8	23	26	2	3	6	6	9	14	8	9	0	0	0	0	0	
November	4,552	NW.	28	2	16	8	5	3	24	9	3	14	8	13	9	8	11	0	2	0	0	4	First killing frost on 20th.
December	3,932	NW.	28	29	14	16	10	7	10	3	6	11	16	15	6	10	8	0	0	0	0	2	
Year 1881	43,782	...	...	...	92	104	115	131	231	88	60	115	159	135	176	54	89	4	18	0	0	21	
1882.																							
January	3,747	NW.	26	16	15	14	6	4	15	3	3	16	17	4	5	22	22	1	0	0	0	1	Light snow on 29th.
February	4,521	SW.	28	8, 20	5	4	8	9	39	3	2	9	5	7	10	11	15	0	1	0	0	0	
March	5,135	W.	26	9	9	9	8	7	36	8	5	6	5	9	13	9	8	0	1	0	0	0	
April	4,765	SW.	36	22	17	6	11	5	35	8	5	3	0	4	17	9	11	0	5	2	0	0	Auroras observed on 16th and 20th. Heavy gale on 22d.
May	4,668	NW.	32	10	11	4	8	19	18	5	5	12	11	6	17	8	8	0	5	0	0	0	
June	3,744	NW.	26	10	2	8	9	10	38	8	7	2	6	9	20	1	2	0	0	0	0	0	

Location of office on June 30, 1882, No. 22 Milam street.

EDWARD N. MEEKINS.
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

SILVER CITY, N. MEX.

[Latitude, 32° 48′; longitude west of Greenwich, 108° 15′. Elevation of barometer above sea-level, 5,890 feet. Elevation of rain-gauge (top) above ground, 9 feet. Elevation of exposed thermometer above ground, 5 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.813	29.799	29.863	29.805	29.892	29.706	63.5	82.8	69.1	71.8	98	57	69.9	37.1	64.7	57.2	6	6	5	5.7	9.62	2.74	23
August	29.842	29.832	29.835	29.837	29.921	29.763	61.0	78.6	66.0	68.5	90	46	79.5	50.5	73.3	67.8	5	5	4	4.7	8.69	1.93	15
September	29.861	29.849	29.860	29.857	30.009	29.605	53.8	76.7	60.0	63.5	88	41	70.7	39.1	62.8	57.5	3	3	3	3.0	3.89	1.41	5
October	29.991	29.965	29.979	29.978	30.111	29.765	47.2	69.2	52.6	56.6	83	30	75.5	46.5	72.4	64.8	3	4	3	3.3	3.21	.90	6
November	30.063	30.014	30.041	30.040	30.264	29.725	29.0	54.1	35.6	39.6	69	13	73.1	42.1	67.1	60.8	2	2	1	1.7	1.55	.78	10
December	30.126	30.101	30.130	30.119	30.367	29.873	29.6	53.7	34.6	39.3	72	11	70.3	42.7	66.2	59.7	2	2	1	1.7	.28	.19	18
Year 1881	30.175	30.026	30.116	30.106	.....	.....	43.9	67.5	51.9	54.6	.....	.....	62.6	32.6	54.0	49.7	2.7	3.5	2.5	2.9	30.82	.....	.....
1882.																							
January	30.059	30.052	30.074	30.062	30.342	29.833	29.4	47.5	32.8	36.6	65	12	72.9	42.6	68.4	61.4	2.3	3.4	3.0	2.9	1.83	.97	29, 30
February	30.095	30.096	30.119	30.103	30.294	29.820	31.0	49.1	36.1	38.7	60	12	72.8	54.1	67.5	64.8	3.8	4.6	2.8	3.7	2.06	.71	14, 15
March	30.040	30.039	30.048	30.042	30.259	29.815	33.8	59.6	44.0	45.8	79	13	52.6	34.6	51.0	46.1	1.9	2.8	2.2	2.3	1.17	.49	17, 18
April	29.877	29.875	29.876	29.876	30.059	29.598	36.9	65.5	50.2	50.9	85	20	48.0	22.7	37.1	35.9	0.9	2.0	1.1	1.3	.08	.08	13
May	29.764	29.756	29.751	29.757	29.895	29.447	44.1	73.3	57.7	58.4	84	34	48.0	22.2	39.2	36.5	1.4	2.9	1.2	1.8	1.37	.83	7, 8
June	29.788	29.780	29.762	29.777	29.899	29.626	53.7	80.3	66.8	66.9	94	42	57.4	29.3	46.4	44.4	2.4	3.8	3.3	3.2	1.92	.58	5

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.55 a. m., 12.55 p. m., and 8.55 p. m., local time.

JAMES B. WALLACE,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132–B.]

SILVER CITY, N. MEX.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurora.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	1,910	SE.	20	3	3	1	0	14	15	4	2	26	28	5	18	8	19	0	16	0	0	0	
August	1,306	NW.	20	7	2	0	0	6	13	9	4	17	42	10	15	6	17	0	14	0	0	0	
September	1,486	N. SE. SW.	14	14 10 21	3	0	0	2	12	8	8	20	37	21	5	4	7	0	5	0	0	0	
October	1,470	NW.	16	29	3	0	0	8	12	3	3	20	44	16	14	1	10	0	0	0	0	4	First frost, 30.
November	1,526	NW.	28	18	11	0	0	7	12	4	3	22	31	24	3	3	0	4	0	0	0	26	
December	2,452	SE.	18	15	11	3	2	7	13	3	7	36	11	28	1	2	1	1	0	0	0	25	
Year 1881	25,451	.....	....	.....	109	7	4	53	138	91	116	262	315	222	110	33	66	16	35	....	....	122	
1882.																							
January	2,541	SE.	20	14	23	3	0	4	8	7	8	26	14	20	7	4	3	8	0	0	0	28	
February	2,641	SW.	24	19	5	0	1	0	15	10	13	33	7	14	10	4	6	5	1	0	0	21	
March	3,324	SW.	28	3	0	0	0	3	15	8	21	35	11	21	8	2	5	1	2	0	0	13	
April	3,813	NW.	28	20	0	0	0	2	15	9	29	31	4	24	6	0	1	0	0	1	0	8	Aurora, 16th.
May	2,847	W.	25	7	5	0	0	2	7	13	19	36	11	24	5	2	4	0	1	0	0	0	
June	2,360	NW.	24	4	0	4	0	0	6	13	13	46	14	17	10	3	8	0	8	0	0	0	

Location of office on June 30, 1882, 43 Yankie street.

JAMES B. WALLACE,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

SITKA, ALASKA.

[Latitude, 57° 3′; longitude west of Greenwich, 135° 19′. Elevation of barometer above sea-level, 63 feet. Elevation of rain-gauge (top) above ground, 96 feet. Elevation of exposed thermometer above ground, 12 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometer.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July*	29.949	29.964	29.968	29.968	30.254	29.468	52.1	56.1	54.5	54.2	67.0	43.0	.....	.....	.....	81.0	.....	.....	.....	8.2	4.40	.94	23
August†	29.973	29.969	29.963	29.971	30.192	29.657	52.5	59.7	58.8	56.7	79.0	43.9	.....	.....	.....	75.8	.....	.....	.....	5.6	1.98	.93	18
September	29.888	29.905	29.882	29.892	30.200	29.195	52.0	56.0	54.1	54.0	63.8	40.5	.....	.....	.....	83.3	.....	.....	.....	6.9	12.11	1.93	9
October	29.983	29.957	29.945	29.953	30.543	29.096	43.6	48.6	46.3	46.3	57.8	32.0	.....	.....	.....	73.8	.....	.....	.....	4.6	5.04	1.81	22
November	29.811	29.839	29.816	29.822	30.333	28.849	41.8	42.3	41.6	41.9	52.8	23.5	79.6	82.8	84.6	82.3	8.7	8.2	8.1	8.3	13.50	2.35	25
December‡	29.449	29.450	29.420	29.440	30.265	28.616	34.4	35.0	35.1	34.8	44.9	14.0	81.4	79.6	80.4	80.5	6.7	8.0	7.4	7.4	10.52	1.13	1
Year 1881	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1882.																							
January	29.850	29.845	29.853	29.849	30.328	29.155	34.7	34.9	34.7	34.8	50.8	8.5	76.4	77.5	77.1	77.0	6.6	7.3	7.4	7.1	14.20	2.57	28, 29
February	29.474	29.504	29.454	29.477	30.796	28.601	30.5	30.9	31.0	30.8	42.0	4.0	78.8	78.9	77.7	78.5	7.5	7.6	7.7	7.6	16.35	3.26	18, 19
March	29.908	29.923	29.917	29.919	30.444	29.127	28.6	32.9	30.9	30.8	44.9	5.5	71.2	66.1	67.4	68.2	4.0	5.1	4.3	4.5	3.53	1.11	6
April	29.748	29.780	29.780	29.769	30.520	29.028	35.6	43.1	41.0	39.9	61.8	25.5	72.8	59.7	62.4	65.0	5.8	5.5	6.0	5.8	4.21	.89	16
May	29.966	29.961	29.953	29.960	30.473	29.548	43.1	50.1	48.7	47.3	69.2	32.0	75.1	66.6	68.5	70.1	6.2	6.2	5.6	6.0	2.89	.69	8
June†	29.941	29.960	29.950	29.950	30.361	29.678	48.9	53.3	52.8	51.7	69.6	38.0	79.1	74.0	73.3	75.5	7.9	7.5	7.2	7.5	3.71	.91	2, 3

*24 days only. †28 days only. ‡27 days only.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 3.07 a. m., 11.07 a. m., and 7.07 p. m., local time.

JOHN J. McLEAN,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

SITKA, ALASKA.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July *a*	5,357	W.	28	4	0	0	2	10	3	27	38	4	3	3	6	22	15	0	0	0	0	0	
August *b*	4,900	W.	30	4	2	4	7	0	2	25	18	25	4	12	7	12	10	0	0	1	0	0	
September *c*	5,273	E.	32	28	5	12	8	10	4	19	19	13	6	8	6	16	21	0	0	1	0	0	
October	5,585	SE.	38	22	0	30	17	9	2	6	4	12	11	14	9	8	13	0	0	4	0	1	First frost 1st.
November *d*	7,918	SW.	43	12	2	10	36	15	4	3	4	11	4	3	4	22	15	*e*9	3	3	1	3	
December *b*	8,884	SE.	74	19	1	15	25	21	6	2	3	4	13	4	12	15	0	*e*25	4	4	2	16	Hurricane 19th; velocity of the wind 84 miles for 5 minutes.
Year 1881																							
1882.																							
January	7,937	S.	44	12	4	16	19	21	5	5	10	4	9	6	6	19	13	11	4	2	2	13	
February	9,342	SE.	44	18	1	15	27	13	5	6	12	2	3	2	8	18	3	20	2	1	5	21	
March	8,200	NE.	44	13	0	23	33	9	1	3	5	8	11	11	13	7	6	6	0	8	5	26	
April	6,507	E.	48	3	0	17	17	15	4	11	5	13	8	8	10	12	6	9	0	6	0	16	
May	5,760	SE.	38	4	1	16	10	11	3	22	5	14	11	8	8	15	8	3	0	3	0	0	Last frost 16th.
June	4,771	S.	32	1	0	6	5	6	6	25	12	13	15	4	5	19	16	0	0	0	0	0	

a Six observations not taken.
b Three observations not taken.
c One observation not taken.
d Four observations not taken.
e Principally snow, sleet, and hail. It is almost impossible to keep a record of the rapid changes that occur; one minute snow, next sleet, next hail, together with rain, and all to be seen within the town limits.

Location of office on June 30, 1882, Castle Building, first floor.

JOHN J. McLEAN,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

SMITHVILLE, N. C.

[Latitude, 33° 55′; longitude west of Greenwich, 78° 1′. Elevation of barometer above sea-level, 34 feet. Elevation of rain-gauge (top) above ground, 35 feet. Elevation of exposed thermometer above ground, 18 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometer.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.002	29.988	30.009	29.999	30.213	29.691	77.4	84.3	78.0	79.9	93	61	82.1	70.2	81.2	77.8	5.6	4.3	3.9	4.6	10.65	2.85	1
August	30.031	30.009	30.027	30.023	30.254	29.791	76.2	81.9	78.5	78.9	89	62	84.3	73.5	79.1	79.0	4.7	5.9	3.3	4.6	3.49	2.10	27
September	30.109	30.085	30.111	30.102	30.328	29.235	75.5	80.6	77.5	77.8	86	60	86.5	78.9	82.3	82.6	4.8	4.5	3.1	4.1	4.42	2.41	9
October	30.182	30.153	30.171	30.169	30.445	29.694	65.9	73.1	68.6	69.2	84	48	85.9	73.9	82.7	80.8	3.3	4.8	3.6	3.9	2.83	.90	31
November	30.223	30.180	30.211	30.205	30.639	29.697	53.3	63.3	57.5	58.0	76	23	83.8	75.3	80.8	80.0	4.3	4.7	4.6	4.5	4.25	.96	29
December	30.212	30.164	30.205	30.194	30.571	29.654	47.4	55.8	50.5	51.2	70	31	83.6	73.0	83.2	79.9	4.8	5.2	3.5	4.5	5.19	1.34	15
Year 1881	30.092	30.066	30.082	30.080	.....	.....	59.9	67.9	62.5	63.4	.....	.....	84.5	73.4	82.3	80.1	4.3	5.0	4.1	4.6	50.64	.....	....
1882.																							
January	30.210	30.175	30.227	30.204	30.680	29.536	46.5	52.8	47.6	49.0	65	20	87.7	77.9	85.5	83.7	6.0	6.2	5.6	5.9	3.36	1.23	31
February	30.231	30.185	30.221	30.212	30.642	29.355	47.5	56.8	51.7	52.0	67	24	86.2	69.7	80.1	78.7	4.3	5.6	4.4	4.8	1.64	.52	15
March	30.166	30.116	30.161	30.148	30.533	29.675	51.7	60.7	55.7	56.0	71	32	82.8	67.2	79.1	76.4	5.1	5.1	3.2	4.5	7.81	3.01	28
April	30.077	30.030	30.055	30.054	30.462	29.519	59.0	67.1	60.4	62.2	77	40	86.4	69.8	86.3	80.8	5.4	4.0	3.8	4.4	1.63	.35	9, 10
May	30.058	30.025	30.042	30.042	30.340	29.637	65.2	72.3	66.4	68.0	83	43	81.5	66.3	82.6	76.8	4.5	4.6	2.1	3.7	1.17	.31	16
June	30.016	29.982	30.008	30.002	30.217	29.738	74.5	81.0	75.1	76.9	92	54	78.5	69.2	80.6	76.1	4.8	5.5	2.6	4.3	2.76	1.16	10

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.56 a. m., 2.56 p. m., and 10.56 p. m., local time.

ORIN PARKER,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

SMITHVILLE, N. C.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurora.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	7,020	S.	24	22	9	8	6	12	19	26	3	8	2	12	7	12	11	0	0	0	0	0	
August	7,507	E.	50	27	4	18	14	10	14	19	4	7	3	8	9	14	5	0	0	0	0	0	
September	6,815	NE.	60	9	5	10	6	24	19	12	8	2	4	13	12	5	7	0	0	0	0	0	
October	6,517	SW.	26	31	6	18	20	4	9	12	13	7	4	11	13	7	8	0	0	0	0	0	
November	5,878	N.	23	3	20	25	12	4	5	12	5	5	2	11	10	9	13	0	0	0	0	1	
December	7,433	S.	36	26	12	26	13	2	9	8	18	5	0	12	12	7	9	0	0	0	0	1	
Year 1881	84,024	.....	....	.....	160	157	122	100	148	206	101	76	25	115	134	112	116	0	0	0	0	23	
1882.																							
January	6,533	SW.	30	31	17	23	3	2	3	19	18	8	0	8	12	11	13	0	1	0	0	9	
February	6,583	SW.	36	4	7	12	12	4	6	19	12	11	1	9	13	6	8	0	0	0	0	3	
March	8,093	SW.	38	27	4	18	13	5	6	21	17	9	0	14	9	8	10	0	1	0	0	0	
April	7,561	SW.	52	23	7	14	20	6	6	20	13	4	0	11	13	6	10	0	1	1	0	0	
May	7,915	S.	27	31	6	9	18	6	7	23	16	8	0	12	16	3	8	0	3	0	0	0	
June	7,942	SW.	31	1	3	2	12	9	6	25	20	13	0	8	21	1	9	0	5	0	0	0	

Location of office on June 30, 1882, the central building in old Fort Johnston.

ORIN PARKER,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

SPOKANE FALLS, WASH.

[Latitude, 47° 39′; longitude west of Greenwich, 117° 25′. Elevation of barometer above sea-level, 1,910 feet. Elevation of rain-gauge (top) above ground, 32 feet. Elevation of exposed thermometer above ground, 22 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°												
July	29.924	29.929	29.882	29.911	30.203	29.592	53.3	72.2	71.8	65.6	96	43	77.3	43.4	45.0	55.2	4.1	4.3	4.2	4.2	2.25	1.15	3
August	29.930	29.922	29.899	29.917	30.093	29.667	49.8	70.7	65.3	61.9	92	38	74.8	42.9	53.6	57.1	3.6	4.1	2.2	3.3	.45	.27	31
September	29.965	29.973	29.949	29.962	30.310	29.647	44.5	61.2	54.8	53.5	83	31	84.4	50.3	65.6	66.8	4.1	5.9	3.3	4.4	2.55	1.14	17
October	30.054	30.081	30.061	30.065	30.348	29.660	38.0	47.0	43.6	42.9	63	18	84.5	67.3	78.4	76.7	6.7	6.9	6.3	6.6	2.41	.41	17
November	30.217	30.231	30.212	30.220	30.671	29.558	29.7	36.0	33.3	33.0	58	3	82.0	71.1	77.2	76.8	7.0	8.3	6.5	7.3	2.23	.33	6
December	30.165	30.157	30.146	30.156	30.594	29.346	27.7	34.0	32.1	31.3	50	10	78.8	65.1	73.1	72.3	8.1	8.1	6.7	7.6	2.44	.73	26
*Year 1881																							
1882.																							
January	30.147	30.150	30.155	30.151	30.659	29.479	19.2	25.6	23.6	22.8	42	—17	83.2	80.0	79.9	81.0	6.1	7.1	6.2	6.5	4.54	1.36	23
February	30.099	30.088	30.080	30.089	30.514	29.586	21.2	29.4	27.8	26.1	45	—14	81.6	77.6	78.5	79.2	7.7	7.8	6.0	7.2	2.25	.44	25, 26
March	30.134	30.147	30.119	30.133	30.650	29.585	30.4	41.1	38.1	36.5	68	7	80.5	67.4	73.4	73.8	5.3	7.4	7.0	6.6	1.04	.34	16
April	30.010	30.008	29.990	30.003	30.507	29.625	36.5	50.7	46.0	44.4	69	29	83.3	55.7	68.3	69.1	5.8	6.3	4.6	5.6	2.84	1.16	21, 22
May	30.022	30.016	29.983	30.007	30.385	29.675	44.4	62.3	56.7	54.5	84	32	79.5	43.1	61.0	61.2	5.2	6.4	5.1	5.6	1.54	.48	16
June	29.952	29.950	29.902	29.935	30.118	29.761	54.3	71.4	68.4	64.7	94.5	39	78.0	46.3	58.2	60.8	5.2	5.8	5.4	5.5	1.17	.32	10

Station opened February 1, 1881.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.19 a. m., 12.19 p. m., and 8.19 p. m., local time.

D. MOORE,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

SPOKANE FALLS, WASH.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	0.1 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,037	S.	24	11, 20	6	10	4	4	22	20	12	5	10	12	13	6	9	0	2	0	0	0	
August	4,067	SW.	32	7	9	11	10	11	16	18	7	6	5	15	14	2	4	0	5	0	0	0	
September	3,472	SW.	31	24	11	14	11	6	10	19	4	11	4	11	13	6	11	0	1	3	0	1	First frost, 26.
October	3,268	NE.	24	3	3	25	11	5	17	10	6	8	8	4	13	14	11	3	0	0	0	8	
November	2,624	SW.	28	5	10	6	7	10	10	18	4	14	11	1	9	20	6	13	0	0	6	20	
December	3,131	S.	30	27	9	9	0	7	11	21	6	19	11	1	13	17	6	8	0	0	7	27	
* Year 1881																							
1882.																							
January	3,082	SW.	28	25	1	16	13	1	6	16	21	9	10	4	13	14	3	15	0	0	14	28	
February	5,017	SW.	29	9	1	9	5	5	9	35	9	4	7	4	9	15	2	13	0	0	6	24	
March	4,924	SW	44	28	2	7	11	2	10	38	7	4	12	6	11	14	5	7	0	0	1	20	
April	4,866	SW.	30	15	3	12	10	14	11	23	11	2	4	8	12	10	11	4	0	2	0	8	Remarkably brilliant aurora April 16.
May	4,646	W.	32	12	2	11	8	4	23	18	11	5	11	7	14	10	9	0	6	0	0	0	Last frost, 20.
June	4,296	W.	35	16	3	5	11	3	5	26	18	11	8	8	13	9	8	0	7	1	0	0	

* Station opened February 1, 1881.

Location of office on June 30, 1882, corner Riverside avenue and Mill street.

D. MOORE,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

SPRINGFIELD, ILL.

Latitude, 39° 39′; longitude west of Greenwich, 89° 39′ Elevation of barometer above sea-level, 644 feet. Elevation of rain-gauge (top) above ground, 61 feet. Elevation of exposed thermometer above ground, 39 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.					Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.	Amount in inches.	Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.041	30.012	30.012	30.022	30.251	29.717	73.0	86.0	78.0	79.0	99.1	57.1	78.1	49.6	70.9	66 2	3.0	4.0	2.0	3.0	3.37	1.51	14
August	30.036	29.993	30.001	30.010	30.227	29.800	70.5	88.0	77.1	78.5	99.5	54.4	69.7	39.9	60.3	56.6	4.0	4.0	2.0	3.3	4.03	3.18	31
September	30.009	29.954	29.989	29.984	30.244	29.631	65.5	79.9	70.8	72.1	94.7	47.0	80.9	51.1	70.7	67.9	4.6	4.7	4.6	4.6	6.43	2.74	30
October	30.128	30.101	30.119	30.116	30.495	29.588	55.5	62.9	57.7	58.7	77.1	41.7	85.7	73.4	84.4	81.2	5.9	6.6	5.6	6.0	10.02	3.19	3
November	30.167	30.130	30.176	30.158	30.699	29.673	38.6	46.3	41.2	42.0	64.2	14.5	78.7	66.1	72.7	72.5	5.1	5.7	4.1	5.0	6.93	3.25	17, 18
December	30.196	30.167	30.195	30.186	30 627	29.735	36.7	44.0	39.0	39.9	61.5	15.0	78.0	64.2	74.0	72.1	6.2	6.3	4.6	5.7	4.81	3.33	13
Year 1881	30.068	30.038	30.055	30.054	.....	.....	48.9	59.5	53.2	53.8	.....	.....	78.3	57.8	71.9	69.3	5.6	5.4	4.3	5.1	56.51	.....	.....
1882.																							
January	30.205	30.166	30.199	30.190	30.747	29.613	29.3	34.5	31.2	31.7	62.5	10.0	77.8	65.7	75.7	73.1	4.8	6.6	5.3	5.6	2.48	.75	4
February	30.113	30.076	30.102	30.097	30.574	29.366	37.5	46.4	42.7	42.2	72.0	17.0	73.0	58.4	68.8	66.7	5.3	5.4	5.0	5.2	7.92	3.38	29
March	30.111	30.068	30.106	30.095	30.610	29.474	39.5	49.4	44.0	44.3	73.0	23.0	69.0	53.1	63.6	61.9	5.1	5.9	4.6	5.2	4.92	1.32	8, 9
April	30.040	30.012	30.021	30.024	30.310	29.447	49.4	61.7	54.4	55.2	82.9	27.8	70.7	45.9	63.8	60.1	4.9	5.7	4.4	5.0	3.85	1.73	21
May	29.979	29.945	29.958	29.961	30.374	29.536	53.3	63.4	57.0	57.9	79.8	40.0	74.3	59.2	72.3	68.6	6.0	6.8	5.9	6.2	10.59	3.35	5
June	29.928	29.907	29.911	29.915	30.205	29.548	66.8	76.8	70.6	71.4	92.5	48.7	80.0	59.9	77.8	72.6	6.1	6.2	4.7	5.7	12.71	3.79	2, 3

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.10 a. m., 2.10 p. m., and 10.10 p. m., local time.

T. B. JENNINGS,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

SPRINGFIELD, ILL.

	Wind.			Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurora.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,711	NW.	27	12	13	15	8	4	11	17	13	11	1	18	10	3	6	0	4	0	0	0	
August	5,410	S.	35	29	12	19	16	15	19	2	2	7	1	15	15	1	4	0	3	0	0	0	But .85 of an inch of rain fell first 30 days. On 31st 3.18 fell in an hour (3.05 in 40 minutes).
September	6,082	S.	32	3	5	4	4	6	49	10	2	9	1	12	11	7	12	0	5	1	0	0	Aurora on 23d.
October	6,354	SW. S.	24	12 15 28	8	7	9	7	26	15	16	3	2	7	12	12	16	0	2	0	0	0	First killing frost on 19th; 7.22 inches of rain fell in first four days.
November	7,386	S.	28	17 25	3	4	4	4	29	8	16	22	0	9	14	7	5	3	1	1	1	8	Aurora a. m. 9th; thunder, followed by snow, 30.
December	5,932	NW.	26	6	10	3	5	7	28	7	14	16	3	5	17	9	7	2	2	0	2	8	
Year 1881	74,474				122	111	115	90	251	115	115	161	15	112	154	99	105	25	42	2	27	96	
1882.																							
January	6,602	W.	43	26	10	3	8	12	22	6	15	17	0	6	16	9	11	3	0	0	6	24	
February	6,849	W.	36	21	5	6	3	8	28	9	13	12	0	9	10	9	10	1	3	0	2	9	
March	8,157	W.	39	21	8	3	9	11	19	6	8	25	4	8	15	8	12	0	6	0	0	11	
April	6,659	S.	34	18	8	17	13	10	14	10	7	4	7	8	14	8	7	1	4	1	0	3	Tornado on 6th; aurora on 16th.
May	6,553	SE.	35	9	14	15	8	15	18	4	5	11	3	6	11	14	18	0	9	0	0	0	Last frost 29th.
June	4,903	NW.	31	3	3	12	5	9	17	18	16	8	2	4	16	10	14	0	14	1	0	0	Aurora 14th; terrific thunder storm 28th.

Location of office on June 30, 1882, post-office building, corner Sixth and Monroe streets.

T. B. JENNINGS.
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

SPRINGFIELD, MASS.

[Latitude, 42° 6′; longitude west of Greenwich, 72° 36′. Elevation of barometer above sea-level, 120 feet. Elevation of rain-gauge (top) above ground, 64 feet; elevation of exposed thermometer above ground, 54 feet.]

	Barometer (to sea).				Temperature.								Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.938	29.886	29.929	29.918	30.328	29.527	67.9	79.1	67.8	71.6	88.6	56.5	79.6	55.4	81.7	72.2	6.5	6.5	4.6	5.9	3.23	1.38	8
August	30.024	29.964	30.001	29.996	30.334	29.569	68.3	78.6	68.5	71.8	91.4	53.0	83.0	60.5	82.8	75.4	5.9	4.9	4.5	5.1	3.23	1.51	18
September	30.124	30.053	30.106	30.094	30.442	29.812	64.6	76.5	65.5	68.9	94.3	46.0	86.0	58.4	87.0	77.1	5.0	5.2	3.9	4.7	.90	.43	23
October	30.171	30.085	30.125	30.127	30.605	29.415	48.6	61.2	51.4	53.7	86.1	28.8	80.2	56.2	79.3	71.8	5.9	6.4	5.4	5.9	3.43	1.15	31
November	30.182	30.127	30.152	30.154	30.655	29.480	37.9	46.6	40.8	41.8	67.2	13.0	79.3	60.4	74.0	71.2	5.5	6.7	6.3	6.2	4.84	1.69	18, 19
December	30.152	30.098	30.143	30.131	30.660	29.266	33.5	41.6	36.1	37.1	61.6	11.6	82.7	65.4	77.5	75.2	6.1	7.0	5.9	6.3	5.14	1.58	27
Year 1881	30.044	29.981	30.027	30.019	.....	.....	46.0	56.3	47.7	50.0	.....	.....	76.8	58.4	77.0	70.8	5.9	5.7	4.9	5.5	49.33	.....	.....
1882.																							
January	30.130	30.115	30.108	30.118	30.833	29.381	23.2	29.6	25.2	26.0	49.7	−12.0	73.8	60.3	70.6	68.2	5.9	5.9	5.3	5.7	4.70	1.14	31
February	30.136	30.119	30.140	30.132	30.805	29.474	26.8	36.8	29.3	31.0	51.3	3.0	77.8	61.5	76.4	71.9	6.2	4.5	4.3	5.0	5.29	1.31	21
March	30.091	30.039	30.098	30.076	30.704	29.525	34.7	42.2	35.5	37.4	58.8	14.9	70.6	52.6	68.1	63.8	6.3	6.5	4.6	5.8	2.98	1.33	1
April	30.038	29.939	30.011	29.996	30.570	29.281	41.4	52.9	42.7	45.7	70.6	22.0	64.5	42.7	63.1	56.8	5.9	7.1	4.7	5.9	1.35	.45	7
May	30.041	29.979	30.022	30.014	30.475	29.484	49.9	59.9	50.0	53.3	77.4	33.0	69.7	48.5	69.6	62.6	7.1	7.3	4.6	6.4	6.11	2.24	28, 29
June	29.904	29.832	29.892	29.876	30.269	29.460	65.1	76.6	64.3	69.7	91.3	46.9	71.6	46.9	69.4	62.6	6.7	6.4	4.8	6.0	4.44	2.38	4

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.18 a. m., 3.18 p. m., and 11.18 p. m., local time.

T. S. OUTRAM,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

SPRINGFIELD, MASS.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	2,641	NW.	16	17	24	6	3	1	23	10	8	11	7	3	19	9	6	0	3	1	0	0	Remarkable aurora 2d.
August	2,826	W.	16	10	17	7	3	2	27	7	6	10	14	5	19	7	6	0	3	1	0	0	Aurora 20th.
September	2,652	E.	15	15	16	12	4	3	30	3	5	5	12	7	15	8	7	0	2	1	0	0	The "dark day" 6th; aurora 12th.
		S.	15	23																			
October	3,430	NW.	24	26	16	3	4	3	25	2	9	16	15	7	13	11	9	0	1	1	0	4	First killing frost 5th; first light frost 6th; aurora 16th.
November	3,954	NW.	24	10	21	5	4	0	20	7	12	16	5	5	14	11	10	2	0	0	0	12	
December	2,892	NW.	22	1	21	1	3	1	30	3	8	9	17	7	11	13	9	3	0	0	3	20	River open 31st; later in season than for 21 years.
Year 1881	42,701				260	84	33	20	261	53	116	164	104	78	166	121	95	30	16	5	31	112	
1882																							
January	4,264	W.	35	27	25	6	2	0	17	4	10	23	6	8	11	12	6	13	0	2	10	28	Auroras 14th and 19th.
February	3,569	W.	22	8	19	5	3	0	20	5	10	15	7	8	13	7	7	7	0	1	7	25	Faint aurora 17th.
March	5,342	NW.	28	4	16	9	3	0	25	5	10	23	2	6	16	9	10	4	0	1	0	18	Faint aurora 19th.
April	4,934	NW.	23	17	17	3	3	3	22	5	12	22	3	6	16	8	7	2	1	3	0	9	Auroras 16th, 17th, 19th, 23d.
May	4,649	W.	23	4	15	19	5	2	29	6	10	6	1	4	16	11	13	0	1	0	0	0	
June	3,700	W.	24	4	13	1	2	2	35	7	18	12	0	4	15	11	12	0	3	1	0	0	Faint aurora 21st.

Location of office on June 30, 1882, Gilmore's Opera House block, corner Main and Pynchon streets.

T. S. OUTRAM,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132–A.]

SPRINGFIELD, MO.

[Latitude, 37° 12′; longitude west of Greenwich, 93° 18′. Elevation of barometer above sea-level, 1,351 feet. Elevation of rain-gauge (top) above ground, 49 feet. Elevation of exposed thermometer above ground, 41 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.					Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 a. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.	Amount in inches.	Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July																							
August																							
September																							
October																							
November																							
December																							
Year 1881																							
1882.																							
January*	30.248	30.225	30.248	30.240	30.836	29.862	33.5	41.5	36.6	37.2	68.6	6	84.2	74.5	78.0	78.9	5.6	7.0	5.1	5.9	2.65	1.15	12.13
February	30.182	30.159	30.187	30.176	30.495	29.577	40.9	52.0	45.6	46.2	72.0	13	76.8	69.3	75.1	73.7	6.1	6.5	5.2	5.9	7.29	1.84	19,20
March	30.186	30.159	30.197	30.181	30.660	29.573	43.6	58.0	50.2	50.6	77.0	24	77.8	64.2	72.7	71.6	5.5	5.8	4.4	5.2	3.19	.88	26
April	30.085	30.053	30.096	30.068	30.392	29.577	51.8	66.6	57.2	58.5	88.5	36	76.0	48.7	63.6	62.8	4.8	5.4	4.3	4.8	3.71	1.52	22
May	30.021	30.006	30.010	30.012	30.326	29.597	54.9	66.7	57.6	59.7	86.0	40.5	82.4	62.0	76.2	73.5	6.1	7.1	6.0	6.7	8.07	2.32	26,27
June	30.014	29.988	29.995	29.999	30.331	29.655	68.6	83.9	72.2	74.9	98.1	46	82.9	54.6	74.1	70.5	4.9	6.7	4.1	5.2	2.70	.82	2

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.55 a. m., 1.55 p. m., and 9.55 p. m., local time.

*Observations commenced January 3, 1882.

JOHN B. MARBURY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

SPRINGFIELD, MO.

	Wind.				Wind at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July																							
August																							
September																							
October																							
November																							
December																							
Year 1881																							
1882.																							
January*	6,740	W.	36	26	13	2	6	17	24	5	8	11	1	4	16	9	9	2	1	0	2	18	Lunar halo 28th and 29th.
February	6,995	W.	40	21	8	8	2	7	33	8	10	8	0	7	9	12	9	1	2	0	1	8	
March	8,618	W. NW.	34	21	12	9	5	12	26	10	9	10	0	9	11	11	9	1	1	0	0	5	Lunar halo 26th.
April	7,881	SW.	36	18	10	13	6	13	25	7	9	7	0	11	10	9	9	0	2	1	0	0	Aurora 16th.
May	7,708	W.	48	27	13	7	9	18	21	5	7	12	1	4	10	17	17	0	6	0	0	0	
June	6,003	NE.	32	14	3	5	3	7	41	17	4	8	2	3	24	3	10	0	5	0	0	0	

* Location of office on June 30, 1882, corner public square and Booneville street.
* Observations commenced January 3, 1882.

JOHN B. MARBURY,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

STARKVILLE, MISS.

[Latitude, 33° 35′; longitude west of Greenwich, 88° 49′. Elevation of barometer above sea-level 455 feet. Elevation of rain-gauge (top) above ground, 1 foot. Elevation of exposed thermometer above ground, 41.4 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 1-10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometer.		Washington time.				Washington time.					Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.	Amount in inches.	Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July																							
August																							
September																							
October																							
November																							
December																							
Year 1881																							
1882.																							
January																							
February																							
March																							
April																							
May*																							
June	30.043	30.002	30.015	30.020	30.312	29.749	64.7	74.9	69.2	69.6	88.1	50.0	82.7	60.4	72.8	72.0	5.1	6.6	4.3	5.3	3.95	1.19	21
							75.2	86.1	79.1	80.1	95.0	58.8	81.3	58.3	73.0	70.9	3.9	6.0	3.8	4.6	2.65	1.19	28

* Barometer not reduced to sea-level during May. Data in May column for 28 days, ending May 31.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.13 a. m., 2.13 p. m., and 10.13 p. m., local time.

M. J. WRIGHT, JR.,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

STARKVILLE, MISS.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—								Number of days—									Remarks.
	Total movement.	Maximum velocity. Direction.	Miles.	Date.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water. Rain.	Snow.	Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
1881.																							
July																							
August																							
September																							
October																							
November																							
December																							
Year 1881																							
1882.																							
January																							
February																							
March																							
April																							
May	6,073	E. W.	36	8 11	14	6	5	20	12	9	6	12	0	6	14	8	10	....	5	0	0	0	For 28 days, ending May 31.
June	5,116	S.	24	3	5	2	3	16	14	29	9	7	5	6	23	1	5	....	2	0	0	0	

Location of office on June 30, 1882, Agricultural College building.

M. J. WRIGHT, JR.,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

STOCKTON, TEX.

[Latitude, 30° 53′; longitude west of Greenwich, 102° 53′. Elevation of barometer above sea-level, 3,010 feet. Elevation of rain-gauge (top) above ground, 2 feet. Elevation of exposed thermometer above ground, 6 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0-10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.998	29.966	29.969	29.977	30.089	29.846	71.7	92.2	80.3	81.4	102.2	62.8	80.0	44.6	62.0	62.2	3.0	4.0	2.0	3.0	1.64	1.12	8
August	30.005	29.974	29.989	29.989	30.122	29.910	69.6	90.3	77.7	79.2	100.2	63.7	78.1	48.4	67.3	64.6	3.0	5.0	1.0	3.0	1.10	.39	21
September	30.036	30.011	30.030	30.026	30.270	29.769	64.9	84.3	73.0	75.0	97.2	53.0	85.1	57.0	71.8	71.3	3.0	4.0	3.0	3.3	1.71	.84	7
October	30.182	30.144	30.167	30.164	30.331	29.868	58.9	74.4	65.2	66.2	88.3	37.0	90.2	62.4	80.4	77.7	4.2	5.2	3.7	4.3	2.67	1.72	9
November	30.266	30.233	30.269	30.256	30.651	29.842	40.9	62.1	46.7	49.9	86.7	23.0	74.9	41.6	69.9	62.1	3.0	2.8	0.7	2.1	.07	.07	10
December	30.338	30.310	30.337	30.328	30.666	30.025	38.4	58.3	43.5	46.7	81.0	20.5	81.6	54.7	79.5	71.9	3.6	5.0	2.9	3.8	1.30	.51	18
Year 1881	30.037	30.006	30.027	30.024	.....	.....	52.8	74.5	60.6	62.7	.....	.....	77.3	46.2	67.7	64.0	4.2	5.7	3.2	4.3	12.65	.....	.....
1882.																							
January	30.153	30.124	30.155	30.144	30.591	29.828	37.8	55.7	43.3	45.6	76.3	14.6	90.6	64.7	84.1	79.8	5.3	5.3	4.1	4.9	.68	.47	19
February	30.149	30.122	30.149	30.140	30.329	29.808	42.1	63.0	49.3	51.5	81.3	20.9	88.2	51.5	80.7	73.5	4.9	6.4	4.2	5.2	1.21	.92	2,3
March	30.114	30.084	30.113	30.104	30.458	29.800	45.6	70.6	55.4	57.2	91.5	23.0	78.6	44.2	67.7	63.5	1.8	4.7	3.2	3.2	.16	.10	14
April	29.967	29.937	29.946	29.950	30.270	29.655	49.3	77.4	61.2	62.6	94.0	24.2	68.2	27.9	51.1	49.1	3.2	3.6	3.2	3.3	.12	.06	13
May	29.923	29.886	29.890	29.903	30.177	29.539	57.7	81.8	66.8	68.8	94.3	41.5	76.4	39.9	68.0	61.4	3.2	2.8	2.0	2.7	.99	.49	3
June	29.868	29.838	29.841	29.849	30.048	29.664	67.0	89.4	75.2	77.2	102.2	54.2	82.0	42.9	65.8	63.6	3.5	3.4	2.1	3.0	3.59	2.46	6

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.16 a. m., 1.16 p. m., and 9.16 p. m., local time.

JAMES O'DOWD,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

STOCKTON, TEX.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	7,308	S.	48	9	0	6	9	46	15	2	0	2	13	14	16	1	6	0	2	0	0	0	
August	6,944	S.	32	17	0	2	14	41	17	3	1	0	15	18	13	0	6	0	3	0	0	0	
September	7,891	SE.	40	5	3	7	4	31	21	7	2	3	12	19	4	7	7	0	0	0	0	0	
October	7,455	W.	40	29	1	6	2	36	15	6	7	3	17	12	11	8	12	0	0	0	0	0	
November	4,864	N.	32	23	5	5	5	11	15	22	5	8	14	18	5	7	1	0	0	0	0	7	First frost 24th.
December	4,761	SW.	36	15	5	1	2	11	10	27	3	14	20	18	6	7	5	0	0	0	0	9	
Year 1881	83,765	.....	....	.....	60	43	54	295	187	151	71	73	161	208	111	46	61	0	16	0	1	59	
1882.																							
January	4,828	SW. SW. W.	32	12 20 30	8	5	1	11	12	13	8	5	30	14	5	12	6	0	0	0	0	15	
February	5,300	NW.	52	7	5	0	5	13	11	12	7	11	20	11	11	6	3	0	0	0	0	7	
March	*5,968	E., S., S., S. S., E.	32	10, 11, 24, 22, 25, 31	6	1	*5	14	12	22	6	7	12	18	7	2	4	0	1	0	0	4	Last frost 8th.
April	7,733	S. SE.	40	4 17	8	1	4	17	17	14	11	4	14	17	9	4	3	0	1	0	0	1	
May	9,125	SE.	40	17	3	4	9	21	23	7	6	10	10	20	8	3	9	0	7	0	0	0	
June	8,910	S. N.	40	3 12	5	0	4	43	18	7	7	0	6	14	14	2	6	0	3	0	0	0	

Location of office on June 30, 1882, on Plaza, about one-half mile from Fort Stockton.

*28½ days only.

JAMES O'DOWD,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

THATCHER'S ISLAND, MASS.

[Latitude, 42° 36′; longitude west of Greenwich, 70° 34′. Elevation of barometer above sea-level, 48 feet. Elevation of rain-gauge (top) above ground, 4 feet. Elevation of exposed thermometer above ground, 7 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.930	29.910	29.925	29.922	30.350	29.454	62.8	68.3	64.2	65.1	76.0	54.0	87.7	62.3	83.9	78.0	3.8	3.9	3.3	3.7	2.89	1.85	26
August	30.007	29.993	29.994	29.998	30.354	29.550	63.2	69.3	64.7	65.7	81.0	49.4	90.3	79.7	89.9	86.6	3.1	3.2	3.4	3.2	.85	.39	7
September	30.136	30.100	30.127	30.121	30.502	29.823	61.7	67.1	62.6	63.8	95.0	53.2	91.2	85.8	90.0	89.0	3.5	4.6	3.8	4.0	3.76	1.72	2,3
October	30.145	30.104	30.121	30.123	30.583	29.456	49.7	56.0	50.7	52.1	78.0	28.5	81.9	77.3	82.6	80.6	5.2	4.3	5.6	5.0	3.19	.73	24
November	30.161	30.107	30.122	30.133	30.671	29.344	40.4	44.8	41.1	42.1	60.1	15.0	73.0	74.9	74.1	74.1	5.0	5.9	3.4	4.8	11.18	3.91	19
December	30.133	30.102	30.104	30.113	30.635	29.139	36.8	40.4	37.5	38.2	67.4	9.5	74.8	76.5	78.7	76.7	5.3	5.4	4.7	5.1	6.80	1.73	22,23
Year 1881	30.024	29.990	30.008	30.007	.....	.....	45.4	50.8	46.5	47.6	.....	.....	82.6	75.4	82.6	80.2	4.6	4.6	4.5	4.6	64.21	.....	.....
1882.																							
January	30.080	30.068	30.078	30.075	30.793	29.340	26.6	31.1	27.5	28.4	50.2	—8.0	81.6	71.1	79.1	77.3	6.1	5.5	4.8	5.5	5.00	1.00	31
February	30.080	30.094	30.112	30.095	30.769	29.277	28.6	35.2	31.7	31.8	49.0	10.0	87.4	71.9	83.0	80.8	5.1	4.3	4.5	4.6	4.69	1.14	9,10
March	30.051	30.023	30.055	30.044	30.672	29.429	33.8	39.3	34.6	35.9	55.5	16.5	80.8	74.2	82.8	79.3	5.6	5.5	3.9	5.0	3.60	1.62	1,2
April	29.993	29.953	29.975	29.974	30.602	29.291	39.5	48.0	40.5	42.7	65.0	23.0	77.3	65.6	76.9	73.3	4.1	5.7	3.9	4.6	2.73	1.31	27,28
May	30.013	29.996	30.008	30.006	30.461	29.591	45.5	52.5	45.5	47.8	67.0	32.0	81.6	71.8	83.3	78.9	5.3	5.4	4.4	5.0	8.72	2.99	14,15
June	29.880	29.827	29.869	29.859	30.251	29.496	59.5	67.3	58.2	61.7	87.0	46.5	82.5	70.5	84.2	79.1	4.5	3.1	3.1	3.6	1.33	.65	4

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7.26 a. m., 3.26 p. m., and 11.26 p. m., local time.

G. LIEBMANN,
Sergeant, Signal Corps, U. S. A.

Annual metorological summary—Continued.

[FORM No. 132—B.]

THATCHER'S ISLAND, MASS.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—								Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurorns.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	6,361	NW. NW. S.	28	1 17 26	8	8	6	7	25	26	2	5	6	10	7	14	8	0	0	0	0	0	
August	7,257	NE.	35	19	6	24	4	3	12	32	1	9	2	11	13	7	5	0	1	0	0	0	
September	7,126	NE.	27	2	1	17	19	10	12	16	8	6	1	2	10	18	9	0	0	0	0	0	
October	10,176	NW.	55	5	10	12	6	9	1	19	6	30	0	13	7	11	10	0	0	0	0	2	First frost October 5.
November	11,377	NW.	56	11	1	8	0	9	1	20	19	32	0	13	7	10	12	2	0	0	0	10	
December	12,064	NE.	45	23	4	10	2	14	10	12	12	29	0	13	6	12	11	2	0	0	4	11	
Year 1881	122,404				97	167	74	90	105	189	131	232	10	109	105	151	92	23	1	0	25	94	
1882.																							
January	12,709	NW.	57	27	5	3	2	7	5	10	30	30	1	7	13	11	6	13	0	2	7	27	
February	12,277	NE.	58	5	15	1	5	6	9	13	10	24	1	10	11	7	9	4	0	1	6	24	
March	13,139	NW.	44	4 13	3	11	6	2	16	12	5	38	0	11	9	11	6	8	0	2	2	18	
April	10,033	NE.	44	28	5	10	7	10	16	11	3	28	0	11	11	8	8	1	0	2	0	5	
May	10,870	NE.	46	15	8	22	9	2	12	6	24	10	0	9	14	8	11	0	0	0	0	0	Last frost May 3.
June	7,098	NW.	32	20	5	2	3	3	19	10	24	23	1	11	16	3	7	0	6	2	0	0	

Location of office on June 30, 1882, Signal Service building.

G. LIEBMANN,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

TOLEDO, OHIO.

[Latitude, 41° 40′; longitude west of Greenwich, 83° 32′. Elevation of barometer above sea-level, 651 feet. Elevation of rain-gauge (top) above ground, 106 feet. Elevation of exposed thermometer above ground, 64 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rain-fall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.					Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.	Amount in inches.	Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.998	29.973	29.979	29.983	30.243	29.720	70.9	81.3	74.8	75.6	95	55	75.8	54.3	73.4	67.8	4	4	3	3.7	5.45	1.59	21
August	30.042	30.007	30.012	30.020	30.242	29.708	68.5	80.9	73.2	74.2	97	55	76.5	52.2	72.3	67.0	4	4	2	3.3	.88	.70	18
September	30.035	29.989	30.009	30.011	30.256	29.630	66.9	78.8	70.5	72.1	95	53	81.1	57.2	78.0	72.1	5	5	4	4.7	5.33	1.82	2
October	30.128	30.099	30.113	30.113	30.492	29.667	53.5	61.4	56.5	57.1	78	35	84.7	69.5	80.2	78.1	6	7	7	6.7	8.49	3.10	2
November	30.137	30.104	30.128	30.123	30.677	29.611	40.1	46.2	41.7	42.7	66	18	79.9	68.8	78.5	75.7	8	7	6	7.0	4.74	1.85	18
December	30.150	30.130	30.146	30.142	30.608	29.628	37.1	41.6	38.7	39.1	59	20.5	81.2	72.7	80.7	78.2	8	6	6	6.7	4.73	1.19	22
Year 1881	30.050	30.012	30.034	30.032	.....	.....	47.9	56.5	51.1	51.8	.....	.....	79.9	64.3	77.0	73.7	5.8	5.9	4.8	5.5	45.91	.....	.....
1882.																							
January	30.164	30.135	30.146	30.148	30.735	29.543	28.3	34.0	30.3	30.9	57	9	75.0	69.5	73.0	72.5	7.0	7.6	6.4	7.0	1.57	.61	26
February	30.110	30.063	30.086	30.086	30.593	29.363	35.5	42.8	39.0	39.1	60	22	75.7	63.6	70.1	69.8	6.0	6.3	4.3	5.5	2.40	.50	19
March	30.088	30.056	30.081	30.075	30.641	29.406	37.2	44.4	40.4	40.7	64.5	25	75.5	63.7	71.3	70.2	7.4	7.0	7.5	7.3	3.02	.83	9
April	30.055	30.025	30.058	30.046	30.316	29.257	42.9	51.8	44.9	46.5	78	22	71.6	55.1	68.0	64.9	6.0	6.9	4.2	5.7	1.66	.68	4,5
May	29.990	29.954	29.966	29.970	30.351	29.533	49.7	57.9	52.7	53.4	74	32	72.3	58.7	69.9	67.0	6.2	6.8	5.0	6.0	4.99	.95	13
June	29.898	29.873	29.888	29.886	30.186	29.488	64.7	72.9	66.8	68.1	90	46	71.0	55.4	69.0	65.1	6.1	6.3	5.4	5.9	4.51	1.42	2,3

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.34 a. m., 2.34 p. m., and 10.34 p. m., local time.

ALLEN BUEIL,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

TOLEDO, OHIO.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	5,168	E.	28	22	7	11	15	3	0	19	29	6	3	14	12	5	11	0	5	1	6	0	
August	4,408	NE.	25	15	7	18	14	2	11	11	10	15	5	17	8	6	5	0	0	0	0	0	Remarkably dry and warm.
September	5,370	SE.	32	30	5	6	5	25	19	11	17	1	1	14	8	8	12	0	7	1	0	0	
October	5,676	S	28	15	8	6	12	10	13	16	21	6	1	6	9	16	19	0	2	0	0	0	The amount of precipitation is 3.87 inches greater than for any month of October since station established. First killing frost October 5.
November	8,090	{SW. / W.}	40	{12 / 5}	2	3	6	3	37	12	25	2	0	4	13	13	11	2	0	0	1	7	
December	6,894	{NW. / SW.}	28	7	7	12	5	2	31	18	14	4	0	7	7	17	11	3	0	0	1	10	
Year 1881	72,759	.....	.....	.....	150	108	118	54	162	151	234	85	33	100	122	143	105	34	25	3	37	94	
1882.																							
January	7,302	SW.	48	26	5	5	11	6	21	18	19	6	2	2	16	13	8	4	0	0	9	23	
February	6,498	SW.	36	21	4	2	8	3	28	13	21	3	2	9	10	9	8	2	0	0	1	14	Storm of sleet 21st.
March	8,019	W.	40	21	7	11	14	4	5	14	28	9	1	3	11	17	12	3	1	0	0	11	
April	7,856	E.	50	23	19	5	20	0	4	8	25	8	1	7	14	9	8	0	1	1	0	6	Mean monthly temperature 5.5° lower than for any month of May since station established.
May	7,688	E.	52	6	13	9	34	1	2	10	21	2	1	7	12	12	15	0	2	0	0	0	
June	6,856	W.	36	4	7	6	26	5	1	21	20	3	1	4	18	8	12	0	12	0	0	0	

Location of office on June 30, 1882, corner Madison and Summit streets.

ALLEN BUELL,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

TUCSON, ARIZ.

[Latitude, 32° 14′; longitude west of Greenwich, 110° 53′. Elevation of barometer above sea-level, 2,369 feet. Elevation of rain-gauge (top) above ground, 1 foot. Elevation of exposed thermometer above ground, 6 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.755	29.740	29.714	29.736	29.870	29.625	74.9	92.9	83.5	83.8	109	68	68.8	40.0	55.0	54.6	4.3	3.8	4.6	4.2	5.69	3.00	26
August	29.775	29.751	29.733	29.752	29.853	29.631	73.8	91.1	81.4	82.1	106	60	78.8	46.7	62.5	62.7	4.0	4.3	4.6	4.3	3.92	2.53	15
September	29.771	29.757	29.733	29.754	29.945	29.534	60.5	88.3	75.6	76.8	105	51	69.8	33.6	56.6	53.3	1.8	1.5	2.4	1.9	2.37	1.33	5
October	29.937	29.914	29.918	29.923	30.125	29.814	56.6	80.8	67.2	68.2	97	38	67.7	36.3	51.3	51.8	2.0	3.5	1.9	2.5	.62	.36	5
November	30.073	30.041	30.066	30.060	30.262	29.798	41.0	67.9	52.0	53.6	81	23	61.5	27.7	44.9	44.7	0.7	2.0	0.8	1.2	.00	.00	.....
December	30.150	30.131	30.154	30.145	30.362	29.923	41.0	65.8	51.8	52.9	82	29	66.2	31.9	51.9	50.0	2.1	3.6	3.1	2.9	.19	.19	17
Year 1881	29.962	29.945	29.938	29.946	.....	.....	55.0	79.4	67.0	67.1	.....	.....	57.3	28.0	43.9	43.1	1.9	2.8	2.2	2.3	14.92	.....	.....
1882.																							
January	30.062	30.038	30.057	30.052	30.319	29.720	39.6	58.4	47.6	48.5	80	24	76.3	45.8	63.9	62.0	4.0	4.6	3.4	4.0	1.75	.44	20
February	30.101	30.098	30.105	30.101	30.359	29.846	41.1	58.9	50.1	50.0	74	27	81.6	47.2	67.4	65.4	4.0	5.1	2.7	3.9	1.64	.82	15
March	30.047	30.038	30.034	30.040	30.226	29.773	46.1	69.9	58.1	58.0	93	27	66.2	29.2	44.3	46.6	2.1	2.9	2.0	2.3	.72	.46	18
April	29.899	29.877	29.873	29.883	30.045	29.643	49.4	76.6	64.1	63.4	100	35	55.4	22.0	35.0	37.5	0.6	1.7	1.4	1.2	.05	.05	13
May	29.809	29.783	29.770	29.787	29.962	29.476	57.6	86.8	74.1	72.8	100	45	46.0	18.0	27.7	30.6	1.7	1.9	1.2	1.6	.01	.01	8
June	29.787	29.762	29.747	29.765	29.911	29.578	66.6	93.5	80.4	80.2	108	51	50.3	24.3	38.2	37.6	2.3	3.5	3.1	3.0	.99	.74	27, 28

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.44 a. m., 12.44 p. m., and 8.44 p. m., local time.

J. L. WHITESIDE,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

TUCSON, ARIZ.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurorns.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	2,861	SE.	35	14	1	5	7	24	14	21	7	12	2	10	15	6	15	0	1	0	0	0	
August	2,143	W.	20	23	1	8	8	22	13	10	5	16	10	10	15	6	8	0	1	0	0	0	
September	2,348	NE.	17	11	3	3	1	27	17	15	6	8	10	21	7	2	5	0	2	0	0	0	
October	2,839	SE.	17	9	4	2	7	40	13	7	6	11	3	20	8	3	4	0	2	0	0	0	
November	3,065	SE. / E.	20	24 / 19	2	5	12	41	5	5	4	12	4	25	5	0	0	0	0	0	0	6	First frost November 11th.
December	3,370	E.	27	15	9	4	13	46	5	8	2	5	1	16	11	4	1	0	0	0	0	7	
Year 1881	34,402				44	57	75	292	151	177	111	152	36	235	100	30	45	3	8	0	0	38	
1882.																							
January	2,812	E.	21	15	5	1	6	26	17	8	7	12	11	14	7	10	6	1	0	0	0	5	
February	2,799	W.	19	1	1	2	7	27	9	5	11	12	10	10	14	4	5	0	0	0	0	5	Last frost February 20th.
March	3,085	W.	19	3	1	1	8	20	13	6	23	10	11	20	8	3	4	0	1	0	0	3	
April	3,396	E.	22	30	2	0	4	27	5	13	16	17	6	25	5	0	1	0	0	0	0	0	
May	3,133	SW.	18	7	2	0	3	18	20	12	19	12	7	23	7	1	1	0	1	0	0	0	
June	2,791	S.	20	30	2	1	8	9	25	12	15	10	8	15	14	1	5	0	5	0	0	0	

Location of office on June 30, 1882, northwest corner Court Square and Alameda street.

J. L. WHITESIDE,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

UMATILLA, OREG.

[Latitude, 45° 55′; longitude west of Greenwich, 119° 21′. Elevation of barometer above sea-level, 340 feet. Elevation of rain-gauge (top) above ground, 5 feet. Elevation of of exposed thermometer above ground, 7 feet.

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.046	30.012	29.981	30.013	30.358	29.652	57.5	76.8	72.7	69.0	105.5	46.5	62.6	34.1	40.0	45.6	3.4	3.2	3.7	3.4	.53	.40	3
August	30.027	30.002	29.970	30.000	30.196	29.729	55.8	75.2	70.3	67.1	99.0	43.7	67.1	35.8	42.0	48.3	2.4	2.9	2.1	2.5	.73	.54	15
September	30.059	30.045	30.017	30.040	30.411	29.750	51.8	69.0	62.4	61.1	91.3	35.4	69.1	37.3	49.4	51.9	4.7	4.4	2.6	3.9	.74	.43	5
October	30.147	30.133	30.129	30.136	30.474	29.728	42.6	55.0	50.3	49.3	68.9	20.5	80.7	56.9	67.7	68.4	6.4	6.5	6.5	6.5	1.54	.26	11
November	30.321	30.322	30.306	30.316	30.785	29.539	36.9	44.3	40.4	40.5	69.6	20.0	80.0	66.7	74.7	73.8	7.7	7.2	6.3	7.1	.98	.35	28
December	30.238	30.229	30.225	30.231	30.615	29.389	32.5	39.7	36.1	36.1	56.0	21.4	88.3	72.9	80.7	80.6	6.8	7.3	6.1	6.7	.45	.17	4
Year 1881	30.151	30.131	30.114	30.132	.....	.....	43.2	52.8	52.1	50.7	.....	.....	77.4	51.4	60.9	63.2	5.5	5.8	4.9	5.4	11.69	.....	....
1882.																							
January	30.180	30.181	30.196	30.186	30.776	29.524	29.7	37.7	33.2	33.6	52.8	4.1	84.0	67.7	75.5	75.7	6.6	6.0	5.9	6.2	.71	.28	23
February	30.149	30.120	30.124	30.131	30.622	29.522	31.2	40.4	36.1	35.9	56.0	4.0	77.3	58.9	69.4	68.5	7.2	7.4	6.0	6.9	.73	.37	28
March	30.149	30.139	30.123	30.137	30.709	29.537	37.4	51.7	45.5	44.9	77.0	21.2	76.4	45.4	56.5	59.4	5.5	6.5	5.8	5.9	.32	.10	15
April	30.066	30.041	30.027	30.045	30.504	29.674	41.3	58.1	51.8	50.4	77.5	30.0	72.6	35.9	51.0	53.2	5.0	5.5	3.7	4.7	.76	.30	8, 9
May	30.070	30.033	29.994	30.032	30.449	29.645	47.5	67.4	62.0	59.0	95.5	34.0	67.4	31.6	40.6	46.5	3.9	5.2	5.4	4.8	.26	.14	3
June	29.966	29.932	29.874	29.924	30.128	29.598	58.0	75.5	71.8	68.4	101.0	46.0	62.1	36.2	40.5	46.3	4.3	4.6	3.8	4.2	.17	.09	6

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.11 a. m., 12.11 p. m., and 8.11 p. m., local time.

JOHN DALY,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

UMATILLA, OREG.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	8,312	W.	48	2	2	4	14	7	2	29	25	8	2	16	10	5	4	0	1	0	0	0	
August	6,780	W.	40	13	3	8	5	10	4	29	26	7	1	20	8	3	4	0	1	0	0	0	Comet visible, 17th.
September	6,638	W.	40	23	2	9	8	11	5	16	31	6	2	12	16	2	7	0	1	1	0	0	First light frost, 10th; mirage, 11th; aurora, 14th.
October	5,216	N.	38	3	7	10	7	19	7	18	17	7	1	4	13	14	11	1	0	0	0	2	First killing frost, 13th.
November	4,698	W.	44	5, 12	9	8	20	14	6	10	19	4	0	1	15	14	5	6	0	0	0	14	Meteors, on 15th, very brilliant.
December	3,776	SW.	36	11	1	1	18	22	5	13	24	7	2	3	8	20	3	4	0	0	0	19	Meteor on 8th.
Year 1881	70,758	.....	....	.....	46	83	151	150	55	219	281	96	14	92	136	137	71	24	8	3	20	88	
1882.																							
January	4,936	SW.	32	25	4	3	23	13	6	16	18	10	0	5	14	12	4	5	0	0	3	21	
February	5,587	N.	56	16	3	8	13	14	4	16	23	1	2	5	7	16	5	3	0	0	4	16	
March	8,002	W.	52	28	4	7	7	12	8	23	24	7	1	6	12	13	6	1	0	1	0	9	
April	7,010	W.	48	19	3	6	10	8	3	21	30	3	6	11	11	8	7	0	0	3	0	2	Last frost, 7th; auroras, 16th, 19th, 20th.
May	6,837	(*)	(*)	(*)	2	8	6	7	5	16	29	12	9	8	18	5	3	0	0	0	0	0	
June	6,862	W.	41	16	4	5	7	5	0	18	35	9	7	10	17	3	2	0	3	0	0	0	

* Self-register out of order.

Location of office on June 20, 1882, First between D and E streets.

JOHN DALY.
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

UVALDE, TEX.

[Latitude, 29° 13′; longitude west of Greenwich, 99° 40′. Elevation of barometer above sea-level, 930 feet. Elevation of rain-gauge (top), on ground. Elevation of expose thermometer above ground, 4 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0-10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Extremes.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.																							
July*	29.821	29.729	29.749	29.765	29.939	29.497	75.1	93.9	83.0	84.0	104	65	83.3	44.9	65.4	65.0	5	5	0	3	1.22	.76	17
August*	29.801	29.715	29.754	29.757	29.915	29.566	75.2	95.3	83.6	84.7	104	67	83.0	41.8	62.8	61.2	4	4	0	3	1.91	.52	9
September†	29.794	29.707	29.762	29.754	29.938	29.501	72.1	90.9	79.2	80.7	99	50	83.7	45.4	67.9	65.7	6	5	2	4	1.44	.63	8
October‡	29.872	29.804	29.860	29.847	30.032	29.481	67.5	81.1	71.6	73.4	93	42	87.9	57.7	77.0	74.5	7	7	4	6	3.15	1.54	18
November§	29.979	29.914	29.980	29.957	30.453	29.508	50.5	67.7	56.1	58.1	91	28	85.7	54.6	74.9	71.2	7	6	3	5	2.24	1.22	5
December‖	30.034	29.985	29.980	30.001	30.400	29.679	49.2	64.9	55.4	56.5	78	31	84.0	69.4	76.7	73.6	5	5	4	5	.91	.23	19
Year 1881	29.847	29.778	29.814	29.813	.....	.....	60.2	79.0	68.1	69.1	.....	.....	80.1	49.1	67.7	65.6	5.3	4.8	2.5	4.2	21.54	.....	...
1882.																							
January¶	30.089	30.059	30.079	30.076	30.216	29.874	53.3	69.7	60.0	61.0	79	38	91.3	63.6	79.1	78.0	4.3	8.0	5.0	5.8	.07	.03	5
February**	30.080	30.072	30.089	30.082	30.321	29.705	58.0	69.3	62.6	63.3	81	35	82.5	62.8	68.9	71.4	5.3	8.9	5.7	6.6	.71	.33	14
March††	30.067	30.050	30.072	30.063	30.554	29.714	59.7	74.3	65.6	66.5	88	37	86.3	57.8	76.6	73.6	8.2	8.0	4.9	7.0	1.41	.60	6,7
April	29.949	29.916	29.939	29.935	30.248	29.558	63.7	82.6	69.9	72.1	98	38	80.2	40.8	65.6	62.2	8.1	5.8	4.5	6.1	.33	.17	30
May	29.909	29.871	29.892	29.891	30.152	29.413	66.4	84.7	74.5	75.2	98	47	82.1	45.6	65.8	64.5	7.3	6.6	5.4	6.4	4.73	1.85	24
June	29.936	29.900	29.912	29.916	30.133	29.706	73.5	92.4	81.8	82.6	101	61	86.1	41.9	64.7	64.2	7.8	5.6	2.6	5.3	.36	.26	6,7

* Record for 30 days, 1 day on the line.
§ Record for 29 days, 1 day on the line.
** Record for 17 days. Office reopened 5.29 a. m., February 12.
† Record for 28 days, 2 days on the line.
‖ Record for 27 days, 4 days on the line.
‡ Record for 29 days, 2 days on the line.
¶ Record for 7 days. Office closed 9.29 p. m., January 7.
†† Record for but 28 days, 3 days on the line.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 5.29 a. m., 1.29 p. m., and 9.29 p. m., local time.

ED. C. IMLAY,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

UVALDE, TEX.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time; Number of times observed blowing from—										Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
July	2,557	E.	13	27	1	4	16	40	18	4	0	0	7	24	1	5	2	0	0	0	0	0	
August	2,051	E.	14	7	4	1	12	30	15	4	0	1	23	22	7	1	7	0	0	0	0	0	
September	3,242	E.	16	6	4	4	5	35	13	2	2	1	20	13	7	8	8	0	0	0	0	0	
October	1,743	NE.	16	24	4	4	11	28	8	2	1	3	20	7	9	13	16	0	0	0	0	0	
November	2,634	SE. NE.	16	1 & 23	10	11	5	17	11	3	1	1	28	6	15	8	10	0	0	0	0	1	First frost November 8.
December	1,931	NW.	16	28	4	5	11	17	4	3	1	4	32	10	5	12	11	0	0	0	0	2	
Year 1881	32,199	.....	..	.....	97	45	101	366	153	45	10	48	181	137	137	77	77	0	0	0	0	92	
1882.																							
January	297	SE.	8	3	0	1	4	2	4	0	0	0	10	1	2	4	3	0	0	0	0	0	
February	1,920	N.	18	20 27 28	7	3	9	14	6	0	1	1	10	1	6	10	8	0	0	0	0	0	
March	2,843	N.	21	27	5	6	7	39	6	5	0	1	17	4	11	13	11	0	0	0	0	0	Last frost March 10.
April	4,141	NW. N.	20	27 29	9	7	7	40	13	0	1	4	9	6	11	13	3	0	0	1	0	0	Brilliant aurora on April 16.
May	4,250	NW. S.	21	10 22	6	4	7	47	12	5	0	3	9	5	11	15	12	0	4	0	0	0	
June	4,062	SE.	14	13 20 29	0	2	8	43	27	4	0	1	5	5	18	7	5	0	0	0	0	0	

Location of office on June 30, 1882, south side Main street, between Fountain Plaza and High street.

ED. C. IMLAY,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

VICKSBURG, MISS.

[Latitude, 32° 23′; longitude west of Greenwich, 90° 54′. Elevation of barometer above sea-level, 244 feet. Elevation of rain-gauge (top) above ground, 53 feet. Elevation of exposed thermometer above ground, 32 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.064	30.018	30.024	30.035	30.196	29.856	77.1	93.3	80.9	83.8	100	62	80.9	49.9	73.7	68.2	5.5	4.2	2.1	3.9	2.45	1.15	13
August	30.018	29.973	29.985	29.992	30.170	29.784	76.5	93.6	81.7	83.9	99	71	49.0	47.8	70.1	65.6	2.9	4.3	2.2	3.1	2.53	2.43	5
																							6
September	30.045	30.012	30.030	30.029	30.193	29.650	69.9	87.3	76.0	77.7	98	51	83.4	48.7	70.0	67.4	4.0	4.8	3.0	3.9	6.11	3.85	14
																							15
October	30.125	30.087	30.114	30.109	30.361	29.804	65.3	78.4	69.4	71.0	90	45	87.0	62.3	80.0	76.2	5.3	6.5	4.3	5.4	9.69	6.44	27
																							28
November	30.206	30.166	30.196	30.189	30.516	29.922	49.6	62.0	55.5	55.7	80	25	79.9	63.0	72.2	71.7	4.3	5.7	4.3	4.8	6.07	3.44	11
																							12
December	30.200	30.163	30.190	30.184	30.587	29.852	48.6	60.3	53.9	54.3	75	33	75.5	58.9	70.6	68.3	4.6	5.1	4.0	4.6	3.18	1.31	14
																							15
Year 1881	30.024	29.981	30.001	30.002	.....	.....	60.3	74.7	65.4	66.8	....	.....	76.7	53.2	70.3	66.7	4.6	4.9	3.3	4.3	51.94	.....	.....
1882.																							
January	30.166	30.147	30.175	30.163	30.633	29.850	51.1	56.9	53.6	53.9	74	30	83.4	74.2	80.0	79.2	8.1	8.2	7.9	8.1	13.83	2.25	20, 21
February	30.167	30.133	30.145	30.148	30.481	29.566	53.7	65.1	58.9	59.2	80	32	78.5	60.9	67.3	68.9	6.0	5.8	6.1	6.0	7.15	2.68	3, 4
March	30.146	30.111	30.134	30.130	30.565	29.697	58.2	70.8	64.5	64.5	84	43	78.1	54.6	64.4	65.7	5.7	4.9	3.3	4.6	7.41	2.76	8, 9
April	30.032	30.003	30.014	30.016	30.304	29.662	61.9	75.9	67.1	68.3	86	47	78.7	54.4	71.7	68.3	5.5	5.2	4.1	4.9	5.44	2.43	18
May	30.008	29.980	29.987	29.992	30.281	29.683	65.2	79.0	70.0	71.4	90	52	77.3	53.5	70.9	67.2	5.2	6.0	3.3	4.8	8.30	2.84	7, 8
June	30.033	30.003	30.009	30.015	30.267	29.768	74.4	88.3	78.4	80.4	99	57	82.1	53.0	72.4	69.2	3.7	5.1	3.0	3.9	.40	.34	7, 8

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.04 a. m., 2.04 p. m., and 10.04 p. m., local time.

H. P. BRISBANE,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

VICKSBURG, MISS.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	3,571	N. E.	27	23	12	17	7	8	12	17	4	13	3	12	18	1	6	0	0	0	0	0	
August	3,855	N. W.	22	23	11	10	14	15	8	22	6	5	2	17	12	2	3	0	0	0	0	0	
September	3,527	S. E.	21	26	14	10	14	30	5	5	5	6	1	15	9	6	6	0	0	0	0	0	
October	4,132	S. W.	24	30	13	14	12	26	7	9	6	5	1	8	13	10	8	0	0	0	0	0	
November	4,877	N. W.	22	23	16	9	4	25	15	6	2	13	0	11	10	9	11	0	0	0	0	3	First frost November 4.
December	4,803	W.	32	29	13	8	16	15	9	9	10	9	4	12	11	8	10	0	0	0	0	0	
Year 1881	56,243	.....	....	.....	146	118	135	195	144	139	72	115	31	150	128	87	90	0	0	0	1	18	
1882.																							
January	4,404	S. N. W.	21	10 17 31	12	14	9	14	18	6	3	10	7	3	5	23	22	0	0	0	0	2	
February	4,157	S.	40	28	3	3	12	18	19	7	7	7	8	7	9	12	13	0	0	0	0	0	
March	4,603	SW.	28	9	9	8	8	13	24	13	5	13	0	10	13	8	10	0	0	0	0	0	Last frost March 11.
April	3,173	NW.	28	27	12	10	2	27	11	12	7	4	5	8	15	7	12	0	0	0	0	0	
May	3,132	N.	36	10	6	2	10	14	16	6	8	14	17	9	14	8	12	0	1	0	0	0	
June	1,895	N.	24	16	4	1	6	12	16	22	1	6	22	9	17	4	4	0	1	0	0	0	

Location of office on June 30, 1882, Washington and Crawford streets.

H. P. BRISBANE,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

VISALIA, CAL.

[Latitude, 36° 20′; longitude west of Greenwich, 119° 16′. Elevation of barometer above sea-level, 348 feet. Elevation of rain-gauge (top) above ground, 45 feet. Elevation of exposed thermometer above ground, 22 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.872	29.879	29.807	29.853	30.080	29.641	62.4	87.0	80.2	76.5	104.0	49.0	65.3	30.2	46.8	47.4	0.2	0.4	0.4	0.3	(¶)	(¶)	14
August	29.839	29.856	29.792	29.829	30.091	29.653	60.7	84.7	77.2	74.2	100.7	50.0	65.2	34.4	51.4	50.3	0.6	0.6	0.6	0.6	.03	.03	7
September	29.847	29.858	29.807	29.837	30.071	29.606	56.5	79.9	70.4	68.9	97.0	44.0	68.2	34.8	55.8	52.9	0.5	0.6	0.1	0.4	.09	.09	22
October	29.993	30.001	29.979	29.991	30.249	29.771	45.6	66.6	56.1	56.1	85.0	30.0	78.6	42.5	66.8	62.6	1.3	1.6	1.2	1.4	.31	.12	25, 28
November	30.125	30.120	30.107	30.117	30.387	29.891	37.7	58.4	47.5	47.9	75.0	26.5	76.9	42.3	64.3	61.2	1.2	1.6	1.3	1.4	.52	.48	15
December	30.158	30.168	30.163	30.163	30.405	29.915	41.4	52.8	47.5	47.2	68.0	27.5	88.0	70.5	81.1	79.9	6.6	7.1	5.4	6.4	.27	.09	6
Year 1881	29.803	29.814	29.778	29.796	.....	.....	51.0	69.4	62.4	60.9	.....	.....	77.1	47.8	63.2	62.7	2.4	3.2	1.8	2.5	7.38	.....	.....
1882.																							
January	30.114	30.117	30.099	30.110	30.383	29.725	35.0	50.2	43.1	42.8	64.0	18.0	79.9	52.8	65.2	66.0	2.5	3.8	3.2	3.2	.87	.41	24
February	30.135	30.158	30.134	30.142	30.430	29.816	37.9	52.1	46.5	45.5	65.0	28.5	82.5	53.4	66.9	67.6	4.0	5.5	3.1	4.2	1.86	.65	10, 11
March	30.087	30.102	30.070	30.086	30.356	29.705	45.5	61.6	56.0	54.4	84.4	30.5	77.6	47.0	57.7	60.8	3.3	4.2	3.0	3.5	1.47	.45	14, 15
April*	30.019	30.039	29.984	30.014	30.224	29.710	47.2	65.1	60.1	57.5	91.4	34.0	77.5	40.0	53.7	57.1	3.0	3.5	3.0	3.2	.95	.37	2, 3
May†	29.919	29.937	29.885	29.914	30.141	29.712	55.4	76.7	69.5	67.2	101.0	43.5	71.5	32.2	43.0	48.9	2.0	2.6	1.1	1.9	.37	.35	24
June‡	29.889	29.900	29.842	29.877	30.063	29.702	60.8	81.5	75.6	72.6	102.5	52.5	63.3	32.0	41.9	45.7	2.4	1.7	0.8	1.6	.02	.01	15, 30

* 25 days only. † 21 days only. ‡ 27 days only. ¶ Rainfall inappreciable.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.11 a. m., 12.11 p. m., and 8.11 p. m., local time.

W. L. SEWARD,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

VISALIA, CAL.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	2,906	NW.	14	18	8	1	8	2	4	11	12	51	1	30	1	0	0	0	0	0	0	0	Earthquake on 3d.
August	2,828	NW.	14	26	3	0	1	2	6	7	13	59	2	28	2	1	1	0	0	0	0	0	
September	3,367	SE. NW.	12	22 28	3	0	5	14	9	6	10	37	6	29	1	0	1	0	0	0	0	0	Lunar halo 2d; light frost 14th.
October	2,285	NW.	18	13	7	1	8	13	12	5	14	29	4	24	6	1	4	0	0	0	0	1	Lunar halo 2d.
November	1,887	SE.	14	10	10	1	5	16	13	15	9	19	2	24	4	2	2	0	0	0	0	7	Lunar halos 5th, 26th, 28th.
December	1,700	NW.	12	15	3	7	7	18	14	8	4	28	4	10	13	8	4	0	0	0	0	9	Lunar halos 2d, 27th, 29th.
Year 1881	29,189	.....	.....	.....	86	23	66	128	86	86	116	473	31	239	85	41	33	0	1	0	0	19	Four foggy days.
1882.																							
January	2,328	NW.	24	11	9	5	8	26	10	8	6	21	0	15	12	4	6	0	0	0	0	16	Hail on 10th.
February	2,239	NW.	20	5	5	3	3	19	10	10	13	21	0	11	13	4	6	0	0	0	0	9	
March	3,499	SW.	30	12	2	5	9	16	13	7	7	30	4	17	8	6	9	0	0	0	0	2	
April	*3,369	NW.	24	6	4	1	4	10	5	8	5	37	5	13	8	4	6	0	0	1	0	0	Light sand storm 2d; aurora 16th.
May	†2,946	NW.	16	6 7	4	2	4	3	1	2	8	47	8	17	1	3	2	0	1	0	0	0	Heavy frost 13th; light frost 14th.
June	‡2,619	NW.	17	9	6	2	1	5	4	4	14	41	6	20	7	0	2	0	2	0	0	0	

*Entire month. †29 days only. ‡28½ days only.

Location of office on June 30, 1882, Palace Hotel Building, corner of Main and Court streets.

W. L. SEWARD,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

WASHINGTON, D. C.

[Latitude, 38° 54′; longitude west of Greenwich, 77° 2′. Elevation of barometer above sea-level, 105 feet. Elevation of rain-gauge (top) above ground, 51 feet. Elevation of exposed thermometer above ground, 44 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.993	29.947	29.972	29.971	30.240	29.686	72.1	85.9	74.2	77.4	97.6	61.6	82.3	53.4	79.6	71.8	2.8	3.7	2.1	2.9	1.67	.42	7
August	30.077	30.015	30.047	30.046	30.313	29.710	70.2	86.3	72.9	76.5	101.0	57.3	83.4	48.0	78.7	70.0	3.0	4.2	2.3	3.2	1.07	.71	7
September	30.113	30.057	30.098	30.089	30.320	29.842	70.7	86.4	73.8	77.0	104.3	59.8	87.2	51.0	83.7	74.0	5.3	4.3	3.6	4.4	2.19	1.33	11
October	30.204	30.134	30.167	30.168	30.611	29.628	56.6	71.2	60.8	62.9	92.2	37.0	84.2	55.8	80.3	73.4	3.8	4.7	4.3	4.3	3.29	1.07	24
November	30.245	30.197	30.222	30.221	30.746	29.738	43.2	53.1	46.9	47.5	76.1	21.4	82.1	63.2	78.0	74.8	4.9	6.1	4.4	5.1	2.45	.93	23
December	30.211	30.164	30.215	30.197	30.685	29.449	37.8	47.2	40.2	41.7	69.6	21.2	87.0	61.1	80.1	76.1	5.8	6.7	5.4	6.0	6.12	1.68	22
Year 1881	30.091	30.038	30.073	30.067	.....	.....	50.9	63.0	54.0	55.9	.....	.....	81.5	56.6	78.1	72.1	5.1	5.5	4.3	5.0	42.20	.....	.....
1882.																							
January	30.224	30.177	30.216	30.206	30.906	29.407	30.7	36.9	32.0	33.2	58.5	8.4	85.6	71.1	85.8	80.8	6.6	6.7	5.5	6.3	7.09	1.01	13
February	30.206	30.142	30.178	30.175	30.755	29.348	35.6	46.6	39.1	40.4	61.9	19.7	80.2	60.1	77.5	72.6	5.2	5.7	4.7	5.2	5.69	1.42	4,5
March	30.149	30.104	30.155	30.136	30.719	29.560	40.2	49.1	42.9	44.1	70.6	23.4	79.6	57.7	70.6	69.3	6.1	5.9	5.6	5.9	3.75	.87	27
April	30.112	30.030	30.060	30.060	30.505	29.397	46.1	57.1	49.1	50.8	84.2	27.4	75.8	54.7	73.9	68.1	5.8	6.1	5.2	5.7	2.55	.85	23
May	30.055	30.001	30.022	30.026	30.452	29.554	55.0	66.0	56.6	59.2	86.1	37.0	78.3	54.8	79.5	70.9	5.8	6.4	6.5	6.2	5.00	1.11	27
June	29.963	29.914	29.942	29.940	30.268	29.552	69.3	81.9	70.3	73.8	95.0	51.1	71.6	47.5	71.3	64.5	6.0	5.9	3.0	5.0	2.33	1.21	1

B. M. PURSSELL,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

WASHINGTON, D. C.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurora.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	3,071	N.	28	7	12	9	2	4	11	6	11	29	9	10	16	5	8	0	7	0	0	0	
August	2,543	NW.	16	6	11	9	4	6	23	2	9	15	14	13	17	1	7	0	3	0	0	0	
September	2,654	E.	20	16	7	8	13	9	24	4	6	8	11	10	14	6	6	0	4	0	0	0	Highest temperature since observations began, on 7th.
October	2,780	NW.	17	4	8	6	2	8	25	6	6	15	17	11	16	4	9	0	0	0	0	0	First light frost on 6th.
November	3,274	NW.	21	24	6	6	6	8	18	1	9	20	16	10	9	11	12	0	0	0	0	7	First killing frost on 16th.
December	3,513	NW.	24	23	15	6	2	3	17	13	5	14	18	8	12	11	11	2	0	0	0	14	
Year 1881	41,484	.....	....	.....	125	109	61	69	190	56	110	244	131	100	164	101	123		19	0	18	86	
1882.																							
January	3,580	NW.	29	29	15	9	6	6	13	6	4	26	8	6	11	14	14	4	0	0	7	22	
February	3,460	NW.	22	{21 22}	11	8	6	6	18	7	0	18	10	9	11	8	10	1	1	0	0	13	
March	4,802	NW.	25	10	12	2	6	9	18	3	3	30	10	6	14	11	13	1	1	0	0	7	
April	4,041	S.	24	19	10	9	5	11	10	7	10	19	9	7	12	11	7	1	3	4	0	2	
May	3,690	W.	21	2	14	13	2	9	21	7	5	10	12	7	11	13	17	0	1	0	0	0	
June	3,303	N.	19	10	7	1	2	3	29	9	9	15	15	5	20	5	8	0	2	0	0	0	

Location of office on June 30, 1882, Nos. 1719 and 1721 G street N. W.

B. M. PURSSELL,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

WEST LAS ANIMAS, COLO.*

[Latitude, 38° 4′; longitude west of Greenwich, 103° 12′. Elevation of barometer above sea-level, 3,905 feet. Elevation of rain-gauge (top) above ground, 1 foot. Elevation of exposed thermometer above ground, 15 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July																							
August																							
September																							
October	27 30.130	28 30.080	23 30.090	30.100	30.367	29.664	27 45.2	28 65.3	23 55.8	55.4	90.0†	30.0†	27 68.2	27 34.0	23 46.6	23 49.6	27 4.3	28 3.7	23 3.5	3.8	.21	.18	5
November	21 30.272	25 30.265	22 30.293	30.277	30.697	29.808	21 24.9	25 42.6	22 32.4	33.3	63.0†	11.0†	21 81.5	25 52.8	22 72.2	17 68.7	21 3.4	25 4.2	22 2.5	3.4	.63	.40	10
December	15 30.319	18 30.314	16 30.363	30.332	30.643	29.918	15 25.0	18 46.7	16 33.7	35.1	60.9†	12.0†	15 83.5	18 47.2	16 75.8	12 68.8	14 5.2	17 3.5	15 2.9	3.9	.04	.03	18
Year 1881																							
1882.																							
January	15 30.122	13 30.079	12 30.128	30.110	30.344	29.783	15 15.9	13 41.3	12 26.3	27.8	55.5	4	15 89.5	13 50.2	12 79.2	12 73.0	13 3.8	13 3.2	12 2.1	3.1	.08	.07	7
February	30.129	30.090	30.117	30.112	30.381	29.665	19.0	49.6	33.0	33.9	68	4	74.6	27.9	52.8	51.8	1.9	2.8	1.6	2.1	.02	.02	20
March	30.113	30.069	30.067	30.083	30.409	29.666	29.1	56.7	43.9	43.2	77	6	62.7	23.2	39.4	41.8	2.3	3.3	2.2	2.6	.10	.07	26
April	29.907	29.859	29.895	29.887	30.410	29.495	38.0	61.9	50.1	50.0	82.5	18	64.9	26.5	42.6	44.7	3.1	4.0	3.1	3.4	.98	.85	29
May	29.853	29.800	29.840	29.831	30.177	29.374	48.7	66.1	53.9	56.2	85	36	74.2	38.6	63.9	58.9	5.7	6.0	5.2	5.6	5.00	1.81	6
June	29.788	29.737	29.744	29.756	30.077	29.477	59.5	80.3	68.8	69.5	100	46	74.7	35.5	54.8	55.0	4.4	3.7	4.0	4.0	2.49	1.51	11

* Station established October 1, 1881. † Reading of exposed thermometer.

NOTE.—7 a. m., 3 p. m., and 11 p m., Washington time, correspond with 5.16 a. m., 1.16 p. m., and 9.16 p. m., local time. The black-faced figures indicate the number of observations from which means are obtained.

F. H. BRANDENBURG,
Corporal, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

WEST LAS ANIMAS, COLO.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July																							
August																							
September																							
October	(*)	S.	32	10	5	11	10	11	8	14	7	10	2	10	10	3	3	0	0	0	(†)	(†)	
November	(*)	NW.	28	23, 4	6	6	3	7	2	15	9	19	1	8	6	3	3	2	0	0	(†)	(†)	
December	(*)	W.	30	7	2	2	5	2	2	10	5	18	3	4	5	2	2	0	0	0	(†)	(†)	
Year 1881																							
1882.																							
January	(*)	(*)	(*)	(*)	3	3	1	5	1	5	3	9	8	6	5	1	0	2	0	0	(†)	(†)	
February	‡4,473	SE., NW.	36	17, 18	2	10	9	6	3	7	22	18	7	20	6	2	0	1	0	0	1	27	
March	7,232	SW.	45	4	6	10	17	3	8	10	14	9	16	18	12	1	1	1	1	0	2	22	
April	9,344	SW.	48	17	6	11	19	8	11	9	18	5	3	16	10	4	3	0	1	1	0	10	
May	9,983	NE.	54	22	6	13	22	9	8	6	12	11	6	4	21	6	12	0	3	0	0	0	
June	7,045	SE.	52	19	3	2	22	15	9	7	9	10	13	10	16	4	8	0	2	0	0	0	

* No record. † No record of reading of maximum and minimum thermometers. ‡ Twenty-six days.

Location of office on June 30, 1882, corner of Vyil avenue and Eleventh street.

F. H. BRANDENBURG,
Corporal, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

WICKENBURG, ARIZ.

[Latitude, 33° 58′; longitude west of Greenwich, 112° 42′. Elevation of rain-gauge (top) above ground, 2 feet. Elevation of exposed thermometer above ground, 4 feet.]

	Barometer (to sea).*						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July							73.6	96.2	84.8	84.8	(†)	64.0	63.2	30.1	59.4	50.9	2.7	3.4	2.5	2.9	1.82	.51	21, 22
August‡							70.7	90.7	79.1	80.0	(†)	51.0	77.6	43.7	72.1	64.5	5.4	1.9	2.0	2.1	5.02	2.02	12
September‡							58.6	85.6	69.3	71.1	(†)	49.0	73.6	39.4	65.9	59.6	2.8	3.7	2.6	3.0	1.16	.77	21, 22
October							47.8	75.4	57.7	60.7	(†)	33.0	71.8	34.7	65.8	57.4	2.6	3.3	2.3	2.7	.09	.06	4
November							34.7	63.1	44.0	47.3	(†)	23.0	66.0	33.8	58.1	52.6	0.7	1.6	1.1	1.1	.41	.41	10
December							35.5	61.8	44.1	47.2	(†)	25.0	72.5	39.3	66.0	59.3	4.3	4.2	3.8	4.1	.36	.34	17
Year 1881							49.1	76.5	60.1	61.9	.....	.....	(§)	(§)	(§)	(§)	(§)	(§)	(§)	(§)	11.40	.....	.....
1882.																							
January‖							33.4	54.6	39.4	42.5	68.0	15.0	75.8	66.4	74.2	71.5	3.4	4.0	2.6	3.3	1.82	1.19	16, 17
February‖							34.0	56.8	43.0	44.6	67.3	10.8	86.0	63.9	73.0	74.3	4.3	4.3	1.9	3.5	.69	.24	20
March¶							38.3	67.1	52.1	52.5	85.2	22.0	64.5	25.2	44.1	44.6	1.7	2.5	1.3	1.8	.00	.00	0
April¶							42.9	73.0	58.2	58.0	94.9	31.3	71.6	44.6	59.0	58.4	1.4	2.8	1.1	1.8	0.04	.03	13
May							.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
June							.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

* No barometer at station. † Maximum thermometer unserviceable. ‡ Data for 28 days only. § Record incomplete. ‖ Data for 25 days only. ¶ Data for 27 days only.

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.37 a. m., 12.37 p. m., and 8.37 p. m., local time.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

WICKENBURG, ARIZ.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	South.	Southeast.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July		S.			4	0	1	9	13	9	7	5	45	24	3	4	9	0	0	0	0	0	
August†		S.			2	3	0	12	13	0	7	2	54	22	5	4	8	0	0	0	0	0	
September†		S.			3	0	2	3	18	1	5	2	56	20	3	2	3	0	0	0	0	0	
October		S.			0	0	0	11	12	4	3	0	63	19	8	4	4	0	0	0	0	0	First light frost October 14th.
November		NW. SE.			0	2	0	10	7	0	4	10	57	26	1	3	1	0	0	0	0	14	First killing frost November 2d.
December		SE.			1	0	0	5	4	3	1	1	78	15	4	12	3	0	0	0	0	13	
Year 1881					27	12	8	64	169	58	193	80	484	286	44	35	37	0	....	0	0	69	
1882.																							
January‡		W.			0	1	0	2	7	1	10	1	54	12	11	2	3	0	0	0	0	14	
February‡		W.			0	2	0	3	11	3	13	11	31	12	10	3	7	0	0	0	0	14	
March§		NW.			1	2	1	6	4	7	4	18	39	18	8	1	0	0	0	0	0	7	
April§		NW.			0	0	0	2	6	5	6	9	53	19	7	1	2	0	0	0	0	2	
May																			0				
June																			0				

*No anemometer on station. † Data for 28 days only. ‡ Data for 25 days only. § Data for 27 days only.

Annual meteorological summary.—Continued.

[FORM No. 132—A.]

WILLIAMSPORT, PA.

[Latitude, 41° 15′; longitude west of Greenwich, 77° 3′. Elevation of barometer above sea-level, 561 feet. Elevation of rain-gauge (top) above ground, 58 feet. Elevation of exposed thermometer above ground, 45 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July																							
August																							
September																							
October																							
November																							
December																							
Year 1881																							
1882.																							
January*	30.132	30.115	30.126	30.124	30.858	29.522	26.4	32.4	27.9	28.9	47	−1	75.3	69.3	80.0	74.9	8.2	8.2	7.0	7.8	3.01	.81	31
February	30.166	30.118	30.141	30.142	30.719	29.440	31.4	39.8	33.5	34.9	57	20	79.2	64.6	80.2	74.7	6.7	6.6	6.2	6.5	3.74	1.28	21
March	30.123	30.061	30.118	30.101	30.702	29.537	36.4	44.5	38.6	39.8	66	22	71.2	57.5	66.4	65.0	7.3	6.7	4.7	6.2	3.48	1.60	1
April	30.063	29.980	30.039	30.027	30.441	29.365	40.5	53.4	44.6	46.2	72	23	69.0	49.6	67.2	61.9	6.9	7.1	5.2	6.4	2.24	.58	19
May	30.040	29.967	29.996	30.001	30.391	29.562	49.4	62.8	53.6	55.3	80	32	73.2	49.1	70.4	64.2	6.3	7.0	5.9	6.4	6.66	1.60	22, 23
June	29.933	29.870	29.912	29.905	30.239	29.482	60.6	78.2	66.6	69.2	95	46	72.9	43.4	68.3	61.5	6.1	6.8	4.6	5.8	3.25	.78	1

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 7 a. m., 3 p. m., and 11 p. m., local time.
* Twenty-five days only.

B. F. HOUGH,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary.

[FORM No. 132—B.]

WILLIAMSPORT, PA.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July																							
August																							
September																							
October																							
November																							
December																							
Year 1881																							
1882.																							
January	5,135	NW.	32	11, 27	8	7	22	3	5	2	7	35	4	4	8	19	7	9	0	0	5	21	
February	3,764	NW.	28	10	9	6	14	3	2	2	25	10	13	4	8	9	11	9	3	0	0	1	19	
March	5,071	N. NW. NW.	28	13 27 30	11	9	7	8	13	5	12	23	5	7	10	14	9	3	1	0	0	14	
April	4,245	NW.	28	21	8	10	6	6	6	3	18	20	13	6	10	14	8	1	2	1	0	3	
May	3,489	N. SE.	22	2, 11	8	12	9	19	2	4	15	7	17	5	13	13	19	0	0	0	0	0	Light frost 2d and 26th.
June	3,495	W.	28	4	3	5	5	3	6	4	29	13	22	6	12	12	12	0	2	0	0	0	

Location of office on June 30, 1882, Third and Pine streets, Green & Co.'s Building.

B. F. HOUGH,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

WILMINGTON, N. C.

[Latitude, 34° 14′; longitude west of Greenwich, 77° 57. Elevation of barometer above sea-level, 52 feet. Elevation of rain-gauge (top) above ground, 45 feet. Elevation of exposed thermometer above ground, 28 feet.]

	Barometer (to sea).				Temperature.							Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.					Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.	Amount in inches.	Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	30.005	29.970	30.031	29.992	30.219	29.655	76.6	86.7	78.3	80.5	96.0	62	82.9	60.3	80.4	74.5	5.4	5.9	3.9	5.1	12.40	4.48	1
August	30.040	30.000	30.033	30.024	30.248	29.789	74.8	85.0	77.6	79.1	94.0	62	87.1	61.6	79.2	76.0	4.1	6.5	4.0	4.9	4.99	2.49	27
September	30.109	30.066	30.110	30.095	30.334	29.302	74.9	83.9	77.7	78.8	90.0	62	84.7	63.9	80.7	76.4	4.2	5.1	3.8	4.4	3.50	2.00	9
October	30.183	30.148	30.189	30.172	30.460	29.672	65.0	75.6	68.9	69.8	87.0	47	79.2	62.6	78.4	73.4	4.2	5.8	3.1	4.4	1.48	.43	19
November	30.223	30.177	30.217	30.206	30.647	29.717	53.4	65.4	57.4	58.7	81.0	26	83.1	62.6	81.7	75.8	5.5	5.7	4.7	5.3	2.95	1.44	29
December	30.212	30.156	30.200	30.189	30.578	29.653	47.4	59.5	51.5	52.8	73.0	31	81.4	61.4	75.2	72.7	5.8	5.8	3.1	4.9	3.64	1.21	22
Year 1881	30.088	30.034	30.080	30.007	.....	.....	59.6	70.4	62.6	64.2	.....	.....	79.6	58.7	76.4	72.5	4.9	5.2	3.9	4.9	51.02	.....	.....
1882.																							
January	30.206	30.169	30.220	30.198	30.708	29.553	48.4	56.9	49.4	51.6	73.0	24	80.3	64.8	75.4	73.5	6.6	7.6	6.2	6.8	1.96	.66	31
February	30.233	30.167	30.216	30.205	30.646	29.346	48.6	61.8	53.2	54.5	77.0	29	76.6	55.4	69.2	67.1	4.9	6.5	4.4	5.3	1.92	.85	4
March	30.165	30.100	30.161	30.142	30.522	29.655	52.7	65.4	56.9	58.3	82.0	36	76.8	51.7	70.0	66.2	6.2	5.5	4.0	5.2	7.09	4.75	27
April	30.079	30.010	30.050	30.046	30.462	29.515	58.7	69.8	61.1	63.2	82.0	42	79.2	55.2	78.6	71.0	5.9	5.6	4.1	5.2	2.27	.58	23
May	30.049	29.991	30.023	30.021	30.329	29.629	64.4	74.9	66.3	68.5	85.5	47	79.0	54.1	77.9	70.3	5.1	6.4	3.4	5.0	1.40	.49	28, 29
June	30.000	29.948	29.988	29.979	30.196	29.684	73.6	82.8	74.4	76.9	93.5	58	77.5	60.4	78.2	72.0	5.2	6.5	3.8	5.2	2.96	.86	4

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 6.56 a. m., 2.56 p. m., and 10.56 p. m., local time.

ANDREW T. SHERWOOD,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

WILMINGTON, N. C.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurora.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4037.0	N.	36	22	6	10	6	7	4	26	10	6	18	10	12	9	10	0	5	0	0	0	
August	4351.5	E.	27	27	2	17	12	14	5	20	5	3	15	11	13	7	7	0	0	0	0	0	
September	3456.5	W.	64	9	5	5	4	14	13	11	3	0	35	6	9	5	9	0	1	0	0	0	Very destructive gale on 9th.
October	4027.5	NE.	25	5	4	19	13	8	8	11	8	5	17	8	18	5	8	0	0	0	0	0	
November	3969.0	SW.	23	12	13	19	8	2	6	7	7	11	17	10	9	11	12	0	0	0	0	1	First ice 25th.
December	5244.0	SW.	32	29	8	21	12	5	9	9	15	5	9	10	14	7	9	0	0	0	0	2	
Year 1881	54880.5	.....	...	.....	102	152	96	99	88	172	113	104	169	110	156	99	126	0	27	0	0	20	
1882.																							
January	5290.0	SW.	25	31	13	16	9	3	2	17	11	16	6	4	13	14	16	0	0	0	0	7	
February	5268.0	W.	44	4	6	7	12	4	5	19	9	14	3	11	6	11	9	0	0	0	0	2	
March	6046.5	SW.	34	1	7	9	12	9	5	25	11	10	5	10	12	9	12	0	2	0	0	0	
April	5257.5	W.	31	22	8	10	5	13	5	20	9	5	15	8	14	8	12	0	1	1	0	0	
May	5499.0	SW.	25	5	3	9	10	10	12	22	13	7	7	6	21	4	6	0	3	0	0	0	
June	4962.0	SW.	32	1	2	4	6	15	1	29	14	15	4	7	15	8	12	0	4	0	0	0	

Location of office on June 30, 1882, Western Union building, Front between Market and Prince streets.

ANDREW T. SHERWOOD,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

WINNEMUCCA, NEV.

[Latitude, 41° 0′; longitude west of Greenwich, 117° 41′. Elevation of barometer above sea-level, 4,327 feet. Elevation of rain-gauge (top) above ground, 6 feet. Elevation of exposed thermometer above ground, 7 feet.]

	Barometer (to sea.)						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.823	29.812	29.778	29.804	30.054	29.594	54.4	81.3	72.5	69.4	97	40	44.4	19.8	22.5	28.9	1.4	1.8	0.9	1.4	.00	.00	.....
August	29.842	29.825	29.790	29.819	29.978	29.590	50.3	80.6	70.2	67.0	100	34	39.1	13.5	18.9	24.2	0.7	0.6	1.2	0.9	.07	.05	6
September	29.950	29.943	29.901	29.931	30.217	29.711	42.4	68.6	58.3	56.4	90	22	49.3	21.7	27.3	32.8	0.8	1.5	1.2	1.2	.12	.08	23
October	30.068	30.073	30.063	30.068	30.278	29.835	33.0	52.7	41.8	42.5	75	11	66.6	44.3	59.1	56.6	2.5	3.9	2.7	3.1	1.37	.68	20
November	30.319	30.312	30.302	30.311	30.549	29.897	24.6	40.2	32.7	32.5	61	5	69.2	49.5	61.6	60.1	2.7	3.5	1.6	2.6	.32	.12	16
December	30.338	30.347	30.328	30.338	30.682	29.992	25.8	36.7	32.0	31.7	47	7	79.2	66.9	73.7	73.3	3.3	4.6	4.2	4.0	1.81	.57	1
Year 1881	30.004	30.004	29.979	29.996	.....	.....	38.8	58.4	50.5	49.2	.....	.....	60.5	36.5	45.1	47.4	2.5	3.7	2.9	3.0	11.91	.....	.....
1882.																							
January	30.175	30.183	30.185	30.181	30.512	29.699	19.1	30.0	25.0	24.7	50	— 4	70.3	63.4	66.1	66.6	4.2	5.1	3.7	4.3	1.03	.30	31
February	30.155	30.171	30.151	30.159	30.575	29.684	18.1	31.4	24.7	24.7	51	—17	70.9	60.8	66.8	66.2	4.6	5.7	4.7	5.0	1.50	.64	16, 17
March*	30.152	30.158	30.146	30.152	30.546	29.664	26.7	41.0	34.3	34.0	72	— 3	72.8	55.5	65.4	64.6	2.9	4.2	2.5	3.2	1.22	.40	10
April	29.967	29.958	29.946	29.958	30.200	29.701	34.7	53.8	44.8	44.4	78	18	73.3	34.2	53.0	53.5	3.8	4.8	4.0	4.2	.85	.53	5, 6
May	29.946	29.924	29.909	29.926	30.174	29.626	40.7	64.9	55.2	53.6	86	23	56.9	22.7	33.8	37.8	2.8	3.5	3.2	3.2	.63	.50	24, 25
June	29.828	29.817	29.789	29.811	29.963	29.596	51.6	74.4	65.7	63.9	92	36	60.9	27.7	38.0	42.2	3.3	3.8	4.1	3.7	1.17	.29	9

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.17 a. m., 12.17 p. m., and 8.17 p. m., local time.
* Thirty days only.

JNO. R. WILLIAMS,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

WINNEMUCCA, NEV.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—									Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Auroras.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	6,939	SW.	36	19	7	15	1	1	16	41	7	4	1	25	5	1	0	0	0	0	0	0	First light frost 26th and first killing 28th.
August	6,549	SW.	40	26	7	17	0	0	27	32	5	5	0	27	4	0	2	0	0	0	0	0	
September	5,979	SW.	30	22	6	22	0	3	14	38	4	3	0	25	4	1	2	0	0	0	0	5	
October	5,998	SW.	44	30	8	21	0	1	17	38	2	5	1	17	12	2	5	1	0	0	0	16	
November	5,296	SW.	41	14	3	45	0	0	8	23	2	8	1	18	10	2	1	2	0	0	0	27	Lunar halo 30th.
December	5,261	SW.	28	11, 24	2	53	1	1	9	23	0	3	1	16	5	10	3	5	0	0	0	25	
Year 1881	73,094				78	317	2	10	159	432	32	51	14	219	99	47	31	21	1	0	1	123	
1882.																							
January	6,213	SW.	30	26	6	41	0	1	5	37	0	1	2	12	12	7	4	6	0	0	10	27	
February	5,650	SW.	30	10	11	37	0	2	2	29	0	2	1	8	12	8	3	7	0	0	8	25	Lunar halo 24th.
March	7,249	SW.	48	19	4	33	1	3	4	37	0	11	0	15	14	2	2	5	0	0	2	22	Solar halo 22d.
April	7,057	SW.	48	24	11	14	2	1	3	42	5	9	3	10	16	4	5	3	0	1	0	16	Lunar halo 20th; aurora 16th and 17th; sun spots 20th.
May	7,281	SW.	38	12	5	18	0	1	4	45	5	14	1	17	10	4	5	0	1	0	0	6	Lunar halo 23d; frost 5th, 15th.
June	5,715	NE.	34	10	6	32	2	2	3	27	4	12	2	13	14	3	7	0	9	0	0	0	Black beetles and grasshoppers destroying crops.

Location of office on June 30, 1882, West End Railroad street.

JNO. R. WILLIAMS,
Sergeant, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

YANKTON, DAK.

Latitude, 42° 54′; longitude west of Greenwich, 97° 30′. Elevation of barometer above sea-level, 1,228 feet. Elevation of rain-gauge (top) above ground, 28 feet. Elevation of exposed thermometer above ground, 20 feet.]

	Barometer (to sea).						Temperature.						Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.				Amount in inches.	Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	8 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.		Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.992	29.969	29.955	29.972	30.179	29.517	69.1	82.6	73.2	75.0	98.5	54.0	84.7	55.8	81.5	74.0	5.2	4.3	4.2	4.6	4.54	1.30	17
August	29.944	29.919	29.917	29.927	30.204	29.618	69.5	86.3	74.6	76.8	101.0	52.0	76.7	49.0	74.3	66.7	5.2	4.8	3.3	4.4	1.77	.66	2
September	29.920	29.883	29.911	29.905	30.285	29.376	53.8	68.7	57.8	60.1	100.0	36.0	83.6	54.2	81.5	73.1	5.3	4.3	3.6	4.4	8.61	3.45	6
October	30.121	30.086	30.098	30.102	30.622	29.418	43.3	56.1	47.1	48.8	76.0	24.0	87.1	59.1	81.9	76.0	6.1	6.4	5.0	5.8	3.47	.66	22
November	30.170	30.134	30.160	30.155	30.730	29.545	27.7	38.7	30.9	32.4	65.0	−1.0	77.8	58.5	76.9	71.1	5.4	5.1	4.9	5.2	.90	.39	18
December	30.189	30.169	30.196	30.185	30.567	29.614	27.7	39.9	30.7	32.8	57.0	4.0	79.5	56.7	74.4	70.2	3.9	5.1	4.1	4.4	.11	.08	10
Year 1881	30.058	30.017	30.040	30.038	.....	.....	40.0	52.3	43.8	45.4	.....	.....	79.9	57.8	77.4	71.7	3.5	3.7	3.1	3.4	40.95	.....	.....
1882.																							
January	30.171	30.125	30.160	30.152	30.717	29.604	17.5	31.6	22.2	23.4	54	−6	69.2	56.7	68.7	64.9	4.4	4.2	4.5	4.4	.04	.03	26
February	30.112	30.088	30.109	30.103	30.605	29.604	22.1	38.4	27.1	29.2	64	−7	72.4	55.5	70.9	66.3	2.9	4.4	3.4	3.6	.09	.07	20
March	30.107	30.092	30.119	30.106	30.738	29.441	28.7	41.5	33.0	34.4	80	Zero.	76.2	56.0	72.2	68.1	6.5	5.2	3.7	5.1	.06	.04	19, 20
April	29.989	29.981	30.009	29.993	30.431	29.486	41.0	54.8	47.0	47.6	86	29	79.1	56.2	72.5	69.3	6.0	6.6	4.4	5.7	2.93	.84	8
May	29.947	29.923	29.937	29.936	30.255	29.382	48.6	61.1	53.7	54.5	88	35	75.7	55.8	72.3	67.9	5.5	6.0	4.7	5.4	5.25	1.99	17, 18
June	29.891	29.863	29.867	29.874	30.251	29.410	61.4	75.9	66.7	68.0	93	42	77.1	56.8	73.8	69.2	5.4	5.6	4.5	5.2	4.87	1.97	22

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, corresponds with 5.38 a. m., 1.38 p. m., and 9.38 p. m., local time.

J. H. ATFIELD,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

YANKTON, DAK.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—								Number of days—										Remarks.
	Total movement.	Maximum velocity. Direction.	Miles.	Date.	North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water. Rain.	Snow.	Thunder-storms.	Aurora.	Maximum below 32°.	Minimum below 32°.	
1881.																							
July	6,108	SE.	30	20	6	14	9	18	20	6	6	8	6	11	13	7	11	0	6	3	0	0	September 28, first frost.
August	6,490	SE.	28	23	5	6	14	14	23	7	5	7	12	9	17	5	8	0	2	0	0	0	
September	6,026	NW.	35	16	10	12	14	3	6	7	8	16	14	10	12	8	12	0	4	3	0	0	
October	5,360	SE. NW. NW. W.	24	10 12 19 31	5	13	11	14	11	3	7	14	25	8	8	15	12	1	3	0	0	0	
November	6,598	NW.	36	23	10	1	3	2	6	12	14	28	14	9	11	10	2	3	0	2	6	24	
December	5,859	NW.	34	6	8	2	2	0	9	26	10	22	14	10	17	4	0	2	0	0	2	29	
Year 1881	76,533	.....	.....	.....	124	129	102	100	121	97	91	195	136	101	164	100	86	37	23	8	78	163	
1882.																							
January	6,554	SW.	33	18	6	2	7	14	6	19	7	21	11	11	12	8	0	2	0	0	8	31	
February	5,602	N.	32	16	9	5	3	7	6	15	19	15	5	14	10	4	0	2	0	0	8	25	
March	7,713	W.	40	4	11	9	15	8	8	2	8	26	6	7	18	6	1	3	1	0	4	23	
April	9,032	W.	40	3	9	11	15	15	11	6	5	15	3	7	14	9	10	1	1	2	0	3	
May	8,204	E.	47	7	17	9	12	10	12	12	4	12	5	8	13	10	12	0	2	0	0	0	
June	6,127	NW.	61	24	6	11	13	16	6	7	9	13	9	8	14	8	13	0	5	0	0	0	

Location of office on June 30, 1882, corner Third and Capitol streets.

J. H. ATFIELD,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—A.]

YUMA, ARIZ.

[Latitude, 32° 44′; longitude west of Greenwich, 114° 36′. Elevation of barometer above sea-level, 141 feet. Elevation of rain-gauge (top) above ground, 21 feet. Elevation of exposed thermometer above ground, 5 feet.]

	Barometer (to sea).				Temperature.							Relative humidity.				Average cloudiness, amount of, 0–10.				Rainfall and melted snow.		
	Washington time.				Extremes.		Washington time.				Self-registering thermometers.		Washington time.				Washington time.					Greatest daily rainfall.	
	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	Maximum.	Minimum.	7 a. m.	3 p. m.	11 p. m.	Mean.	7 a. m.	3 p. m.	11 p. m.	Mean.	Amount in inches.	Amount in inches.	Date.
1881.							°	°	°	°	°	°											
July	29.905	29.813	29.758	29.792	30.000	29.579	80.7	102.0	93.0	91.9	113.3	71.2	62.5	33.9	41.1	45.8	2.0	1.7	1.0	1.6	.20	.11	15
August	29.789	29.801	29.755	29.782	29.937	29.569	78.5	98.3	89.0	88.6	109.6	65.6	74.3	37.7	50.3	54.1	1.5	1.8	1.1	1.5	.08	.08	9
September	29.770	29.777	29.743	29.763	30.017	29.504	71.5	93.9	82.6	82.7	107.4	58.8	68.3	29.9	48.2	48.8	0.6	1.8	0.5	1.0	.05	.05	21
October	29.878	29.887	29.866	29.877	30.140	29.716	59.5	82.0	69.8	70.4	98.2	47.2	70.6	30.9	49.9	50.5	1.2	2.5	1.1	1.6	(*)	(*)	25
November	30.041	30.048	30.026	30.038	30.282	29.761	49.9	68.2	56.9	58.3	83.4	35.5	49.7	21.7	39.3	37.9	0.4	2.1	0.5	1.0	.00	.00	0
December	30.089	30.104	30.090	30.094	30.374	29.873	48.2	66.9	55.8	57.0	79.5	36.8	59.7	32.2	47.5	46.5	3.8	5.5	2.9	4.1	.10	.10	18
Year 1881	29.909	29.919	29.887	29.905	.....	.....	60.9	82.7	72.1	71.9	.....	.....	61.8	28.9	41.8	44.1	1.2	2.1	1.0	1.4	0.98	.....	.....
1882.																							
January	30.038	30.050	30.033	30.040	30.373	29.618	42.9	58.6	49.0	50.2	76.4	27.2	68.5	41.3	60.1	56.6	2.4	4.1	2.8	3.1	1.35	.61	12, 13
February	30.090	30.113	30.097	30.100	30.411	29.842	46.4	63.2	53.6	54.4	78.1	35.8	60.1	31.0	47.3	46.1	1.7	4.4	1.6	2.6	.01	.01	1
March	30.028	30.052	30.015	30.032	30.260	29.690	51.7	72.7	62.6	62.3	91.7	38.9	54.8	22.2	33.7	36.9	1.1	3.0	1.2	1.8	.00	.00	0
April	29.913	29.930	29.894	29.912	30.111	29.649	54.3	79.2	67.9	67.1	102.8	43.7	57.9	18.5	32.5	36.3	1.0	1.9	0.9	1.3	.00	.00	0
May	29.815	29.830	29.791	29.812	30.000	29.506	63.3	89.8	78.4	77.2	103.5	53.8	58.3	20.0	30.9	36.4	1.1	1.5	1.4	1.3	.00	.00	0
June	29.786	29.798	29.755	29.780	29.920	29.598	68.0	95.8	84.1	83.0	108.7	58.2	58.0	21.6	32.9	37.5	1.8	2.6	0.6	1.7	.05	.05	18

NOTE.—7 a. m., 3 p. m., and 11 p. m., Washington time, correspond with 4.30 a. m., 12.30 p. m., and 8.30 p. m., local time.

*Rainfall inappreciable.

O. D. STEWART,
Private, Signal Corps, U. S. A.

Annual meteorological summary—Continued.

[FORM No. 132—B.]

YUMA, ARIZ.

	Wind.				Winds at 7 a. m., 3 and 11 p. m., Washington time: Number of times observed blowing from—									Number of days—								Remarks.
	Total movement.	Maximum velocity.			North.	Northeast.	East.	Southeast.	South.	Southwest.	West.	Northwest.	Calm.	Clear.	Fair.	Cloudy.	.01 inch or more of water.		Thunder-storms.	Aurorus.	Maximum below 32°.	Minimum below 32°.	
		Direction.	Miles.	Date.													Rain.	Snow.					
1881.																							
July	4,854	SE.	23	19	1	3	5	18	23	23	11	1	8	24	7	0	2	0	1	0	0	0	Meteor on 4th.
August	4,519	SW.	27	5	3	2	7	30	11	19	4	7	10	24	7	0	1	0	2	0	0	0	Meteor on 24th; sand-storm on 24th.
September	3,430	SE.	28	11	4	13	5	18	5	17	6	14	8	25	5	0	1	0	0	0	0	0	Meteors on 5th, 8th, 12th, 19th; lunar halo 27th.
October	2,400	SW. N.	15	7 31 1	8	16	5	10	5	11	10	12	16	20	11	0	0	0	0	0	0	0	Sand-storm 9th and 10th.
November	4,675	N.	28	19	39	11	1	0	3	3	5	15	13	26	4	0	0	0	0	0	0	0	Meteors 2d, 25th; lunar halo 24th.
December	3,435	N.	22	29	38	17	1	5	2	5	7	13	5	11	15	5	1	0	1	0	0	0	First frost of season, light, on 13th; meteor on 7th; lunar halos 1st, 4th, 6th, 27th, and 31st.
Year 1881	47,238	.....	...	.....	170	123	52	121	113	161	127	112	116	288	69	8	8	0	7	0	0	1	
1882.																							
January	4,068	S.	27	12	37	17	4	8	4	5	4	10	4	14	14	3	5	0	0	0	0	2	Meteors 5th, 9th, 17th; lunar halos 2d, 5th, 13th, 28th.
February	4,259	W.	31	6	20	7	4	7	1	10	9	25	1	15	11	2	1	0	0	0	0	0	Solar halo 27th: lunar halos 3d, 4th, 5th, 23d, 24th.
March	4,681	NW.	30	3	21	6	3	2	13	16	5	20	7	22	8	1	0	0	0	0	0	0	Solar halo 18th; meteor 29th; numerous sand-storms.
April	4,608	NW.	34	20	12	6	3	5	9	20	12	19	4	24	5	1	0	0	0	0	0	0	Solar halo 27th; meteors 5th, 28th; lunar halos 1st, 2d, and 21st; numerous sand-storms.
May	4,376	NW.	38	6	4	2	2	13	19	7	13	21	12	26	4	1	0	0	0	0	0	0	Meteors 14th, 20th; lunar halos 1st, 3d, 24th, 25th; numerous sand-storms.
June	4,210	W.	25	9	1	4	1	24	12	11	11	8	18	23	6	1	1	0	0	0	0	0	Meteors 5th, 18th, 21st, 25th; lunar halo 6th; solar halo 13th.

Location of office on June 30 1882, depot quartermaster's office.

O. D. STEWART.
Private, Signal Corps, U. S. A.

APPENDIX 55.

Showing stations inspected, by whom, and when inspected, during fiscal year ending June 30, 1882.

Station.	By whom inspected.	When inspected.
Albany, N. Y	Second Lieut. J. S. Powell, Signal Corps, U. S. A	Dec. 23–24, 1881.
Almota, Wash	First Lieut. C. E. Kilbourne, acting signal-officer	December 8–9, 1881.
Alpena, Mich	Second Lieut. J. S. Powell, Signal Corps, U. S. A	November 28, 1881.
Atlanta, Ga	Second Lieut. J. S. Powell, Signal Corps, U. S. A	Dec. 16–18, 1881.
Atlantic City, N. J	First Lieut. James Allen, acting signal-officer	February 25–26, 1882.
Baltimore, Md	do	February 10–11, 1882.
Bangor, Me	do	January 3–4, 1882.
Barnegat, N. J	do	February 27–28, 1882.
Boothbay, Me	First Lieut. J. P. Story, acting signal-officer	September 10, 1881.
Boston, Mass	Second Lieut. J. S. Powell, Signal Corps, U. S. A	January 14–17, 1882.
Buffalo, N. Y	do	Dec. 13–15, 1881.
Burlington, Vt	do	Dec. 26–27, 1881.
Brackettville, Tex	Second Lieut. L. E. Sebree, Signal Corps, U. S. A	March 28–31, 1882.
Brownsville, Tex	do	March 12–15, 1882.
Cape Henry, Va	First Lieut. W. E. Birkhimer, acting signal-officer	September 7–9, 1881.
Cape May, N. J	Second Lieut. J. S. Powell, Signal Corps, U. S. A	February 23–24, 1882.
Chatham, Mass	First Lieut. J. P. Story, acting signal-officer	September 20, 1881.
Cheyenne, Wyo	First Lieut. C. E. Kilbourne, acting signal-officer	April 24–26, 1882.
Chicago, Ill	Second Lieut. J. S. Powell, Signal Corps, U. S. A	Nov. 19–22, 1881.
Chincoteague, Va	do	February 20–21, 1882.
Charleston, S. C	First Lieut. James Allen, acting signal-officer	Dec. 22, 23, 1881.
Cincinnati, Ohio	do	Nov. 18–19, 1881.
City Island, N. Y	First Lieut. J. P. Story, acting signal-officer	September 23, 1881.
Cleveland, Ohio	Second Lieut. J. S. Powell, Signal Corps, U. S. A	December 9–10, 1881.
Cœur d'Alene (Fort), Idaho.	First Lieut. C. E. Kilbourne, acting signal-officer	December 1–2, 1881.
Colfax, Wash	do	December 6, 1881.
Coleman, Tex	Second Lieut. W. A. Glassford, Signal Corps, U. S. A	Nov. 25–27, 1881.
Colorado Springs, Colo.	do	January 4–10, 1882.
Colorado Springs supply station, Colo.	do	Do.
Concho (Fort), Tex	do	Nov. 17–18, 1881.
Davis (Fort), Tex	do	Nov. 7–10, 1881.
Dayton, Wash	First Lieut. C. E. Kilbourne, acting signal-officer	Dec. 16–20, 1881.
Deer Isle, Me	First Lieut. J. P. Story, acting signal-officer	September 14, 1881.
Delaware Breakwater, Del.	Second Lieut. J. S. Powell, Signal Corps, U. S. A	February 19, 1882.
Detroit, Mich	do	December 2–4, 1881.
Denver, Colo	Second Lieut. W. A. Glassford, Signal Corps, U. S. A	Dec. 20–30, 1881.
Eastport, Me	Second Lieut. J. S. Powell, Signal Corps, U. S. A	January 6–8, 1882.
El Paso, Tex	Second Lieut. W. A. Glassford, Signal Corps, U. S. A	November 1–3, 1881.
Erie, Pa	Second Lieut. J. S. Powell, Signal Corps, U. S. A	Dec. 11–12, 1881.
Escanaba, Mich	do	Nov. 14–16, 1881.
Fall River, Mass	First Lieut. J. P. Story, acting signal-officer	September 7, 1881.
Florence, Ariz	Second Lieut. W. A. Glassford, Signal Corps, U. S. A	October 21–23, 1881.
Grand Haven, Mich	Second Lieut. J. S. Powell, Signal Corps, U. S. A	Nov. 23–25, 1881.
Griffin (Fort), Tex	Second Lieut. W. A. Glassford, Signal Corps, U. S. A	Nov. 30–Dec. 1, 1881.
Gloucester, Mass	First Lieut. J. P. Story, acting signal-officer	September 18, 1881.
Henrietta, Tex	Second Lieut. W. A. Glassford, Signal Corps, U. S. A	Dec. 11–12, 1881.
Highland Light, Mass.	First Lieut. J. P. Story, acting signal-officer	September 19, 1881.
Hyannis, Mass	do	September 20, 1881.
Indianapolis, Ind	First Lieut. James Allen, acting signal-officer	Nov. 23–25, 1881.
Jacksboro, Tex	Second Lieut. W. A. Glassford, Signal Corps, U. S. A	December 6–7, 1881.
La Mesilla, N. Mex	do	October 29–31, 1881.
Laredo, Tex	Second Lieut. L. E. Sebree, Signal Corps, U. S. A	January 17–19, 1882.
Lapwai, Idaho	First Lieut. C. E. Kilbourne, acting signal-officer	December 12, 1881.
Lewiston, Idaho	do	Dec. 10–12, 1881.
Los Angeles, Cal	do	February 3–6, 1882.
Louisville, Ky	First Lieut. James Allen, acting signal-officer	Nov. 20–22, 1881.
Lynn, Mass	First Lieut J. P. Story, acting signal-officer	September 17, 1881.
Marquette, Mich	Second Lieut. J. S. Powell, Signal Corps, U. S. A	Nov. 13–14, 1881.
Marblehead, Mass	First Lieut. J. P. Story, acting signal-officer	September 17, 1881.
Maricopa, Ariz	First Lieut. C. E. Kilbourne, acting signal-officer	February 11–13, 1882.
Memphis, Tenn	First Lieut. James Allen, acting signal-officer	December 2–3, 1881.
Milwaukee, Wis	Second Lieut. J. S. Powell, Signal Corps, U. S. A	Nov. 17–18, 1881.
Montgomery, Ala	First Lieut. James Allen, acting signal-officer	Dec. 14–15, 1881.
Mt. Washington, N. H	Second Lieut. J. S. Powell, Signal Corps, U. S. A	Dec. 28–30, 1881.
Nashville, Tenn	First Lieut. James Allen, acting signal-officer	December 4–6, 1881.

Stations inspected, by whom, and when inspected, during fiscal year, &c.—Continued.

Station.	By whom inspected.	When inspected.
New Bedford, Mass	First Lieut. J. P. Story, acting signal-officer	September 21, 1881.
Newburyport, Mass	do	September 12, 1881.
New Haven, Conn	Second Lieut. J. S. Powell, Signal Corps, U. S. A	January 28–30, 1882.
New Haven Light, Conn	First Lieut. J. P. Story, acting signal-officer	September 5, 1881.
New London, Conn	Second Lieut. J. S. Powell, Signal Corps, U. S. A	Jan. 31–Feb. 1, 1882.
New Orleans, La	First Lieut. James Allen, acting signal-officer	December 8–12, 1881
Newport, R. I	Second Lieut. J. S. Powell, Signal Corps, U. S. A	January 20–21, 1882.
New Shoreham, R. I	do	January 21–22, 1882.
New York, N. Y	do	February 2–5, 1882.
Norfolk, Va	First Lieut. W. E. Birkhimer, acting signal-officer	September 5–7, 1881.
North Platte, Nebr	First Lieut. C. E. Kilbourne, acting signal-officer	April 27–28, 1882.
Olympia, Wash	Second Lieut. J. S. Powell, Signal Corps, U. S. A	Dec. 20–21, 1881.
Oswego, N. Y	First Lieut. C. E. Kilbourne, acting signal-officer	Dec. 31, 1881–Jan. 2 1882.
Omaha, Nebr	do	April 28–May 2, 1882
Philadelphia, Pa	Second Lieut. J. S. Powell, Signal Corps, U. S. A	February 6–9, 1882.
Phœnix, Ariz	First Lieut. C. E. Kilbourne, acting signal-officer	February 15–16, 1882
Ploche, Nev	do	April 17–19, 1882.
Pike's Peak, Colo	Second Lieut. W. A. Glassford, Signal Corps, U. S. A	January 4–10, 1882.
Pittsburgh, Pa	Second Lieut. J. S. Powell, Signal Corps, U. S. A	November 8–11, 1881
Prescott, Ariz	First Lieut. C. E. Kilbourne, acting signal-officer	February 22–28, 1882
Prescott, Ariz. (city office).	do	February 27, 1882.
Provincetown, Mass	First Lieut. J. P. Story, acting signal-officer	September 10, 1881.
Port Huron, Mich	Second Lieut. J. S. Powell, Signal Corps, U. S. A	Nov. 30–Dec. 1, 1881.
Portland, Me	do	December 31, 1881–January 2, 1882.
Portland, Oreg	First Lieut. C. E. Kilbourne, acting signal-officer	Nov. 28, and Dec. 23 27, 1881.
Pomeroy, Wash	do	December 13–15, 1881
Portsmouth, N. H	First Lieut. J. P. Story, acting signal-officer	September 12, 1881.
Red Bluff, Cal	First Lieut. C. E. Kilbourne, acting signal-officer	January 21–23, 1882.
Rio Grande City, Tex	Second Lieut. L. E. Sebree, Signal Corps, U. S. A	May 20–22, 1882.
Rochester, N. Y	Second Lieut. J. S. Powell, Signal Corps, U. S. A	Dec. 16–19, 1881.
Rockland, Me	First Lieut. J. P. Story, acting signal-officer	September 13, 1881.
Roseburg, Oreg	First Lieut. C. E. Kilbourne, acting signal-officer	Dec. 28–29, 1881.
Sacramento, Cal	do	January 17–20, 1882.
San Diego, Cal	do	Jan. 28–Feb. 1, 1882.
Sandusky, Ohio	Second Lieut. J. S. Powell, Signal Corps, U. S. A	December 7–8, 1881.
Santa Fé, N. Mex	Second Lieut. W. A. Glassford, Signal Corps, U. S. A	October 1–3, 1881.
Sandy Hook, N. J	Second Lieut. J. S. Powell, Signal Corps, U. S. A	March 1–2, 1882.
San Francisco, Cal	First Lieut. C. E. Kilbourne, acting signal-officer	Nov. 15–21, 1881.
Salt Lake City, Utah	do	April 10–13, 1882.
Savannah, Ga	First Lieut. James Allen, acting signal-officer	Dec. 19–21, 1881.
Sill (Fort), Ind. Ter	Second Lieut. W. A. Glassford, Signal Corps, U. S. A	Dec. 16–18, 1881.
Silver City, N. Mex	do	October 12–13, 1881.
Southeast Light, R. I	First Lieut. J. P. Story, acting signal-officer	September 7, 1881.
Spokane Falls, Wash	First Lieut. C. E. Kilbourne, acting signal-officer	December 3–4, 1881.
Springfield, Mass	Second Lieut. J. S. Powell, Signal Corps, U. S. A	January 27–28, 1882.
Stewart's Ranch, Ariz	Second Lieut. W. A. Glassford, Signal Corps, U. S. A	October 25–27, 1881.
Saint Louis, Mo	First Lieut. James Allen, acting signal-officer	Nov. 26–30, 1881.
Stockton, Tex	Second Lieut. W. A. Glassford, Signal Corps, U. S. A	Nov. 12–15, 1881.
Stonington, Conn	First Lieut. J. P. Story, acting signal-officer	September 6, 1881.
Thatcher's Island, Mass	Second Lieut. J. S. Powell, Signal Corps, U. S. A	January 12–13, 1882
Toledo, Ohio	do	December 4–6, 1881.
Tucson, Ariz	Second Lieut. W. A. Glassford, Signal Corps, U. S. A	October 16–19, 1881.
Umatilla, Oreg	First Lieut. C. E. Kilbourne, acting signal-officer	Dec. 21–22, 1881.
Verde (Fort), Ariz	do	March 2–3, 1882.
Visalia, Cal	do	March 7–8, 1882.
Wickenburg, Ariz	do	February 18–20, 1882.
Winnemucca, Nev	do	April 5–8, 1882.
Wilmington, N. C	First Lieut. James Allen, acting signal-officer	Dec. 24–25, 1881.
Wood's Holl, Mass	Second Lieut. J. S. Powell, Signal Corps, U. S. A	January 18–19, 1882.
Yuma, Ariz	First Lieut. C. E. Kilbourne, acting signal-officer	February 8–10, 1882.

APPENDIX 56.

List of Boards of Trade, Chambers of Commerce, and other organizations which had on June 30, 1882, appointed permanent committees to confer with the Chief Signal Officer of the Army.

Name of organization.	State.	Committee.
Chamber of Commerce	New York	Edward Hincken, F. B. Thurber, George W. Blunt, James S. T. Stranahan, James H. Frothingham.
Board of Trade, Buffalo	do	A. Richmond, G. S. Hazard, J. H. Vought.
Board of Trade, Detroit	Michigan	Theodore P. Hall, James Flynn, A. G. Hibbard.
Board of Trade, Chicago	Illinois	W. B. Walker, J. J. McDermid, J. H. French.
Chamber of Commerce, Milwaukee	Wisconsin	John L. Hathaway, J. B. Merrill, E. M. Peck
Chamber of Commerce, Duluth	Minnesota	Charles F. Johnson, Dr. V. Smith, M. J. Forbes.
Board of Trade, Baltimore	Maryland	R. W. Cator, W. G. Bowdpin, D. L. Bartlett, German H. Hunt, Frank Jenkins.
Board of Trade, Cleveland	Ohio	R. K. Winslow, R. F. Lyon, J. C. Sage.
Chamber of Commerce, Charleston	South Carolina	E. H. Frost, W. P. Hall, F. W. Dawson.
Chamber of Commerce, Memphis	Tennessee	B. J. Semmes, Thomas H. Allen, W. P. Proudfit.
Board of Trade, Oswego	New York	J. L. McWhorter, A. H. Failing, W. R. Hosmer.
Committee appointed by mayor, Rochester.	do	George Schofield, John Siddons.
Board of Trade, Portland	Maine	F. K. Arnold, C. H. Dodd, Col. J. McCracken.
Board of Trade, Mobile	Alabama	Hon. P. Hamilton, T. Henry, esq., F. G. Bromberg.
Chamber of Commerce, Wilmington	North Carolina	A. H. Van Bokkelen, George Harriss, W. L. De Rossett.
Board of Trade, Indianapolis	Indiana	J. H. Holliday, J. H. Steiner, V. K. Hendricks, F. M. Churchman, W. J. Holliday.
Chamber of Commerce, Saint Paul	Minnesota	R. O. Sweeney, Rev. D. R. Breed, M. N. Kellog.
Board of Trade, Davenport	Iowa	James M. Dalzel, F. W. Angell, Charles E. Beiderbecke.
Board of Trade, La Crosse	Wisconsin	William W. Jones, D. A. McDonald, David Austin.
Cotton Exchange, New Orleans	Louisiana	C. Bussey, G. W. Embry, James H. Allen.
Chamber of Commerce, New Haven	Connecticut	Hon. Henry G. Lewis, Johnson T. Platt.
Chamber of Commerce, Cairo	Illinois	W. P. Halliday, Peter Cuhl.
Board of Trade, Cincinnati	Ohio	Charles H. Larr, George Merrell, Alex. Hill, A. C. Neave, F. H. Lawson.
Board of Trade, Dubuque	Iowa	Dr. Asa Horr, J. S. Hetherington.
Board of Trade, Albany	New York	E. A. Durant, jr., John H. Reynolds, C. B. Tillinghast.
Board of Trade, Louisville	Kentucky	W. R. Belknap, Dr. James W. Holland, J. B. Speed.
Meteorological Committee, Springfield.	Massachusetts	E. W. Bond, H. C. Lee, J. G. Benton, E. Ingersoll, S. D. Brooks, A. P. Stone.
Meteorological Committee, Newport.	Rhode Island	S. C. Bailey, S. W. Macy, Benjamin Finch, Thomas Cogeshall, L. P. Clarke, S. H. Norman, S. Powell.
Chamber of Commerce, Cincinnati	Ohio	William S. Munson, A. Erkenbrecher, H. Goepper.
Board of Health, Nashville	Tennessee	J. D. Plunkett.
Cotton Exchange, Savannah	Georgia	C. M. Holst, A. L. Hartridge, E. M. Green.
Cotton Exchange, Nashville	Tennessee	John F. Wheeloss.
Merchants' Club, Omaha	Nebraska	James E. Boyd, G. H. Collins, O. H. Ballou, William Stephens.
Chamber of Commerce, San Francisco.	California	Capt. William L. Merry, W. W. Dodge, J. S. Taber.
Polytechnic Society of Kentucky, Louisville.	Kentucky	Prof. T. W. Tobin, Dr. J. A. Octerlong, E. A. Grant, M. D.
Meteorological Committee, Indianola.	Texas	H. J. Huck, J. H. Dale, D. Sullivan, E. Reiffert.
Cotton Exchange, Mobile	Alabama	W. H. Gardner, J. A. McCarr, A. Proskauer.
Merchants' Exchange, Baltimore	Maryland	W. G. Atkinson, W. G. Loud, O. M. Vesper.
Board of Trade, Omaha	Nebraska	Thomas Gibson, Charles F. Goodman, D. S. Barriger.
Maritime Exchange, Philadelphia	Pennsylvania	E. K. Stevenson, P. A. Decaw, F. W. Taylor.
Chamber of Commerce, Los Angeles.	California	Dr. J. P. Widney, J. de Barth Shorb, I. W. Lord.

List of Boards of Trade, Chambers of Commerce, and other organizations, &c.—Continue

Name of organization.	State.	Committee.
Meteorological Committee, Sandusky.	Ohio	J. O. Moss, R. B. Hubbard, C. N. Ryan.
Cotton Exchange, Norfolk	Virginia	G. L. Arps, H. S. Reynolds, J. N. Vaughan
Chamber of Commerce, Astoria	Oregon	Augustus C. Kinney, C. L. Parker, J. Robb.
Coal, Iron, and Manufacturers' Association, Chattanooga.	Tennessee	Rev. J. W. Bachman, J. T. Hill, John Griffis.
Committee appointed by mayor, New London.	Connecticut	James Fitch, E. A. Delaney, R. M. Watman, Leonard Smith, C. W. Woodbridg G. F. Marshall, H. S. Bartlett.
Board of Trade, Springfield	Illinois	Frank Fleury, Isaac H. Hawley, E. P. Bu lingham, M. G. Hall.
Cotton and Produce Exchange, Little Rock.	Arkansas	Logan H. Roots, John G. Fletcher, J. Darragh, John E. Rearden.
Merchants' Exchange, Saint Louis.	Missouri	Capt. E. W. Gould, Capt. J. P. Keiser, Cap S. W. McMunn, Marcus A. Wolff, Pet Lehman, T. G. Conant.
Cotton Exchange, Shreveport	Louisiana	C. H. Minge, C. G. Thurmont, H. Johnston.
Society of Natural History, San Diego.	California	G. W. Barnes, C. J. Fox, E. J. Buell.
Produce Exchange, Toledo	Ohio	W. T. Walker. W. H. Bellman, H. D. Wa bridge.
Cotton Exchange, Memphis	Tennessee	Clarence P. Hunt, Jos. Tildesley, Jam Connor, Michael Burke, S. J. Kohlman, N. Snowden, J. T. Day, B. Löwenstei
Society of Arts, Massachusetts Institute of Technology, Boston.	Massachusetts	W. H. Niles, J. A. Dresser, George L. Ro erts.

APPENDIX 57.

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, D. C., August 19, 1882.

The CHIEF SIGNAL OFFICER:

SIR: I have the honor to state that the work on the revision of the circular of March 15, 1875, relative to danger lines, having been intrusted to Mr. H. A. Hazen, I have also, therefore, given him the work on the cognate subject, namely, the compilation of the reports relative to the floods of March, 1882, which latter were recently transferred from the Fact Room to the Study Room. As the latter work presupposes the completion of the former, I have the honor to present the following report thereon in anticipation of the completion of both works.

Very respectfully,

CLEVELAND ABBE,
Professor and Assistant O. C. S. O.

THE REVISION OF THE CIRCULAR ON DANGER LINES, DATED MARCH 15, 1875.

The accompanying order No. 48, of June 27, 1881, was prepared by Lieut. A. W. Greely, and this report is made from the replies to this order. Many delays have occurred in the issue of this revision owing to defective replies and neglect on the part of observers in delaying answers. Several of the stations have not yet replied, though every effort has been put forth to obtain replies. I have arranged, 1, in a convenient form for reference, all the essential points relating to river gauges; 2, as the information relating to danger lines seemed of great importance, there is given nearly a complete copy of the observers' notes relating thereto; 3 tables of highest and lowest waters are given.

It should be borne in mind that as no expense was provided for in determining levels, many of the elevations herein given are only approximate; this is especially so in regard to the elevations above sea of all gauges, except those at regular Signal Service meteorological stations.

The work of compilation has been done by—

H. A. HAZEN,
Computer, O. C. S. O.

[Signal-Service Orders No. 48.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, D. C., June 27, 1881.

The following reports will be prepared and forwarded, without unnecessary delay, to this office from all river stations:

First. Report what low-water or other stage of the river is adopted as the zero of the station-gauge, *and why this was assumed*, with a statement of the corresponding depths of water in the channel or on the bars, which were used as reference points at that station in the establishment of the zero point.

Second. State whether the river gauges at your station are estimated in feet and inches, in feet and hundredths (or whatever the system of notation on the scale).

Third. A statement of the readings of station river-gauges for highest and lowest water of each year, with the respective dates, since the station was established. If the station-gauge was in use before the Signal Service station was established, give these data, as far back as attainable, with name of observer.

Fourth. A statement of the readings of any other river-gauges by whomsoever kept in the immediate vicinity of the station, giving the highest and lowest water for each year, with the name of person who kept the record. If such record has been kept simultaneously with that of the regular station, state, by the mean of at least ten simultaneous readings during some period of low water, the comparative zero of the two gauges.

Fifth. For records of similar data not now accessible at the station, state by whom and for what periods kept, and if accessible elsewhere, in whose possession and where at the present time.

Sixth. A statement of the horizontal distance along the river channel, in miles and feet, of all gauges from the station-gauge, and whether up or down stream; this statement to cover all the gauges reported upon under the second and fourth heads of this order.

Seventh. A statement of the reading on the station-gauge corresponding to the beginning of "Danger," the nature of the danger, and at what reading it is extensively threatened.

Eighth. Report in detail, so far as it can be accurately ascertained, the differences of level, in feet and inches, between the zeros of all the gauges and the following points, viz: 1, the beds of railroad tracks at all the neighboring depots; 2, the bench-marks of canals; 3, the planes of reference adopted by the city or town engineers in their surveys; 4, the cistern of the Signal Service barometer at the station.

Ninth. Report upon any well-defined and well-authenticated marks now existing, showing the height attained by special floods and low waters not otherwise recorded on the station-gauge, or which exceeded its extreme limits. State what these extreme high or low water marks would be relatively to the zero of the station-gauge, if these data can be furnished without the cost of running levels, and what extension of the station-gauge is necessary to cover these extreme cases.

Tenth. Give any additional information or explanation of the foregoing that may be useful in revising and extending the circular on Danger Lines, dated March 15, 1875 (see Annual Report of Chief Signal Officer, 1875, pp. 357–361), and Special Reports of Lieut. A. W. Greely (Annual Report of Chief Signal Officer, 1874, pp. 312–322). Thus, every change in the elevation of the gauges, or of the zeros of any of these gauges, should be noted, and the exact extent and date of the change reported. The building of bridges, dams, canals, or other obstructions, or their removal if sufficient to retard or impede the flow of the river, and thus affect the height of water on the gauges, should be noted, with the date of such changes. These reports are not to involve increased expenses at any station, and no expenses will be approved which have not been estimated for, and approved and ordered from this office before they were undertaken.

By order of the Chief Signal Officer.

LOUIS V. CAZIARC,
First Lieutenant Second Artillery, Acting Signal Officer.

Revision of the circular of March 15, 1875, on danger lines at Signal Service river stations.

Station.	Zero of gauge.	Highest water.	Danger line.		Height of zero.			Remarks.
					Below railroad track at—	Below S. S. bar.	Above sea.	
			Beginning.					
			′ ″		′ ″	′ ″	′	
Augusta, Ga	Low water, 1835.	37′ 10″, 1840	32 6	At 37′ the entire city would be flooded. At 35′ nearly one-half of the city would be flooded.	Union depot	31 4	54 1	129	
Boonville, Mo	Low water, Dec. 1, 1872.	33′ 7″, 1844	20 0	At 23′ Old Franklin across the river would be flooded.	Missouri Pacific Depot.	38 6		547	High water of 1844 is located by a stone at the foot of Main street.
Brownsville, Pa	5′ above river bed.	36′, Apr., 1852	25 0	At 30′ danger is extensively threatened.				873	
Brunswick, Mo	Low water, Feb. 6, 1876.	31′, 1844	16 0	At this height many cultivated farms are flooded.	Wabash, Saint Louis and Pacific.	32 0		628	Zero of gauge will be placed 5′ lower on July 1, 1881. This is low water of February 6, 1876.
Cairo, Ill	Low water, Oct. 25, 1871.	50′ 11″, Mar. 21, 1867.	40 0	At 51′ 4″ water would overflow the levee and flood the city.	Illinois Central	51 3	86 5	290	
Chattanooga, Tenn	Low water, Sept., 1839.	58½′, 1867	33 0	At 38′ many dwellings are flooded.	Union Depot	49 9	152 0	621	
Cincinnati, Ohio	2′ 4″ below low water, 1858.	63′ 6″, 1847	50 0	Dangerous for boats to navigate in very high or low water.	Ohio and Mississippi	55 4	189 9	430	
Confluence, Pa	1′ above bed of river.	13′ 6″, Aug., 1875	10 0	At 11′ 5″ water runs into some houses and damages property on banks.	Baltimore and Ohio	22 0		1,322	
Davenport, Iowa	.34′ below low water, 1864.	20′ 6″, Mar., 1868	15 0	This would endanger property in lower part of Rock Island and Muscatine.	Chicago, Rock Island and Pacific.	49 2	70 5	545	
Decatur, Ala	Low water, Oct., 1878.	28′, 1867	20 0		Memphis and Charleston.	36 2		537	
Dubuque, Iowa	Low water, 1864	22′ 8″, June 23, 1880.	16 0		Chicago, Milwaukee and Saint Paul.	21 7	80 6	584	At low water all bars are exposed from 6″ to 5′.
Eugene City, Oreg	11′ above river bed.	24′, 1861 and 1862.	10 0	This endangers stock on bottom lands and merchandise on lower wharves.				457	Zero corresponds to depth of 3′ on bars.
Evansville, Ind	Low water, 1867.	46′, 1832	None	Grade of city is 48′ 2″ above zero. At 36′ bottoms above and below are endangered.	From	50 to 56		320	

Revision of the circular of March 15, 1875, on danger lines at Signal Service river stations—Continued.

Station.	Zero of gauge.	Highest water.	Danger line.		Height of zero.			Remarks.
					Below railroad track at—	Below S. S. bar.	Above sea.	
			Beginning. ′ ″		′ ″	′ ″	′ ″	
Folsom City, Cal	Low water, 1876 or 1877.	42′, Jan., 1861	35 0				200(?)	
Fort Smith, Ark	7′ above low water.	23′, Jan., 1868	15 0	At 20′ the bottoms are flooded, destroying crops, cattle, &c.	24		436(?)	There would seem to be a cycle in the flow of the river of seven or eight years. High water, 1844, 1852, 1859, 1868, and 1878. Low water, 1847, 1856, 1863, 1871, 1879, 1880, and 1881.
Freeport, Pa	Low water, 1868.	34′, 1832	20 0		Track on bridge 31 0		741	Zero represents 1′.5 on the "Dock Riffle," one mile above gauge.
Helena, Ark	Low water, 1872.	46′ 5″, 1862	37 to 38 0	At 44′ the levees are endangered.	Abt. 47 0		150(?)	Zero gives about 4′ on bars.
Hermann, Mo	Low water, Dec., 1878.	24′ 7″, May, 1881	21 0		34 0		abt. 477	
Jefferson City, Mo	Low water, 1867.	Over Water st., 1844.	20 0	This floods bottoms of Calloway County, opposite Missouri Pacific.	28 5		528	Gauge is very liable to be washed away.
Kansas City, Mo	1′ 6″ below low water, Dec. 2, 1874.	37′, 1844	21 0				734	
Keokuk, Iowa	Low water, Dec., 1873.	21′ 6″, 1851	14 6		Track foot of Main street. 27 3	142 7	475	Zero gives 16″ water on Des Moines Rapids.
La Crosse, Wis	Low water, Oct., 1871.	15′ 2″, June 19, 1880.	24 0	This would flood lower part of the city. No dangerous rise has ever occurred here.	Milwaukee and Saint Paul. 23 8	82 0	643(?)	Zero gives about 2′ of water in channel.
Leavenworth, Kans	Low water, Nov., 1871.	25′ 10″, Apr. 29, 1881.	20 0		Union Depot 26 5	88 8	753	
Le Claire, Iowa	Low water, 1864	14′ 6″, June 25, 1880.	10 0	This begins to overflow bottoms of Wapsipmicon River 10 miles above here.			abt. 545	
Little Rock, Ark	9″ above low water, Oct., 1879.	31′, 1844	23 0	This floods low lands; at 29′ danger is extensively threatened.	Iron Mountain 38 0	85 1	213	

Louisville, Ky	*Sill of lock of canal.*	*40′ 6″, 1832*	25 0	*Damage slight at this mark.*	*Ohio and Mississippi.*	52 9	147 2	383	Since extension of the dam the readings are not comparable with those before.
Marysville, Cal	River bed		15 0	Dangerous to levees		Abt. 7 3		Abt. 60	
Memphis, Tenn	1′ above low water, Dec. 25, 1872.	34′ 0″, 1867	34 0		Louisville and Nashville.	42 8	134 6	166	0′. 95 has been added to gauge readings since May 6, 1881.
Morgantown, W. Va	River bed	1852	20 0	Dangerous to navigation. No special danger till 28′ to 30′ is reached.			173 0	790	Water slacked very little, if any, by the dam.
Nashville, Tenn	Low water, Aug., 1860.	55′ 2″, 1847	40 0				313 8	193 0	Depth of channel at gauge, 12′.
New Geneva, Pa	River bed	40′ 0″, 1852	18 0	Impedes navigation and endangers mill property by back water.					Sudden rises are generally from Chattanooga River.
New Orleans, La	High water, Apr. 16, 1874.	Zero, Apr., 1874	— 3 0		New Orleans and Mobile.	1 9½	41 2.5	14 8	
Oil City, Pa	6″ above low water, Sept., 1880.	21′ 0″, Mar. 17, 1865.	13 0	At 20′ some of the streets are flooded and two bridges are endangered.				1,000 0 (abt.)	Zero of gauge gives no water on Charley's Riffle, the shallowest point between Oil City and Pittsburgh.
Omaha, Nebr	Low water, 1867.	23′ 9⅛″, Apr. 25, 1881.	18 0		Union Pacific	72 0	130 0	983 0	
Oroville, Cal	Lowest water known.		10 0	Threatens danger to Marysville and country below Oroville.					Channel is continually shifting and changing.
Paducah, Ky	Low water, 1857	53′ 0″, 1867	40 0						
Pittsburgh, Pa	Log, foot of Market street.	35′ 0″, Feb., 1832	22 0	A sudden rise above 18′ would endanger navigation.	Union Depot	43 5	67 8	604 0	Dam at Davis's Island affects the water at this gauge.
Plattsmouth, Nebr	Low water, Dec. 6, 1873.	19′ 3″, Apr. 25, 1881.	16 7		B. and M	27 1		908 9	
Port Eads, La	2′ 9″ below mean flood-tide.	4′ 4″ Oct. 1, 1877		No danger line			9 3		Depth of channel in South Pass, in front of station, is 32′ when gauge reads 2′ 9″.
Portland, Oreg	Low water, 1867.	28′ 2″, June 24, 1876.	15 0	This floods lower docks, and at 26′ the upper docks are flooded.			66 5		There is a tide of 1′ 6″ during low water.
Red Bluff, Cal	Low water, 1876.	28′6″, Feb. 4, 1881	20 0	At 22′ bottoms are flooded		62 0	80 5	26 6	Depth of water on bars at zero from 2′ to 4′.
Sacramento, Cal	Low water, Sept. 1, 1849.	26′6″, Feb. 4, 1881	25 0	Dangerous to levees within 20 miles of this city.	Central Pacific	29 0	65 0	5 0	If levee breaks on opposite side it relieves this.
Saint Louis, Mo	Low water, Dec. 21, 1863.	41′ 5″, June 27, 1844.	32 0				173 2	395 0	Water at zero has a depth in channel of from 30′ to 36′.

Revision of the circular of March 15, 1875, or danger lines at Signal Service river stations—Continued.

Station.	Zero of gauge.	Highest water.	Danger line.		Height of zero.			Remarks.
					Below railroad track at—	Below S. S. bar.	Above sea.	
			Beginning.					
			′ ″		′ ″	′ ″	′ ″	
Saint Paul, Minn	Low water, Sept. 5–13, 1877.	19′8″, Apr. 29, 1881	7 0	Above 14′ danger is extensively threatened.	Chicago, Milwaukee and Saint Paul. 22 3	137 7	673 0	The zero of this gauge is involved in some confusion.
Umatilla, Oreg.....	Low water, Mar., 1874.	30 0″, June, 1876.	31 0	32′ would be dangerous to the town; 30′ caused great danger 100 miles below.	.....	38 2	262 0	
Vicksburg, Miss.....	Low water, 1871.	52′ 10″, 1864	41 0	Danger is chiefly along the Louisiana side. No danger to Vicksburg, which is on the bluffs.	.....	190 3	54 0	
Warsaw, Ill.....	3 feet above river bed.	21 5″, 1851	12 0	.....	.....	.....	abt. 500 0	
Yankton, Dak	Bed of river.....	30′ 0′, Feb., 1868′.	24 0	.....	Railroad 23 6	51 8	1,170 0	

ADDITIONAL NOTES RELATING TO DANGER LINES.

AUGUSTA, GA.

The peculiar topography of the country surrounding this city renders it very liable to overflow, and nearly every year grave apprehensions are felt. About 1½ miles above the river gauge a natural hollow, known as Hawk's Gully, exists, and by this channel the water first enters the city; and the danger is also increased by its near proximity to the Augusta Canal, and the probability of crevasses being formed in the embankment of the same. About a mile below the river gauge the river bends sharply to the southeast; and here a thick growth of trees and underbrush, by obstructing to a certain extent the flow of water, causes it to back up towards the city.

CAIRO, ILL.

At 46 feet all the lowland between Cairo and Memphis, on the Kentucky and Tennessee side, is inundated, and in some places the expanse of water is 30 miles or more in width, and the only grounds above water are those surrounding the Chickasaw Bluffs, which are at intervals between Cairo and Memphis.

Danger is extensively threatened at 49 feet, when the water flows over the banks in many places and inundates the country for many miles on both sides of the river; at 51 feet 4 inches on gauge, the water would overflow the top of Cairo levee and submerge the entire city. Heavy rainfall results in great damage to the valley.

Supplementary to the fully appreciated warning afforded by the Signal Service, the Coal, Iron, and Manufacturers' Association of this city, in 1880, appointed a committee on flood signals, of which Rev. J. W. Bachman is chairman, who have, since June, 1880, organized and kept up a system of reports from voluntary observers, at twenty points on the river above, embracing the entire drainage system of the Tennessee in Virginia, North Carolina, and this State, with marked beneficial results to the community.

CHATTANOOGA, TENN.

Danger line begins at 33 feet upon the gauge, at which height the low grounds in south Chattanooga are submerged, but there is no apprehension till 38 feet is reached, when various dwellings and manufacturing establishments begin to be flooded and communication with the surrounding country by roads interrupted. The Tennessee is subject to very rapid rises from heavy rainfall in the mountains, constituting the rim of its basin. In twenty-four hours, September 15–16, 1878, the water rose almost perpendicularly from 9 inches to 10 feet 7 inches on the gauge, with no rain here. In cases of both the disastrous floods of 1867 and 1875 there had been a great previous accumulation of snow in the mountains of Virginia, North Carolina, and Tennessee, which, suddenly melting, and combined with very heavy rainfall, resulted in great damage to this valley.

DECATUR, ALA.

Danger is at 20 feet, at which height the water overflows all lowlands adjacent, destroys crops and often stock, which may be overtaken far from mounds or high places. The island in the river often suffers worse than and earlier than the mainland. At 22 feet and 23 feet the danger is still greater, as the mounds are covered, and stock is liable to be drowned or starved unless rescued.

The highest water ever known here was 28 feet above zero, in 1867, and is marked on bridge pier where the gauge is secured; great damage was done to stock, buildings, hay and fodder stacks, &c.

DUBUQUE, IOWA.

At 16 feet the water floods islands and bottom lands; at 18 feet the lower floors of houses on flats are covered; at 20 feet all saw-mills must close, the levee is flooded, two plow-works, three iron-works, and one oil-mill would have to stop, and danger would be extensively threatened; at 21 feet the main tracks and depots of the Chicago, Milwaukee and Saint Paul Railroad and the Illinois Central Railroad are 6 feet under water, and travel greatly obstructed. No farms or bottom lands within 5 miles of the city.

HERMANN, MO.

The reading of the water gauge corresponding to the beginning of danger is supposed to be 21 feet above low water of 1878, this being the height at which the river begins to overflow its lowest banks; at 25 feet it enters the higher bottom or farming lands, and danger is then extensively threatened.

KANSAS CITY, MO.

The danger line is 21 feet above zero. The nature of the danger would be the overflowing of the bottoms opposite the city; at 23 feet danger would be extensively threatened, and the water would overflow parts of western portion of city, known as West Kansas City. This portion of the city is densely populated, contains large elevators, machine shops, packing houses, wholesale houses, stock yards, Union Depot, and several railroad freight depots. During the high water of 1881 several of the railroad tracks through this portion of the city were under water as much as 3 feet, depending on the surface of the ground.

KEOKUK, IOWA.

Danger line is 14 feet 6 inches on Signal Service gauge; above this line the Keokuk and Saint Louis Railroad and bottom lands lying south of the mouth of the Des Moines River are threatened. The Des Moines River empties into the Mississippi about 2½ miles below this city, and floods are greatly influenced by the stage of water in the Des Moines River, backing up the Mississippi.

LEAVENWORTH, KANS.

Danger begins at a stage of water corresponding to 19 feet on the station gauge, by submerging the railroad tracks at Oak Mills, 11 miles north of the city. At 20 feet the farms on the lowlands are overflowed, and nearly 2 feet of water is on the railroad tracks in several places, both north and south of the city.

MEMPHIS, TENN.

The present danger line is at 34 feet. The Arkansas shore opposite, and Tennessee shore above and below are inundated in many places when river gauge reads 33 feet 6 inches, as recorded in the station daily journal March 2, 1880. Superintendent Smith, of the Little Rock and Memphis Railroad, says that when gauge reads 32 feet the river overflows in many places and makes connection with Four-Mile Bayou distant 5 miles.

The depression caused by the earthquake of 1811 at New Madrid, Mo., and vicinity, it is believed, allows the Mississippi passage to the Saint Francis River basin, which it reaches with inundation when the gauge is 30 feet. (See Report Secretary of War, 1871, part 2, pp. 356–358.) At 30 feet life and property are threatened at Bradley's Landing, Ark. In foregoing, gauge readings given are those published as reduced to low-water of December 25, 1872.

NASHVILLE, TENN.

No damage is anticipated under 39 or 40 feet. At a height of 30 feet the lowlands in the northern portion of the city become flooded, slightly impeding travel, but not overflowing houses. On opposite bank of river, in East Nashville, the land is much lower than here. With a reading of 42 feet buildings are greatly endangered; any rise over 1 foot per hour is dangerous to goods along the bank.

NEW ORLEANS, LA.

Records in this office show that with a reading of minus 3 feet 8 inches on gauge there is danger of crevasses being formed both above and below gauges.

The danger line has been placed at different stages: In 1872 at minus 3 feet; some time after this it was placed at minus 2 feet 5 inches. (Report of Chief Signal Officer for 1874, page 316.) Again, it was placed at minus 2 feet 8 inches and minus 3 feet 8 inches, and finally in 1875 it was placed at minus 1 foot 5 inches. At all the above stages it is reported ascreating great alarm; Belle Chasse, Greenwood, and Point La Hache crevasses did not occur until the reading of the gauge was minus 0 feet 4 inches.

As crevasses may occur at stages between 4 feet and zero, it would appear that the formation of crevasses depends more on the condition of the levees than the stage of water in the river. There is little danger from an overflow of banks; the danger lies in the bad condition of the levees. In the great floods of the spring of 1881 the eastern rivers sent out great volumes of water earlier than the western, and the gauge read no higher than minus 2 feet 2 inches.

Reading of gauge at time of crevasses.

Date.	Reading.	Crevasses.
	′ ″	
January 30, 1880	−3 2	At Cazeborne, 5 miles from city; quickly stopped.
February 6, 1880	−3 4	At Kemerez, 15 to 200 feet wide; no great damage.
March 7, 1880	−2 4	At Lockport, 34 feet 6 inches wide; slight damage.
April 1, 1880	−1 7	At south side of river, 4 miles above Algiers, 10 feet wide, 8 feet deep; on the 2d, increased and several plantations were submerged.
April 20, 1880	−0 11	No crevasse.
April 8, 1881	−2 2	Do.

Fears are entertained when the gauge indicates minus 2 feet; at this stage, with high waters in the north and east rivers, the levees are strengthened at the weakest point and everything held in readiness in the event of a break occurring.

OMAHA, NEBR.

General overflow begins at about 18 feet; Union Pacific Railroad shops and smelting-works are flooded at about 20 feet; then danger is extensively threatened; water will begin to cover the tracks and bridges near the Union Pacific transfer depot, and any further rise will suspend all railroad business, inundating tracks and railroad buildings, the stock yards, and submerging all the lower portion of Council Bluffs, Iowa, and Omaha.

PLATTSMOUTH, NEBR.

Sixteen feet 7 inches endangers farms on east side of river. During the high water of April, 1881, the water at 16 feet backed up over thousands of acres of low grounds. As it went on upward it flooded the entire bottom (5 miles wide), and drove all the residents, with stock and goods, out. At 16 feet also it begins cutting on the railroad embankments, as also on the river bank 1½ miles above Plattsmouth (but on the east side of the river), at a dangerously low place (embanked and riprapped by the railroad company to protect it). At 16 feet the water broke through this and swept down through the bottoms, taking embankments and defenses in the rear, and causing very great damage (talk of from $100,000 to $500,000). To the residents of the bottom the old line, 16 feet 7 inches, is not far from danger. The railroad company is raising and strengthening their defenses to a higher point.

SAINT LOUIS, MO.

The city directrix is 33.8 feet above the zero of gauge, and is located opposite No. 4 South Front street. It is the high-water mark of 1826, established by Col. R. Paul, city surveyor, and approved by the board of aldermen for that year. This point is a few yards below Market street. The latter runs perpendicularly to the river bank east and west, dividing the city into two portions, nearly equal before the incorporation of Carondelet with the city of Saint Louis proper. The central *business* portion of the city extends nearly equal distances north and south of Market street. Plum street is its southern, Cherry street its northern terminus along the levee, which between these points is nearly on a level with the city directrix. For this portion of the city I would designate any rise in the river above 32 feet as the "danger line." More than half the houses along the levee, at this stage of water, would be flooded to a greater or less extent, and all the merchandize on the levee would be submerged or washed away.

The extreme northern and southern portions of the city, however, are exposed to danger at a stage of water much lower than that above indicated; most of this territory would be threatened by any rise above 30 feet, much of it by a rise above 29 feet. These portions are chiefly occupied by lumber yards, stock yards, bucket fac-

tories, and similar establishments, containing a vast quantity of material of a perishable nature, liable to suffer great damage. All the country on the left bank of the river almost as far back as the bluffs (with the exception of a few high places) from Alton, Ill., to a point opposite Cape Girardeau is liable to be flooded at a 30-foot stage on the Saint Louis gauge.

WARSAW, ILL.

The danger point on gauge is 12 feet; then it endangers the lowlands, which begin about 1¼ miles south of gauge. We have here some very sudden rises, as we are just below the mouth of the Des Moines River, which enters the river about one-half mile north of this place, and I find that the channel of the Mississippi is being thrown more to the east side of the dikes which have been put up by the Government on the west bank.

Highest and lowest waters at the river stations of the United States Signal Service.

Year.	Augusta, Ga.						Boonville, Mo.						Brownsville, Pa.					
	Highest.			Lowest.			Highest.			Lowest.			Highest.			Lowest.		
	Date.	Feet.	Inches.	Date.	Feet	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.,	Feet.	Inches.
1871..	.....	..	..	.....	..	..	.....	..	..	.....	..	..	.....	..	..	.....	..	..
1872..	.....	..	..	.....	..	..	.....	..	..	.....	..	..	.....	..	..	.....	..	..
1873..	.....	..	..	.....	..	..	.....	..	..	.....	..	..	Nov. 25	26	6	Oct. 4	2	9
1874..	.....	..	..	.....	..	..	.....	..	..	Dec. 31	1	0	Apr. 10	28	0	June 25	3	3
1875..	Dec. 20	27	5	Sept. 12	4	5	July 7	18	10	Jan. 1	1	0	Aug. 3	35	10	Jan. 23	3	0
1876..	Apr. 12	25	7	Aug. 1	2	6	May 8	17	0	Feb. 7	1	4	Sept. 18	27	0	June 25	2	10
1877..	Apr. 14	29	9	Aug. 18	4	3	June 13	19	0	Jan. 1	3	5	Jan. 16	38	6	Jan. 6	2	4
1878..	Jan. 11	21	6	July & Aug.	3	10	July 6	16	3	Jan. 11	1	3	Dec. 11	23	4	Sept. 28	2	4
1879..	Dec. 16	30	1	July —	3	10	July 1	17	0	Feb. 17	1	10	Jan. 19	27	1	Oct. 25	2	5
1880..	Mar. 17	28	5	Oct. 27	4	2	July 13	14	3	Dec. 11	1	9	Dec. 6	30	0	May 23,	3	9
1881..	Mar. 18	32	4	July 11	4	8	May 3	21	11	Jan. 1 to Feb. 5.	4	1				Sept. 25, Oct. 16.		

Year.	Brunswick, Mo.						Cairo, Ill						Chattanooga, Tenn.					
	Highest.			Lowest.			Highest.			Lowest.			Highest.			Lowest.		
	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.
1871..	.....	..	..	.....	..	..	.....	..	..	.....	..	..	.....	..	..	.....	..	..
1872..	.....	..	..	.....	..	..	.....	..	..	.....	..	..	.....	..	..	.....	..	..
1873..	.....	..	..	.....	..	..	Mar. 26	42	7	Oct. 16, 17.	3	8	.....	..	..	.....	..	..
1874..	.....	..	..	.....	..	..	Apr. 26, 27.	47	4	Nov. 10	3	0	May 1	29	8	Nov. 7	0	8
1875..	July 7	15	6	Jan. 4	−4	5	Aug. 7	45	2	Jan. 25	5	4	Mar. 1	53	11½	Oct. 29	2	6
1876..	May 9	14	5	Feb. 6	−5	0	Apr. 6	46	5	Dec. 30	0	3	Jan. 1	33	0	Oct. 19	1	0
1877..	June 12	15	5	Dec. 3, 4	−1	4	Apr. 14	40	7	Jan. 1	1	1	Apr. 11	28	10	Oct. 5	1	2
1878..	July 2, 3	11	11	Dec. 20	−4	0	Apr. 9	37	1	Oct. 18, 22.	0	0	Feb. 25	19	2	Sept. 15	0	11
1879..	July 1	12	3	Dec. 9	−2	6	Dec. 31	36	0	Oct. 9, 10.	2	7	Jan. 15	38	0	Oct. 9, 10	0	2
1880..	July 22, 24.	7	6	Nov. 20, 22.	−4	4	Mar. 21, 23.	44	7	Nov. 29	5	8	Mar. 19	36	4	Oct. 30	1	0
1881..	May 2	15	6	.....	...	...	.....	..	..	.....	...	...	Feb. 14	22	5	Sept. 14	0	0

Highest and lowest waters at the river stations of the United States Signal Service—Cont'd.

Year.	Cincinnati, Ohio.						Confluence, Pa.						Davenport, Iowa.					
	Highest.			Lowest.			Highest.			Lowest.			Highest.			Lowest.		
	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.
1871..	May 13	40	6	Oct. 12	2	8	.....	...	...	.....	...	...	.....	...	...	.....	...	...
1872..	Apr. 13	41	9	Oct. 14	3	0	.....	...	...	.....	...	...	.....	...	...	.....	...	...
1873..	Dec. 18	44	5	Oct. 12	3	8	.....	...	...	.....	...	...	.....	...	...	.....	...	...
1874..	Jan. 11	47	11	Sept. 23	2	8	Dec. 29	12	8	Nov. 7	—0	7	.....	...	...	.....	...	...
1875..	Aug. 6	55	5	Sept. 18	4	1	Aug. 2	13	6	Sept. 8, 9	—0	5	Apr. 29	12	11	Nov. 27, 28.	0	2
1876..	Jan. 29	51	9	Sept. 4	6	3	Sept. 18	11	7	Sept. 2, 6	—0	7	Apr. 16	13	9	Jan. 12	1	6
1877..	Jan. 20	53	8	Oct. 7, 9	3	5	Nov. 24	11	7	Oct. 3	—0	6	Apr. 4, 5	9	11	Sept. 15, 17.	0	6
1878..	Dec. 15	41	2	Oct. 22, 24.	4	4	Nov. 28	8	2	Oct. 12, 18.	—0	7	July 17	7	2	Sept. 19, 20.	0	11
1879..	Dec. 27	42	4	Oct. 23	2	5	Jan. 28	10	0	Oct. 12, 16.	—0	8	June 1	7	10	Sept. 30, Oct. 1, Dec. 14.	1	1
1880..	Feb. 17	53	8	Oct. 28, 29.	3	9	June 15	9	7	Oct. 16, 23.	—0	7	June 26	18	5	Nov. 20	1	7
1881..	.....	...	...	.....	...	...	.....	...	...	.....	...	...	Apr. 12	16	6	July 22, 23.	5	4

Year.	Decatur, Ala.						Dubuque, Iowa.						Eugene City, Oreg.					
	Highest.			Lowest.			Highest.			Lowest.			Highest.			Lowest.		
	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.
1871..	.....	...	...	.....	...	...	May 12	16	10	Oct. 8	2	3	.....	...	...	.....	...	...
1872..	.....	...	...	.....	...	...	May 26	12	5	Nov. 23	2	7	.....	...	...	.....	...	...
1873..	.....	...	...	.....	...	...	June 14	15	8	Nov. 23	2	3	.....	...	...	.....	...	...
1874..	.....	...	...	.....	...	...	May 14	11	4	Dec. 1	1	9	.....	...	...	.....	...	...
1875..	Dec. 1	18	6	Oct. 31	1	0	Apr. 27	16	6	Nov. 30	1	0	.....	...	...	.....	...	...
1876..	Jan. 3	19	8	Oct. 22	0	1	May 29	16	8	Dec. 2	2	4	.....	...	...	.....	...	...
1877..	Apr. 13	18	4	Sept. 5	0	4	Jan. 18	8	8	Mar. 10	1	6	.....	...	...	.....	...	...
1878..	Feb. 26	13	4	Oct. 1	0	0	July 15	8	11	Dec. 11	1	7	.....	...	...	.....	...	...
1879..	Jan. 19	20	6	Oct. 3	0	1	May 29, 30.	10	7	Oct. 1	2	2	.....	...	...	.....	...	...
1880..	Mar. 22	21	8	Oct. 23	0	0	June 23, 24.	22	8	Mar. 18	2	5	.....	...	...	Nov. 27	0	6
1881..	Mar. 20	16	10	Sept. 14, 15.	—0	8	May 10	16	10	.....	...	...	Jan. —	22	0	.....	...	...

Year.	Evansville, Ind.						Fort Smith, Ark.						Freeport, Pa.					
	Highest.			Lowest.			Highest.			Lowest.			Highest.			Lowest.		
	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.
1871..	.....	...	...	.....	...	...	.....	...	...	.....	...	...	.....	...	...	.....	...	...
1872..	.....	...	...	.....	...	...	.....	...	...	.....	...	...	.....	...	...	.....	...	...
1873..	.....	...	...	.....	...	...	.....	...	...	.....	...	...	.....	...	...	.....	...	...
1874..	.....	...	...	.....	...	...	.....	...	...	.....	...	...	.....	...	...	.....	...	...
1875..	Aug. 11	41	11	Sept. 22	2	6	.....	...	...	.....	...	...	Dec. 13	29	3	June 23	—0	3
1876..	Jan. 31	43	4	Dec. 20	3	10	.....	...	...	.....	...	...	Jan. 8	23	4	Nov. 7	—0	9
1877..	Jan. 23	41	6	Oct. 14	0	1	.....	...	...	.....	...	...	Apr. 3	21	0	Sept. 9	0	2
1878..	Dec. 18	31	10	Oct. 28	1	5	.....	...	...	.....	...	...	Feb. 12	19	0	Sept. 1	0	0
1879..	Dec. 30	37	4	Nov. 14	0	8	Apr. 24	5	3	Sept. 30 and Oct. 15.	—5	1	Mar. 10	19	1	Sept. 25	0	0
1880..	Feb. 21	42	1	Oct. 8	2	1	Apr. 5	5	11	Dec. 31	—5	2	Dec. 11	23	0	Aug. 30	0	2
1881..	Feb. 10	38	11	.....	...	...	Feb. 9	7	5	Jan. 2	—5	5	Mar. 12	22	10	Oct. 16 to 24.	—0	6
													Jan. 1	17	6	Sept. 27	0	2
													June 10	20	5	.....	...	...

Highest and lowest waters at the river stations of the United States Signal Service—Cont'd.

Year.	Helena, Ark.						Hermann, Mo.						Jefferson City, Mo.					
	Highest.			Lowest.			Highest.			Lowest.			Highest.			Lowest.		
	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.
1871..	.....	...	...	.....	...	...	.....	...	...	.....	...	...	.....	...	...	.....	...	...
1872..	Apr. 26	39	0	Dec. 26	0	0	.....	...	...	.....	...	...	.....	...	...	.....	...	...
1873..	Apr. 20	39	8	Oct. 19	4	0	.....	...	...	.....	...	...	.....	...	...	.....	...	...
1874..	May 11	45	10	Nov. 16	3	8	June 19	12	5	Dec. 29	0	0	.....	...	...	.....	...	...
1875..	Apr. 12	42	5	Nov. 9	7	7	Aug. 1	17	10	Jan. 5	−1	8	July 31	18	0	Jan. 11, to 23.	0	4
1876..	Apr. 18	44	10	Dec. 31	3	5	July 6	18	9	Dec. 9	−0	11	July 5, 6	15	8	Dec. 18, to 23.	1	2
1877..	Apr. 30	41	10	Jan. 4	1	8	June 13	18	4	Oct. 13	2	3	June 13, 14.	17	3	Jan. 25, to 27.	1	8
1878..	May 3	38	10	Oct. 2	7	2	July 8	14	5	Dec. 21	−5	0	June 30	17	11	Dec. 16, to 17.	0	0
1879..	Jan. 31	37	2	Nov. 14	5	1	June 29	15	4	Dec. 22	−0	10	June 28	15	0	Dec. 22, to 25.	0	4
1880..	Mar. 31	43	8	Nov. 3	8	1	July 15	12	7	Dec. 6	−0	10	July 14	14	0	Dec. 31	0	8
1881..	May 14	43	8	.....	...	...	May 19	10	7	.....	...	...	May 4	18	9	Jan. 1	0	5

* These observations are from the old gauge, whose zero was 5 feet above the present zero.

Year.	Kansas City, Mo.						Keokuk, Iowa.						La Crosse, Wis.					
	Highest.			Lowest.			Highest.			Lowest.			Highest.			Lowest.		
	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.
1871..	.....	...	...	.....	...	...	.....	...	...	.....	...	...	.....	...	...	.....	...	...
1872..	.....	...	...	.....	...	...	.....	...	...	.....	...	...	.....	...	...	.....	...	...
1873..	.....	...	...	.....	...	...	.....	...	...	.....	...	...	.....	...	...	.....	...	...
1874..	.....	...	...	Dec. 2	1	6	Mar. 26, 27.	9	6	Dec. 31	1	4	May 10	8	5	Nov. 28	2	8
1875..	Apr. 30	17	10	Nov. 30	1	10	July 9	13	8	Dec. 19	0	9	Apr. 22	9	7	Aug. 24 to 27.	−1	5
1876..	June 16	18	0	Dec. 9	2	0	Apr. 17	17	3	Feb. 4	1	4	May 22	9	4	July 25, 26.	−0	2
1877..	June 10	22	3	Dec. 17	3	10	Apr. 9, 10.	12	4	Oct. 1	0	9	July 12, 13.	4	11	Aug. 26	−2	3
1878..	July 2	19	10	Jan. 12, 13.	3	6	June 10	11	9	Jan. 12	1	6	Apr. 30	4	5	Sept. 16 to 19.	−0	8
1879..	June 30	19	3	Mar. 1	3	2	June 2	9	2	Dec. 20	0	0	July 19, 20.	7	10	Sept. 17 to 29.	0	6
1880..	July 10 to 12.	16	8	Nov. 22	2	0	June 20	18	2	Nov. 23, 24.	0	3	June 19	15	2	Mar. 24 to 26.	1	0
1881..	Apr. 30	26	4½	Feb. 23	4	6	Apr. 24, 25.	18	2	.....	...	...	May 4, 5.	12	0	Apr. 12, 13.	2	8

Highest and lowest waters at the river stations of the United States Signal Service—Cont'd.

Year.	Leavenworth, Kans.						Le Claire, Ia.						Little Rock, Ark.					
	Highest.			Lowest.			Highest.			Lowest.			Highest.			Lowest.		
	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.
1871																		
1872																		
1873																		
1874				Dec. 24	2	3												
1875	Apr. 30	17	3	Jan. 1	2	3	Apr. 30	10	4	Dec. 2	—0	3						
1876	July 6	16	5	Dec. 2, 3, & 10.	3	3	June 1	10	3	Dec. 4	—0	3						
1877	June 13	19	8	Dec. 19	3	10	Apr. 3	6	11	Mar. 12	—0	1						
1878	July 2	18	6	Jan. 10	3	7	June 5	5	6	Dec. 14	—0	6				Oct. 12 to 22.	—0	9
1879	June 30	16	5	Mar. 1	3	3	June 1	6	6	Dec. 14	+1	0						
1880	July 15	16	0	Feb. 3, 4, & 8.	2	9	June 25	14	6	Oct. 14	1	10	Mar. 14	14	8	Nov. 6, 7.	—0	6
1881	Apr. 29, 30.	25	10										Feb. 20	17	1			

Year.	Louisville, Ky.						Marysville, Cal.						Memphis, Tenn.					
	Highest.			Lowest.			Highest.			Lowest.			Highest.			Lowest.		
	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.
1871																Dec. 29	—0	11
1872													Apr. 24	31	6	Dec. 25	—0	11
1873	Dec. 19	18	6	Oct. 9, 12–17.	2	4							Mar. 3	32	6	Oct. 30	1	0
1874	Jan. 12, 13.	25	0	Sept. 24	2	1							May 2	34	0	Nov. 16	1	5
1875	Aug. 7	29	7	Sept. 22, 23.	3	0							Aug. 15	33	1	Jan. 27	3	2
1876	Jan. 20	31	0	Dec. 18	4	1							Apr. 8	34	1	Dec. 30	1	2
1877	Jan. 21	30	0	Oct. 8	2	6							Apr. 29	32	1	Jan. 2	0	8
1878	Dec. 17	16	0	Oct. 25, 27.	3	0							May 2	29	1	Oct. 24	2	11
1879	Dec. 28	20	6	Oct. 9–15.	1	11							Jan. 29	28	1	Oct. 9	1	0
1880	Feb. 18, 19.	30	6	Oct. 2, 3, 29, and Nov. 1.	3	0					4	6	Mar. 24	33	5	Oct. 31	2	7
1881							Sept. 4	18	2		5	0						

Highest and lowest waters at the river stations of the United States Signal Service—Cont'd.

Year.	Morgantown, W. Va.						Nashville, Tenn.						New Geneva, Pa.					
	Highest.			Lowest.			Highest.			Lowest.			Highest.			Lowest.		
	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.
1871																		
1872							Apr. 15	39	5	Sept. 23, 24; Oct. 29.	0	2						
1873							Feb. 21, 22.	39	0	Oct. 13, 16, 17.	0	0						
1874							Apr. 16, 17.	49	2	July 8–10.	1	0	Dec. 29	21	9	Nov. 10	0	7
1875	Aug. 3	25	0	Jan. 1–3	0	7	Mar. 2	41	4	Sept. 13	1	6	Aug. 3	31	4	Sept. 15	1	0
1876	Jan. 24	13	4	Jan. 2–5; Aug. 6, 7; Oct. 29–31; Nov. 1–3.	0	4	Jan. 29	34	6	Oct. 19–21.	0	10	Sept. 18	20	11	Jan. 17, 18.	1	4
1877	Jan. 16	27	6	Aug. 29–31; Sept. 4–17.	0	4	Jan. 22	40	4	Sept. 4; Oct. 20, 21.	1	1	Jan. 16	36	4	Oct. 2, 3	0	10
1878	Nov. 23, 28.	13	8	Oct. 16	0	3	Apr. 26	27	3	Sept. 23; Oct. 9.	0	4	Dec. 11	21	2	Oct. 17–21.	1	0
1879	Dec. 25	15	3	July 2–4	0	2	Jan. 19	41	4	Oct. 3	0	5	Jan. 18	18	10	Nov. 1–9	0	9
1880	Dec. 5	22	6	Dec. 27	2	9	Mar. 17	46	6	Sept. 26	0	7	Feb. 14	26	3	Aug. 2	1	7
1881													Apr. 14	18	8	July 6–8	1	11

Year.	New Orleans, La.						Oil City, Pa.						Omaha, Nebr.					
	Highest.			Lowest.			Highest.			Lowest.			Highest.			Lowest.		
	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.
1871																		
1872																		
1873	May 21	−2	8	Nov. 8	−14	5												
1874	Apr. 16	+0	6	Nov. 28	−15	0	Dec. 29	8	0	Nov. 1–16.	−0	4				Dec. 4	2	2
1875	Apr. 22	−4	0	Nov. 16	−14	10	Apr. 2	11	5	Sept. 9	−0	5	Apr. 27	17	10	Nov. 23	1	10
1876	May 10	−2	10	Dec. 30	−16	2	Feb. 12	11	1	Aug. 19–25.	−0	4	June 20	14	10	Dec. 2	1	7
1877	May 30	−3	7	Jan. 3	−15	10	Mar. 10	12	4	Sept. 30, Oct. 4	−0	5	June 13	17	5	Dec. 18	5	2
1878	May 19	−3	0	Dec. 28	−14	3	Dec. 10	11	0	Oct. 16	−0	3	June 25	17	10	Dec. 14	4	9
1879	Feb. 16	−3	8	Nov. 22	−14	7	Mar. 11	13	6	Oct. 17	−0	6	June 28	17	0	Dec. 10	2	1
1880	Apr. 24	−0	11	Nov. 2	−14	10	Jan. 7	6	6	Sept. 19–26.	−0	6	July 9	17	1	Nov. 27	4	5
1881	Apr. 18	−2	2				Feb. 10	14	6				Apr. 25	23	10			

* Zero was changed on April 16, 1874, so that all heights before this date refer to a zero 6 inches lower than those afterwards

Highest and lowest waters at the river stations of the United States Signal Service—Cont'd.

Year.	Oroville, Cal.						Paducah, Ky.						Pittsburgh, Pa.					
	Highest.			Lowest.			Highest.			Lowest.			Highest.			Lowest.		
	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.
1871																		
1872																		
1873																		
1874																		
1875							Mar. 23	44	4	Oct. 24	3	3	Aug. 3	21	0	Sept. 10	0	4
1876							Feb. 5	44	11	Dec. 3	0	3	Sept. 19	20	9	Sept. 3	0	2
1877							Jan. 27	38	10	Sept. 16	1	3	Jan. 17	22	1	Oct. 2	—0	7
1878							Apr. 29	29	0	Oct. 31	0	11	Dec. 11	24	6	Oct. 20	—0	7
1879							Jan. 25	38	10	Oct. 16	0	8	Mar. 12	19	11	Oct. 19	—1	1
1880	Feb. 3	19	0	Dec. 3	—0	3	Mar. 23	44	0	Oct. 30	2	2	Feb. 14	21	7	Oct. 20	—0	6
1881							Feb. 24	40	6				Jan. 10	27	1			

Year.	Plattsmouth, Nebr.						Portland, Oreg.						Sacramento, Cal.					
	Highest.			Lowest.			Highest.			Lowest.			Highest.			Lowest.		
	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.
1871																		
1872																		
1873	July 3	16	5	Dec. 2	0	0							May 26, 27.	22	7	Oct. 2 to 20.	4	7
1874	June 16	7	8	Dec. 19	—0	9							Jan. 26	22	2	Oct. 7 to 29.	4	4
1875	Apr. 28	13	3	Nov. 22	—0	7							Mar. 8	24	8	Oct. 11 to 16.	7	1
1876	June 21	12	0	Dec. 2	0	3	June 24	28	2	Dec. 23	1	2	Mar. 16 to 19.	18	2	Aug. 31 to Oct. 21.	5	2
1877	July 13	13	11	Mar. 9	—0	8	Mar. 16	19	1	Jan. 25	1	2						
1878	June 25	14	1	Dec. 23	0	0	June 15	14	8	Dec. 30	0	1	Feb. 25	26	0	Sept. 18	5	3
1879	June 28	12	5	Dec. 12	0	4	July 1, 2.	19	4	Jan. 2	—0	1		17	6	Sept. 22	5	10
1880	July 8	13	1	Mar. 15	—1	3	July 1, 2.	27	4	Nov. 30	0	11	Apr. 22	24	6	Nov. 8 to 23.	7	5
1881	Apr. 25	19	8										Feb. 4	26	6			

Highest and lowest waters at the river stations of the United States Signal Service—Cont'd.

Year.	Saint Louis, Mo.						Saint Paul, Minn.						Umatilla, Oreg.					
	Highest.			Lowest.			Highest.			Lowest.			Highest.			Lowest.		
	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.
1871..	.....	...	...	.....	...	...	.....	...	...	.....	...	...	.....	...	...	.....	...	...
1872..	June 12 to 14.	23	0	Dec. 4	2	6	May 20, 21.	9	8	Oct. 26, 27.	3	10	.....	...	...	.....	...	...
1873..	Apr. 11	25	3	Dec. 1	4	6	Aug. 21	18	4	Sept. 22	4	4	.....	...	...	.....	...	...
1874..	June 20	18	5	Dec. 30, 31.	3	4	July 2	13	6	Nov. 25 to 28.	4	11	.....	...	...	.....	...	...
1875..	Aug. 3	29	11	Jan. 3	2	9	Aug. 16	19	11	Aug. 22	4	0	.....	...	...	.....	...	...
1876..	May 10 and 11.	32	6	Feb. 7	5	0	Apr. 10	12	11	Nov. 26	3	10	.....	...	...	.....	...	...
1877..	June 14	26	7	Oct. 4	6	10	May 25, 26.	7	8	Sept. 5 to 13.	1	9	.....	...	...	.....	...	...
1878..	June 15	25	9	Dec. 27	5	11	Apr. 27	6	8	Dec. 3, 4.	0	7	June 12	18	0	Dec. 31	0	11
1879..	July 3	21	2	Dec. 26	3	6	July 11	10	9	Sept. 28	0	11	June 17	22	2	Jan. 5	1	0
1880..	July 10 to 12.	25	5	Nov. 29	2	10	June 17	15	3	Oct. 10, 14.	1	8	July 2	28	1	Mar. 20	1	5
1881..	.....	...	...	.....	...	...	Apr. 20	19	8	.....	...	...	June 11, 17.	20	10	.....	...	...

Year.	Vicksburg, Miss.						Warsaw, Ill.						Yankton, Dak.					
	Highest.			Lowest.			Highest.			Lowest.			Highest.			Lowest.		
	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.	Date.	Feet.	Inches.
1871..	.....	...	...	.....	...	...	.....	...	...	.....	...	...	.....	...	...	.....	...	...
1872..	.....	...	...	Jan. 1	0	6	.....	...	...	.....	...	...	.....	...	...	.....	...	...
1873.	May 28	40	7	Jan. —	2	4	.....	...	...	.....	...	...	Nov. 29	15	2	June 30, July 1.	4	2
1874..	Apr. 29	45	8	Nov. 16	3	0	Mar. 12	10	0	Dec. 13	2	0	July 4	15	0	Nov. 21, 22.	5	9
1875..	May 15	40	11	Jan. 31	8	7	Apr. 11	14	9	Dec. 19	1	3	Apr. 24, 25.	15	10	Nov. 7	5	8
1876..	May 10	44	11	Dec. 31	4	0	Mar. 22	16	11	Nov. 8	2	0	Apr. 13	13	9	Dec. 11–13.	3	0
1877..	May 13	41	7	Jan. 7	2	3	June 26	13	4	Jan. 1	1	0	June 11, 12.	13	0	Dec. 29–31.	4	0
1878..	Mar. 27	40	11	(*)	...	...	June 8	11	2	Feb. —	1	0	June 22, 23.	11	6	Dec. 13	2	9
1879..	Apr. 15	35	4	(*)	...	...	June 2	9	10	Oct. 2	1	11	June 26, 27.	12	6	Nov. 5, 6, 7; Dec. 1, 4.	2	7
1880..	Apr. 9	43	2	Oct. 25	7	8	June 28	19	8	Nov. 23	2	0	July 5	18	2	Mar. 16	0	10
1881..	May 11	41	7	.....	...	...	Oct. 28	20	8	.....	...	...	Apr. 5	29	3	.....	...	...

*No reading. By improvements the river left the gauge dry, and a new one had to be erected at Kleinston. The zero is the same as the old gauge.

APPENDIX 57.

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington City, May 18, 1882.

SIR: I have the honor to inclose herewith blank forms for report on the recent overflow of the river in your vicinity. The blanks explain themselves.

It is the purpose of this Bureau to publish a comprehensive report upon the flood as soon as the necessary data can be obtained from reliable sources. Your co-operation in this important work is earnestly solicited, as its success depends upon the interest taken in the matter by persons who reside in the overflowed districts and were present during the time of the flood.

Will you kindly fill up one of the blanks with the information called for therein and forward it to this office at your earliest convenience. A copy of the report will be sent you as soon as published?

I am, very respectfully, your obedient servant,

W. B. HAZEN,
Brig. and Bvt. Maj. Genl., Chief Signal Officer, U. S. A.

What extent of the levee in your vicinity was broken?
State height in feet above danger line reached during the flood; also date danger line was reached.
What fluctuations were noticed during flood?
Give date of highest water in your vicinity during recent flood.
What point of reference is used to measure changes in the river at your place?
How many feet did the river rise when highest above this point of reference?
Give highest water previous to recent flood, with date of same.
How far inland from river did flood reach in your vicinity?
What was width of overflowed district, measured east and west?
Describe any peculiarities you may have observed in connection with the recent rise of the river and its decline.
What was rate of current (if any) in your immediate vicinity?
Give estimated damage to lands and buildings in your county.
Give estimated damage to provisions and supplies in your county.
Give estimated damage to stock and farming implements in your county.
Give estimated damage to staple products, grain, cotton, sugar, &c., in your county.
Here give grand total damage done in your county.
Give names of persons known to have lost their lives.

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington City, ——— —, 188–.

SIR: I have the honor to acknowledge with thanks the receipt of your report of the recent flood in the Lower Mississippi Valley. Similar reports have been received from other parts of the overflowed region, and a general report is in preparation, and when published a copy will be furnished you.

I am, very respectfully, your obedient servant,

W. B. HAZEN,
Brig. and Bvt. Maj. Gen., Chief Signal Officer, U. S. A.

ABSTRACT OF A REPORT ON THE FLOODS OF 1882.

Early in May of 1882 the inclosed circular, having seventeen questions relating to the spring floods, with the accompanying letter of transmittal was, widely distributed throughout the flooded districts, through the nearest offices of the Signal Service. Answers to these circulars were received from 372 persons, and the accompanying acknowledgment has been sent. Besides these replies, there have been used in making up this report rainfall statistics from 22 regular stations of the Signal Service and 57 volunteer reports, also records from 15 River stations; all these stations are either upon the Missouri, Mississippi, and Ohio Rivers or upon their watersheds.

On projecting the river records so as to show the oscillations, the following table (1) was prepared:

TABLE 1.—*Showing the dates on which the danger line was reached, together with the date and record of highest water during the first six months of* 1882.

Station.	Danger line.		Date of highest water.	Gauge reading at highest.	Above danger.
	Date of reaching.	Date of receding.			
				Feet.	*Feet.*
Cincinnati, Ohio	Feb. 18	Feb. 27	Feb. 21	58.5	8.5
Louisville, Ky	Feb. 17	Feb. 28	Feb. 22	37.2	12.2
Paducah, Ky	Jan. 15	Mar. 21	Feb. 26	49.8	9.8
Cairo, Ill	Jan. 14	Apr. 4	Feb. 25 and 26.	51.8	11.8
Memphis, Tenn	Jan. 25	Apr. 29	Mar. 7	36.0	2.0
Helena, Ark	Jan. 17	Apr. 18	Mar. 9	47.4	7.4
Vicksburg, Miss	Jan. 21	May 4	Mar. 20	48.7	7.7
New Orleans, La	Jan. 28	May 11	Mar. 27	—0.4	2.6
Le Claire, Iowa	Apr. 20	Apr. 28	Apr. 22	11.3	1.3
Keokuk, Iowa	Apr. 22	May 2	Apr. 25	17.1	2.1
Warsaw, Ill	Apr. 9	May 7	Apr. 25	17.8	5.8
Nashville, Tenn	Jan. 11, Mar. 9.	Feb. 2, Mar. 16.	Jan. 22	54.5	14.5

TABLE 2.—*Showing the dates previous to* 1882 *on which the danger line was reached, and the date and record of highest water.*

Station.	Danger line.		Date of highest water.	Gauge reading.	Amount above danger line.
	Date of reaching.	Date of receding.			
				Feet.	*Feet.*
Cairo, Ill	Feb. 19, 1873	Mar. 2	Feb. 25	42.4	2.4
	Apr. 8, 1873	Apr. 17	Apr. 14	42.2	2.2
Cairo, Ill	Feb. 25, 1874	Mar. 14	Mar. 10	45.2	5.2
	Apr. 15, 1874	May 13	Apr. 26	47.9	7.9
Nashville, Tenn	Apr. 10, 1874	Apr. 25	Apr. 16	40.7	9.7
Vicksburg, Miss	Mar. 13, 1874	May 4	May 1	47.1	6.1
Memphis, Tenn	Apr. 19, 1874	May 14	May 1	35.0	1.0
Vicksburg, Miss	Mar. 28, 1875	May 9	Apr. 24	43.0	2.0
Cairo, Ill	Mar. 8, 1875	Apr. 2	Mar. 20	44.0	4.0
Cincinnati, Ohio	Aug. 3, 1875	Aug. 9	Aug. 7	55.2	5.2
Louisville, Ky	Aug. 5, 1875	Aug. 10	Aug. 7	29.6	6.6
Cairo, Ill	July 20, 1875	Aug. 10	Aug. 8	45.3	5.3
Cairo, Ill	Jan. 29, 1876	Feb. 15	Feb. 4	45.3	5.3
	Mar. 22, 1876	Apr. 13	Apr. 6	46.6	6.6
Memphis, Tenn	Mar. 31, 1876	Apr. 17	Apr. 7	35.0	1.0
Vicksburg, Miss	Feb. 12, 1876	Mar. 16	Mar. 8	42.3	1.3
	Apr. 28, 1876	June 13	May 19	44.7	3.7
Nashville, Tenn	Feb. 13, 1880	Feb. 22	Feb. 19	44.0	4.0
	Mar. 13, 1880	Mar. 22	Mar. 17	40.5	0.5
Cairo, Ill	Feb. 19, 1880	Mar. 30	Mar. 20	44.8	4.8
Vicksburg, Miss	Mar. 10, 1880	May 3	Apr. 11	44.3	3.3
Cairo, Ill	Apr. 13, 1881	May 11	Apr. 19	44.2	4.2
Leavenworth, Kans	Apr. 23, 1881	May 3	Apr. 29	26.0	6.0

I have also prepared from the curves of river oscillations, published in the "Report of the Chief Signal Officer" for the years 1873 to 1881 inclusive, a second similar Table 2 for purposes of comparison.

These tables show strikingly the longer continuance and greater depths of water in the floods of 1882 over those of any other year since 1873. Table 1 also shows that there were two distinct flood seasons, the first one, in January, in the Cumberland River, and the second, in February and March, in the Ohio and Lower Mississippi Rivers. To these may be added a third partial flood season, in the Upper Mississippi River, occurring the last of April and the first of May; this, however, was of very slight extent, and little or no damage accompanied it.

In looking for the causes of these floods I have prepared Table 3, showing monthly rainfalls during the first four months of 1882 at various stations, and the departures from the mean value for the past ten years. The enormous excess in January of 10 inches and more in the valley of the Cumberland, occurring almost wholly before the 22d of the month, readily accounts for the floods of the same.

TABLE 3.—*Rainfall (monthly) at various stations during* 1882.

Station.	January.	Departure from mean.	February.	Departure from mean.	March.	Departure from mean.	April.	Departure from mean.
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Yankton	0.04	— .52	0.09	— .71	0.06	—1.15	2.93	+ .36
Omaha	.74	+ .24	.60	— .09	.79	— .71	4.31	+1.60
Leavenworth	.83	— .57	1.17	— .29	1.15	—1.29	4.15	+ .70
Saint Louis	2.80	+ .54	8.94	+6.07	3.49	+ .22	3.58	— .16
Saint Paul	.67	— .39	2.35	+1.07	3.25	+1.50	1.61	— .63
La Crosse	.75	— .45	1.11	— .04	2.37	+ .33	1.96	— .63
Dubuque	.84	— .63	.59	— .80	1.49	—1.03	4.47	+1.44
Davenport	.90	— .90	.62	— .75	2.90	+ .48	3.15	— .11
Keokuk	1.07	— .59	1.54	+ .20	3.30	+ .90	3.22	— .04
Pittsburgh	4.58	+ 1.68	3.14	+ .86	5.18	+ .51	1.39	—1.15
Cincinnati	6.02	+ 2.22	7.04	+3.60	6.17	+2.09	2.71	— .63
Indianapolis	3.74	+ .66	7.28	+3.90	6.11	+1.81	3.08	— .09
Louisville	6.29	+ 1.97	9.69	+5.71	5.85	+1.30	2.17	—2.31
Knoxville	16.98	+10.95	6.10	+1.17	4.35	—1.18	3.88	—1.84
Nashville	14.40	+ 9.17	8.58	+3.44	9.36	+4.05	3.55	—2.12
Cairo	6.35	+ 1.79	10.14	+6.03	4.22	— .16	4.14	— .16
Memphis	12.87	+ 6.46	9.92	+4.58	9.10	+2.92	3.56	—3.20
Vicksburg	13.83	+ 8.77	7.15	+2.08	7.41	+ .37	5.44	—1.05
New Orleans	4.54	— .41	4.04	— .82	.92	—5.01	4.83	—1.16

In order to study into the causes for the extraordinary high waters in the Lower Mississippi, Tables 4 and 5 have been prepared. These show, first, the monthly rainfall at three typical stations in the Missouri and Mississippi watersheds, namely, Leavenworth, Keokuk, and Saint Louis, and a corresponding number for the Ohio Valley, namely, Knoxville, Nashville, and Louisville; second, the mean monthly height of the Mississippi River at Saint Louis and Cairo and of the Ohio at Louisville.

TABLE 4.—*Giving the monthly rainfall at Leavenworth, Kans., Keokuk, Iowa, and Saint Louis, Mo., together with the mean monthly river-gauge reading at Saint Louis, Mo., and Cairo, Ill.*

Date.	Monthly rainfall.				Mean height of river at—	
	Leavenworth.	Keokuk.	Saint Louis.	Mean.	Saint Louis.	Cairo.
1872.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Feet.*	*Feet.*
January	0.13	0.07	0.64	0.28	4.6	.....
February	.87	.39	1.15	.80	8.9	.....
March	1.95	2.88	2.43	2.42	8.1	.....
April	2.98	3.60	3.17	3.27	15.3	.....
May	7.91	3.70	5.97	5.86	18.1	.....
June	4.75	5.81	4.28	4.95	20.7	.....
July	9.92	6.77	4.41	7.03	17.7	.....
August	6.56	1.97	.93	3.15	12.6	.....
September	4.22	2.20	3.45	3.31	8.1	.....
October	2.06	.42	.55	1.01	5.7	.....
November	.06	.74	2.01	.94	5.7	.....
December	1.34	.50	1.70	1.18	4.3	.....
1873.						
January	3.02	3.31	3.53	3.29	9.0	.....
February	1.03	.53	1.52	1.03	9.6	.....
March	1.75	.51	2.10	1.45	12.8	.....
April	5.07	5.05	6.86	5.86	19.6	.....
May	5.38	3.42	5.27	4.69	26.5	.....
June	3.15	1.21	6.08	3.68	23.9	27.5
July	2.04	8.77	5.96	5.59	22.4	25.0
August	2.40	.54	.07	1.06	11.5	12.7
September	3.04	8.73	3.02	3.46	7.5	6.4
October	1.56	4.69	3.27	3.17	6.8	4.0
November	.89	1.43	1.64	1.32	6.0	10.5
December	5.24	8.56	5.10	6.30	9.5	27.0

TABLE 4.—*Giving the monthly rainfall, &c.*—Continued.

Date.	Monthly rainfall.				Mean height of river at—	
	Leavenworth.	Keokuk.	Saint Louis.	Mean.	Saint Louis.	Cairo.
1874.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Feet.*	*Feet.*
January	3.14	3.66	3.04	3.28	5.3	24.8
February	1.35	.89	3.66	1.97	10.6	30.9
March	3.05	1.14	4.36	2.85	15.3	40.4
April	2.80	2.40	3.43	2.88	16.4	41.4
May	1.60	1.65	3.70	2.32	15.3	31.6
June	4.00	4.01	2.06	3.07	15.5	14.7
July	3.23	4.54	5.71	4.49	13.3	11.6
August	1.72	3.87	4.70	3.43	8.1	8.3
September	5.50	7.02	2.32	5.25	7.7	7.0
October	1.49	1.96	1.09	1.51	8.1	5.9
November	3.40	2.17	2.32	2.65	6.9	5.5
December	1.35	1.20	1.46	1.36	4.8	9.9
1875.						
January	0.23	0.61	0.54	0.46	5.5	14.6
February	1.25	1.84	2.59	1.89	5.4	19.3
March	2.50	1.67	4.08	2.75	9.0	40.3
April	1.67	.89	2.53	1.70	18.0	33.5
May	3.53	6.70	5.48	5.24	19.6	28.4
June	3.85	8.33	10.84	7.67	20.2	22.0
July	8.82	12.70	9.49	10.34	25.5	36.2
August	3.73	3.83	2.66	3.41	17.4	35.2
September	1.97	4.02	.24	2.28	15.8	15.1
October	.72	2.71	1.23	1.55	10.3	9.5
November	.39	.59	.89	.62	7.7	11.5
December	2.60	3.93	2.42	2.98	5.5	19.4
1876.						
January	1.42	3.68	4.75	3.28	11.8	33.5
February	.20	1.45	2.86	1.51	9.0	41.1
March	5.17	3.45	6.90	5.17	15.5	32.1
April	7.65	3.99	2.25	4.63	25.9	41.9
May	6.78	5.28	3.13	5.06	24.5	35.2
June	5.71	6.70	6.43	6.28	23.7	28.5
July	4.01	6.70	5.18	5.33	25.1	30.4
August	3.40	4.03	5.03	4.15	13.7	16.2
September	3.56	11.08	7.63	7.42	18.3	19.3
October	2.70	2.12	1.66	2.19	11.1	10.9
November	2.87	2.82	1.74	2.48	11.4	11.3
December	.31	.23	.18	.24	10.8	4.7
1877.						
January	.71	.84	1.24	.94	10.4	19.1
February	.50	.15	.88	.51	11.3	20.3
March	4.39	3.76	3.41	3.85	10.2	23.2
April	7.14	4.22	2.86	4.74	20.7	37.8
May	8.67	5.55	3.11	5.78	22.5	31.9
June	10.00	7.82	8.69	8.84	23.9	27.1
July	5.34	7.06	2.88	5.09	21.1	23.5
August	2.85	2.52	2.61	2.66	12.2	11.0
September	1.95	3.61	3.56	3.04	8.9	6.6
October	4.87	7.11	4.92	5.63	8.8	5.6
November	2.44	3.05	3.76	3.08	10.8	13.4
December	3.18	2.90	3.34	3.14	11.8	18.2
1878.						
January	2.34	.17	2.36	1.62	11.6	21.0
February	2.94	2.95	1.69	2.53	14.3	28.4
March	2.35	3.78	2.79	2.97	16.8	30.8
April	2.86	2.31	0.74	3.97	16.5	25.1
May	5.28	3.47	4.63	4.46	20.8	30.5
June	5.27	3.93	2.40	3.87	23.7	26.4
July	3.08	2.37	3.92	3.12	20.1	21.1
August	3.31	5.27	4.75	4.44	16.2	16.0
September	2.04	1.36	3.42	2.47	9.9	11.2
October	1.16	2.31	3.27	2.25	10.1	6.8
November	2.76	1.93	1.38	2.02	8.9	8.5
December	2.16	1.95	3.48	2.53	8.5	23.9
1879.						
January	1.16	.50	1.64	1.10	9.2	22.0
February	.54	.53	1.48	.85	8.5	28.5
March	.32	1.71	1.92	1.32	10.1	27.5

TABLE 4.—*Giving the monthly rainfall, &c.*—Continued.

Date.	Monthly rainfall.				Mean height of river at—	
	Leavenworth.	Kooknk.	Saint Louis.	Mean.	Saint Louis.	Cairo.
1879—Continued.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Feet.*	*Feet.*
April	.42	1.56	2.31	1.43	13.9	32.7
May	3.04	2.27	.95	2.09	11.8	14.4
June	9.90	2.63	4.04	5.52	16.7	17.1
July	4.99	1.98	1.07	2.98	17.9	16.8
August	.18	4.57	2.23	2.33	13.0	13.5
September	3.41	1.12	1.34	1.96	8.6	11.4
October	4.25	.28	.68	1.74	8.0	4.1
November	7.85	3.91	4.30	5.35	10.3	8.2
December	2.34	1.45	2.84	2.21	9.3	25.1
1880.						
January	2.00	3.91	3.83	3.25	11.6	35.8
February	1.40	1.94	2.65	2.00	10.0	31.0
March	2.22	1.83	2.51	2.19	10.4	41.9
April	1.38	4.79	3.31	3.16	15.3	32.9
May	5.01	*5.92	3.44	4.79	15.8	27.2
June	1.69	3.06	2.46	2.40	19.0	28.3
July	6.86	2.25	5.17	4.76	22.6	26.4
August	7.06	3.81	1.53	4.13	12.9	11.2
September	2.78	3.21	3.10	3.03	12.1	11.0
October	3.69	2.02	2.09	2.60	10.2	7.7
November	2.40	1.13	2.07	2.07	7.3	11.1
December	.40	.67	1.80	.96	5.5	19.5
1881.						
January	.44	.50	.40	.48	8.4	17.5
February	4.84	2.54	4.16	3.85	11.5	32.9
March	2.17	2.42	1.95	2.18	18.8	35.2
April	1.86	3.12	2.14	2.37	27.1	40.8
May	3.65	1.35	3.96	2.99	27.1	34.1
June	5.27	8.70	2.74	5.57	22.6	25.0
July	1.72	3.08	2.13	2.31	21.1	20.8
August	2.74	.66	.31	1.30	11.5	9.1
September	6.89	4.10	3.14	4.71	20.7	8.1
October	5.73	8.01	7.21	6.98	21.7	18.
November	3.42	2.59	6.74	4.25	25.2	21.
December	1.18	1.70	1.70	1.53	17.7	13.
1882.						
January	.83	1.67	2.80	1.57	12.2	42.5
February	1.17	1.54	8.94	3.88	14.5	47.5
March	1.15	3.30	3.49	2.65	18.0	40.1
April	4.15	3.22	3.58	3.65	20.9	34.4
May	2.53	7.11	4.55	4.73	23.9	37.8
June	5.06	9.45	4.53	6.35	26.7	38.1

TABLE 5.—*Giving the monthly rainfall at Knoxville, Tenn., Nashville, Tenn., and Louisville, Ky., together with the mean monthly river-gauge reading at Louisville and Cairo.*

January	5.14	5.22	2.39	4.25	12.2	24.8
February	2.73	9.23	5.18	5.71	12.3	30.9
March	3.96	5.26	6.63	5.28	10.9	40.4
April	17.32	11.84	6.01	11.72	13.1	41.4
May	2.35	1.49	1.17	1.67	8.8	31.6
June	5.11	2.87	2.95	3.64	4.7	14.7
July	3.13	2.05	2.71	2.83	4.6	11.6
August	7.89	3.52	3.23	4.88	5.4	8.3
September	2.43	3.12	.62	2.09	3.1	7.0
October	.64	2.63	2.04	1.80	3.5	5.9
November	4.99	6.12	5.90	5.67	3.1	5.5
December	2.69	4.19	4.77	3.88	7.2	9.9
1875.						
January	6.92	6.15	2.42	5.16	7.6	14.6
February	10.18	3.00	2.00	5.11	8.1	19.3
March	13.07	8.14	4.54	8.58	13.3	40.3
April	5.86	4.25	.87	3.66	9.7	33.5
May	1.23	1.78	4.07	2.94	7.7	28.4

TABLE 5.—*Giving the monthly rainfall, &c.*—Continued.

Date.	Monthly rainfall.				Mean height of river at—	
	Knoxville.	Nashville.	Louisville.	Mean.	Louisville.	Cairo.
1875—Continued.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Feet.*	*Feet.*
June	4.06	5.63	5.79	5.53	6.1	22.0
July	7.64	8.12	16.46	10.74	11.0	36.2
August	5.60	1.60	2.19	3.13	13.8	35.2
September	4.14	3.79	1.05	2.99	4.1	15.1
October	2.81	1.25	1.92	1.99	4.7	9.5
November	4.25	5.46	6.14	5.28	7.3	11.5
December	7.21	4.30	5.67	5.73	10.7	10.4
1876.						
January	3.99	6.41	11.63	7.34	15.1	33.5
February	4.90	2.22	2.96	3.36	14.5	41.1
March	5.89	5.28	6.01	5.73	10.5	32.1
April	2.78	3.62	4.50	3.63	10.3	41.9
May	6.25	3.40	1.00	3.55	8.2	35.2
June	4.07	5.05	6.52	5.41	6.0	28.5
July	3.93	7.15	3.61	4.90	6.7	30.4
August	1.87	5.77	4.29	3.98	6.2	16.2
September	1.60	2.52	2.66	2.26	7.6	19.3
October	1.81	2.68	7.61	4.03	6.2	10.9
November	2.36	1.26	1.63	1.75	6.5	11.3
December	1.74	.95	1.24	1.31	5.3	4.7
1877.						
January	7.49	4.05	3.95	5.16	15.3	19.1
February	1.15	1.06	.44	.88	8.2	20.2
March	6.65	4.95	4.93	5.51	10.0	28.2
April	8.79	9.47	5.31	7.86	9.7	37.8
May	1.64	1.25	3.98	2.29	8.4	31.9
June	4.50	6.02	5.57	5.36	6.8	27.1
July	2.12	3.25	4.19	3.19	6.3	23.5
August	2.01	4.16	2.70	2.96	3.8	11.0
September	7.38	5.40	3.02	5.27	3.4	6.6
October	3.70	2.61	1.81	2.71	3.4	5.6
November	6.57	4.93	4.49	5.33	6.1	13.4
December	2.36	2.49	4.19	3.01	7.8	18.3
1878.						
January	2.85	3.34	3.25	3.15	9.0	21.9
February	1.01	2.11	2.25	1.79	10.3	28.4
March	2.87	3.48	4.06	3.47	10.3	30.8
April	4.69	6.88	3.53	5.03	5.2	25.1
May	2.38	2.33	4.50	3.07	9.7	30.5
June	5.10	3.28	5.34	4.57	7.2	20.4
July	5.37	9.43	4.08	6.29	5.9	21.1
August	6.86	5.02	4.21	5.36	6.0	16.0
September	.73	1.28	2.52	1.51	6.8	11.2
October	5.40	2.17	3.44	3.67	3.9	6.8
November	5.40	3.20	4.78	4.46	6.9	8.5
December	5.10	6.04	5.10	5.41	12.5	23.9
1879.						
January	9.59	6.32	2.52	6.14	12.7	22.0
February	5.89	3.13	2.31	3.78	10.8	28.5
March	3.17	3.81	5.66	4.21	12.0	27.5
April	3.96	2.88	4.63	3.82	9.8	32.7
May	3.43	2.88	1.68	2.66	6.2	14.4
June	1.99	2.50	3.39	2.96	5.1	17.1
July	3.28	8.47	1.18	4.31	3.8	10.8
August	2.89	4.62	10.02	5.84	5.9	13.5
September	.22	5.18	5.88	3.75	4.8	11.4
October	3.14	2.90	.59	2.21	2.3	4.1
November	3.11	5.85	4.90	4.62	3.8	8.2
December	8.28	9.15	7.93	8.45	9.3	25.1
1880.						
January	2.16	3.74	4.61	3.50	12.3	35.8
February	4.43	12.37	5.40	7.40	13.7	31.0
March	8.59	8.16	5.14	7.30	13.9	41.9
April	6.20	5.26	7.32	6.26	7.4	32.9
May	2.50	4.13	6.09	4.24	8.0	27.2
June	3.38	3.95	4.11	3.81	7.5	23.3
July	6.28	5.69	2.18	4.72	6.0	20.4

TABLE 5.—*Giving the monthly rainfall, &c.*—Continued.

Date.	Monthly rainfall.				Mean height of river at—	
	Knoxville.	Nashville.	Louisville.	Mean.	Louisville.	Cairo.
1880—Continued.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Feet.*	*Feet.*
August	4.45	2.22	2.82	3.20	5.2	11.2
September	3.64	5.39	2.44	3.82	4.9	11.0
October	.71	7.24	6.39	4.78	3.7	7.7
November	5.36	5.77	3.83	4.99	6.2	11.1
December	3.74	3.32	3.52	3.53	9.0	19.5
1881.						
January	4.41	3.54	3.24	3.73	11.9	17.5
February	4.20	5.48	4.05	4.58	16.5	32.9
March	3.90	2.79	2.46	3.05	10.3	35.2
April	2.99	5.12	3.45	3.89	11.8	40.8
May	1.14	3.67	2.35	2.39	7.6	34.1
June	5.18	3.70	3.78	4.20	7.4	25.0
July	4.05	.86	2.18	2.36	5.1	20.9
August	1.77	1.81	.15	1.24	3.7	9.1
September	2.31	6.49	2.70	3.83	2.7	8.1
October	5.14	4.74	3.44	4.44	3.8	18.0
November	5.31	4.84	2.79	4.31	7.4	21.0
December	5.32	4.83	6.00	5.38	10.6	13.0
1882.						
January	16.98	14.49	6.29	12.59	10.1	42.5
February	6.10	8.58	9.69	8.12	22.6	47.5
March	4.35	9.36	5.85	6.52	14.3	46.1
April	3.88	3.55	2.17	3.20	8.7	34.4
May	6.77	7.34	7.46	7.19	12.3	37.8
June	3.56	2.51	5.23	3.79	11.2	38.1

The following may be noted as the characteristics of Table 4: first, the maximum mean rainfall over the Mississippi River watersheds occurring in June compares closely with the maximum height of the river at Saint Louis; second, in February, 1882, the Mississippi River is very much higher than usual.

Table 5 shows that in the Ohio watershed the maximum mean rainfall occurs in March, and the fluctuation of the river at Louisville closely follows that of the rainfall. We may safely say, then, that an unusually early spring, causing a more rapid melting of the snow, combined with excessive rainfalls, caused simultaneous high waters in both the Mississippi and Ohio Rivers.

In pursuing this investigation I have prepared Table 6, showing for the years from June, 1879, to June, 1882, the progress down the river of unusually high and low waters. This has developed the remarkable fact that while wave crests may be traced from Cincinnati, Ohio, on the Upper Ohio River, to Vicksburg, Miss., the same is not true of wave crests appearing at Saint Louis, on the Mississippi River. The same fact is also shown in Tables 4 and 5, the maximum mean monthly heights appearing from one to two months *earlier* at Cairo than at Saint Louis, on the Mississippi River, but at the *same* month nearly every year, when compared with those at Louisville, Ky., on the Ohio River.

TABLE 6.—*Showing the dates on which highest and lowest waters reached various river stations, from June, 1879, to June, 1882.*

HIGHEST WATER.

Year.	Cincinnati.			Evansville.			Paducah.			Cairo.			Memphis.			Helena.			Vicksburg.			New Orleans.		
	Date.	Gauge reading.	Days from Cincinnati.	Date.	Gauge reading.	Days from Cincinnati.	Date.	Gauge reading.	Days from Cincinnati.	Date.	Gauge reading.	Days from Cincinnati.	Date.	Gauge reading.	Days from Cincinnati.	Date.	Gauge reading.	Days from Cincinnati.	Date.	Gauge reading.	Days from Cincinnati.	Date.	Gauge reading.	Days from Cincinnati.
		Feet.			*Feet.*			*Feet.*			*Feet.*			*Feet.*			*Feet.*			*Feet.*			*Feet*	
1879	Sept. 3	25.5	0	Sept. 5	20.0	2	Sept. 7	16.2	4	Sept. 7	19.4	4	Sept. 9	13.6	6	Sept. 11	18.7	8	Sept. 14	18.4	11	.....	.....	.....
1879	Dec. 27	42.5	0	Dec. 30	37.3	3	Dec. 31	37.6	4	*Jan. 2	37.4	6	*Jan. 6	29.4	10	*Jan. 8	38.1	12	.....	.....	.....	.....	.....	.....
1880	Jan. 9	42.4	0	Jan. 12	37.0	3	Jan. 16	39.4	7	Jan. 16	41.9	7	Jan. 19	32.4	10	Jan. 22	41.3	13	Jan. 31	40.0	22	Feb. 1	−3.0	.....
1880	Feb. 16	53.2	0	Feb. 21	42.3	5	Feb. 23	42.4	7	Feb. 24	43.8	8	Mar. 2	33.3	15	.....	.....	.....	.....	.....	.....	.....	.....	.....
1880	Apr. 29	45.6	0	May 3	35.2	4	May 6	33.2	7	May 6	38.4	7	May 10	30.0	11	May 11	38.5	12	May 13	40.8	14	.....	.....	.....
1880	Dec. 8	37.2	0	Dec. 9	31.6	1	Dec. 11	32.0	3	Dec. 11	31.5	3	Dec. 14	23.9	6	Dec. 15	31.8	7	Dec. 19	31.9	11	Dec. 22	−6.5	.....
1881	Feb. 17	51.5	0	Feb. 19	38.7	2	Feb. 23	40.6	6	Feb. 24	42.6	7	Mar. 1	32.5	11	Mar. 5	41.8	16	Mar. 8	41.8	19	.....	.....	.....
1881	Apr. 17	41.9	0	Apr. 20	34.8	3	Apr. 20	38.6	3	Apr. 20	45.3	3	Apr. 28	34.4	11	May 5	43.8	18	May 11	41.6	24	.....	.....	.....
1882	Jan. 24	45.8	0	.....	.....	.....	Jan. 30	48.8	6	Jan. 31	47.6	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1882	Feb. 21	58.5	0	.....	.....	.....	Feb. 26	49.8	5	Feb. 26	49.8	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mean	.....	.....	.....	.....	.....	2.9	.....	.....	5.2	.....	.....	5.7	.....	.....	10.0	.....	.....	12.3	.....	.....	16.8	.....	.....	.....

LOWEST WATER.

1880	Feb. 10	14.3	0	Feb. 11	13.3	1	Feb. 11	14.8	1	Feb. 12	19.0	2	Feb. 12	14.9	2	Feb. 13	22.4	3	Feb. 17	27.3	7	Feb. 19	−6.1	9
1881	Jan. 2	8.8	0	Jan. 5	5.5	3	Jan. 8	5.5	6	Jan. 8	5.3	6	Jan. 10	2.4	8	Jan. 12	7.4	10	.....	.....	.....	Jan. 13	−7.0	15

*1880.

It is to be noted that the progress of the wave crest is dependent in great measure upon the height of water in the river, and becomes very irregular as the water reaches a high stand. In general the higher the water the longer is the time of movement, though there is on the whole a remarkable uniformity in the time of passage from one station to the next.

In the floods of 1882 it has been found impossible to trace wave crests to the Lower Mississippi River owing to the uniform and continuous wave.

It may appear as if in the previous discussion too much weight has been given to the actual rainfall and not enough has been given to the rise produced by the melting of the winter's snow. The rainfall may be regarded as supplementing the melting snow, and in some years, especially in 1882, as almost entirely masking whatever influence may be due to it.

A rather interesting question arises incidentally in this connection, namely: Why may not the water-sheds of these rivers, containing many hundred thousand square miles, be regarded as an immense rain-gauge with measuring scales at the various river gauges? The observations are not sufficiently extended as yet to admit of a very full discussion of the problem, but it would seem as though with some corrections we might obtain an idea of the relative rainfall from year to year over a large district much more completely in this manner than from the average of a few stations great distances apart. I have collected, mostly from the International Bulletin, all the daily records of rainfall at Cincinnati, Knoxville, Nashville, Saint Louis, Cairo, Memphis, and Vicksburg, from March, 1875, to May, 1882, in order to determine if possible the relation between sudden river rises, as well as great and extended ones, and actual rainfall for the two or three days preceding, but have not as yet carried the investigation far enough for a satisfactory result. The great difficulties in such a work may be seen from the fact that there are a very limited number of stations, and from the immense irregularity in the fluctuations of a river at different stages of water.

Turning, now, to the answer to the flood circular, it is proposed to introduce here only a few of the more prominent points, leaving a more extended statement for the full report.

First. Replies from the January flood on the Cumberland River.

Many of the replies from towns near the mouth of the river note the fact that while the river was steadily rising yet there were only light and infrequent rains in that region. Another reply states that, at the first rise, the water was perfectly clear, but at the second, a week later, it was very muddy. Nearly all the replies make particular mention of the fact that, contrary to the usual experience, the rise was exceedingly rapid, while the decline was correspondingly slow; the latter, in some districts, was a great advantage, however, as the losses sustained on houses and fences swept away was more than made up by the deposit of a heavy alluvion. Lands that heretofore have received large deposits of sand, at every overflow, are now heavily coated with rich soil, and the yield of these lands, many of them usually planted to corn, will give, with a fair season, an increase over the usual yield of from 15 to 20 bushels per acre. I find the following statement in one of the Nashville papers: "Hundreds of thousands of trees which, in the great flood of 1847, stood in the lowlands, have been cut down, thus giving wider scope to the backwaters." Also, one of the replies states that, "Were the banks as heavily wooded as in the great floods of 1824, the river would undoubtedly have risen some 10 feet higher than it actually did." It should be borne in mind, however, that applying precisely the same reasoning we may say that these heavily wooded banks higher up the river would have kept the waters from rushing directly to the river, and possibly "from a greater abundance of springs" (due to the same forests) "at that time," the flow of water would have been distributed over a much longer period, and the very high waters thus would have been avoided.

Losses from this flood were small, except in Davidson County, Tennessee, in which the losses, confined mostly to Nashville, were as follows. These estimates were carefully made by the State and county authorities:

Loss on land and buildings	$325,000
Loss on provisions and supplies	250,000
Loss on stock and implements	185,000
Loss on staple products	400,000
Total in county	1,160,000

Lumbermen, rivermen, and merchants estimate the loss at $1,500,000.

Second. The floods of the Lower Mississippi River.

The following is a general statement of the loss of life and property in the counties bordering on the Mississippi, from Cairo to the mouth. These estimates are necessarily only approximate; frequently three or four observers in the same county have given estimates differing by $100,000, or even $200,000. The loss of life in nearly every instance is accompanied by the names of those lost:

East bank of the Mississippi River below Cairo.

TENNESSEE.

County.	Loss on property.	Loss of life.
Lake	$50,000	2
Lauderdale	15,000	1
Tipton	300,000	4
Total	365,000	7

MISSISSIPPI.

Tunica	$1,000,000	9
Bolivar	500,000	4
Washington	75,000	5
Warren	50,000	10
Jefferson	150,000	1
Wilkinson	12,000	2
Total	1,787,000	31

LOUISIANA.

EAST BANK.		
East Baton Rouge	$3,000,000	3
Ascension	150,000	1
Saint James	350,000	.....
WEST BANK.		
Carroll	200,000	7
Madison	..	2
Tensas	150,000	3
Concordia	900,000	About 15
Avoyelles	130,000	7
Pointe Coupée	563,000	20
West Baton Rouge	1,200,000	.....
Assumption	75,000	3
La Fourche	30,000	.....
Total	6,748,000	61

ARKANSAS.

WEST BANK.

Mississippi	$60,000	6
Crittenden	200,000	11
Saint Francis	75,000	2
Lee	200,000	5
Phillips	100,000	7
Desha	120,000	8
Total	755,000	39

APPENDIX 58.

WASHINGTON, D. C., *August* 22, 1882.

To the CHIEF SIGNAL OFFICER OF THE ARMY,
Washington, D. C.:

SIR: I have the honor to submit the following report, showing the progress made by the Signal Service during the past year in the organization of State weather services. These services are under the control of State officers or State colleges, and the observers forward their reports by mail at the close of each month to the chief of the State weather service, who prepares and publishes a general summary of the meteorological conditions as determined from observations received. This publication is usually issued by the 10th of the month, and received at the office of the Chief Signal Officer in Washington in time to be used in the preparation of the Monthly Weather Review of this service. State services co-operating with the Signal Service have been organized in Ohio, Indiana, Illinois, Michigan, Kansas, Nebraska, Missouri, and New Jersey, and efforts are now being made in many other States to perfect similar organizations.

As an inducement to observers this service furnishes blank forms, and in some cases rain-gauges and thermometers. A copy of the Monthly Weather Review is also furnished to each co-operating observer.

The following is a general description of the organization in each State, with copies of correspondence showing the efforts made by this office to extend the usefulness of the Signal Service in each section of the country.

The Iowa State weather service was organized by the legislature of Iowa after repeated efforts of Professor Gustavus Hinrichs, the distinguished professor of chemistry of the Iowa State University. This was the first State weather service organized, and the results obtained show the value of such organizations. The following is a copy of the law establishing the weather service of the State of Iowa:

AN ACT to establish a central station of the Iowa "Weather Service," and for the appointment of a director thereof. [Laws, XVII, General Assembly, State of Iowa, chapter 45.]

SECTION I. *Be it enacted by the General Assembly of the State of Iowa,* That there be and hereby is established at Iowa City a central station for the Iowa weather service, and hereby is established at Iowa City a central station for the Iowa weather service, with Gustavus Hinrichs as director thereof, and in case of his death or disability his successor shall be appointed by the governor.

SEC. II. The duties of said director shall be to establish volunteer weather stations throughout the State, and supervise the same; to receive reports therefrom, and reduce the same to tabular form, and report the same quarterly to the State printer for publication in the form of the Iowa weather reports.

SEC. III. That the State printer be authorized to print two thousand copies of the said Iowa weather report quarterly, one thousand copies of which shall be distributed by said director, and one thousand copies delivered to the secretary of state, to be by him distributed in the same manner as other State documents.

SEC. IV. That there is appropriated the sum of one thousand dollars annually, or so much thereof as may be necessary, for the purpose of meeting the actual expenses in carrying out the provisions of this measure; but no part of said sum shall be used in payment of salaries to any officer or officers, except for clerk hire, and upon the order of said director.

SEC. V. This act, being deemed of immediate importance, shall take effect and be in force from and after its publication in the Iowa State Leader and the Iowa State Register newspapers published at Des Moines, Iowa.

The Missouri State weather service was established in that State, and is at present under the direction of Prof. F. E. Nipher, with Saint Louis as a central station. This service now has a force of 44 observers, who furnish a monthly report to the central office, a review of which Prof. F. E. Nipher forwards regularly to this office. The value of this service has long been recognized by this office, and a plan was seriously thought of to inaugurate with the least possible difficulty similar services in other States.

With a view of extending these State organizations the following letter was draughted and sent, on April 11, 1881, to the governors of each State and Territory, except those of Missouri and Iowa:

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, D. C., April 11, 1881.

SIR: By the organic law relating to the meteorological division of the Signal Service, a copy of which is inclosed, you will perceive that Congress contemplated therein a general weather service that shall be as useful as possible to the whole United States.

Experience has, however, shown that in many questions relating to agriculture and other interests, more minute details are needed, such as can only be obtained by having at least one report from every county, and this extension of the work must, for the present, devolve upon the individual States.

It is considered desirable that each State should, as far as practicable, establish some such system as is suggested in the accompanying memorandum.

I shall be pleased to learn from you whether there is any officer of your State authorized to assume charge of weather observations and climatic statistics, upon whom the duty of organizing such work can be imposed by you, or whether special legislation will be required to enable you to establish a weather service in your State.

This office will always be glad to co-operate in the development of meteorological services in the respective States.

I am, very respectfully, your obedient servant,

W. B. HAZEN,
Brig. & Bvt. Maj. Gen'l, Chief Signal Officer, U. S. A.

His Excellency the GOVERNOR OF ———, &c.

The sending of this letter was the first active part taken by this office. Inclosed in each was a printed memorandum, defining the object of State weather services, and containing a copy of the law establishing the Iowa weather service. To gain a clear understanding of this subject I will here repeat the memorandum:

"MEMORANDUM.

"The object of a State weather service should be to observe and utilize every feature of the weather that affects the prosperity of the inhabitants of the State as to crops, health, life, &c., omitting, perhaps, only those few items already provided for by the General Government at Washington, such as general storm predictions. The State service is, therefore, essentially a plan for gathering and utilizing local climatic data, and eventually it will define precisely the localities most favorable or unfavorable to special crops, diseases, &c.

"The chief of the State service should be in such communication with the Chief Signal Officer of the Army that he may at any time receive from Washington and rapidly disseminate throughout his State any information of importance, such as predictions of frosts, tornadoes, floods, &c.

"The State weather service may be wholly volunteer, and under the charge of a director or superintendent appointed by the governor, or it may be made a part of the duties of some officer now authorized by law, as the surveyor-general, the superintendent of public instruction, the president of some State college, scientific school, agricultural college, &c. The observer in each county may be a voluntary observer, or it may be made part of the duty of some county officer to make the daily record and monthly report.

"Observations should be taken, if possible, at all State, county, and municipal offices and institutions, such as jails, asylums, hospitals, libraries, toll-gate keepers, surveyors, colleges and high schools, water-works, canal-lock keepers, &c.

"The instruments used should, when practicable, be of uniform patterns, carefully tested before used by comparison with known standards, and should include at least one maximum and minimum thermometer, one dew-point or other hygrometer, and rain-gauge, all of which, with a supply of blanks and stamped envelopes for one year, need not cost more than $15 per station.

"The director should be fully impressed with the importance of the work, and should issue each month a review, to be furnished to each county paper for publication and to each observer within ten days after the close of the month.

"The Chief Signal Officer will be pleased to furnish sample forms, instructions for taking observations, price lists of standard instruments, and to give any information relative to this subject which the experience of the Signal Service may afford, and as an illustration of the action already taken by some of the States, a copy of the law establishing the weather service of the State of Iowa is herewith inclosed." (An act, &c., given previously and considered unnecessary to be repeated.)

It was not expected that this letter would have the desired effect at once, for there were many obstacles and difficulties to surmount. Yet the answers received from the executive departments of the different States and Territories are gratifying and show

the interest manifested by the officials. Of 24 communications received in answer to the proposition, but one State, New York, looked upon a weather service as undesirable. It is hoped, however, that the appreciative citizens of that State may yet be convinced of the value of such an organization and be able to secure favorable action leading to its establishment. The following is a true copy of the letter received from the governor of that State:

STATE OF NEW YORK,
Executive Chamber, Albany, February 7, 1882.

SIR: The governor directs me to say, in reply to your letter of the 27th of January, that in his opinion the people of this State are not desirous of the establishment of a State weather service and therefore he is unable to comply with your suggestion.

Yours, respectfully,

HENRY E. ABELL,
Private Secretary.

General W. B. HAZEN,
Chief Signal Officer U. S. A., Washington, D. C.

While the letter of April 11, 1881, reached most governors at the close of session of State legislature and too late to be submitted—a feature which caused much delay—yet the proposition was entertained favorably, submitted to scientific men, and discussed as to advantages and benefits to be derived therefrom.

The Illinois State weather service which had been partially organized under the auspices of the Illinois State Board of Agriculture, with its secretary, Mr. S. D. Fisher, as managing director, is now in co-operation with this office. Though not yet sanctioned by law, the governor of Illinois has offered his assistance in the passage of such a bill and invited this service to cordial co-operation. Mr. S. D. Fisher has met with great success in the organization of his corps of observers. So far he has secured 32, and intends to increase the number to one observer for each county if possible. This office has not been able to render much assistance, as the extent of that service was not made known until July 31, 1882; yet twelve rain-gauges, with overflow attachment, and twenty-four measuring sticks, together with a suitable amount of blank forms and envelopes, have been sent to Mr. Fisher, and it is hoped that soon returns will be made of the operations of that service.

In regard to the organization of a weather service in Kansas, the governor of that State referred this office to Mr. J. K. Hudson, secretary of the department of agriculture. This department in 1874 organized a small corps of observers, to make a monthly report of maximum, minimum, and mean temperatures and rainfall. Three stations, Lawrence, Leavenworth, and Wellington, being provided with a better line of instruments, made fuller reports. These reports have been continued to this date and appear in the publication of that department. Mr. Hudson expressed his entire willingness to co-operate, but he thought that the expense for providing instruments, &c., would be a sticking point in following the suggestions of this office. In the mean time the Washburne College of Topeka, Kans., was active in establishing a State weather service under the direction of Prof. J. T. Lovewell. This gentleman succeeded in obtaining thirty-one observers in different counties, and will undoubtedly make a good showing. At his request this office extended a helping hand by sending him twenty exposed thermometers, one small wind-vane, set of anemometer cups, one copy of Instructions to Voluntary Observers, and an appropriate amount of blank forms and envelopes.

Upon the suggestion of the governor of Nebraska, this office communicated with Mr. S. R. Thompson, superintendent of the State Agricultural College, Lincoln, in regard to a State weather service. Mr. Thompson had been collecting meteorological data from different parts of the State, and was desirous of availing himself of the assistance offered by this service. He has now a corps of twenty-nine observers, which doubtless will be increased as the work progresses and people become familiar with its value. Each observer has been supplied with a copy of Instructions to Voluntary Observers.

The State of Michigan gives fair promise of having a State weather service organized of not little importance. The governor has promised to bring the matter to the attention of the legislature at its next session, in 1883, and good results are anticipated. In the mean time a State weather service has been inaugurated under the direction of Mr. Henry B. Baker, M. D., secretary of the State Board of Health, Lansing, Mich. There are as yet only nine observers, but they are mostly men of education, belonging generally to the medical profession, and will doubtless render excellent reports. All have been supplied with blank forms, envelopes, and a copy of Instructions to Voluntary Observers.

The next State weather service organized in compliance with letter of April 11, 1881, is that of Indiana. It is the most extensive organization of its kind existing

in any one State. Upon the suggestion of the governor of that State, a letter was addressed on June 30, 1881, to Mr. J. B. Conner, chief of bureau, department of statistics, Indianapolis, Ind., relative to the establishment of a State weather service. Mr. Conner's reply to that letter gives probably the best understanding of his views, and may be appropriately given here:

DEPARTMENT OF STATISTICS,
Indianapolis, Ind., July 11, 1881.

DEAR SIR: I have the honor to acknowledge the receipt of yours of June 30, ultimo, in regard to the collection of meteorological facts for your office. The legislature of this State made no special provision for this, and yet the act creating this office is so broad that it is told to be within the discretion of the chief of the bureau to do this work. With a view to utilize the valuable facts which might be gathered by proper observations in various sections of the State, for my annual report, I would gladly undertake the work. After a little inquiry I find that many or all the chief institutions of learning in the State, as well as some very competent private individuals, would be willing to do the local work. If it is your desire, I will, on receipt of assurances to that effect, ascertain at once how many counties in the State I can organize for the work. If I understand your wishes in this behalf, it is that this office organize the work in as many counties of the State as convenient, taking the local reports and consolidating them for your office. Please advise me in this regard.

By oversight you failed to inclose the Monthly Weather Review, which you mention as inclosed in yours.

I am, very respectfully, your obedient servant,

JNO. B. CONNER,
Chief Bureau of Statistics of Indiana.

Gen. W. B. HAZEN,
Chief Signal Officer, U. S. A., Washington, D. C.

Since the date of that letter a corps of 71 observers has been organized in that State, and Mr. Conner is anticipating that the first fruit of his labors will be received in the present month. All observers have been amply supplied. This office furnished 1 barometer, 75 exposed thermometers, 75 rain-gauges with overflow attachment, 125 measuring sticks, and a suitable amount of stationery, such as blanks, stamped envelopes, &c., together with a copy of Instructions for Voluntary Observers for each station. Excellent work is expected from this service.

The greatest interest evinced, however, in the establishment of a State weather service was that in Ohio. An extract of the governor's views, in reply to letter of April 11, 1881, may be interesting:

STATE OF OHIO,
Executive Department, Columbus, April 18, 1881.

DEAR SIR: * * * I will keep the matter in form for presentation to the legislature by my successor, or for renewed advices from your department, as I deem it a subject of great importance, and regret that it was not presented to me for action earlier in the session of the general assembly.

I have the honor to be, very respectfully, your obedient servant,

CHAS. FOSTER.

Gen. B. W. HAZEN,
Chief Signal Officer, Washington, D. C.

Under such favorable auspices a State weather service of Ohio was sanctioned by law. The following is the bill providing for that service:

[Sixty-fifth general assembly, regular session.]

H. B. No. 481.

BY THE COMMITTEE ON AGRICULTURE.

A BILL to establish a meteorological bureau for the State of Ohio.

SECTION 1. Be it enacted by the general assembly of the State of Ohio, that there be, and hereby is, established at the State University at Columbus, Ohio, a central office for meteorological observations, with the professor of physics of said university, the secretary of the State board of agriculture, and a third person, to be appointed by the governor, as a board of directors; the members of the board of directors shall be commissioned by the governor and be duly qualified as like officers of the State.

SEC. 2. The professor of physics of said university is hereby appointed president of the board, and by and with the advice of the directors shall establish, if practica-

ble, one volunteer weather station in each Congressional district, and supervise the same; he shall receive reports therefrom, and reduce the same to tabular form, and report the same monthly to the State printer for publication as the Ohio weather report.

SEC. 3. That the State printer be authorized to print 2,000 copies of each monthly report; 1,000 copies shall be distributed by said board, and 1,000 copies shall be delivered to the secretary of state, to be distributed by him in the same manner as other State documents.

SEC. 4. There is hereby appropriated for the ensuing year, for the establishment and maintenance of said bureau and stations, the sum of $2,000, or so much thereof as may be necessary for the purpose of meeting the actual expenses of carrying out the provisions of this act. No part of said sum shall be paid for salaries of any officer or for office rent, but a reasonable part of the same may be paid for the services of a clerk at the central station.

SEC. 5. No money shall be expended except upon the order of the resident director, by and with the approval of the board.

SEC. 6. This act shall take effect from and after its passage.

Much credit is due to the efforts of Prof. F. C. Mendenhall, of the Ohio State University, Columbus; and it may be of interest to add here an extract of an able article in the Columbus Daily Times, containing an address of Professor Mendenhall delivered before the general assembly:

METEOROLOGY—PROFESSOR MENDENHALL DISCOURSES LEARNEDLY UPON THIS SUBJECT IN THE LEGISLATIVE HALLS.

Some weeks ago Governor Foster, in a message to the senate, suggested the propriety of appropriating a certain sum for the establishing of a weather bureau in this State in consonance with an idea transmitted by the Chief Signal Officer of the United States, at Washington. It not being deemed expedient, however, to proceed in this matter without first investigating the subject and discovering what benefits would accrue to the State were such bureau established, no immediate action was taken regarding the message. The advisability of a thorough ventilation of the matter being apparent to all, an invitation was extended to Professor Mendenhall, of the Ohio State University, to address the assembly on this subject, and a request made that he would explain any benefits to be derived from any such action as was suggested.

In accordance with this invitation a very large representation from both legislative bodies assembled last evening in the hall of the house of representatives, where a lecture was to be delivered. A large sprinkling of citizens and of students from the university were also present, and the remarks of the professor, illustrated by blackboard drawings, were listened to with much attention.

The following summary of the lecture will prove both interesting and instructive as explaining the meteorological problem:

* * * * * * * *

"The Weather Bureau of the United States is recognized for its efficiency by the whole world. It was believed that if data regarding the weather of to-day were gathered from a large area, the result would be a means of prophesying the weather of to-morrow. Knowing the direction of the weather, and the velocity with which it is traveling to-day, it is easier to tell what the weather will be in a certain locality to-morrow.

"The Signal Corps of the United States was the inception of the weather department, and General Myer saw the advisability of thus utilizing it. Prof. Cleveland Abbe, an Ohio gentleman, sent the first telegraphic weather prediction ever attempted. Ninety per cent. of the weather predictions are true as given out by the United States Bureau.

"Millions and millions of dollars are annually saved by the work of this department, particularly on the lakes and at the seaboard. The question which interests you is the desirability of extending this service in your State. As our country is so large, the data gathered are few, and General Hazen is anxious to secure a number of volunteer observers, twenty or thirty throughout the State, one in every Congressional district. For my part, I would like to see one in every county. There is no doubt that volunteers could be secured. There are now twenty such in the State, who send in voluntary reports. It is proposed to furnish each observer with minimum instruments. Reports are to be made, from once a week to once a month, to a central bureau, located at Columbus. The reports of observations will be printed and distributed every month. The chief of the service at Washington would telegraph any remarkable changes that are imminent, which information could be sent through the State. This is done in Illinois, Iowa, and Michigan with great success.

"The meteorological report from Illinois is very interesting in this connection. There is a corn famine in Southern Illinois, which was predicted last July and August. The

State is divided into three sections for meteorological purposes. In July in the northern section 3.36, in the middle 2.8, and in the southern .48 inches of rain fell, and hence the prophecy could easily be made; the average fall in the latter section being 4 to 5 inches. The greatest consulters of weather statistics are wheat speculators, who thus get 'pointers' regarding the future production of wheat.

"The idea is to place this information before the producers, so that they may know what effect may be expected from weather statistics obtained. The farmers in the country about Cornell University have erected a tall pole near Ithaca, where balls are run up, visible for many miles, giving the weather probabilities for the next twenty-four hours.

"I need not argue this question longer. The sum is small and the expense will be repaid in the first year. * * *

"Permanent acquisitions of value to our meteorological phenomena will undoubtedly grow from the establishment of this system, and you owe it to yourselves to recognize the value of science *per se;* you know how science has struggled; you know that no scientific investigator undertakes his experiments with a view of turning them into dollars and cents. Large sums to be expended in the interest of science are now annually appropriated in England by authority of Parliament, and I hope that you may do this not only for the purposes expressed, but also for science itself, which has heretofore 'gone it alone.'" * * *

The result was, as stated before, that the bill passed without trouble; but, owing to its recent passage, the Ohio State weather service has not yet been put in active operation. This office, however, has furnished Professor Mendenhall with 20 rain-gauges, 20 measuring sticks, and 60 copies of Instructions to Voluntary Observers, and a suitable amount of blanks and envelopes, to be distributed by him, as observers are enlisted for this valuable work. It gives fair promise to become a service of great extent and utility.

The New Jersey State weather service, under direction of Mr. W. Earle Cass, Newark, is well organized, and has for several months past rendered monthly reports. The corps consists now of 16 observers, who have all been supplied with a copy of Instructions to Voluntary Observers. Under the active supervision of Mr. Cass, who evinces a great interest in that service, the citizens of New Jersey may confidently expect substantial benefits. The establishment, or at least the rapid development, of the New Jersey State weather service, is in some measure due to an article in the New York Herald. That paper, in commenting on State weather services, says in the introduction as follows:

"STATE WEATHER BUREAUS—THE CHIEF SIGNAL-OFFICER AT WASHINGTON ADVOCATES THEIR ESTABLISHMENT—GOOD RESULTS AT SMALL EXPENSE ANTICIPATED.

"General Hazen, who, since his appointment to the position of Chief Signal Officer, has made several changes in the service that cannot fail to call forth the approval of the public, now proposes a scheme which, if developed, will prove of great benefit to every one. Over the broad expanse of territory between the Rocky Mountains and the Atlantic coast line the Signal Service Bureau have about ninety stations, from which are sent to Washington three daily meteorological observations. By charting those reports the location and character of the areas of high and low pressure are discovered, and upon them depends the weather forecasts that are made every day at the central office. Owing to the small number of stations they must necessarily be very far apart, hence General Hazen's proposition, which is as follows: Each State in the Union should have an independent weather service for the purpose of gathering and utilizing local climatic data. By such a system the people would in time become conversant with physical conditions of every locality and be guided thereby. In the tornado season the results of observations in temperature and humidity would be invaluable, because they would enable a correct forecast of their development to be made."

"HOW OPERATED."—Here the article enumerates what has been given in the memorandum, beginning with "The State weather service may be wholly volunteer and under the charge," &c.

These above-named State weather services have been organized, and are or will be in a very short time in operation.

The following are the States or Territories, which, judging by the tone of the communications from their respective governors and others interested, may be expected to succeed in organizing a corps of observers: Vermont, Massachusetts, Virginia, Kentucky, North Carolina, Florida, Louisiana, Mississippi, Wisconsin, Nevada, Arizona, and California. I will refer to each State individually, and give in brief the answers received to letter of April 11, 1881.

The communication sent to the governor of Vermont was referred by him to Mr. Hiram A. Cutting, State geologist and secretary board of agriculture. Mr. Cutting's reply is worthy of note, and runs as follows:

STATE OF VERMONT, OFFICE OF STATE GEOLOGIST,
Lunenburg, April 26, 1881.

HON. SIR: Your letter of the 11th instant, to "governor of Vermont" has been referred by him to me for an answer, doubtless because I am the oldest continuous observer of meteorological phenomena in the State. I am sorry to say that no available appropriation exists in the State, and nothing can formally be done until the session of legislature in 1882. I shall be willing to do anything I can to forward the work, but as I already send monthly reports to you I suppose I can do no better. Governor Farnham, our present incumbent, has much interest in the advancement of agriculture and its attendent sciences in this State, and if there was anything he could do in the matter he would be very glad to lend his aid, but as it is probable that with the next legislature there will come a new governor, the future is uncertain. Please suggest to Governor Farnham or myself anything that we can do without any means at our command and we shall be glad to favor you as far as able.

I am, very respectfully, your obedient servant,

HIRAM A. CUTTING,
State Geologist and Secretary Board of Agriculture.

Maj. Gen. W. B. HAZEN,
P. S.—I inclose pamphlet.

While the governor of an adjoining State, Massachusetts, regretted the inopportune time, it being then near close of session of legislature, yet he was not averse to the plan, and promised to have the matter referred to the adjutant-general of the Commonwealth.

In Virginia the process of establishing a State weather service is at a standstill, but Dr. Thomas Pollard, commissioner of agriculture, to whom the governor referred as the proper person to take the matter in hand, has expressed his willingness to lend such influence as he may have in securing favorable action. The matter will be brought before the next legislature by the governor himself, and it is hoped that the result will be in accordance with the wishes of the governor and this office. Mr. P. C. Guthrie, of Richmond, Va., who has had some experience in the signal service, also offered his assistance and services as an observer.

Although no reply was received direct from the executive department of Kentucky, the letter of April 11, 1881, was referred to Mr. A. R. Crandall, professor of natural history, Agricultural and Mechanical College, Lexington, Ky. His reply will best give the progress of the work in that State, and is as follows:

LEXINGTON, KY., *February* 15, 1882.

RESPECTED SIR: Some time since your letter to the governor of Kentucky, inclosing memorandum for a State meteorological service, was handed to me, and although the date indicates a delay of more than a year, yet I am desirous of making some move in the direction of establishing a station here in connection with the State Agricultural and Mechanical College, and take the liberty of writing for such information as you may be able to give us.

I think no action has been taken looking to the carrying out of the suggestions of your letter, and I am afraid it will be a long time before any State aid can be expected. It is possible that we may lay the foundation for such a service by establishing a well-equipped station here.

Your letter was doubtless handed to me because I have taken some interest in the meteorology of this region.

Respectfully,

A. R. CRANDALL,
Professor Natural History, Agricultural and Mechanical College, Kentucky.

Maj. Gen. W. B. HAZEN,
Chief Signal Officer United States.

Of course the establishment of a regular signal-service station at Lexington could not be thought of, it being too near Cincinnati and Louisville, and not required for the general weather service, and so a board of officers decided at this office. The same idea was conveyed to Mr. J. K. Patterson, president of the above college, in a letter of July 31, 1882, with appropriate remarks and suggestions on the benefits of a State weather service and with an invitation to co-operate. Inclosed in this letter were 2 copies of the New York Herald of February 1, 1882, containing an article on State weather services, and 2 copies of the act establishing a similar organization in Ohio. A reply is expected daily.

Much better results were obtained in the State of North Carolina, for here a weather service was found to have been in operation for years past, under the supervision of the State geologist, Mr. W. C. Kerr, with a central station at Raleigh. The follow-

ing letter received at this office will give a good description of the work done in that State:

GEOLOGICAL ROOM,
Raleigh, N. C., April 29, 1881.

SIR: Your letter on the subject of an extension of the weather service in North Carolina has been referred by Governor Jarvis to me for answer.

By reference to the Geology of North Carolina, 1875, vol. i, p. 70, you will see a list of the stations, 32 in number, where observations have been secured. I am now publishing vol. ii, in which I shall have about 40 stations. This office has for ten years furnished blanks, instruments, envelopes, postage, and instructions to observers, wherever they could be obtained, and in a few cases has paid a small sum, one or two dollars a month. But not half of the persons furnished with appliance continue to make observations more than a few weeks or months. I furnish a rain gauge and thermometer with blanks (of which I inclose a copy), and about a dozen also with a hygrometer—Winlock's Hydrophant.

Now, I shall be glad of any assistance or suggestions looking to a more complete and effective service. The governor will use his influence to aid in securing observations at several public institutions, soon to be completed; but it seems impossible to secure observations in many counties, and even whole regions, without some additional inducements. Through the university, whose classes I meet in the winter, and the State normal school where the teachers assemble from a large part of the State, which I meet in the summer, I am able to ascertain the best qualified persons willing to undertake the observations; but even then my progress is very slow.

I shall be glad to get your instrument lists; and if your office will furnish me such intelligence of importance as you refer to, I will make arrangements for its dissemination.

I should be glad to have a copy of your daily weather map, if it can, &c.,

* * * * * * *

Yours, very respectfully,

W. C. KERR.

General W. B. HAZEN,
Chief Signal-Officer, &c.

This letter was replied to on June 30, 1881; and of which I will give an extract, touching the more important parts.

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, D. C., June 30, 1881.

SIR: In reply * * * I have the honor to state that I will issue in a few days a small manual for the use of volunteer observers of the Signal Service, which will, it is hoped, contain all the necessary instructions for taking meteorological observations. With this you will doubtless be able to increase the number of observers in your State. The Signal Service will further co-operate with you in the supply of blanks and stationery, and will, in return for copies of monthly reports, furnish you with a copy of the "Monthly Weather Review" for each observer. I think, however, that it would be well for you to secure some favorable action of the State legislature at the next session, as suggested in my letter to Governor Jarvis, as this would give the service the authority of law, and doubtless secure more regularity in the reports.

* * * * * * *

Very respectfully, &c.,

W. B. HAZEN.

Mr. W. C. KERR,
State Geologist, Raleigh, N. C.

Up to date, however, this service has not been in co-operation with that of North Carolina, owing, probably, to the fact that no answer was received by this office in reply to communication of June 30, 1881.

The governors of the States of Florida, Louisiana, and Mississippi acknowledged the importance of the project, and promised to bring the matter before the State legislature.

The State of Wisconsin, however, bids fair to soon imitate the noble example set by its sister States in the establishment of State weather services. The following two letters received at this office are the best evidence thereof:

STATE OF WISCONSIN,
Executive Department, Madison, April 15, 1881.

Sir: In reply to your esteemed favor of the 11th instant, I regret to be obliged to say that there is no provision of law whereby a "weather service" can be established in this State. But for this circumstance I should be much gratified to co-

operate with you in the directions indicated in the memorandum accompanying your communication.

Very respectfully, your obedient servant,

WILLIAM E. SMITH,
Governor.

Gen'l W. B. HAZEN,
Chief Signal-Officer, Washington, D. C.

The second letter referred to above is dated January 30, 1882, and is as follows:

DEAR SIR: I have this day forwarded to the legislature your communication of January 23, with the memorandum therein contained, relative to a State weather service, as requested.

I express my thanks for your letter and would be pleased if this State could be of utility in advancing the practical benefits of the science to which your communication relates.

Very respectfully, yours,

J. M. RUSK.

The result of the action of legislature has not yet been received, but strong hopes for the passage of the bill are entertained.

The State of Nevada, I may say, has evinced great interest in meteorological reports. The following communication received is ample proof of the value it attaches to meteorological data.

STATE OF NEVADA, EXECUTIVE DEPARTMENT,
Carson City, April 19, 1881.

SIR: Replying to yours of the 11th instant, relative to meteorological reports for this State, to establish a system of reports from the several counties of this State as indicated in your letter would require legislation for such service, including an appropriation for expenses. As our legislature meets biennially, and has but recently adjourned, such legislation cannot be had until 1882.

An act was passed last winter (a copy of which is herewith transmitted) providing for the purchase of such reports from Mr. Charles W. Friend, from observations taken by him at this point.

Under proper arrangements, perhaps Mr. Friend could be induced to receive and transmit to you reports from this and other points within the State.

I respectfully suggest that you correspond with him upon the subject.

I am, sir, yours, very truly,

JOHN H. KINKEAD,
Governor of Nevada.

General A. B. HAZEN,
Chief Signal-Officer, U. S. Army, Washington, D. C.

This letter gave rise to correspondence with Mr. C. W. Friend, which resulted in that gentleman's intention of establishing a State weather service. A report of his actions and progress has not yet been received at this office, but may be expected daily.

The following is a copy of the act inclosed in Governor Kinkead's letter:

AN ACT to procure meteorological reports for the State of Nevada, and to provide for the payment of the same.

The people of the State of Nevada represented in senate and assembly do enact as follows:

SECTION 1. The secretary of state is hereby directed to contract with Chas. W. Friend for the purchase of monthly meteorological reports for the years 1881 and 1882, to be filed in said secretary of state's office for the use and benefit of the State of Nevada, for the sum of $12.50, to be paid monthly upon the receipt of said meteorological reports at the secretary of state's office. The sum of $300 in gold coin is hereby appropriated out of the general fund from any moneys not otherwise specially appropriated.

The governor of the Territory of Arizona readily foresaw the good results attending such a service, and offered his hearty co-operation in the matter, but no further correspondence was had on the subject, owing perhaps to the numerous military posts and signal-service stations in that Territory at which meteorological observations are taken.

While the State of California has as yet no regularly organized State weather service, strenuous efforts are being made by the State engineer, Mr. Wm. Ham Hall, to accomplish the object. The following letter contains some interesting facts in regard thereto, and is worthy of note:

STATE OF CALIFORNIA, OFFICE OF THE STATE ENGINEER,
Sacramento, May 12, 1881.

SIR: Your communication concerning the establishment of a State signal service, addressed to his excellency the governor of California, under date of April 11, 1881, has been handed to me with the request that I write in reply.

There are not at this time any systematic or extended meteorological observations being made by State authority in California.

As the result of individual enterprise or official zeal on the part of those in charge of some of the State or county institutions, such service is being performed at perhaps a dozen different stations in as many different counties; but, I apprehend, for the most part, in the counties and towns or cities where there are at present observations made under your direction.

Since assuming charge of this department I have been at some pains to establish a number of stations for the observation of rainfall precipitation in localities where such service was not being performed.

This movement was made with a view of amassing data from which to discuss the question of water supply for irrigation in the southern part of the State, and the question of arterial drainage in the northern valleys.

A difficulty has been encountered in securing trustworthy and intelligent observers who will gratuitously devote the time necessary to the service with the degree of regularity essential for even this class of observation, and I fear that for the observations which would require greater regularity of recordation we would be less successful in securing the needful attendance.

To inaugurate a really good system of observations in this State would require the sanction of special legislation, which we cannot hope to secure now for the next 20 months at least, seeing that the legislature does not meet until January, 1883.

Even then I can hardly hope for a favorable consideration of the proposition. The people of our State, and especially those elected to make the laws, have but little appreciation of the economic value of any scientific investigation whatever.

This department has barely escaped abolition at the hands of the legislature just adjourned; yet our results are such as to appeal very much more to the popular utilitarian idea of immediate returns than any purely meteorological work and results would be.

I hope I appreciate your labors and suggestions, and I will be pleased to co-operate with you in the way you mention as far as means at hand will permit.

I will immediately have inquiry made as to where we may hope to secure the desired observations, and prepare a schedule upon which I will write you more at length in the course of the next few weeks.

Meanwhile, be kind enough to forward me such information in the nature of "sample forms, instructions for taking observations, price lists of standard instruments," as you may have at command, together with such "information relative to the subject which the experience of the Signal Service may afford," and which you think may be of service in the premises.

* * * * * * * *

Very respectfully, your obedient servant,

WM. HAM HALL,
State Engineer.

Brig. Gen. W. B. HAZEN,
Chief Signal-Officer, U. S. Army, Washington, D. C.

Difficulties mentioned by Mr. Hall were met in many States, and the failure to succeed in placing the matter before legislature was mainly due to the fact that the session in mostly every instance was near its close and would not meet again until 1883. By that time steps will be taken to increase the State weather services and induce the legislatures to look upon this subject with favor.

In conclusion I may say that, as a preliminary step, several copies of the act of the general assembly of Ohio relating to a State weather service have been sent to Sergt. W. U. Simons, at Little Rock, Ark., to be distributed by him to scientific people and others interested in like organizations. It will no doubt induce them to compete with other States in the progress of science.

Great hopes are therefore entertained that the coming year 1883 will be one in which this service takes an important step in the advancement of its usefulness and the promotion of the science of meteorology.

I am, sir, very respectfully, your obedient servant,

H. H. C. DUNWOODY,
First Lieutenant, Fourth Artillery, A. S. O. and Assistant.

APPENDIX No. 59.

Bulletin of international meteorological observations, taken simultaneously on January 1, 1881.

7. a. m., WASHINGTON MEAN TIME.

[Collated at the Office of the Chief Signal Officer of the Army of the United States from observations made in each instance in compliance with a special request, and printed for exchange with the co-operating observers. The time for simultaneous international meteorological observations is now 35 minutes earlier than before January 1st, 1881. For the present any observations taken at 7.35 a. m. will be published with a †.]

ALGERIAN SERIES.

[Furnished by the co-operation of General Maritz, Commandant Supérieur du Génie in Algeria.]

Stations.	Barometer.				Temperature of the air.		Relative humidity.	Wind.			Clouds.				Rainfall or melted snow in the past 24 hours.		Weather.	Observers.
	Corrected for instrumental error and temperature.		Reduced to sea-level.					Direction.	Velocity.		Force.	Amount.		Direction.				
	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second	0—10.	Upper. 0—10.	Lower. 0—10.	Upper. From—	Lower. From—	Inches.	Millimeters.		
Mogador, Morocco			30.04	763.0	63.3	17.4	70	NE.			2		5			0	0	Fair	Dr. Ollive.
Nemours			30.24	768.1	58.5	14.7	68	NE.			2		0			0	0	Clear	Raynard.
Algiers			30.22	767.5	50.0	10.0	89	NNW.			2		10			0.791	20.1	Covered	Nicolas.
La Calle			39.19	766.7	51.8	11.0	87	W.			4		10			0	0	Covered	Fonfréde.
Tunis			30.12	765.0															Jacques.
Sfax			30.18	766.6															Gau.
Saida			30.18	766.6	43.2	6.2	88	NE.			2		3			0	0	Pretty fair	Dumas.
Tebessa			30.13	765.2	43.2	6.2	88	NNW.			3		10			0	0	Covered	Watrin.
Geriville																			Lonchamp.
Laghouat			30.24	768.2	51.4	10.8	52	NNW.			2		2			0	0	Fair	Herbin.
Biskra			30.19	766.9	62.6	17.0	89	NW.			5		5			0	0	Cloudy	Baudasse.

Bulletin of international meteorological observations, taken simultaneously on January 1, 1881—Continued.

AUSTRALIAN SERIES.

[Furnished by the co-operation of R. L. J. Ellery, Director of the Melbourne Observatory at Melbourne, N. S. W., and the respective observers.]

Stations.	Barometer.				Temperature of the air.		Relative humidity.	Wind.				Clouds.				Rainfall or melted snow in the past 24 hours.		Weather.	Observer.
	Corrected for instrumental error and temperature.		Reduced to sea-level.					Direction.	Velocity.		Force.	Amount.		Direction.					
	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0—10.	Upper. 0—10.	Lower. 0—10.	Upper. From—	Lower. From—	Inches.	Millimeters.		
Melbourne, Victoria	29.68	753.9	29.77	756.1	56.0	13.3	86	S.	7	3.1	.....	.....	6	.....	.....	0	0	Fine	R. L. J. Ellery.
SUB-SERIES.																			
Hobart Town, Tasmania	.....	.....	29.61	752.1	67	19.4	.....	W.	.....	.....	3	.....	10	.....	.....	0.03	0.8	Squally	Francis Abbott, F. R. A. S.

AUSTRO-HUNGARIAN SERIES.

[Furnished by the co-operation of Professor Dr. Julius Hann, Director of the Imperial and Royal Central Meteorological Institute at Vienna.]

Agram	29.64	752.8	30.21	767.3	39.9	4.4	73	NE.	.....	.....	1	.....	10	.....	.....	0.008	0.2	.....	Prof. Ivan Stozir.
Cracow, I. R. Observatory	29.44	747.7	30.24	768.1	34.2	1.2	92	W.	3.8	1.7	.....	.....	10	.....	.....	0.067	1.7	.....	Dr. Wiersbicki.
Eperies	29.22	742.1	30.12	765.1	41.4	5.2	72	N.	.....	.....	1	.....	9*	.....	S.	0	0	.....	Julius Mikolik.
Gratz†	28.97	735.7	30.27	768.8	38.1	3.4	83	SSE.	.....	.....	2	.....	7	.....	.....	0	0	.....	Andreas Rospini.
Hermannstadt	28.68	728.5	30.15	765.7	43.7	8.5	84	NW	.....	.....	1	.....	10	.....	.....	0.222	5.65	.....	Prof. A. Gottschling.
Kremsmunster Obs'y	28.87	733.4	30.28	769.1	34.9	1.6	82	WNW.	.....	.....	2	.....	5	.....	.....	0	0	.....	The Staff.
Lemberg	29.12	739.7	30.15	765.8	36.7	2.6	87	NE.	.....	.....	1	.....	10	.....	.....	Inap.	Inap.	.....	Dr. T. Stanecki.
Polar	29.97	761.2	30.08	764.1	47.7	8.7	61	ENE.	.....	.....	2	.....	2	.....	.....	0	0	.....	I. R. Hydrographic Office.
Szuthmar	29.67	753.6	29.73	755.1	43.7	6.5	83	SW.	.....	.....	2	.....	8	.....	.....	0.610	15.5	.....	Beicht Petér, S. J.
Szegedin	29.86	758.5	30.15	765.9	39.2	4.0	90	Calm.	.....	.....	0	.....	7	.....	.....	0.156	3.95	.....	Karl Stancel.
Trieste	30.03	762.8	30.13	765.4	46.2	7.9	65	ENE.	.....	.....	2	.....	2	.....	.....	0	0	Almost clear.	P. Busin.
Vienna	29.51	749.5	30.25	768.4	41.0	5.0	56	W.	.....	.....	3	.....	8	.....	.....	0	0	.....	I. R. Central Met. Obs'y.

BELGIAN SERIES.

[Furnished by the co-operation of J. C. Houzeau, director of the Royal Observatory at Brussels.]

Brussels	Royal Observatory.
Furnes	M. E. de Cae.
Maeseyck	M. Pierrot.

BRITISH SERIES.

[Furnished by the co-operation of the Meteorological Council, London, Robert H. Scott, Esq., F. R. S., Secretary, and the respective observers.]

Aberdeen	29.87	758.7	29.97	761.2	46.0	7.8	66	W.	8	3.6			9		0	0	Misty	W. Boswell.
Armagh Observatory	30.03	762.7	30.27	768.8	43.7	6.5	95	SSW.	10	4.5			10				Gloomy	S. Call.
Bidston, Liverpool Obs'y			30.26	768.8	44.2	6.8	70	WSW.	27	12.1			10				Overcast	John Hartnup.
Bolton, Sharples	29.72	754.9	30.27	768.8	37.9	3.3	90	SW.	3	1.3			10				Raining	Thomas Mackereth.
Bradford, Yorkshire	29.84	757.9	30.23	767.8	43.5	6.4	86	W.			3		10		0.01	0.3	Overcast	J. McLandsborough, F. R. S.
Bridgetown, Barbadoes	29.98	761.5	30.01	762.2	80.0	26.7	74	NE.			2		3				D. clouds	Pvt. J. Surgener, A. H. C.
Cardington			30.30	769.6	39.0	3.9	86	W.			0.2		9				Overcast	John McLaren.
Chatham, School M. E	30.23	767.8	30.37	771.4	42.1	5.6	76	Calm.			0		3				Misty	Cpl. Gwinn, R. E.
Falmouth, Observatory	30.19	766.8	30.42	772.7	47.3	8.5	93	W.			1		9				Foggy	The Staff.
Fort Napier, Natal	27.49	698.2	29.72	754.9	79.2	26.2	78	NE.			1		0				Blue sky	Pvt. E. K. Anniss, A. H. C.
Free Town, Sierra Leone	29.58	751.3	29.81	757.2	86	30.0	84	SE.			1		5				D. clouds	C. E. Keane.
Galway, Queen's College			30.23	757.8	49	9.4	93	SW.			2		10				Overcast	J. O'Donaghadue.
Gibraltar, Mediterranean	30.16	766.1	30.21	767.3	55.6	13.1	65	E.			3		4				Blue sky	2nd Cpl. O. Baldwin.
Glasgow, Observatory	29.92	760.0	30.12	765.0	45.8	7.7	86	W.			4		10				Overcast	D. G. MacLean.
Greenwich, Royal Obs'y	30.18	766.6	30.36	771.1	33.8	1.0	86	WSW.			1		10				Overcast	The Staff, for G. B. Airy.
Guernsey	30.19	766.8	30.41	772.4	47.5	8.6	81	NNW.			2		5				D. clouds	Dr. S. E. Hoskins, F. R. S.
Kew, Observatory	30.32	770.1	30.35	770.9	40.0	4.4	87	WSW.	5	2.2			10					The Met'rological Office.
Leicester, Museum	30.02	762.5	30.28	769.1	41.1	5.1	91	SW.			1		10				Overcast	J. E. Carryer.
Malta, Mediterranean	29.93	760.2	30.01	762.2	64.4	18.0	70	NW.			1		4				D. clouds	A. King.
Nassau, Bahamas			30.06	763.5	72.5	22.5	98	SW.			2		4				D. clouds	C. S. Duncombe.
Oscott, St. Mary's College	29.81	757.2	30.34	770.6	39.9	4.4	93	SW.			1		10				Misty	Rev. Stephen J. Whitty.
Oxford, Radcliffe Obs'y	30.10	764.5	30.36	771.1	40	4.4	91	WSW.			3		7				Misty	The Staff, for E. J. Stone, esq.
Plymouth	30.32	770.1	30.39	771.9	45.2	7.3	98	Calm.			0		10				Drizzling	John Merrifield.
Sandwick Manse, Orkneys			29.88	758.9	44.9	7.2	96	W.	28	12.5			10				Drizzling	Rev. C. Clouston, LL. D.
Scutari Cemetery, Turkey	30.05	763.3	30.12	765.0	57.0	13.9	67	SSW.			2		7		Bl'nk	Bl'nk	D. clouds	Sergt. W. H. Lyne.
Sheffield	30.05	763.3	30.35	770.9	45.0	7.2	88	SW.			1		10		0.03	0.8	Overcast	W. F. Cooper.
Silloth Rectory	30.15	765.8	30.18	766.6	43.7	6.5	89	W.			2		10		0	0	Overcast	Rev. F. Redford, A. M.
Stonyhurst Observatory			30.25	768.3	43.5	6.4	98	SW.	11	4.9			10				Raining	Rev. S. J. Perry.
Strathfield Turgiss	30.14	765.5	30.37	771.4	39.0	3.9	87	W.			1–2		10				Rain and fog	Rev. C. H. Griffith, F. M. S.
Truro, Royal Institution	30.32	770.1	30.40	772.1	51	10.6	93	W.			4		10				Raining	W. Newcombe.
Valencia, Observatory	30.37	771.4	30.40	772.1	50.9	10.5	93	W.	11	4.9			10				Raining	The Met'rological Office.

Bulletin of international meteorological observations, taken simultaneously on January 1, 1881—Continued.

CANADIAN SERIES.

[Furnished by the co-operation of Charles Carpmael, A. M., F. R. A. S., director of the Magnetic Observatory at Toronto and Superintendent of the Meteorological Office of the Dominion of Canada, and the respective observers.]

Stations.	Barometer.				Temperature of the air.		Relative humidity.	Wind.			Clouds.				Rainfall or melted snow in the past 24 hours.		Weather.	Observers.
	Corrected for instrumental error and temperature.		Reduced to sea-level.					Direction.	Velocity.		Amount.		Direction.					
	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	Force. 0—10.	Upper. 0—10.	Lower. 0—10.	Upper. From—	Lower. From—	Inches.	Millimeters.		
Bathurst, N. B.	30.02	762.5	30.06	763.5	—3.5	—19.7	.....	NW.	5	2.2	.....	0	3s	.....	.....	0	0	Clear	Hon. J. Ferguson.
Chatham, N. B.*	29.98	761.5	30.06	763.5	—1.2	—24.4	90	Calm.	0	0	.....	8ck	2ks	SW.	SW.	0	0	Fair	G. A. Blair.
Charlottetown, P. E. Isld.	30.02	762.5	30.07	763.8	3	—16.1	95	W.	3	1.3	.....	2c	2s	W.	.....	0	0	Fair	H. J. Cundall, C. E.
Chicontime, Quebec	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Rev. V. A. Huart.
Cornwall, Ontario	29.98	761.5	30.19	766.8	0.8	—17.3	94	SW.	.....	.....	2	0	2s	.....	.....	0	0	Clear	James Smith, M. A.
Dalhousie, N. B.	29.98	761.5	30.02	762.5	3.0	—16.1	.....	W	.....	.....	1	.....	10s	.....	.....	0	0	Cloudy	H. A. Johnson.
Father Point, Quebec*	30.02	762.5	30.04	763.0	7	—13.9	84	SW.	8	3.6	.....	.....	10n	.....	.....	0	0	Cloudy	J. McWilliams.
Fredericton, N. B.	30.08	764.0	30.15	765.8	—18.9	—28.3	100	Calm.	0	0	.....	1cs	0	W.	.....	0	0	Fair	Prof. Harrison.
Fort Garry, Manitoba*	28.86	733.0	29.79	756.7	—9	—22.8	96	S.	10	4.5	.....	Haze	0	.....	.....	0	0	Hazy	James Stewart.
Granton, Ontario	29.04	737.6	30.26	768.6	8.6	—13.0	76	W.	.....	.....	1	.....	10n	.....	.....	0	0	Cloudy	James Grant.
Halifax, N. S.*	29.99	761.7	30.13	765.3	13	—10.6	94	W.	4	1.8	.....	0	8k	.....	.....	Inap.	Inap.	Cloudy	A. Allison.
Hamilton, Ontario	29.85	758.2	30.28	769.1	8.1	—13.3	76	SW.	.....	.....	2	0	9ks	.....	.....	0	0	Cloudy	Geo. Dickson, B. A.
Kingston, Ontario*	29.82	757.4	30.20	767.1	0	—17.8	85	W.	5	2.2	.....	5k	0	Calm	.....	0	0	Fair	S. Woods, M. A.
Little Glace Bay, N. S.	29.95	760.7	29.99	761.7	12.7	—10.7	89	W.	8	3.6	.....	0	5k	.....	.....	0	0	Fair	C. H. Rigby.
Montreal, Quebec*	29.96	761.0	30.18	766.6	3	—16.1	73	SW.	15	6.7	.....	0	0	.....	.....	0	0	Clear	C. H. McLeod, C. E.
Moose Factory, Ontario	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	J. R. Nason.
Norwood, Ontario	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Rev. T. F. Fotheringham, M. A.
Parry Sound, Ontario*	29.34	745.2	30.09	764.3	16	—8.9	92	SW.	20	8.9	.....	.....	10n	.....	SW.	0.59	15.0	Light snow.	Rev. R. Moseley.
Peterboro, Ontario	29.43	747.5	30.26	768.6	—10.7	—23.7	59	SW.	.....	.....	1	0	0	.....	.....	0	0	Clear	J. F. Jeffers, M. A.
Port Dover, Ontario	29.51	749.5	30.28	769.1	8	—13.3	100	SW.	20	8.9	.....	5k	5n	SW.	.....	0.02	0.5	Cloudy	H. Morgan.
Port Stanley, Ontario	29.56	750.8	30.27	768.8	10	—12.2	94	W.	24	10.7	.....	.....	10ks	.....	W.	0.04	1.0	Cloudy	M. Payne.
Quebec, Quebec*	29.74	755.4	30.10	764.5	—1	—18.3	.....	W.	.....	.....	1	.....	10n	.....	W.	0	0	Light snow.	Capt. Ashe, R. N.
Rockliffe, Ontario*	29.61	752.1	30.12	765.0	3	—16.1	78	Calm.	0	0	.....	.....	10n	.....	SW.	0	0	Cloudy	W. H. McIntyre.

St. Andrews	*30.06*	*763.5*	*30.11*	*764.8*	*4*	*—15.6*	*84*	*NW.*	*2*	*0.9*	.....	*5k*	*2s*	*W.*	.....	*0*	*0*	*Fair*	.....
St. John's, N. B.	*29.94*	*760.5*	*30.12*	*765.0*	*6.0*	*—14.4*	*100*	*NW.*	*7*	*3.1*	.....	*7ck*	*0*	.....	.....	0	0	Fair	G. Murdock, C. E.
*Saugeen, Ontario**	*29.36*	*745.7*	*30.15*	*765.8*	*9*	*—12.8*	*85*	*S.*	*20*	*8.9*	.....	.....	*10s*	.....	.....	0.12	3.0	Cloudy	K. Stewart.
Stratford, Ontario	*28.88*	*733.5*	*30.33*	*770.4*	*0.3*	*—17.6*	*88*	*SW.*	*7*	*3.1*	.....	.....	*10s*	.....	*W.*	0	0	Cloudy	C. J. MacGregor, M. A.
*Sydney, C. B.**	*29.99*	*761.7*	*30.03*	*762.7*	*15*	*—9.4*	*90*	*SW.*	*8*	*3.6*	.....	.....	*10s*	.....	Calm	0	0	Fair	T. C. Hill, C. E.
*Toronto, Ontario**	*29.85*	*758.2*	*30.28*	*769.1*	*7*	*—13.9*	*90*	*W.*	*5*	*2.2*	.....	.....	*10n*	.....	.....	0	0	Cloudy	Magnetic Observatory.
Windsor, N. S.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Woodstock, Ontario	29.08	738.6	30.26	768.6	8.1	—13.3	93	SW.	11	4.9	.....	.....	10ks	.....	NW.	0	0	Cloudy	Prof. Wolverton.
Yarmouth, N. S.*	30.04	763.0	30.11	764.8	20	—6.7	75	Calm.	0	0	.....	.....	10s	.....	.....	0.18	4.6	Cloudy	Lt. F. E. Wilmot, R. N.
SUB-SERIES.																			
St. John's Newfoundland	29.94	760.5	30.12	765.0	23	—5.0	100	NW.	2	0.9	.....	.....	10n	.....	.....	0	0	.....	John Delany.
St. Pierre, N. F., Marine Hospital.	.....	.....	29.91	759.7	24.8	—4.0	.....	NW.	.....	.....	.....	2	.....	.....	.....	0	0	.....	The Commandant.

Stations marked with a * are telegraphed daily to the office of the Chief Signal Officer of the Army.

CAPE COLONY SERIES.

[Furnished by the co-operation of the Meteorological Commission of Cape Colony, Cape Town, and the respective observers.]

Beaufort West, C. Colony	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cape Town, C. G. H. Obs'y	30.01	762.2	30.04	763.0	81.0	27.2	47	S.	9.4	4.2	.....	0	0	.....	.....	0	0	Clear	The Staff, for D. Gill.
C. St. Francis Lt. House	29.94	760.5	.....	.....	68.0	20.0	87	WSW.	16.6	7.4	.....	.....	3k	.....	.....	0	0	Fine	John Duthie.

CHINESE SERIES.

[Furnished by the co-operation of Marc Dechevrens, S. J., director of the Meteorological Observatory at Zi-Ka-Wei.]

SUB-SERIES.																			
Zi-Ka-Wei, near Shanghai	30.53	775.4	30.55	776.0	28.4	—2.0	88	N.	1.8	0.8	.....	0	.....	.....	.....	0	0	Clear	M. Marc Dechevrens, S. J.

Bulletin of international meteorological observations, taken simultaneously on January 1, 1881—Continued.

COSTA RICA SERIES.

(By authority of the Minister of Foreign Affairs.)

[Furnished by the co-operation of Senor Frederico Maison, Director of the Central Office of Statistics and Meteorology.]

Stations.	Barometer.				Temperature of the air.		Relative humidity.	Wind.				Clouds.				Rainfall or melted snow in the past 24 hours.		Weather.	Observers.
	Corrected for instrumental error and temperature.		Reduced to sea-level.					Direction.	Velocity.		Force.	Amount.		Direction.					
												Upper.	Lower.	Upper.	Lower.				
	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0—10.	0—10.	0—10.	From—	From—	Inches.	Millimeters.		
San José	26.24	666.5	29.96	761.0	59.9	15.5	89	SE			1	10				0	0	Clear	Frederico Maison.

DANISH SERIES.

[Furnished by the co-operation of Capt. N. Hoffmeyer, Director of the Royal Danish Meteorological Institute at Copenhagen.]

Copenhagen	30.07	763.7	30.11	764.9	33.8	1.0	80	W.	13	6			2					
Fanöe	30.12	765.1	30.14	765.6	36.7	2.6	82	WSW.			4		9					
Godthaab, Greenland	28.94	735.1	28.98	736.2	18.0	— 7.8	77	NW.			1		10					
Stykkisholm, Iceland	28.87	733.3	28.91	734.4	33.3	0.7	93	W.			2		8					
Thorshavn	29.39	746.4	29.42	747.3	46.0	7.8	90	SW.	31	14			10					
Vestervig	29.96	760.9	30.05	763.3	36.9	2.7	73	W.			2		10					

[Furnished by the co-operation of the Central Meterological Office of France, Prof. E. Mascart, Director, and the respective observers.]

Agen, Normal School	29.82	757.4	30.47	774.1	52.2	11.2	80	NW.			1		k		E.	0	0		M. Labroue, Director.
Alençon	29.87	758.6	30.42	772.6	38.5	3.6	94	W.			1		10k	NW.	W.	0.04	1.	Snowing	M. Nicot, Director.
Arras, Engineer School	30.11	764.7	30.37	771.5	36.5	2.5	93	NW.	3	1.4			s						M. Klein, Commandant.
Avignon, Normal School	30.14	765.6	30.22	767.6	42.3	5.7	54	N.			6		0			0	0	Very clear	M. Giraud, Director.
Bar-sur-Seine	29.83	757.7	30.42	772.6	36.5	2.5	88	S.			1		10			0	0	Covered	C. Saillard, Director.
Beauvais, Normal School	30.11	764.7	30.39	771.8	39.6	4.2	83	W			1		8			0.08	2.	Very cloudy	Frère Eugene Marie.
Besançon, Normal School	29.21	741.8	30.30	769.5	54.1	12.3	75	N.			1		2n		S.	0	0	Slightly cl'dy	M. Gobin, Director.
Bordeaux, Observatory	30.24	768.0	30.51	775.0	40.5	4.7	76	SW.			1		0			0.020	0.5	Hazy	M. Rayet, Director.
Bourges, Normal School	29.91	759.8	30.48	774.2	45.3	7.4	96	NNW.			1	2c				0	0	Slightly cov.	M. Postel, Director.
Brest, Naval Observatory	30.25	768.4	30.50	774.6	48.2	9.0	92	N.			1		3		N.	0.118	3.00		Ch. de Rermaree, Direct'r.
Châlons-sur-Marne, N. Sc'l	30.08	764.0	30.41	772.4	35.6	2.0	96	Calm.			0		8		NW.	0	0	Very cloudy	M. Bietrix, Director.
Charleville, Normal Sch'l	29.84	757.8	30.38	771.6	35.2	1.8	87	SW.			1		5			0.047	1.2	Cloudy	M. Jadot, Director.
Clermont-Ferrand, Obs'y	29.02	737.1	30.46	773.6	33.8	1.0	62	N.			1		10					Light snow	M. Baumier, Director.
Cluny, Normal School	29.55	750.5	30.42	772.7	35.6	2	67	NE.			1		8			0.102	2.6		M. Alluard, Director.
Commercy, Normal Sch'l	29.49	749.0	30.39	771.9	39.2	4	87	W.			2		10		NE.			Snowing	Gouré de Villemontée, Dir.
Gap, Normal School	27.54	699.5	30.13	765.3	45.0	7.2	97	N.			1		10n					Snowing	Dr. Coullet, Director.
Greasque, Bouches-du-Rhone	29.06	738.1	30.20	767.1	41.4	5.2	56	NW.			3		3			0	0		M. Jeangirard, Director.
													5		NW.	0	0		L. Kina, Director.
Grenoble, Normal School	29.48	748.8	30.29	769.3	37.0	2.8	65	WNW.			3		10			0.024	0.60	Rain & snow	M. Ablard, Director.
Guéret, Normal School	28.84	732.4	30.54	775.7	32.9	0.5	86	NW.			1		10		SE.	0	0	Covered	M. Rivoir, Director.
Lamballe, Normal School	30.11	764.8	30.39	771.8	46.4	8	85	W.			2		Mist		W.	0.126	3.2	Misty	M. Ollitrault, Director.
Lescar, Normal School	29.87	758.8	30.57	776.5	46.2	7.9	59	NW.					0			0.346	8.80	Clear	M. Chauvin, Director.
Lorient, Naval Obs'y	30.45	773.5	30.56	776.1	46.0	7.8	89	W.			1		10		W.	0	0	Covered	Lt. T. Carré, Director.
Lyon Obs'y, Park Station	29.28	743.8	30.35	771.0	35.8	2.1	64	NNE.			3		n		N.	0.008	0.2		Ch. André, Director.
Mans, Normal School	30.19	766.8	30.51	775.0	41.2	5.2	94	NW.			1		2		NNE	0	0	Slightly cl'dy	M. Piboen, Director.
Marseilles, Observatory	29.85	758.2	30.13	765.2	42.1	5.6	73	NNW.			1		7		WSW.	0	0		E. Stephan, Director.
Montlouis l'institute	24.94	633.5	30.16	766.0	27.5	— 2.5	68	NE.	18.6	8.3			10	N.		0.236	6.0		M. Cave, for Dr. Fines.
Montpellier, Normal Sch'l	29.96	760.8	30.26	768.6	45.3	7.4	37	N.			6		0			0	0	Clear	M. F. Galzin, Director.
Nancy, Normal School	29.56	750.9	30.37	771.5	33.1	0.6	92	NE.			1		2s		WNW.	0	0	Slightly cl'dy	M. Hasse, Director.
Nantes, Observatory	30.41	772.4	30.58	776.6	44.2	6.8	85	W.			1		10		N.	0	0	Gloomy	M. L. E. Larocque, Dir.
Nice	30.01	762.3	30.05	763.2	55.4	13.0	28	NW.			3		5	NW.	NW.	0	0	Cloudy	Capt. Boissière, Director.
Perpignan, Observatory	30.19	766.7	30.29	769.4	43.0	6.1	49	S.	29.8	13.3			4		NW.	0	0		Dr. Fines.
Pic-du-Midi, Plantade	22.56	572.9			13.1	—10.5							10			0.839	21.3	Snowy	M. Baylac, for General de Nansouty.
Privas, Normal School	29.26	743.2	30.36	771.2	43.2	6.2	42	N.			3		5k	N.	N.	0	0	Cloudy	M. Tallieu.
Puy de Dôme Obs'y, Sum't	25.28	642.2			17.1	— 8.3	97	N.			3		10			0.476	12.1	Snow and fog	M. Alluard, Director.
Rochefort, Naval Obs'y	30.49	774.4	30.52	775.2	42.8	6.0	91	WSW.			1		0			0.08	2.	Clear	Lt. E. Decante, Director.
Roche-sur-Yon, N. School	30.19	766.8	30.41	772.4	43.2	6.2	79	WNW.			1		10			0	0	Covered	M. Mouillot, Director.
Rodez, Normal School	28.11	714.1	30.38	771.7	33.1	0.6	89	NW.			2		10		NW.	0	0	Covered	M. Richard, Director.
Rouen, Normal School	30.41	772.4	30.50	774.6	40.3	4.6	80	NW.			1		2		NW.	0.071	1.8	Slightly cl'dy	M. Platrier, Director.
Saint Lô, Normal School																			M. Delaplanche, Director.
Saint Maur, Observatory	30.25	768.4	30.42	772.6	41.0	5.0	72	WNW.			1		10	NE.	N.				E. Renou, Director.

‖ Observation taken 25 minutes late.

Bulletin of international meterological observations, taken simultaneously on January 1, 1881—Continued.

FRENCH-SERIES—Continued.

Stations.	Barometer.				Temperature of the air.		Relative humidity.	Wind.				Clouds.				Rainfall or melted snow in the past 24 hours.		Weather.	Observers.
	Corrected for instrumental error and temperature.		Reduced to sea-level.					Direction.	Velocity.		Force.	Amount.		Direction.					
	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0—10.	Upper. 0—10.	Lower. 0—10.	Upper. From—	Lower. From—	Inches.	Millimeters.		
Toulouse, Observatory	29.77	756.2	30.50	774.8	36.0	2.2	81	NW.			3		1		W.	0.008	0.2	¼ covered	M. de Tastes.
Tours	30.24	768.0	30.43	773.0	41.0	5.0	81	N.			1		2	Calm.	N.	0.012	0.3		Dr. A. Berigny, Director.
Versailles, Observatory	29.92	760.0	30.41	772.5	36.0	2.2	89	NW.			1					0	0		
SUB-SERIES.																			
Paris, Montsouris Obs'y																		Clear	B. Bailland, Director.
																			M. Marié Davy, Director.

GERMAN SERIES.

[Furnished by the co-operation of Prof. Dr. G. Neumayer, Director of the German Marine Observatory at Hamburg.]

Bamberg	29.43	747.6	30.30	769.7	32.9	0.5	87	NW.			4		3k	W.		0.091	2.3		Prof. Dr. Hoh.
Berlin	30.10	764.4	30.28	769.0	33.1	0.6	87	W.			1		7			0	0		Prof. Dr. Arndt.
Breslau	29.75	755.7	30.29	769.3	32.7	0.4	85	NW.			2		6			0	0		Royal University Obs'y.
Carlsruhe	29.96	760.9	30.41	772.4	34.9	1.6	90	SSW.			2		10	SW.		0	0		Albert Senz.
Cassel	29.71	754.7	30.33	770.3	34.9	1.6	78	S.			4		6	SW.		0	0		Dr. H. Möhl.
Frankfort on the Main	30.07	763.8	30.46	773.7	32.7	0.4	90	WSW.			0		10			0.028	0.7	Snowing	Physical Society.
Friedrichshafen	28.85	732.9	30.37	771.3	33.4	0.8	87	SE.			2		10	NE.		0.016	0.4	Snowing	Ch'f Telegrapher Wilhelm
Hamburg	30.19	766.9	30.26	768.7	34.7	1.5	92	W.			3		9			0	0		Dr. R. Kleeman.
Kiel	30.13	765.2	30.14	765.6	35.2	1.8	83	WSW.			1		6			0.002	0.04		Prof. Dr. G. Karsten.
Leipsic, Astrom'l Obs'y	29.87	758.6	30.31	769.9	33.1	0.6	85	SW.			2		2			0.087	2.2	Hazy	Prof. Dr. Bruhns.
Magdeburg	30.06	763.4	30.29	769.4	32.5	0.3	94	W.			3		1s	W.		0	0		Dr. Assmams.
Memel	30.02	762.6	30.07	763.8	37.0	2.8	84	W.			6		5k						Reinbrecht & Issermann.

Munich	*28.44*	*722.4*	*30.32*	*770.2*	*32.5*	*0.3*	*76*	*NW.*			*2*	*10*	*NW.*		*0.071*	*1.8*			Central Station.
Neufahrwasser	*30.16*	*766.0*	*30.17*	*766.4*	*30.7*	*— 0.7*	*84*	*SSW.*			*2*	*0*			*0*	*0*			A. Lothes.
Neustadt, Palatinate	*29.92*	*759.9*	*30.45*	*773.4*	*34.3*	*1.3*	*80*	*W.*			*2*	*10*			*0*	*0*			Dicknether.
Stuttgart	*29.36*	*745.8*	*30.30*	*769.6*	*35.1*	*1.7*	*69*	*W.*			*1*	*3*	*W.*		*0*	*0*			Prof. Dr. Schoder.
Thorn																			Dr. O. Cunerth.
Weissenburg, Bavaria	28.74	730.1	30.29	769.4	33.4	0.8	83	Calm.			0	9	NW.		0.094	2.4			Prof. Kemlein.
Wustrow	30.19	766.7	30.21	767.3	35.6	0.0	82	WSW.			4	5s			0	0			Prof. S. Reimer.

GREEK SERIES.

[Furnished by the co-operation of Prof. Dr. J. F. Julius Schmidt, Director of the Royal Observatory at Athens.]

Athens	29.77	756.1	30.16	766.0	61.0	16.1		S.			1.0							Smoky	Alexander Wourlisch.

INDIAN SERIES.

[Furnished by the co-operation of H. F. Blanford, Meteorological Reporter to the Government of India, at Calcutta.]

Kurrachee	29.96	760.8	30.01	762.2	74.4	23.6	76	WSW.	5.0	2.2		6	WNW.		0	0	D. clouds		
Deesa	29.48	748.8	29.96	761.0	71.7	22.1	45	SSE.	5.2	2.3		6	S.		0	0	D. clouds		
Bombay	29.91	759.8	29.95	760.7	80.5	26.9	69	NNW.	12.0	5.4		0			0	0	Blue sky		
Poona, Yarrowda	28.09	713.4	29.92	759.9	87.3	30.7	22	WNW.	6.0	2.7		0			0	0	Blue sky		
Belgaum	27.40	669.6	29.92	760.1	81.1	27.3	19	E.	3.0	1.3		0			0	0	Blue sky		
Lahore	29.27	743.3	30.04	762.9	64.6	18.1	40	E.	1.6	0.7		10			0	0	Misty		
Roorkee	29.12	739.7	30.06	763.6	60.8	16.0	60	W.				3			0	0			
Agra	29.48	748.8	30.08	763.9	59.3	14.1	44	NW.	0.8	0.4		0			0	0			
Nagpur	28.93	734.8	29.98	761.4	80.4	26.9	44	SE.	2.4	1.1		4	W.		0	0	D. clouds		
Jubbulpore	28.66	728.0	30.06	763.6	70.2	21.2	34	Calm.	1.6	0.7		3			0	0	D. clouds		
Lucknow	29.72	754.8	30.11	764.8	62.3	16.8	49	Calm.	0.3	0.1		0			0	0	Blue sky		
Allahabad	29.74	755.4	30.07	763.8	62.3	16.8	64	Calm.	1.0	0.4		0			0	0	Blue sky		
Patna	29.89	759.3	30.08	764.1	63.9	17.7	77	W.	1.2	0.5		0			0	0	Blue sky		
Hazaribagh	27.99	710.9	30.08	764.1	61.1	16.1	55	NNW.	4.2	1.9		0			0	0	Blue sky		
Cuttack	29.96	761.0	30.04	763.0	77.5	25.3	63	WSW.	0.7	0.3		1			0	0	Blue sky		
Calcutta, Alipore	30.00	762.0	30.02	762.6	70.3	21.3	70	NNE.	3.0	1.3		0			0	0	Blue sky		
Goalpara	29.64	752.8	30.06	763.6	62.2	16.8	73	ESE.	8.5	3.8		0			0	0	Blue sky		
Chittagong	29.90	759.6	30.00	762.0	69.8	21.0	69	WSW.	2.2	1.0		2			0	0	Blue sky		
Sibsagar	29.76	756.0	30.12	765.1	57.3	14.1	87	NE.	1.3	0.6		0			0	0	Blue sky		

Bulletin of international meteorological observations, taken simultaneously on January 1, 1881—Continued.

ITALIAN SERIES.

(By authority of the Minister of Agriculture, Industry, and Commerce.)

[Furnished by the co-operation of Prof. P. Tacchini, Director of the Central Meteorological Office at Rome, and the respective observers.]

Stations.	Barometer.				Temperature of the air.		Relative humidity.	Wind.				Clouds.				Rainfall or melted snow in the past 24 hours.		Weather.	Observers.
	Corrected for instrumental error and temperature.		Reduced to sea-level.					Direction.	Velocity.		Force.	Amount.		Direction.					
												Upper.	Lower.	Upper.	Lower.				
	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0—10.	0—10.	0—10.	From—	From—	Inches.	Millimeters.		
Udine	29.75	755.6	30.17	766.4	44.6	7.0	55	E.	1.8	0.8			5			0	0		Prof. Giovanni Clodig.
Milan	29.62	752.4	30.17	766.2	39.2	4.0	92	SW.	0.7	0.3			8	NW.		0.016	0.4		Prof. Schiaparelli.
Padua	30.02	762.6	30.14	765.6	48.2	9.0	48	ENE.	13.6	6.1			3	NE.		0	0		Prof. Dott. Lorenzoni.
Moncalieri	29.23	742.5	30.18	766.6	44.6	7.0	28	N.	2.5	1.1			0			0	0		Prof. P. F. Denza.
Genoa	29.89	759.3	30.10	764.4	49.6	9.8	36	N.	12.5	5.6			0			0	0		Prof. G. M. Garibaldi.
Mondovi	28.20	716.3	30.22	767.5	39.6	4.2	29	W.			4		0			0	0		Prof. D. C. Bruno.
Pesaro	30.04	763.1	30.10	764.4	43.7	6.5	84	W.	7.4	4.3			10			0	0		Prof. Luigi Guidi.
Florence	29.78	756.4	30.04	763.0	48.0	8.9	54	NE.			6		6	SSW.		0	0		Cav. F. Meucci.
Leghorn	29.95	760.8	30.04	763.0	50.2	10.1	55	ENE.	9.8	4.4			3			0	0		Prof. P. Monte.
Rome	29.80	756.9	29.98	761.4	49.5	9.7	82	NNW.	6.9	3.1			10			0	0		Prof. P. S. Ferrari.
Lecce	29.73	755.2	29.99	761.8	60.4	15.8	79	S.	14.3	6.4			8	S.		0	0		Prof. C. de Giorgi.
Cosenza	29.11	739.5	30.02	762.5	56.3	13.5	65	Calm.	0	0			10	SSE.		0.055	1.4		Prof. D. Conti.
Cagliari	29.77	756.1	29.97	761.1	54.1	12.3	54	NNW.			4		4	NNW.		0	0		Prof. A. Pacinotti.
Palermo	29.77	756.2	30.02	762.6	56.8	13.8	81	WNW.	3.8	1.7			10	WNW.		0	0		Prof. G. Ciacciatore.
Syracuse	29.97	761.2	30.01	762.3	60.8	16.0	69	SW.	6.3	2.8			10	S.		0	0		Prof. Vincenzo Guiliano.
SUB-SERIES.																			
Naples, S. R.	29.46	748.2	29.99	761.8	52.3	11.3	75	ESE.	3.1	1.4			10k	WSW.		0.012	0.3		Prof. F. Brioschi.
Stelvio	22.10	561.6			6.8	—14.0	58	NE.					0			0	0		P. F. Denza.
Valdobbia	22.06	560.4			12.2	—11.0	59	SE.					0			0	0		

JAPANESE SERIES.

[Furnished by the co-operation of I. Arai, Director of the Imperial Meteorological Observatory at Tokei.]

Hiroshima, I. M. Obs'y†	30.23	767.8	30.24	768.1	41.4	5.2	69	NE.	4.9	2.2	.....	.....	10ck	.....	.....	0	0	Gloomy	K. Sasaki.
Kioto	29.96	761.0	30.14	765.5	35.4	1.9	97	.....	.....	.....	.....	.....	2s	.....	.....	0.006	0.15	Clear	.....
Nagasaki, I. M. Obs'y	30.08	764.0	30.29	769.3	42.0	5.6	70	N.	7.3	3.3	.....	.....	10s	.....	.....	0	0	.....	S. Takehayashi.
Tokei Observatory, Yeddo	29.89	759.2	29.96	761.0	33.3	0.7	75	N.	5.8	2.6	.....	0	0	.....	.....	0	0	Clear	The Staff.
Wakayama	30.09	764.3	30.15	765.8	45.0	7.2	60	NW.	8.5	3.8	.....	.....	9cks	.....	.....	0.002	0.05	Cloudy	S. Iwahashi.

MAURITIUS SERIES.

[Furnished by the co-operation of C. Meldrum, Secretary of the Meteorological Society of Mauritius.]

Mauritius Obs'y, Mauritius	29.86	758.4	30.05	763.2	80.2	26.8	67	NE.	14.0	6.3	.....	0	8	.....	ENE.	0	0	Cloudy	A. N. Figoy.

MEXICAN SERIES.

(By authority of the Secretary of Public Works.)

[Furnished by the co-operation of Senor Mariano Bàrcena, Director of the Central Meteorological Observatory in the City of Mexico, and the respective observers.]

Colima	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	R. Banda, C. E.
Guadalajara	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Prof. L. Perez.
Guanajuato	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Vicente Fernandez.
Leon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Prof. M. Leal.
Mazatlan	29.79	756.6	30.05	763.3	64.5	18.1	78	NNE.	.....	.....	2	0	1k	.....	.....	0	0	Clear	F. Quijano, C. E.
Mexico, Central Obs'y	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	The Staff.
Morelia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	M. Fena, M. D.
Pabellon, Aguascalientes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	M. V. de Leon, M. E.
Puebla, Catholic Institute	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Prof. P. Spina.
San Luis Potosi	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	G. Barroeta, M. D.
Tlacotalpam	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Prof. M. M. Cházaro.
Vera Cruz	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Prof. J. Rossell.
Zacatecas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	J. C. Castrillon.

Bulletin of international meteorological observations, taken simultaneously on January 1, 1881—Continued.

NETHERLANDS SERIES.

[Furnished by the co-operation of Prof. Buys Ballot, Director of the Royal Meteorological Institute of the Netherlands at Utrecht.]

Stations.	Barometer.				Temperature of the air.		Relative humidity.	Wind.				Clouds.				Rain fall or melted snow in the past 24 hours.		Weather.	Observers.
	Corrected for instrumental error and temperature.		Reduced to sea-level.					Direction.	Velocity.		Force.	Amount and kind.		Direction.					
	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0—10.	Upper. 0—10.	Lower. 0—10.	Upper. From—	Lower. From—	Inches.	Millimeters.		
Flushing	30.34	770.6	30.34	770.6	41.4	5.2	.....	WNW.	.....	.....	2	.....	.....	.....	.....	0.457	11.6	.....	
Groningen	30.21	767.2	30.26	768.6	34.7	1.5	.....	SW.	.....	.....	1	.....	.....	.....	.....	0.028	0.7	.....	
Helder	30.25	768.4	30.26	768.4	40.5	4.7	.....	WSW.	.....	.....	2	.....	.....	.....	.....	0.075	1.9	.....	
Hellevoetsluis	30.31	769.8	30.31	769.8	39.7	4.3	93	W.	.....	.....	1	.....	.....	.....	.....	0.165	4.2	.....	
Utrecht	30.27	768.8	30.32	770.0	37.9	3.3	86	W.	.....	.....	2	.....	8	.....	.....	0.067	1.7	Very cloudy	H. van der Brink.

NORWEGIAN SERIES.

[Furnished by the co-operation of Prof. H. Mohn, Director of the Royal Norwegian Meteorological Institute at Christiania.]

Bergen	29.75	755.7	29.82	757.3	33.1	0.6	89	SSE	25.7	11.5	.....	.....	10	.....	.....	0.465	11.8	Rain & snow	
Christiania	29.71	754.5	29.86	758.5	20.5	—6.4	82	NE	0	0	.....	.....	9	.....	.....	0	0	.....	
Gjæsvær	29.24	742.7	29.26	743.3	23.7	—4.6	.....	SE	.....	.....	2	.....	5	.....	.....	.....	.....	.....	
Lodingen	29.33	745.0	29.38	746.2	27.9	—2.3	79	SE	.....	.....	4	.....	8	.....	.....	0.902	22.9	.....	

PORTUGUESE SERIES.

[Furnished by the co-operation of J. C. de Brito Capello, Director of the Meteorological Observatory of the Infante Dom Luiz at Lisbon.]

Angra, Azores	39.09	764.3	39.25	768.3	59.7	15.4	85	ESE	18.6	8.03			6			0.079	2.0		Dr. J. A. Sampaio.
Campo Major	29.39	746.6	30.43	773.0	47.8	8.8	47	NNE	6.3	2.8			2			0	0		Dr. A. M. R. dos Santos.
Funchal, Madeira	30.09	764.2	30.17	765.4	62.8	17.1	62	E	9.4	4.2			10			0	0		Capt. D. A. de Cunha.
Lisbon Observatory	30.11	764.9	30.49	774.4	44.4	6.9	66	NE	12.5	5.6			0			0	0		The Staff.
Ponta Delgada, Azores	30.17	766.3	30.24	768.1	61.5	16.4	79	E	12.5	5.6			10			0.035	0.9		

RUSSIAN SERIES.

[Furnished by the co-operation of Professor H. Wild, Director of the Imperial Central Physical Observatory of Russia at St. Petersburg.]

Akmolinsk	28.80	731.6	29.98	761.5	6.8	—14.0	100	WSW	40	18			10			Bl'k	Bl'k		
Archangel	29.79	756.6	29.81	757.1	10.9	—11.7	85	ESE	13	6			10						Capt. Ssceliwerstow.
Astrakhan	30.44	773.1	30.35	771.0	35.1	1.7	94	WSW	2	1			10					Light fog	Capt. Wisganow.
Barnaul	29.54	750.3	30.07	763.8	22.1	—5.5	88	SW	2	1			10						Meteorological Obs'y.
Dorpat	29.54	750.3	29.80	756.8	32.0	0.0	85	SW	13	6			9k						Observatory.
Ekaterinburg	29.26	743.2	30.33	770.3	6.3	—14.3	85	NNW	4	2		2c							Meteorological Obs'y.
Kazan	29.97	761.2	30.26	768.7	12.7	—10.7	85	SE	9	4			10						Observatory.
Kertch	30.19	766.7	30.21	767.2	46.0	7.8	92	S	4	2			4						Lagorio & Sastyrez.
Kieff	29.38	746.3	30.04	763.1	35.8	2.1	100	NNW	7	3			10n					Foggy	Observatory.
Krotkowo, N. 53° 47', E. 48° 34'.																			Cand. Eatjanow.
Lugan	29.92	760.0	30.13	765.4	33.6	0.9	82	ESE	2	1			10						Meteorological Obs'y.
Moscow	29.30	744.2	29.88	758.9	34.9	1.6	89	SSW	7.8	3.5			10s						Meteorological Obs'y.
Nertchinsk	28.00	711.2	30.69	779.6	—21.1	—29.5	87						0						Meteorological Obs'y.
Nikolaiev	30.01	762.3	30.08	764.1	45.0	7.2	99	S	9	4			10m						1st Lieut. Kurdakov.
Nikolaievsk, on the Amoor.	29.69	754.0	29.77	756.2	—13.4	—25.2	75	Calm	0	0			0						Lieut. Iwanow.
Nukuss	30.29	769.3	30.54	775.6	35.2	1.8	75	WSW	4	2		8ck							Dr. Dobrochotow.
Pekin, China	30.39	771.8	30.53	775.4	20.5	—6.4	43	Calm	0	0			0						Physical Observatory.
St. Petersburg	29.72	754.8	29.73	755.2	30.6	—0.8	77	WSW	13	6			9kn					Light cl'ds	Central Physical Obs'y.
Tashkend, Laboratory	28.79	731.2	30.45	773.5	33.4	0.8	85	Calm	0	0			10						Teich, A. M.
Tiflis	28.87	733.3	30.34	770.5	44.4	6.9	50	N	2	1			0						Physical Observatory.
Warsaw	29.80	756.8	30.24	768.1	30.4	—0.9	92	WNW	4	2			10ks						Astronomical Obs'y.
Wilna	29.65	753.2	30.09	764.3	34.3	1.3	76	W	7	3			1						Berg, Assistant.
Yeniseisk	29.91	759.6	30.22	767.6	7.9	—13.4	90	SE	2	1			10						M. O. Marks, Phot.

Bulletin of international meteorological observations, taken simultaneously on January 1, 1881—Continued.

SCOTTISH SERIES.

[Furnished by the co-operation of Alexander Buchan, M. A., F. R. S. E., Secretary of the Scottish Meteorological Society at Edinburgh, and the respective observers.]

Stations.	Barometer.				Temperature of the air.		Relative humidity.	Wind.				Clouds.				Rainfall or melted snow in the past 24 hours.		Weather.	Observers.
	Corrected for instrumental error and temperature.		Reduced to sea-level.					Direction.	Velocity.		Force.	Amount and kind.		Direction.					
												Upper.	Lower.	Upper.	Lower.				
	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Miles per second.	0—10	0—10.	0—10.	From—	From—	Inches.	Millimeters.		
Leith, Restalrig Park	.....	.....	30.09	764.3	44.8	7.1	92	W	.....	.....	6	.....	10s	.....	.....	0	0	Overcast	Andrew Gibb.
Monach Lt.-House, Hebrides.	.....	.....	30.01	762.2	50	10.0	93	WSW	.....	.....	4	.....	10	.....	.....	0.4	10	.....	J. Youngclause.
North Unst, Shetland Islands.	.....	.....	29.70	754.4	.....	.....	.....	W	.....	.....	7	.....	10	.....	.....	Bl'k	Bl'k	.....	Robert Burnet.

SPANISH SERIES.

[Furnished by the co-operation of Antonio Aguilar, Director of the Royal Observatory at Madrid, and the respective observers.]

Barcelona, Met. Obs'y	30.07	763.7	30.18	766.5	49.3	9.6	44	NNW	1.6	0.7	.....	.....	1ks	.....	.....	0	0	Clear	Antonio Rave, Director.
Bilbao, Met. Obs'y	30.47	773.8	30.52	775.3	42.4	5.8	94	SE	2.6	1.17	.....	.....	10	.....	.....	0.575	14.6	Raining	Prof. Manuel de Naveran.
Burgos, Met. Obs'y	27.42	696.5	.....	.....	35.6	2.0	82	N	5.0	2.24	.....	.....	3	.....	.....	0.059	1.5	Cloudy	Domingo Mantiny Perez.
Madrid, Royal Obs'y	28.12	714.2	30.45	773.5	41.4	5.2	57	N	20.4	9.1	.....	0	4	.....	.....	0	0	Cloudy	The Staff.
Murcia, Met. Obs'y	30.17	766.2	30.32	770.1	51.3	10.7	66	WNW	5.6	2.5	.....	2	3	SW	.....	0	0	Clouds	Olayo Diaz, Director.
Santiago, Met. Obs'y	29.60	751.7	30.53	775.4	44.8	7.1	76	NE	8.1	3.6	.....	.....	2	.....	.....	0.008	0.2	Light cl'ds	R. Gil Villanueva, Dir.
SUBSERIES.																			
Havana, Cuba, W. I	29.97	761.2	30.04	762.9	67.2	19.6	94	SE	1.8	0.8	.....	1c	0	SW	.....	0.012	0.3	Fair	Benito Vines, S. J.
Manilla, Philippine Islands.	29.90	759.5	29.95	760.8	78.9	26.1	70	ESE	0	0	.....	.....	8kn	.....	E	0	0	Covered	Federico Faura, S. J.

San Fernando, Naval Obs'y.	*30.23*	*767.8*	*30.33*	*770.4*	*54.1*	*12.3*	*47*	*NE*	*9.4*	*4.2*	.....	*0*	*2*	.....	*NE*	*0*	*0*	.....	Capt. C. Pujazon, R. N., Dir.
San Juan de Porto Rico, W. I.	*30.02*	*762.6*	*30.11*	*764.9*	*74.1*	*23.4*	*95*	*SE*	*10.6*	*4.76*	.....	*3k*	*≈ 4kn*	*SE*	*SE*	*0.148*	*3.75*	*Cloudy*	Enrique Gadoa, Chief Engineer.

SWEDISH SERIES.

[Furnished by the co-operation of Prof. R. Rubenson, Director of the Royal Swedish Meteorological Institute, and of Prof. H. H. Hildebrandsson, Director of the Meteorological Observatory of the Upsala University.]

Haparanda	29.48	748.9	29.52	749.9	20.5	—6.4	95	NE	.....	.....	2	.....	10	.....	.....	0.079	2.0	.....	
Umea	29.50	749.2	29.55	750.5	19.0	—7.2	100	Calm	.....	.....	0	.....	8	.....	.....	0.083	2.1	.....	
Hernosand	29.56	750.9	29.61	752.2	31.5	—0.3	79	WNW	.....	.....	2	.....	5	.....	.....	0.031	0.8	.....	
Stockholm	29.64	752.9	29.82	757.4	29.1	—1.6	94	NW	.....	.....	4	.....	8	.....	.....	0	0	.....	
Wisby	29.82	757.3	29.87	758.8	35.2	1.8	82	WNW	.....	.....	4	.....	5	.....	.....	0	0	.....	
SUB-SERIES.																			
Upsala	29.71	754.5	29.79	756.7	27.0	—2.8	73	W	8.3	3.7	.....	.....	4	N	.....	0.004	0.10	.....	Nils Ekholm.

SWISS SERIES.

[Furnished by the co-operation of Prof. Rob. Billwiller, Director of the Central Meteorological Observatory of Switzerland, and Prof. E. Plantamour, Director of the Observatory at Geneva.]

Geneva	28.87	733.3	30.35	770.8	36.5	2.5	69	N	.....	.....	3	.....	1	.....	.....	0.035	0.9	Clear	The Observatory.
Zurich	28.66	728.0	30.37	771.4	33.1	0.6	83	W	.....	.....	1	.....	9	.....	.....	0.028	0.7	Snowing	The Observatory.

At Geneva the corresponding departures from the normal values are: Bar. +5.6 mm.; Ther. +1°.0 cent.; Hum. —11 per cent.

TURKISH SERIES.

Furnished by the co-operation of A. Coumbary, Effendi, Director of the Central Observatory at Constantinople, and of Prof. C. V. A. van Dyck, Superintendent of the Lee Observatory at Beirut.]

Constantinople	.....	.....	30.19	766.7	57.7	14.3	65	SW	12	5.5	.....	.....	7	.....	SW	0	0	.....	The Observatory.
Valona	.....	.....	30.03	762.8	64.8	18.2	.....	S	.....	.....	2	.....	5	.....	.....	0	0	Cloudy	A. Bertrand.
SUB-SERIES.																			
Beirut, Lee Obs'y, Syria	.....	.....	30.25	768.3	61.9	16.6	62	NW	.....	.....	2	.....	1k	.....	.....	0	0	.....	Prof. C. V. A. van Dyck.

Bulletin of international meteorological observations, taken simultaneously on January 1, 1881—Continued.

UNITED STATES SERIES.

(By authority of the Secretary of War.)

[Furnished by the co-operation of W. B. Hazen, Brigadier and Brevet Major-General, Chief Signal Officer, U. S. Army.]

Stations.	Barometer.				Temperature of the air.		Relative humidity.	Wind.				Clouds.				Rainfall or melted snow in the past 24 hours.		Weather.	Observers.
	Corrected for instrumental error and temperature.		Reduced to sea-level.					Direction.	Velocity.		Force.	Amount and kind.		Direction.					
	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Miles per second.	0–10.	Upper. 0–10.	Lower. 0–10.	Upper. From—	Lower. From—	Inches.	Millimeters.		
Albany, N. Y.	30.29	769.4	30.38	771.6	—5	—20.6	100	S	2	0.9	.....	0	Fog	.....	Calm	0	0	Clear	
Alpena, Mich.	29.43	747.5	30.13	765.3	9	—12.8	78	SW	11	4.9	.....	.....	10s	.....	Calm	0	0	Cloudy	
Atlanta, Ga.	28.99	736.3	30.22	767.6	22	—5.6	72	N	6	2.7	.....	Haze	10s	.....	Calm	0	0	Cloudy	
Atlantic City, N. J.	30.40	772.1	30.42	772.7	3	—16.1	72	W	2	0.9	.....	.....	0	.....	Calm	0	0	Clear	
Augusta, Ga.	30.04	763.0	30.26	768.6	29	—1.7	67	NE	5	2.2	.....	Haze	10s	.....	Calm	0	0	Threaten'g.	
Baltimore, Md.	30.38	771.6	30.44	773.2	—2	—18.9	67	W	2	0.9	.....	0	Haze	Calm	Calm	0	0	Hazy	
Barnegat, N. J.	30.40	772.1	30.42	772.7	5	—15.0	87	NW	5	2.2	.....	.....	0	.....	.....	0	0	Clear	
Bismarck, Dak.	27.83	706.9	29.69	754.1	12	—11.1	80	E	2	0.9	.....	.....	10s	.....	Calm	0	0	Cloudy	
Boise City, Idaho	27.35	694.7	30.31	769.9	28	—2.2	83	NW	4	1.8	.....	0	10s	.....	Calm	0.15	3.8	Cloudy	
Boston, Mass.	30.11	764.8	30.28	769.1	0	—17.8	70	W	10	4.5	.....	0	0	.....	.....	0	0	Clear	
Bracketville, Tex.	28.98	736.1	30.12	765.0	20	—6.7	85	Calm	0	0	.....	0	0	.....	.....	0	0	Clear	
Brownsville, Tex.	28.25	717.5	30.30	769.6	21	—6.1	86	Calm	0	0	.....	0	0	.....	.....	0.19	4.8	Clear	
Buffalo, N. Y.	29.52	749.8	30.31	769.9	1	—17.2	71	SW	9	4.0	.....	0	8s	.....	SW	0.03	0.8	Fair	
Burlington, Vt.	30.00	762.0	30.32	770.1	1	—17.2	71	S	11	4.9	.....	Haze	0	.....	.....	0	0	Clear	
Cairo, Ill.	29.91	759.7	30.34	770.6	15	—9.4	82	Calm	0	0	.....	0	Fog	Calm	Calm	0	0	Clear	
Campo, Cal.	27.42	696.5	29.99	761.7	29	—1.7	89	E	3	1.3	.....	0	0	.....	.....	0	0	Clear	
Camp Thomas, Ariz.	27.26	692.4	.....	.....	23	—5.0	86	Calm	.....	.....	0	.....	5s	.....	Calm	0	0	Fair	
Cape Henry, Va.	30.36	771.1	30.37	771.4	26	—3.3	75	N	6	2.7	.....	2c	10s	.....	NW	0	0	Cloudy	
Cape May, N. J.	30.37	771.4	30.44	773.2	8	—13.3	78	N	4	1.8	.....	0	0	Calm	.....	0	0	Fair	
Castroville, Tex.	29.41	747.0	30.18	766.6	18	—7.8	53	NW	2	0.9	.....	.....	0	.....	.....	0	0	Clear	
Cedar Keys, Fla.	29.98	761.5	30.00	762.0	38	3.3	100	N	19	8.5	.....	0	10s	.....	NE	0.86	21.8	Cloudy	
Champaign, Ill.	29.29	744.0	30.18	766.6	3	—16.1	73	S	8	3.6	.....	.....	0	.....	.....	0	0	Clear	

Charleston, S. C	*30.18*	*766.6*	*30.24*	*768.1*	*33*	*0.6*	*79*	*N*	*9*	*4.0*			10n		Calm	*0.14*	*3.6*	Light rain
Charlotte, N. C	*29.38*	*746.2*	*30.27*	*768.8*	*16*	*—8.9*	*83*	*NE*	*6*	*2.7*		5cs	10s		Calm	0	0	Cloudy
Chattanooga, Tenn	*29.42*	*747.3*	*30.30*	*769.6*	*13*	*—10.6*	*81*	*N*	*2*	*0.9*			Sm'e	SW	Calm	0	0	Fair
Cheyenne, Wyo	*23.77*	*603.8*	*29.71*	*754.6*	*28*	*—2.2*	*88*	*NW*	*14*	*6.3*		0	10n		Calm	Inap	Inap	Light snow
Chicago, Ill	*29.39*	*746.5*	*30.14*	*765.5*	*10*	*—12.2*	*18*	*SW*	*6*	*2.7*		10cs	0			0	0	Clear
Chincoteague, Va	30.38	771.6	30.40	772.1	14	—10.0	82	N	8	3.6		0	0	S		0	0	Cloudy
Cincinnati, Ohio	29.64	752.8	30.38	771.6	2	—16.7	72	SE	4	1.8		0	Fog		Calm	Inap	Inap	Clear
Cleveland, Ohio	29.63	750.0	30.35	770.9	2	—16.7	86	S	7	3.1		0	0			0	0	Clear
Coleman City, Tex	28.27	718.0	30.09	764.3	15	—9.4	65	SW	6	2.7		0	0			0	0	Clear
Columbus, Ohio	29.42	747.3	30.37	771.4	0	—17.8	70	S	4	1.8		5c	0			0	0	Clear
Concho, Tex	28.08	713.2	29.88	758.9	20	—6.7	85	SW	2	0.9		0	0	Calm		0	0	Fair
Corsicana, Tex	29.78	756.4	30.28	769.1	24	—4.4	61	S	2	0.9		0	0			0	0	Clear
Davenport, Iowa	29.41	747.0	30.11	764.8	8	—13.3	78	Calm	0	0			0			0	0	Clear
Dayton, Wash	28.50	723.9	30.22	767.6	32	0.0	100	SW	6	2.7		0	10s		Calm	0.29	7.4	Cloudy
Deadwood, Dak	25.04	636.0			34	1.1	70	SW	4	1.8		0	0			0.05	1.3	Clear
Decatur, Tex	28.94	735.1	30.20	767.1	24	—4.4	74	S	8	3.6		0	0			0	0	Clear
Delaware Breakwater, Del.	30.39	771.9	30.41	772.4	15	—9.4	82	W	3	1.3		0	5ks		SW	0	0	Fair
Denison, Tex	29.36	745.7	30.21	767.3	21	—6.1	86	SW	5	2.2			0			0	0	Clear
Denver, Colo	24.51	622.5	29.73	755.1	37	2.8	53	W	8	3.6		0	10s		Calm	0	0	Cloudy
Des Moines, Iowa	29.07	738.4	30.04	763.0	5	—15.0	75	Calm	0	0		0	0			0	0	Clear
Detroit, Mich	29.53	750.0	30.28	769.1	4	—15.6	74	SW	3	1.3		0	0			0	0	Clear
Dodge City, Kans	27.19	690.6	29.66	753.4	6	—14.4	52	SW	2	0.9		0	0			0	0	Clear
Dubuque, Iowa	29.34	745.2	30.14	765.5	—7	—21.7	59	Calm	0	0		0	Fog		Calm	0	0	Fair
Duluth, Minn	29.22	742.2	29.98	761.5	—6	—21.1	100	SW	1	0.4		0	0			0	0	Clear
Eagle Pass, Tex	29.43	747.5	30.23	767.8	21	—6.1	86	NE	1	0.4			0			0	0	Clear
Eagle Rock, Tex	25.22	640.6	29.87	758.7	21	—6.1	86	Calm	0	0			10s		Calm	0.49	12.4	Cloudy
Eastport, Me	30.06	763.5	30.14	765.5	8	—13.3	78	W	4	1.8		0	10s		W	0	0	Cloudy
Edinburgh, Tex					23	—5.0	60	N			1	0	8ks		Calm	0.03	0.8	Fair
El Paso, Tex	26.21	665.7			10	—12.2	58	Calm	0	0		0	1s		Calm	0	0	Clear
Erie, Pa	29.52	749.8	30.32	770.1	4	—15.6	86	S	11	4.9			Haze		Calm	0	0	Clear
Escanaba, Mich	29.37	746.0	30.09	764.3	5	—15.0	75	S	2	0.9		10k	10s		Calm	0	0	Cloudy
Florence, Ariz	28.48	723.4	30.08	764.0	35	1.7	61	NE	2	0.9		0	0	W		0	0	Cloudy
Fort Apache, N. Mex	24.93	633.2	30.38	771.6	22	—5.6	58	SE	1	0.4			2s		Calm	0	0	Fair
Fort Assinaboine, Mont	27.09	688.1			25	—3.9	75	SW	5	2.2		0	10s		Calm	Inap	Inap	Cloudy
Fort Bennett, Dak	28.06	712.7	29.54	750.3	11	—11.7	80	Calm	0	0			0			0	0	Clear
Fort Benton, Mont	27.16	689.8			26	—3.3	100	W	4	1.8			10n		Calm	0.04	1.0	Light snow
Fort Buford, Dak	27.78	705.6			15	—9.4	100	W	5	2.2			10n		Calm	0.18	4.6	Light snow
Fort Custer, Mont	26.81	681.0			27	—2.8	100	N	4	1.8		0	10n		Calm	0.01	0.3	Light snow
Fort Davis, Tex	25.04	636.0	30.00	762.0	20	—6.7	85	W	8	3.6		0	5s		Calm	0	0	Fair
Fort Elliott, Tex	27.12	688.8	29.57	751.1	11	—11.7	20	N	4	1.8		0	0			0	0	Clear
Fort Gibson, Ind. T	29.58	751.3	30.17	766.3	18	—7.8	68	SE	4	1.8		2cs	0			0	0	Clear
Fort Grant, Ariz	25.10	637 5	29.90	759.4	29	—1.7	56	NE	3	1.3		0	0	Calm		0	0	Clear
Fort Griffin, Tex	28.79	731.3	30.17	766.3	18	—7.8	68	Calm	0	0			0			0	0	Clear
Fort Keogh, Mont	27.31	693.7			28	—2.2	78	N	15	6.7			10s		Calm	0.04	1.0	Cloudy
Fort Macon, N. C																		
Fort Missoula, Mont	26.74	679.2			22	—5.6	86	Calm	0	0			10n		Calm	0.41	10.4	Heavy snow
Fort McKavett, Tex	27.75	704.8	29.81	757.2	20	—6.7	70	SW	7	3.1		0	0			Inap	Inap	Clear
Fort Shaw, Mont	26.33	668.3			27	—2.8	100	W	4	1.8			10n		Calm	0.12	3.0	Light snow
Fort Sill, Ind. T	28.78	731.0	29.98	761.5	14	—10.0	82	Calm	0	0		0	0			0	0	Clear
Fort Stevenson, Dak	27.71	703.8			11	—11.7	60	W	4	1.8			10ks		W	0	0	Cloudy
Fort Verde, Ariz					27	—2.8	76	NW			1	5cs	0	W		0	0	Fair
Fredericksburgh, Tex	28.87	720.6	30.06	763.5	21	—6.1	71	Calm	0	0		0	0			0	0	Clear

Bulletin of international meteorological observations, taken simultaneously on January 1, 1881—Continued.

UNITED STATES SERIES—Continued.

Station.	Barometer.				Temperature of the air.		Relative humidity.	Wind.				Clouds.				Rainfall or melted snow in the past 24 hours.		Weather.	Observers.
	Corrected for instrumental error and temperature.		Reduced to sea-level.					Direction.	Velocity.		Force.	Amount.		Direction.					
	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0—10.	Upper. 0—10.	Lower. 0—10.	Upper. From—	Lower. From—	Inches.	Millimeters.		
Galveston, Tex	30.23	767.8	30.27	768.8	32	0.0	79	NW	4	1.8	.....	Haze	0	Calm	.....	0	0	Clear	
Grand Haven, Mich	29.44	747.8	30.14	765.5	16	—8.9	66	SE	6	2.7	.....	10k	0	S	.....	0.19	4.8	Cloudy	
Hatteras, N. C	30.27	768.8	30.29	769.4	32	0.0	79	N	24	10.7	.....	.....	10s	.....	Calm	0.04	1.0	Cloudy	
Helena, Mont	25.69	652.5	.....	.....	26	—3.3	100	SW	1	0.4	.....	.....	10m	.....	Calm	0.06	1.5	Heavy snow	
Henrietta, Tex	29.10	739.1	30.12	765.0	18	—7.8	68	S	6	2.7	.....	0	0	.....	.....	0	0	Clear	
Indianapolis, Ind	29.37	746.0	30.25	768.3	4	—15.6	74	SE	5	2.2	.....	0	Sm'e	.....	Calm	0	0	Clear	
Indianola, Tex	30.29	769.4	30.32	770.1	22	—5.6	72	NW	6	2.7	.....	0	0	.....	.....	Inap	Inap	Clear	
Jacksborough, Tex	28.94	735.1	30.18	766.6	20	—6.7	85	S	3	1.3	.....	0	0	.....	.....	0	0	Clear	
Jacksonville, Fla	30.09	764.3	30.14	765.5	39	3.9	91	NW	8	3.6	.....	.....	10n	.....	Calm	0.09	2.3	Light rain	
Keokuk, Iowa	29.39	746.5	30.10	764.5	16	—8.9	66	SW	3	1.3	.....	0	0	.....	.....	0	0	Clear	
Key West, Fla	30.02	762.5	30.05	763.3	72	22.2	90	S	11	4.9	.....	5k	0	SW	.....	0.01	0.3	Fair	
Kitty Hawk, N. C	30.31	769.9	30.34	770.6	29	—1.7	78	NE	28	12.5	.....	5k	0	W	.....	0	0	Fair	
Knoxville, Tenn	29.24	742.7	30.36	771.1	12	—11.1	80	NE	7	3.1	.....	5cs	0	SW	.....	0	0	Fair	
La Crosse, Wis	29.24	742.7	30.08	764.0	—6	—21.1	61	S	5	2.2	.....	0	0	.....	.....	0	0	Clear	
La Mesilla N. Mex	26.07	662.2	30.22	767.6	14	—10.0	82	Calm	0	0	.....	0	0	.....	.....	0	0	Clear	
Laredo, Tex	29.81	757.2	30.18	766.6	23	—5.0	86	Calm	0	0	.....	0	0	.....	.....	0	0	Clear	
Leavenworth, Kans	29.14	740.1	30.05	763.3	16	—8.9	66	S	3	1.3	.....	0	0	.....	.....	0	0	Clear	
Lewiston, Idaho	29.42	747.3	30.10	764.5	33	0.6	79	SW	1	0.4	.....	.....	10s	.....	Calm	0.80	20.3	Cloudy	
Little Rock, Ark	29.92	760.0	30.27	768.8	23	—5.0	73	S	1	0.4	.....	2ck	5ks	W	W	0	0	Fair	
Los Angeles, Cal	29.70	754.4	30.05	763.3	45	7.2	76	NE	4	1.8	.....	0	0	.....	.....	0	0	Clear	
Louisville, Ky	29.69	754.1	30.31	769.9	8	—13.3	55	SE	3	1.3	.....	0	Sm'e	.....	Calm	0	0	Clear	
Lynchburgh, Va	29.64	752.8	30.42	772.7	2	—16.7	72	E	1	0.4	.....	.....	10s	.....	Calm	0	0	Cloudy	
Madison, Wis	29.01	736.8	30.11	764.8	—1	—18.3	68	S	4	1.8	.....	0	0	.....	.....	0	0	Clear	
Marquette, Mich	29.26	743.2	30.03	762.7	11	—11.7	60	SW	4	1.8	.....	.....	10s	.....	Calm	0	0	Cloudy	
Mason, Tex	28.48	723.4	30.41	772.4	20	—6.7	85	W	3	1.3	.....	0	0	.....	.....	0	0	Clear	
Memphis, Tenn	29.92	760.0	30.29	769.4	22	—5.6	72	SE	2	0.9	.....	0	5s	.....	Calm	0	0	Fair	
Milwaukee, Wis	29.33	745.0	30.13	765.3	5	—15.0	75	SW	4	1.8	.....	0	0	.....	.....	0	0	Clear	

Mobile, Ala	30.16	766.1	30.24	768.1	28	−2.2	100	N.	11	4.9		0	10n		Calm	0.12	3.0	Heavy sleet.
Montgomery, Ala	29.98	761.5	30.23	767.8	27	−2.8	88	N.	6	2.7			10s		Calm	0	0	Cloudy
Morgantown, W. Va	29.33	745.0	30.46	773.7	0	−17.8	70	Calm.	0	0			Haze			0	0	Clear
Moorhead, Minn	28.79	731.3	29.83	757.7	0	−17.8	70	S.	8	3.6		0	0			0	0	Clear
Mount Washington, N. H	23.34	592.8	29.70	754.4	−17	−27.2	68	NW.	46	20.6		0	2s		NW.	0	0	Clear
Nashville, Tenn	29.75	755.6	30.34	770.6	16	−8.9	83	W.	1	0.4		5cs	0	Calm	W.	0	0	Fair
New Haven, Conn	30.25	768.3	30.38	771.6	−3	−19.4	66	W.	4	1.8		0	0			0	0	Clear
New London, Conn	30.29	769.4	30.35	770.9	2	−16.7	72	NW.	5	2.2		0	0			0	0	Clear
New Orleans, La	30.17	766.3	30.23	767.8	34	1.1	70	N.	7	3.1		5c	0	SW.		0.01	0.3	Fair
Newport, R. I	30.26	768.6	30.31	769.9	8	−13.3	78	W.	18	8.0		0				0	0	Clear
New River, N. C																		
New Shoreham, R. I	30.31	769.9	30.34	770.6	11	−11.7	60	NW.	18	8.0		0	Haze		Calm	0.09	2.3	Clear
New York, N. Y	30.21	767.3	30.41	772.4	5	−15.0	75	W.	2	0.9		0	Fog.		Calm	0	0	Clear
Norfolk, Va	30.31	769.9	30.37	771.4	22	−5.6	72	N.	4	1.8			10ssm		N Cm	0	0	Cloudy
North Platte, Nebr	26.79	685.5	30.50	774.7	14	−10.0	82	NW.	3	1.3			10s		Calm	0	0	Cloudy
Olympia, Wash	30.27	768.8	30.31	769.9	41.0	5.0	96	SE.	1	0.4		0	5s		Calm	0.40	10.4	Fair
Omaha, Nebr	28.74	730.0	29.93	760.2	8	−13.3	78	S.	6	2.7		0	0			0	0	Clear
Oswego, N. Y	29.93	760.2	30.28	769.1	9	−12.8	68	SW.	10	4.5		Haze	2s		W.	0	0	Fair
Pensacola, Fla	30.21	767.3	30.24	768.1	31	−0.6	89	NW.	8	3.6			10n		Calm	0.02	0.5	Light sleet
Philadelphia, Pa	30.38	771.6	30.43	772.9	10	−12.2	79	Calm.	0	0			Fog.		Calm	0	0	Dense fog
Phœnix, Ariz	28.90	734.0	30.82	782.8	30	−1.1	57	E.	1	0.4		2c	0	E.		0	0	Fair
Pike's Peak, Colo	17.38	441.4	29.59	751.6	1	−17.2	71	NW.	24	10.7		0	0			0.14	3.6	Clear
Pilot Point, Tex																		
Pioche, Nev	23.97	608.8	29.74	755.4	31	−0.6	69	N.	7	3.1		0	0			0	0	Clear
Pittsburgh, Pa	29.50	749.3	30.40	772.1	7	−13.9	77	SW.	5	2.2		0	0			Inap.	Inap.	Clear
Port Huron, Mich	29.48	748.8	30.22	767.6	7	−13.9	77	S.	16	7.2			10s		Calm	0	0	Cloudy
Portland, Me	30.14	765.5	30.20	767.1	4	−15.6	48	W.	9	4.0		0	2s		Calm	0	0	Clear
Portland, Oreg	30.30	769.6	30.38	771.6	37	2.8	100	Calm.	0	0			Fog.		Calm	0.01	0.3	Dense fog
Portsmouth, N. C					30.0	−1.1	78	NE.	25	11.7			10n		NE.	0.01	0.3	Sleeting
Prescott, Ariz	24.69	627.1	30.05	763.3	26	−3.3	75	SW.	1	0.4		0	0			0	0	Clear
Punta Rassa, Fla	29.98	761.5	30.00	762.0	57	13.9	94	NE.	9	4.0		8cs	1ks	S.	S.	1.59	39.9	Cloudy
Red Bluff, Cal	29.90	759.4	30.26	768.6	44.0	6.7	92	N.	5	2.2		0	0			0	0	Clear
Rio Grande City, Tex	30.08	764.0	30.33	770.4	20	−6.7	85	Calm.	0	0		0	0			0.04	1.0	Clear
Rochester, N. Y	29.62	752.3	30.31	769.9	1	−17.2	71	SW.	3	1.3		0	2s		Calm	0	0	Clear
Roseburg, Oreg	29.83	757.7	30.42	772.7	44	6.7	96	Calm.	0	0		0	5s		Calm	0	0	Fair
Sacramento, Cal	30.13	765.3	30.21	767.3	48	8.9	93	N.	10	4.5			10s		Calm	0	0	Cloudy
Saint Louis, Mo	29.60	751.8	30.23	767.8	13	−10.6	81	S.	13	5.8		0	0			0	0	Clear
Saint Paul, Minn	29.02	737.1	29.95	760 7	−6	−21.1	81	E.	7	3.1		0	0			0	0	Clear
Salt Lake City, Utah	25.59	650.0	29.92	760.0	34	1.1	70	NW.	12	5.4			10n		Calm	0.06	1.5	Light snow
San Antonio, Tex	29.53	750.0	30.30	769.6	21	−6.1	71	Calm.	0	0		0	0			0	0	Clear
San Diego, Cal	29.99	761.7	30.06	763.5	47	8.3	70	NE.	7	3.1		0	0			0	0	Clear
Sandusky, Ohio	29.56	750.8	30.31	769.9	6	−14.4	76	S.	14	6.8			10s		Calm	0	0	Cloudy
Sandy Hook, N. J	30.36	771.1	30.40	772.1	10	−12.2	58	SW.	10	4.5		0	0			0	0	Clear
San Francisco, Cal	30.16	766.1	30.22	767.6	52	−11.1	89	N.	6	2.7			10s		Calm	0	0	Cloudy
Santa Fé, N. Mex	23.03	585.0	29.57	751.1	18	−7.8	51	N.	6	2.7		0	0			0	0	Clear
Savannah, Ga	30.12	765.0	30.22	767.6	33	0.6	95	N.	8	3.6			10n		Calm	0.23	5.8	Light rain
Shreveport, La	30.01	762.2	30.28	769.1	28	−2.2	77	Calm.	0	0			10s		Calm	0	0	Cloudy
Silver City, N. Mex	24.13	612.9	30.56	776.2	25	−3.9	62	NW.	2	0.9		0	0			0	0	Clear
Smithville, N. C	30.25	768.3	30.29	769.4	28	−2.2	100	N.	6	2.7			10n		Calm	0.22	5.6	Sleeting
Socorro, N. Mex	25.41	645.4	29.47	748.5	4	−15.6	48	NE.	2	0.9		0	0			0	0	Clear
Springfield, Ill	29.43	747.5	30.17	766.3	11	−11.7	70	S.	7	3.1		0	0			0	0	Clear
Springfield, Mass	30.22	767.6	30.36	771.1	−9	−22.8	54	Calm.	0	0		0	0			0	0	Clear
Stockton, Tex	26.88	682.7	29.88	758.9	25	−3.9	75	SW.	8	3.6		0	1s		Calm	0	0	Fair

Bulletin of international meteorological observations, taken simultaneously on January 1, 1881—Continued.

UNITED STATES SERIES—Continued.

Stations.	Barometer.				Temperature of the air.		Relative humidity.	Wind.				Clouds.				Rainfall or melted snow in the past 24 hours.		Weather.	Observer.
	Corrected for instrumental error and temperature.		Reduced to sea-level.					Direction.	Velocity.		Force.	Amount.		Direction.					
	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0—10.	Upper. 0—10.	Lower. 0—10.	Upper. From—	Lower. From—	Inches.	Millimeters.		
Saint Vincent, Minn	28.82	732.0	29.68	753.9	0	—17.8	100	S.	10	4.5	.....	0	0	.....	.....	0	0	Clear	
Thatcher's Island, Mass	30.23	767.8	30.29	769.4	5	—15.0	50	W.	14	6.3	.....	5k	0	W.	.....	0	0	Fair	
Toledo, Ohio	29.51	749.5	30.26	768.6	7	—13.9	78	SE.	7	3.1	.....	0	0	.....	.....	0	0	Clear	
Tucson, Ariz	27.53	699.2	30.08	764.0	29	—1.7	67	Calm.	0	0	.....	0	0	.....	.....	0	0	Clear	
Umatilla, Oreg	29.95	760.7	30.49	774.4	21	—6.1	93	SE.	10	4.5	.....	0	5s	.....	SE.	0.03	0.8	Fair	
Uvalde, Tex	29.27	743.4	30.19	766.8	17	—8.3	67	Calm.	0	0	.....	0	0	.....	.....	0	0	Clear	
Vicksburgh, Miss	30.02	762.5	30.30	769.6	30	—1.1	68	SE.	2	0.9	.....	.....	10s	.....	Calm	0	0	Cloudy	
Visalia, Cal	29.80	756.9	30.18	766.6	50	10.0	93	NW.	6	2.7	.....	.....	Fog.	.....	Calm	0	0	Dense fog	
Washington, D. C	30.31	769.9	30.44	773.2	—10	—23.3	54	N.	3	1.3	.....	0	Fog.	.....	Calm	0	0	Clear	
Wickenberg, Ariz	.....	.....	.....	.....	30	—1.1	68	NW.	.....	.....	1	2c	5s	Calm	Calm	0	0	Cloudy	
Wilmington, N. C	30.25	768.3	30.31	769.9	31	—0.6	79	NE.	7	3.1	.....	.....	10s	.....	Calm	0.09	2.3	Cloudy	
Winnemucca, Nev	25.76	654.3	30.12	765.0	34	1.1	70	SW.	4	1.8	.....	Haze	2ks	.....	SW.	0	0	Fair	
Wood's Holl, Mass	30.24	768.1	30.28	769.1	11	—11.7	80	NW.	24	10.7	.....	0	2s	.....	NW.	0	0	Fair	
Yankton, Dak	28.46	722.9	29.87	758.7	3	—16.1	73	Calm.	0	0	.....	0	0	.....	.....	0	0	Clear	
Yuma, Ariz	29.88	758.9	30.03	762.7	46	7.8	40	NE.	1	0.4	.....	0	0	.....	.....	0	0	Clear	
SUB-SERIES.																			
Bogota, U. S. Colombia	22.00	558.8	.....	.....	50.5	10.3	76	Calm.	0	0	.....	0	2s	.....	.....	0	0	Fair	Thomas Herran.
Havana, Cuba, W. I	30.01	762.2	30.06	763.5	70	21.1	90	Calm.	0	0	.....	4c;cs	0	Calm	.....	0.02	0.5	Fair	Charles Hasselbrink.
Jakobshavn, Greenland	28.81	731.8	28.87	733.3	16.9	—8.4	.....	S.	.....	.....	6	.....	10	.....	.....	0	0	.....	
Kingston, Jamaica, W. I	30.06	763.5	30.07	763.8	72.4	22.4	83	Calm.	0	0	.....	5cs	5s	E.	E.	0.02	0.05	.....	James Gall.
Navassa, W. I	30.00	762.0	30.08	764.0	76.5	24.7	73	NE.	11	4.9	.....	5k	5s	E.	NE.	0.04	1.0	Fair	F. M. Everett.
Paramaribo, D. Guiana, S. A.	30.02	762.5	30.02	762.5	79	26.1	87	E.	.....	.....	2	5k	5s	E.	.....	0	0	Fair	Dr. C. J. Hering.

Puerto Berrio, U. S. Colombia.	29.39	746.5	29.95	760.7	80	26.7	85	Calm.	.....	.....	0	.....	10ks s	.....	N.	0	0	Cloudy.....	Francesco J. Cisneros.
Rivas, Nicaragua	.....	.....	.....	.....	73.4	23	.....	NE.	.....	.....	2	0	7ks	.....	NE.	0	0	.....	Earl Flint.
Santiago de Cuba, W. I.....	30.08	764.0	30.11	764.8	74	23.3	81	Calm.	0	0	.....	4c	0	.....	.....	0	0	.....	Robert Mason.
St. Thomas, W. I.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	G. O. Gelfich.
Upernavik, Greenland.....	28.53	726.0	28.64	727.4	— 1.3	—18.5	.....	SE.	.....	.....	6	.....	4	.....	.....	0	0	.....	.....
York Factory, B. A.....	29.91	759.7	29.95	761.0	—26.0	—32.2	.....	W.	5	2.2	.....	0	1s	.....	W.	0	0	Fair	J. Fortescue & W. Wood.

Bulletin of international meteorological observations, taken simultaneously on January 1, 1881—Continued

BRITISH NAVAL SERIES.

[Furnished by the co-operation of the Meteorological Council, London, Robert H. Scott, Esq., F. R. S., Secretary.]

Stations and vessels.	Barometer reduced to sea-level.		Temperature of the air.		Relative humidity.	Wind.				Clouds.				Rainfall or melted snow in the past 24 hours.		Sea-swell.		Weather.	Captain or responsible officer.
						Direction.	Velocity.		Force.	Amount.		Direction.							
										Upper.	Lower.	Upper.	Lower.						
	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0—10.	0—10.	0—10.	From—	From—	Inches.	Millimeters.	Character.	Direction from—		
H. M. S. Albatross																			Capt. J. P. McClear.
H. M. S. Alert																			Comm. A. J. Errington.
H. M. S. Alexandra																			Capt. Lord Walter Kerr.
H. M. S. Antelope																			Capt. Hon. W. H. Joliffe.
H. M. S. Arab																			Comm. R. W. Stopford.
H. M. S. Bacchante																			Capt. Lord C. Scott.
H. M. S. Beacon																			Comm. G. Hand.
H. M. S. Bittern																			Comm. E. B. Pusey.
H. M. S. Blanche																			Capt. C. G. F. Knowles.
H. M. S. Boadicea																			Capt. F. W. Richards.
H. M. S. Champion																			Capt. G. R. Hope.
H. M. S. Cockatrice																			Capt. H. T. Gerfell.
H. M. S. Comus																			Capt. J. W. East.
H. M. S. Condor																			Comm. F. W. Egerton.
H. M. S. Coquette																			Lt. Comm. J. L. Barr.
H. M. S. Cruiser																			Capt. F. A. Wetherall.
H. M. S. Curacoa																			Capt. W. H. Cuming.
H. M. S. Danae																			Capt J. C. Parvis.
H. M. S. Daring																			Capt. F. J. Eliott.
H. M. S. Dido																			Capt. C. Domville.
H. M. Dock-Yard, Bermuda.																			Capt. J. Moresby.

H. M. S. Dragon																	Capt. Hulton.
H. M. S. Druid																	Capt. W. R. Kennedy.
H. M. S. Dryad																	Comm. John Hext.
H. M. S. Eclipse																	Comm. E. St. J. Garforth.
H. M. S. Egeria																	Comm. C. Johnstone.
H. M. S. Emerald																	Capt. W. H. Maxwell.
H. M. S. Encounter																	Capt. L. Ching.
H. M. S. Eurydus, Bombay, India.	29.92	760.0	79	26.1	70	NW.		2		0						Blue sky	Capt. R. D. King.
H. M. S. Falcon																	Comm. W. H. C. Selby.
H. M. S. Fantome																	Capt. W. C. Karslake.
H. M. S. Fawn																	Capt. P. Aldrich.
H. M. S. Flamingo																	Capt. R. N. Castance.
H. M. S. Flying Fish																	Capt. R. F. Hoskyn.
H. M. S. Gannet, Callao Bay, Peru.	29.98	761.5	67	19.4	89	SSE.		2		3						D. clouds	Comm. E. G. Bourke.
H. M. S. Garnet																	Capt. L. F. Jones.
H. M. S. Griffon																	Capt. T. L. H. Ward.
H. M. S. Hecla																	Capt. J. L. Way.
H. M. S. Humber																	Capt. C. C. P. Fitzgerald.
H. M. S. Inconstant																	Capt. E. H. Seymour.
H. M. S. Iris																	Capt. H. F. Cleveland.
H. M. S. Iron Duke																	Comm. R. H. Thornton.
H. M. S. Kingfisher																	Capt. W. G. Scott.
H. M. S. Lapwing																	Comm. S. Grove.
H. M. S. Lily																	Capt. C. J. Brownrigg.
H. M. S. London																	Capt. R. H. Napier.
H. M. S. Magpie, N. 26° 10′, E. 119° 55′.	30.40	772.1	46.4	8.0	80	NE.		5		10						Misty	Capt. J. F. G. Grant.
H. M. S. Malabar, N. 22° 16′, E. 37° 29′.	30.04	763.0	73	22.8	85	NW.		1		2	NW.			2	NW.	D. clouds	Capt. H. Rawson.
H. M. S. Minotaur, N. 38° 42′, W. 9° 06′.	30.44	773.2	52	11.1	76	E		3		0						Blue sky	Capt. J. G. Mead.
H. M. S. Modeste																	Capt. G. Tyron, C. B.
H. M. S. Monarch																	Capt. J. H. Corfe.
H. M. S. Moorhen																	Capt. J. A. Fisher.
H. M. S. Northampton, Bermuda, W. I.			63	17.2	72	NW.		1		5						D. clouds	Capt R. G. Kinahan.
H. M. S. Orontes																	Capt. T. G. Jones.
H. M. S. Pegasus																	Capt. F. R. Dicken.
H. M. S. Pelican																	Capt. A. C. Paget.
H. M. S. Penguin																	Capt. H. H. Grenfel.
H. M. S. Phœnix																	Capt. Hon. A. C. Littleton.
H. M. S. Rambler																	Capt. H. H. Edwards.
H. M. S. Ready																	Comm. P. H. W. Mayow.
H. M. S. Rifleman																	
H. M. S. Rocket																	

Bulletin of international meteorological observations, taken simultaneously on January 1, 1881—Continued.

BRITISH NAVAL SERIES—Continued.

Stations and vessels.	Barometer reduced to sea-level.		Temperature of the air.		Relative humidity.	Wind.				Clouds.				Rainfall or melted snow in the past 24 hours.		Sea-swell.		Weather.	Captain or responsible officer.
						Direction.	Velocity.		Force.	Amount.		Direction.							
	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0—10.	Upper. 0—10.	Lower. 0—10.	Upper. From—	Lower. From—	Inches.	Millimeters.	Character.	Direction from—		
H. M. S. Ruby																			Capt. C. E. Foot.
H. M. S. Salamis																			Capt. A. Fitz George.
H. M. S. Sea Gull																			Comm. M. Byles.
H. M. S. Serapis, N. 47° 40′, W. 8° 40′.	30.53	775.4	52	11.1	93	WNW.			4-5		10				3		WNW.	Overcast	Capt. G. P. Lewis.
H. M. S. Shannon																			Capt. J. D'Arcy.
H. M. S. Superb																			Capt. L. H. Ward.
H. M. S. Tenedos																			Capt. C. G. Fane.
H. M. S. Thetis																			Capt. P. W. Stephens.
H. M. S. Thunderer																			Capt. P. H. Colomb.
H. M. S. Triumph																			Capt. A. H. Markham.
H. M. S. Turquois																			Capt. M. B. Medlycott.
H. M. S. Tweed																			
H. M. S. Tyne																			Capt. J. E. Stokes.
H. M. S. Urgent																			Comm. W. S. Brown.
H. M. S. Wild Swan																			Capt. S. H. P. Dacres.
H. M. S. Wolverine																			Comm. J. C. Wilson, A. D. C.
H. M. S. Woodlark																			Capt. R. D. Cumming.
H. M. S. Zephyr																			Lt. Comm. G. W. Pollard.

Bulletin of international meteorological observations, taken simultaneously on January 1, 1881—Continued.

PORTUGUESE NAVAL SERIES.

[Furnished by the co-operation of J. C. de Brito Capello, Director of the Meteorological Observatory of the Infante Dom Luiz at Lisbon.]

Stations and vessels.	Barometer reduced to sea-level.		Temperature of the air.		Relative humidity.	Wind.				Clouds.				Rainfall or melted snow in the past 24 hours.		Sea-swell.		Weather.	Observers.
						Direction.	Velocity.		Force.	Amount.		Direction.							
	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0—10.	Upper: 0—10.	Lower. 0—10.	Upper: From—	Lower. From—	Inches.	Millimeters.	Character.	Direction from—		
Rio Lima: Porto Praya, Cape Verde Islands.	29.95	760.8	76.1	24.5	87	ENE.	.....	.....	2	.....	4	.....	.....	0	0	2	SE.	D. clouds.....	S. C da Silva Costa, Comd't.
Sado: Mossamedes, Benguela.	29.92	759.9	73.4	23.0	73	NW.	.....	.....	1	.....	1	.....	NW.	0	0	1	.....	Blue sky.....	G. A de Brito Capello, Comd't.
Tamega.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

UNITED STATES NAVAL SERIES.

By authority of the Secretary of the Navy.

[Furnished by the co-operation of the Navy Department, through Commodore William D. Whiting, U. S. N., Chief of Bureau of Navigation.]

Navy Yard, Pensacola, Fla.	30.41	772.4	38	3.3	90	N.	5	2.2	.....	.....	10	.....	N.	0	0	.....	.....	Cloudy	
Navy Yard, Portsmouth, N. H.	30.09	764.3	.....	.....	.....	NW.	14	6.3	.....	.....	0	.....	.....	0	0	.....	.....	Clear	
Adams: Callao, Peru.....	30.07	763.8	68	20.0	90	Calm.	.....	.....	0	.....	5	.....	SW.	.....	.....	Lóng	W.	Fair	
Alaska: *Navy Yard, Mare Island, Cal.	30.17	766.3	51	10.6	93	Calm.	.....	.....	0	.....	10	.....	.....	0	0	.....	.....	Misty.....	

Bulletin of international meterological observations, taken simultaneously on January 1, 1881—Continued.

UNITED STATES NAVAL SERIES—Continued.

Stations and vessels.	Barometer reduced to sea-level		Temperature of the air.		Relative humidity.	Wind.				Clouds.				Rainfall or melted snow in the past 24 hours.		Sea-swell.		Weather.	Observers.
						Direction.	Velocity.		Force.	Amount.		Direction.							
	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0—10.	Upper. 1—10.	Lower. 1—10.	Upper. From—	Lower. From—	Inches.	Millimeters.	Character.	Direction from—		
Alert: Hong-Kong, China	30.14	765.5	58	14.4	70	Calm.	.....	.....	0	.....	2	.....	Calm.	0	0	Sm'h	.....	Fair	
Alliance: N. 28° 00′, W. 91° 00′.	30.18	766.6	54	12.2	87	NNE.	.....	.....	2-3	.....	10	.....	NNE.	Light		Sm'h	NNE.	Cloudy	
Ashuelot: Tientsin, China.	30.55	776.0	21	—6.1	100	WNW.	.....	.....	1	.....	0	.....	.....	.....	.....	.....	.....	Clear	
Colorado: New York, N. Y.	30.38	771.6	6	—14.4	100	W.	0	0	.....	.....	0	.....	.....	0	0	.....	.....	Clear	
Constitution: N. Yard, League Island, Pa.	.....	.....	—3	—19.4	.....	Calm.	0	0	.....	.....	0	.....	.....	.....	.....	.....	.....	Dense fog	
Franklin: Off N. Yard, Norfolk, Va.	30.32	770.1	25	—3.9	.....	NNW.	8.4	3.8	.....	.....	8	.....	NW.	0	0	.....	.....	Cloudy	
Galena: N. 36° 46′ W. 41° 20′.	30.09	764.3	63	17.2	89	SW.	.....	.....	5	.....	10	.....	.....	.....	.....	Mod.	W.	Cloudy	
Independence: N. Yard, Mare Island, Cal.	30.23	767.8	52	11.1	86	Calm.	0	0	.....	.....	2	.....	WSW.	0	0	.....	.....	Clear	
Jamestown: *Sitka, Alaska.	29.98	761.5	37	2.8	90	E.	.....	.....	1	.....	8	.....	.....	0	0	Sm'h	.....	Cloudy	
Kearsarge: Curacoa, W. I.	30.01	762.2	78	25.6	82	E.	.....	.....	2	.....	2	.....	E.	.....	.....	Long	.....	Fair	
Lackawanna: †Ancon, Peru.	30.16	766.1	71	21.7	80	S.	.....	.....	1	.....	10	.....	S.	0	0	.....	.....	Cloudy	
Marion: S. 50° 28′, W. 64° 25′.	29.61	752.1	49	9.4	78	WSW.	.....	.....	5	.....	.....	.....	.....	.....	.....	Mod.	.....	Clear	
Michigan: Erie, Pa.	30.33	770.4	5	—15.0	.....	SW.	.....	.....	4	.....	0	.....	.....	.....	.....	.....	.....	Clear	
Minnesota: New York, N. Y.	30.41	772.4	5	—15.0	.....	W.	.....	.....	1	.....	0	.....	.....	.....	.....	.....	.....	Hazy	

Monocacy: Shanghai, China.	*30.56*	*776.2*	*33*	*0.6*	*90*	*NNW.*			*1*		*0*							*Clear*
New Hampshire: Port Royal, S. C.	30.17	766.3	35	1.7	100	NNE.	18	8.0			10		NNE.	0.30	7.6			Drizzling
Nepsic: Villafranca, France.	30.04	763.0	56	13.3	24	N.			3		5					Sm'h		D. Clouds
Onward: †Chimbote Bay, Peru.	29.95	760.7	70	21.1	75	S.			4		2		N.			Long	N.; W	Fair
Palos: Shanghai, China.	30.59	777.0	30	—1.1	100	NNW.			1		2							Fair
Passaic: Washington, D. C.	30.45	773.4	—14	—25.6	50	NW.			1		0							Clear
Pensacola: San Francisco, Cal.	30.22	767.6	52	11.1	93	N.			1		10							Hazy
Portsmouth: Washington, D. C.	30.23	767.8	—11	—23.9	100	Calm.			0		0							Hazy
Powhatan: New York, N. Y.	30.37	771.4	8	—13.3		N.			2		0							Hazy
Quinnebaug: Alexandria, Egypt.	30.26	768.6	64	17.8	68	NNE.			3		5		NNW.			Sm'h		Fair
Richmond: Shanghai, China.	30.54	775.7	37	2.8	70	NNE.			2		2			0	0			Clear
Saratoga: Baltimore, Md.	30.41	772.4	—2	—18.9	100	NW.			2					0	0			Foggy
Shenandoah: *Montevideo, Uruguay.	29.80	756.9	72	22.2	85	NNE.			4		10		W.			Sm'h		Cloudy
Saint Louis: League Island, Pa.	30.35	770.9	—5	—20.6	100	NW.	2	0.9			0			0	0			Foggy
Swatara: †Yokahama, Japan.	29.88	758.9	42	5.6	58	NE.			2		0					Sm'h		Blue sky
Tennessee: Barbadoes, W. I.	30.07	763.8	83	28.3	70	ENE.	18	8.0			8		ENE.	0.005	0.13	Sm'h		Cloudy
Trenton: *Villafranca, France.	30.02	762.5	64	17.8	25	N.			3		5			0	0			Fair
Vandalia: Navy Yard, New York.	30.41	772.4	10	—12.2	79	W.			1		0							Clear
Wabash: Boston, Mass.	30.28	769.1	1	—17.2	100	W.	10	4.5			0			0	0			Clear
Waehusetts: Panama, Panama.	29.57	751.1	76	24.4	91	NW.			.2		5		N.	0	0			Fair
Wyoming: Naples, Italy.	29.99	761.7	55	12.8	74	NE.			1		10		NNE.			Sm'h		Showery

Bulletin of international meteorological observations, taken simultaneously on January 1, 1881—Continued.

BRITISH MERCHANT-MARINE SERIES.

[Furnished by the co-operation of the British Meteorological Office, and the owners of the respective lines and vessels.]

Lines and vessels.	Barometer reduced to sea-level.		Temperature of the air.		Relative humidity.	Wind.				Clouds.				Rainfall or melted snow in the past 24 hours.		Sea-swell.		Weather.	Captain or responsible officer.
						Direction.	Velocity.		Force.	Amount and kind.		Direction.				Character.	Direction from—		
	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0—10.	Upper. 0—10.	Lower. 0—10.	Upper. From—	Lower. From—	Inches.	Millimeters.				
S. S. Algeria																			Capt. W. Gill.
Barque Astarte																			Capt. G. F. Parson.
S. S. Baltic																			Capt. H. Parsell.
Ship Baroda,‡ S. 24° 26′, E. 60° 15′.	30.09	764.3	79.8	26.6	67	NW			1		3							Blue sky	Capt. C. J. Russell.
S. S. Bateshire																			Capt. John Arbuckle.
Barque Belleisle																			Capt. A. J. Brown.
Ship Blychswood																			Capt. E. Heggum.
Chin Yang,‡ N. 41° 03′, W. 14° 19′.	30.52	775.2	54.4	12.4	65	NE			5		9							Overcast	Capt. N. Youlden.
City of Agra,‡ S. 53° 58′, W. 155° 30′.	30.18	766.6	45.5	7.5	88	NNE			3		10							Overcast	Capt. T. Young.
Barque Commewyne‡																			Capt. W. Scott.
Barque Coppename, N. 45° 53′, W. 12° 36′.	30.65	778.5	51.3	10.7	63	NW			1		9							Overcast	Capt. A. Buchan.
Denbigshire																			Capt. H. Y. Murdoch.
Barque Dochra,‡ S. 22° 00′, E. 80° 20′.	30.06	763.5	76	24.4	73	ESE			5		5							D. clouds	Capt. H. Spalding.
Ship Ellen Stuart																			Capt. J. E. C. Patterson
Barque Elissa																			Capt. A. Watson.
S. S. Ethiopia‡																			Capt. A. Campbell.
S. S. Fleurs Castle																			Capt. J. Kidder.
Barque Gem																			Capt. H. Park.
S. S. Gordon Castle																			Capt. W. Waring.
Barque Harvest Home																			Capt. H. H. Williams.

Ship Iron Cross, N. 48° 18', W. 23° 20'.	30.33	770.4	55.8	13.2	96	SSW		6		7					6	S	Drizzling	Capt. W. Randall.
S. S. Kangaroo																		Capt. A. Kellett.
Kryolith																		Capt. Alex. Wilson.
S. S. Lamperts																		Capt. G. H. Jones.
Laomene																		Capt. W. P. Hughes.
Ship Lochee,‡ S. 8° 50', E. 86° 42'.	29.84	757.9	79.5	26.4	84	WSW		4		6							Showery	Capt. J. Raeburn, RNR
S. S. Lusitania																		Capt. C. A. F. Powell.
Majestic																		Capt. W. Ellery.
Barque Markland ‡																		Capt. H. W. Dyke.
Barque Mertola																		Capt. E. W. Turner.
Nairnshire																		Capt. W. Niven.
S. S. Nizam																		Capt. J. W. Brady.
Queen of Cambria																		Capt. M. Parry.
S. S. Richmond																		Capt. W. H. Stuart.
S. S. Scotia																		Capt. R. Cato.
Barque Shun Lee																		Capt. John M. Gray.
S. S. Seine																		Capt. H. Manning.
S.S. Strathleven,‡ N. 14° 30', E. 52° 50'.	29.94	760.5	76.5	24.7	82	ENE		3		7							D. clouds	Capt. C. W. Pearson.
Schooner Traveler																		Capt. A. Simpson.
S. S. Wyberton‡																		Capt. R. J. Blacklin.
ALLAN LINE.																		
A. Schumacher & Co.																		
S. S. Hibernian																		Capt. F. Archer.
S. S. Moravian																		
S. S. Peruvian																		Capt. W. H. Smith, RNR
CUNARD LINE.																		
Ch. G. Francklyn.																		
S. S. Algeria																		Capt. W. Watson.
S. S. Bothnia																		
S. S. Scythia, N. 43° 39', W. 48° 38'.	30.02	762.5	40	4.4	91	W		5		10			Hea	vy	Mod.	WN	Dull	Capt. W. H. P. Hains
WHITE STAR LINE.																		
Ismay, Imrie & Co.																		
S. S. Adriatic																		Capt. J. W. Jennings.
S. S. Britannic																		Capt. H. Perry.
S. S. Celtic																		Capt. Benj. Gleadell.
S. S. Germanic, N. 51° 42', W. 15° 22'.†	30.49	774.4	53	11.7	——	WSW		4		8		WSW	0	0	Mod.	WSW	Misty	Capt. Ch. W. Kennedy
S. S. Republic																		Capt. B. I. Irving.

Bulletin of international meteorological observations, taken simultaneously on January 1, 1881—Continued.

GERMAN MERCHANT-MARINE SERIES.

Lines and vessels.	Barometer reduced to sea-level.		Temperature of the air.		Relative humidity.	Wind.				Clouds.				Rainfall or melted snow in the past 24 hours.		Sea-swell.		Weather.	Captain or responsible officer.
						Direction.	Velocity.		Force.	Amount and kind.		Direction.							
	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0—10.	Upper. 0—10.	Lower. 0—10.	Upper. From—	Lower. From—	Inches.	Millimeters.	Character.	Direction from—		
NORTH GERMAN LLOYD—OF BREMEN. *A. Schumacher & Co.*																			Capt. C. Undütsch.
S. S. Braunschweig																			Capt. H. Maur.
S. S. Hermann, N. 48° 57′, W. 25° 35′.	30.17	766.3	55.4	13.0	.....	SW	.....	.....	6	.....	8	.....	SW	0	0	R'gh	.....	Fair	
S. S. Köln, N. 38° 32′, W. 71° 35′.	30.31	769.9	36.5	2.5	.....	WNW	.....	.....	4–5	.....	8	.....	WNW	Hail	Rain	Mod.	WNW	Cloudy	
S. S. Leipzig‡																			Capt. F. Pfeiffer.
S. S. Ohlo																			Capt. G. Meyer.

SWEDISH MERCHANT-MARINE SERIES.

Bark Adolf Fredholm,‡ S. 24°13′, W. 42° 26′‡	30.04	763.0	77	25	88	NE	.....	.....	8	.....	5	.....	.....	.....	.....	.....	.....	D. clouds	Capt. Alb'rt Fredholm
Ship Peru,‡ N. 15° 09′, W. 64° 01′.	30.04	763.0	78.6	25.9	88	NE	.....	.....	5	.....	4k	.....	.....	.....	.....	.....	.....	Squally	Capt. O. F. Sköterbrand.

UNITED STATES MERCHANT-MARINE SERIES.

[Furnished by the co-operation of the owners and agents of the respective lines and vessels.]

AMERICAN S. S. Co.																			
H. B. Welsh, President.																			
S. S. Illinois, Liverpool, England.	30.16	766.1	46	7.8	92	WSW			4		10		SW					Cloudy	Capt. J. W. Shackford.
S. S. Indiana, † N. 42° 14′, W. 63° 50′.†	30.01	762.2	31	—0.6	69	W			4		2		W	0	0	Mod.	W	Fine	Capt. R. W. Sargent.
S. S. Ohio, N. 41° 11′, W. 65° 13′.*†	30.13	765.3	41	5.0	91	NW			3		10		NW	Sn'w		Sm'll	W	Cloudy	Capt. Henry Morrison.
S. S. Pennsylvania, Philadelphia, Pa†.	30.28	769.1	2	—16.7		W			2		2		SW	0	0			Fair	Capt. Geo. H. Dodge.
CALIFORNIAN AND MEXICAN S. S. Co.																			
J. Birmingham.																			
S. S. Newburn																			Capt. W. Metzger.
OCCIDENTAL AND ORIENTAL S. S. Co.																			
Leland Stanford, Pres.																			
S. S. Belgic, N. 37° 10′, W. 163° 47′.†	29.41	747.0	58	14.4	76	SSW			6		2		SW	0	0	High	SW	Clear	Capt. L. Meyer.
S. S. Gaelic, N. 44° 57′, 173° 03′.*†	29.19	741.4	51	10.6	79	SW			4		5?		SW			Mod.	SW	Clear?	Capt. W. H. Kidley.
S. S. Oceanic, N. 25° 50′, E. 121° 47′.	30.38	771.6	55	12.8	93	N			6		10		NE	0	0	High	NE	Overcast	Capt. Metcalf.
OREGON RAILWAY AND NAVIGATION CO.																			
K. Van Olerendorp.																			
S. S. Geo. W. Elder																			Capt. J. M. Lachlan.
S. S. Columbia																			Capt. E. Polemann.
S. S. Oregon, mouth of Willamette River, Oregon.†	30.34	770.6	87.5	3.1	95	Calm			0		10							Foggy	Capt. Fred. Bolles.

Bulletin of international meteorological observations, taken simultaneously on January 1, 1881—Continued.

UNITED STATES MERCHANT-MARINE SERIES—Continued.

Lines and vessels.	Barometer reduced to sea-level.		Temperature of the air.		Relative humidity.	Wind.				Clouds.				Rainfall or melted snow in the past 24 hours.		Sea-swell.		Weather.	Captain or responsible officer.
						Direction.	Velocity.		Force.	Amount and kind.		Direction.							
										Upper.	Lower.	Upper.	Lower.						
	Inches.	Millimeters.	Fahrenheit.	Centigrade.	Per cent.	From—	Miles per hour.	Meters per second.	0-10.	0-10.	0-10.	From—	From—	Inches.	Millimeters.	Character.	Direction from—		
PACIFIC COAST S. S. Co.																			
Goodall, Perkins & Co.																			
S. S. Ancon, N. 32° 41', W. 117° 16'.†	30.02	762.5	56	13.3	81	SE	.....	.....	3	.....	2	.....	E	.....	.....	Mod.	W	Fair	Capt. E. Alexander.
S. S. Idaho	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	C. E. Lyons, 1st Officer.
S. S. Orizaba	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Capt. Chas. B. Johnson.
S. S. State of California, N. 38° 37', W. 123° 50'.†	30.23	767.8	54	12.2	93	NW	.....	.....	4	.....	2	.....	NW	.....	.....	Light	wsw	Clear	Capt. G. Debney.
S. S. Victoria, San Francisco, Cal.†	30.22	767.6	51	10.6	93	W	.....	.....	1	.....	0	.....	.....	.....	.....	.....	.....	Clear	Capt. H. M. Hayward.
PACIFIC MAIL S. S. Co.																			
J. B. Houston, Prest.																			
S. S. Alaska	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Capt. D. S. Austin.
S. S. Australia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	A. Bannerman.
S. S. City of New York	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Capt. W. B. Seabury.
S. S. City of Panama	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Capt. M. Connolly.
S. S. City of Peking	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Capt. G. G. Berry.
S. S. City of Sidney, S. 34° 03', E. 163° 49'.*†	29.58	751.3	65	18.3	84	WSW	.....	.....	6	.....	9	.....	WSW	0.125	3.18	R'gh	NW	Cloudy	Capt. H. C. Dearborn.
S. S. City of Tokio	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Capt. J. Maury.
S. S. Colima, Panama, Panama.†	29.96	761.0	76	24.4	86	NW	.....	.....	2	.....	2	.....	NW	0	0	.....	.....	Fair	Capt. R. R. Searle.

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PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

W. B. Hazen

BRIG. & BVT. MAJ. GEN'L, CHIEF SIGNAL OFFICER, U. S. A.

Data, as appearing in the International Bulletin of similar date.

Isobars in *black* exhibit atmospheric pressure at sea-level, and are charted from data as reported by the several observers.

Isotherms in *red* exhibit temperature of air, similarly charted.

Broken or dotted lines indicate that the lines so broken are doubtful.

Arrows, when charted, fly with the wind and exhibit wind-direction and force.

S. S. Dakota																		Capt. D. E. Griffiths.
S. S. Granada																		Capt. J. M. Cavarly.
S. S. Zealandia																		Capt. R. C. Ghest.
RED STAR LINE.																		
Jas. A. Wright, Prest.																		
S. S. Belgenland‡																		
S. S. Nederland																		Capt. S. Stokes.
S. S. Rhynland‡																		
S. S. Vaderland, N. 45° 10′, W. 45° 07′.‡	30.22	767.6				WSW			5		10		W	0	0	Long	wsw	Cloudy	Capt. J. C. Jannson.
MISCELLANEOUS.																		
Sch'r Abby K. Bentley																		Capt. A. Mehaffey.
Schooner Addie Fuller, Brunswick, Ga.	30.10	764.5	87	2.8	100	NNE	3	1.3			10n		NE	0.73	18.5			Rainy	Capt. J. Jorgensen.
Sch'r Annie R. Lewis																			Capt. S. S. Lewis.
Bark Carrie Heckle																			Capt. B. F. Woodbury
Brigantine George, Arrago, P. R.††	30.32	770.1	80	26.7		ENE			5		2		E	Showers		Sm'th		Squally	Capt. W. H. Champlin.
U. S. S. Fish Hawk, Navy Yard, Norfolk, Va.†	30.44	773.2	26	−3.3	63	N	1	0.4			8n			0	0			Cloudy	
Sch'r Hattie V. Kelsey																			Capt. J. L. Randall.
Ship Jumna																			Capt. Jas. S. Gawin.
Bark Sunbeam, Lisbon, Spain.‡†	30.42	772.7	48	8.9	100	NE			4		0			0	0			Clear	Capt. Jos. Hand.

Published by order of the Secretary of War.

W. B. HAZEN,
Brig. & Bvt. Maj. Gen'l, Chief Signal Officer, U. S. A.

APPENDIX No. 60

International simultaneous meteorological observations, including a monthly summary with daily bulletins and accompanying charts, for the month of January, 1881.

Monthly summary of international meteorological observations, January, 1881.

Stations.	Latitude.	Longitude.	Local time.	Altitude of barometer above sea.		Result of simultaneous observations for January, 1881.																				Average cloudiness.	Total precipitation.	
						Mean barometer.				Mean temperature.		Mean relative humidity.	Wind.															
						Actual.		Reduced.					Directions.									Total movement.							
				Feet.	Meters.	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.		N.	NW.	W.	SW.	S.	SE.	E.	NE.	C.	Miles.	Kilometer.	0–10.	Inch.	Millimeters.
ALGERIAN SERIES.	° ′	° ′																										
Mogador †	N. 31 30	W. 9 44	11.29 a.m.	56	17	.....	.....	30.03	762.8	65.8	18.8	76.6	.....	...	1	18	2	2	2	4	2	.....	.....	5	0.73	18.5
Nemours †	N. 35 06	W. 1 51	12.01 p.m.	20	6	.....	.....	29.96	761.0	64.4	18.0	75.0	5	...	8	...	6	...	9	3	...	.....	.....	2	0.94	23.9
Algiers †	N. 36 47	E. 3 04	0.20 p.m.	99	325	.....	.....	29.95	760.6	61.3	16.3	64.0	2	1	12	7	2	3	1	2	1	.....	.....	6	5.58	141.8
La Calle †	N. 36 54	E. 8 26	0.42 p.m.	36	11	.....	.....	28.98	761.4	64.0	17.8	67.2	.....	...	5	15	6	2	1	2	...	.....	.....	6	0	0
Tunis †	N. 36 47	E. 10 11	0.49 p.m.	46	14	.....	.....	29.94	760.5	.....	.....	.....	.....	...	...	...	...	...	...	...	...	.....	.....	.....	.....	.....
Sfax †	N. 34 45	E. 10 36	0.50 p.m.	?	?	.....	.....	30.06	763.5	.....	.....	.....	.....	...	...	...	...	...	...	...	...	.....	.....	.....	.....	.....
Saida †	N. 34 51	E. 0 10	0.09 p.m.	2844	867	.....	.....	30.03	762.8	60.3	15.7	61.3	1	...	10	4	4	3	6	3	...	.....	.....	2	0	0
Tebessa †	N. 35 24	E. 8 06	0.40 p.m.	2890	881	.....	.....	30.03	762.7	57.6	14.2	38.6	.....	4	17	2	5	...	...	3	...	.....	.....	5	0	0
Geriville †	N. 33 45	E. 1 10	0.13 p.m.	4285	1306	.....	.....	.....	.....	.....	.....	.....	.....	...	...	...	...	...	...	...	...	.....	.....	.....	.....	.....
Laghouat †	N. 33 48	E. 2 51	0.19 p.m.	2556	779	.....	.....	30.12	765.1	64.2	17.9	51.5	.....	3	4	8	7	3	5	1	...	.....	.....	2	0	0
Biskra †	N. 34 51	E. 5 40	0.31 p.m.	410	125	.....	.....	30.08	764.0	64.0	17.8	65.6	1	19	1	...	...	...	9	1	...	.....	.....	5	0	0
AUSTRALIAN SERIES.																												
Melbourne	S. 37 49	E. 144 58	9.47 p.m.	91	28	29.83	758.2	29.94	760.5	64.0	17.8	70.4	.....	1	4	...	7	10	8	1	...	.....	.....	5	0.74	18.8
Sub-series.																												
Hobart Town	S. 42 52	E. 147 22	9.58 p.m.	105	32	.....	.....	29.99	761.7	78.2	22.9	.....	1	7	2	6	2	11	1	1	...	.....	.....	5	0.52	13.2
AUSTRO-HUNGARIAN SERIES.																												
Agram	N. 45 47	E. 15 53	1.12 p.m.	512	156	29.48	747.4	29.99	761.8	28.6	—1.9	85.2	3	4	1	2	2	2	...	6	11	.....	.....	8	3.72	94.6

Cracow	N. 50 04	E. 20 00	1.28 p.m.	722	220	29.17	741.0	29.98	761.5	22.5	−5.3	88.5	1	5	16	6			1	2					6	0.30	7.6
Eperies	N. 48 58	E. 21 15	1.33 p.m.	820	250	29.03	737.8	29.95	760.6	23.9	−4.5	75.0	4	4			4	1		18					7	0.53	13.4
Gratz †	N. 47 05	E. 15 28	1.10 p.m.	1171	357	28.68	728.5	30.00	762.0	27.5	−2.5	73.5	2	1	3	3	16	4	1	1					4	0.19	4.9
Hermannstadt	N. 45 47	E. 24 13	1.45 p.m.	1355	412	28.47	723.2	29.99	761.7	25.3	−3.7	89.5		7	8	1	7	6	2						6	2.23	56.6
Kremsmünster	N. 48 04	E. 14 08	1.04 p.m.	1260	384	28.52	724.5	29.97	761.3	23.5	−4.7	88.4	1	1	4	1		6		2	16				5	0.38	9.6
Lemberg	N. 49 50	E. 24 00	1.44 p.m.	978	298	28.88	733.5	29.92	759.9	24.1	−4.4	77.7		15		4	8	6		3					7	0.34	8.7
Pola	N. 44 52	E. 13 51	1.03 p.m.	105	32	29.76	755.9	29.87	758.8	41.7	5.4	74.7	3	3	1		1	3	10	10					8	5.30	134.7
Szathmar	N. 47 49	E. 22 51	1.39 p.m.	430	131	29.52	749.7	29.97	761.3	28.2	−2.1	85.9	2	1	2	5	6	7	5	2	1				7	2.34	59.5
Szegedin *b*	N. 46 15	E. 20 07	1.28 p.m.	256	78	29.65	753.0	29.95	760.7	28.6	−1.9	*f*85.1	2	4	1	1	4	1	2		10				6	1.84	34.0
Trieste	N. 45 39	E. 13 46	1.04 p.m.	85	26	29.83	757.7	29.93	760.1	39.0	3.9	72.9	13			1			2		15				7	8.12	79.2
Vienna	N. 48 12	E. 16 22	1.14 p.m.	663	202	29.24	742.8	29.99	761.7	25.9	−3.4	76.4	4	2	10			10			5				6	0.86	21.9
Belgian Series.																															
Brussels	N. 50 51	E. 4 22	0.26 p.m.	187	57	29.68	753.9	29.89	759.2	30.0	−1.1	69.8		3	2	8	6		4	8	5				6	1.52	38.6
Furnes	N. 51 04	E. 2 40	0.19 p.m.	20	6																										
Maeseyck	N. 51 06	E. 5 48	0.32 p.m.	115	35	29.77	756.1	29.89	759.8	30.9	−0.6	85.8	4	1	5	7	2		8	4					7	1.02	26.9
British Series.																															
Aberdeen	N. 57 10	W. 20 6	0.00 m.	86	26	29.82	757.4	29.92	760.0	31.1	−0.5	79.3	2	7	12	2	6	1	1						7	1.84	46.7
Armagh	N. 54 21	W. 6 39	11.42 a.m.	206	63	29.68	753.9	29.93	760.2	32.8	0.4	86.5	2			13	3	4	3	6					e7		
Bidston	N. 53 24	W. 3 04	11.58 a.m.	180	85			29.91	759.7	33.1	0.6	84.1	1		3	7		9	5	6					6		
Bolton	N. 53 35	W. 2 28	11.58 a.m.	481	145	29.39	746.5	29.95	760.7	31.6	−0.2	93.0	6	2	1	4	4	6	4	4					6		
Bradford *e*	N. 53 48	W. 1 47	0.01 p.m.	362	110	29.49	749.0	29.89	759.2	32.1	0.1	81.9		3	1	4	1	10	2	5					7	0.22	5.6
Bridgetown	N. 13 04	W. 59 37	8.10 a.m.	28	9	30.00	762.0	30.03	762.7	80.3	26.8	71.7								31					4		
Cardington	N. 52 08	W. 0 27	0.06 p.m.	109	33			29.88	758.9	32.5	0.3	87.4	4	7	7	1	4		4	4					6		
Chatham	N. 51 25	E. 0 33	0.10 p.m.	120	37	29.77	756.1	29.91	759.7	33.9	1.1	85.9		4	1	3	1		2	7	5				4		
Falmouth	N. 50 09	W. 5 04	11.48 a.m.	200	61	29.63	752.6	29.86	758.4	38.9	3.8	79.5	4	1	2	1	4	4	6	9					8		
Fort Napier	S. 30 00	E. 31 00	2.12 p.m.	2200	671	27.59	700.8	29.80	756.9	a78.0	25.6	83.9			3				4	2	22				4		
Free Town	N. 8 30	W. 13 14	11.15 a.m.	224	68	29.64	752.8	29.87	758.7	85.1	29.5	80.8		5	1	10	2	7		2	4				4		
Galway	N. 53 15	W. 9 03	11.32 a.m.	25	8			29.83	757.7	35.8	1.8	86.9	12		1	4	4	3	3	4					5		
Gibraltar	N. 36 06	W. 5 21	11.47 a.m.	50	15	29.94	760.5	29.99	761.7	61.0	16.1	93.3		3	7	11	1	2	6	1					7		
Glasgow	N. 55 53	W. 4 17	11.51 a.m.	90	27	29.72	754.9	29.92	760.0	31.1	−0.5	88.4	10	1	2	3	1	1	4	9					4		
Greenwich	N. 51 29	0 00	0.08 p.m.	159	48	29.72	754.9	29.90	759.4	33.6	0.9	84.8	3	2	2	6	4	1	3	10					6		
Guernsey	N. 49 27	W. 2 41	11.58 a.m.	204	62	29.60	751.8	29.82	757.4	40.0	4.4	78.1	1	5	1	2	2	4	2	14					5		
Kew	N. 51 28	W. 0 19	0.07 p.m.	34	10	29.88	758.9	29.92	760.0	33.9	1.1	80.8	1	6	4	3	2	4	1	10					6		
Leicester	N. 52 39	W. 1 08	0.04 p.m.	245	75	29.67	753.6	29.94	760.5	32.5	0.3	90.0	3			10	2		1	14	1				8		
Malta	N. 36 00	E. 14 30	1.06 p.m.	111	34	29.84	757.9	29.91	759.7	65.1	18.4	70.0			11	4	10		3	2	1				4		
Nassau	N. 25 04	W. 77 22	6.58 a.m.	44	13			30.11	764.8	71.9	22.2	86.7	1	2		8	4	5	1	10					5		
Oscott	N. 52 28	W. 1 55	0.00 m.	483	147	29.38	746.2	29.93	760.2	31.6	−0.2	89.3	5	3	3	4	2	4	1	9					8		
Oxford	N. 51 46	W. 1 17	0.03 p.m.	232	70	29.66	753.4	29.92	760.0	32.5	0.3	*d*89.9	3	4	4	2	1	2	4	6	5				6		
Plymouth	N. 50 22	W. 4 10	11.51 a.m.	69	21	29.78	756.4	29.85	758.2	36.8	2.7	85.4	4	4		1	3	4	1	10	4				6		
Sandwick Manse	N. 59 05	W. 3 20	11.54 a.m.	94	29			29.89	759.2	34.0	1.1	96.0	5	2	5	4	3	6	3	2	1				6		
Scutari Cemetery	N. 41 00	E. 29 03	2.04 p.m.	60	18	29.87	758.7	29.94	760.5	45.3	7.4	78.0	4	2		7	2	4	3	8	1				9		
Sheffield	N. 53 23	W. 1 28	0.02 p.m.	260	79	29.62	752.3	29.92	760.0	34.3	1.8	90.3	3	4	1	3	6	1	1	8	4				7	0.22	5.6
Silloth Rectory	N. 54 52	W. 3 22	11.54 a.m.	28	9	29.90	759.4	29.93	760.2	31.4	−0.3	67.0	1		2	1	1	1	7	5	13				5	0.46	12.7
Stonyhurst	N. 53 51	W. 2 28	11.58 a.m.	863	110			29.92	760.0	32.0	0.0	81.5	8		4	3		1	3	11	1				6		
Strathfield Turgiss	N. 51 17	W. 0 53	0.04 p.m.	197	60	*g*29.70	*g*754.4	*g*29.93	*g*760.2	33.5	0.8	88.6	4	2	5	2	2	1	3	12					6		
Truro	N. 50 16	W. 5 04	11.53 a.m.	43	12					40.7	4.8	79.3	1	2	1	3	1	6	3	14					7		
Valencia	N. 51 55	W. 10 18	11.27 a.m.	20	6	29.84	757.9	29.87	758.7	40.6	4.8	77.1	5		3	1	2	4	12	4					6		

Monthly summary of international meteorological observations, January, 1881—Continued.

Stations.	Latitude.	Longitude.	Local time.	Altitude of barometer above sea.		Result of simultaneous observations for January, 1881.																		Average cloudiness.	Total precipitation.	
						Mean barometer.				Mean temperature.		Mean relative humidity.	Wind.													
						Actual.		Reduced.					Directions.									Total movement.					
				Feet.	Meters.	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.		N.	NW.	W.	SW.	S.	SE.	E.	NE.	C.	Miles.	Kilometer.	0-10.	Inch.	Millimeters.
CANADIAN SERIES.	° ′	° ′																								
Bathurst *e*	N. 47 39	W. 65 43	7.45 a.m.	4	1	29.96	761.0	30.00	762.0	— 6.3	—21.3		4	9	1	...	...	...	...	...	12			6	1.90	48.8
Charlottetown	N. 46 14	W. 63 10	7.55 a.m.	38	12	29.84	757.9	29.89	759.2	12.3	—10.9	90.4	2	5	16	1	1	1	...	2	3	4661	7509	6	7.03	179.1
Chatham	N. 47 03	W. 65 29	7.45 a.m.	50	15	29.88	758.9	29.95	760.7	3.3	—15.9	92.2	1	5	7	...	...	...	...	...	18	2427	3906	6	2.26	57.4
Chicontimi																								7	1.98	50.3
Cornwall	N. 45 01	W. 74 43	7.09 a.m.	175	53	29.89	759.2	30.11	764.8	3.4	—15.9	96.4	...	5	12	4	...	...	6	6	...	...	...	5	2.70	68.6
Dalhousie	N. 48 04	W. 66 21	7.32 a.m.	30	9	29.91	759.7	29.95	760.7	5.8	—14.6		...	1	21	1	...	...	2	...	4	...	...	8	2.50	63.5
Father Point	N. 48 31	W. 68 28	7.34 a.m.	20	6	30.00	762.0	30.03	762.7	4.8	—15.1	74.4	6	8	...	11	2	1	...	2	1	...	...	2	0.12	3.0
Fort Garry	N. 49 51	W. 97 07	5.39 a.m.	758	231	29.31	744.5	30.27	768.8	—15.4	—26.3	98.7	6	5	4	9	2	1	1	...	3	5299	8528	5	2.48	63.0
Fredericton	N. 45 57	W. 66 39	7.41 a.m.	59	18	29.95	760.7	30.02	762.5	3.8	—15.7	89.7	2	17	4	...	...	...	2	...	6	...	...	7	1.60	40.6
Granton	N. 43 12	W. 81 21	6.43 a.m.	1015	309	28.97	735.8	30.18	766.6	10.3	—12.1	87.3	2	3	7	1	2	1	...	4	11	...	...	3	3.60	91.4
Halifax	N. 44 39	W. 63 36	7.53 a.m.	122	37	29.79	756.7	29.93	760.2	17.5	— 8.1	91.3	4	14	10	...	...	...	1	...	1	1	...	7	1.60	40.6
Hamilton	N. 43 16	W. 79 53	6.49 a.m.	332	101	29.73	755.1	30.16	766.1	1.4	—17.0	87.5	...	4	1	22	...	...	...	4	...	...	...	3	3.60	91.4
Kingston	N. 44 14	W. 76 39	7.02 a.m.	335	102	29.75	755.6	30.12	765.0	7.8	—13.4	85.7	5	1	5	4	2	1	1	8	4	4103	6606	8	2.08	52.8
Little Glace Bay	N. 46 11	W. 59 58	8.08 a.m.	34	10	*b*29.70	*b*754.4	*b*29.74	*b*755.4	*a*21.4	— 5.9	*a*94.1	8	5	5	...	5	3	1	2	2			6	2.19	55.6
Montreal	N. 45 31	W. 73 33	7.13 a.m.	187	57	29.90	759.4	30.12	765.0	6.2	—14.3	83.4	1	1	10	7	3	2	3	1	2			7	3.65	92.7
Moose Factory	N. 51 16	W. 80 56	6.44 a.m.	30	9																			6	2.73	69.3
Parry Sound	N. 45 19	W. 80 01	6.48 a.m.	641	195	29.87	746.0	30.13	765.3	7.1	—13.8	78.8	3	1	2	2	1	5	14	1	2	5574	8970	9	2.70	68.6
Peterborough *c*	N. 44 17	W. 78 20	6.54 a.m.	688	210	29.32	744.7	30.13	765.3	6.1	—14.4	68.8	5	4	7	3	...	...	1	3	5			6	2.70	68.6
Port Dover	N. 42 47	W. 80 13	6.47 a.m.	635	194	29.40	746.7	30.16	766.1	12.7	—10.7	94.4	6	4	2	10	...	...	...	2	7	5144	8278	8	2.74	69.6
Port Stanley	N. 42 40	W. 81 13	6.43 a.m.	592	180	29.46	748.3	30.17	766.3	12.3	—10.9	90.8	3	3	15	3	...	2	5	...	...			8	2.00	50.8
Quebec	N. 46 48	W. 71 12	7.2 a.m.	293	89	29.74	755.4	30.10	764.5	3.3	—15.9	82.0	...	8	13	1	...	...	1	5	3	...	...	6	1.99	50.6
Rockliffe	N. 46 10	W. 77 48	6.57 a.m.	418	127	29.63	752.6	30.15	765.8	— 1.8	—18.8	81.2	...	4	5	...	...	...	5	1	...	10	3795	6107	6	1.75	44.4
Saugeen	N. 44 30	W. 80 21	6.42 a.m.	641	208	29.35	745.5	30.12	765.0	1.6	—16.9	89.7	1	2	2	7	7	2	4	5	1	8691	13986	9	3.49	88.6
St. Andrews						29.94	760.5	30.00	762.0	12.0	—11.1	82.1	6	17	2	...	1	2	1	1	1			4	2.52	64.0
St. John, N. B.	N. 45 17	W. 66 03	7.44 a.m.	150	46	29.80	756.9	29.99	761.7	12.9	—10.6	95.4	5	17	4	...	1	1	...	8	...			6	3.83	97.3
Stratford	N. 43 23	W. 81 00	6.44 a.m.	1182	360	28.71	729.2	30.15	765.8	8.5	—13.1	93.5	...	2	4	5	...	2	1	...	17			8	2.37	60.2
Sydney	N. 46 08	W. 60 10	8.07 a.m.	27	8	29.79	756.7	29.84	757.9	20.7	— 6.3	91.5	2	5	8	5	2	3	2	2	2	6956	11194	7	4.06	103.1
Toronto	N. 43 39	W. 79 23	6.50 a.m.	350	150	29.74	755.4	30.16	766.1	14.1	— 9.9	88.9	8	7	7	4	1	...	...	4	...	7034	11320	8	2.13	54.1
Windsor																										

Woodstock	N. 43 08	W. 80 47	6.48 a.m.	980	299	28.96	735.6	30.15	765.8	10.4	—12.0	94.4	3	3	7	10	1	2	1	3	1				8	3.78	96.0
Yarmouth *f*	N. 43 50	W. 66 02	7.44 a.m.	61	19	29.91	759.7	29.98	761.5	2.4	—16.4	78.5	6	9				1	1	6	2				7	2.84	72.1
Sub-series.																															
St. Johns, N. F	N. 47 34	W. 52 42	8.37 a.m.	150	46	29.80	756.9	29.94	760.5	26.6	— 3.0	100.0	2	7	3		5	7		8					4	3.91	99.3
St. Pierre	N. 46 47	W. 56 08	8.24 a.m.	?	?			29.69	754.1	25.2	— 3.8		1	11	5	1	1	5	3	4						0.85	21.6
CAPE COLONY SERIES.																															
Cape St. Francis *a*	S. 34 10	E. 24 53	1.48 p.m.	25	7	29.90	759.4			70.8	21.6	80.0			2	12	1	6	9						4	1.27	32.8
Cape Town *a*	S. 34 02	E. 18 29	1.22 p.m.	27	8	29.89	759.2	29.93	760.2	81.4	27.4	53.9		8		2	9	10	1						4	0.36	9.1
CHINESE SERIES.																															
Zi-Ka-Wei	N. 31 12	E. 121 26	8.14 p.m.	23	7	30.28	769.2	30.30	769.7	34.2	1.2	72.3	6	3	6	8		8		5					2	0.03	0.7
COSTA RICA SERIES.																															
San José	N. 9 56	W. 84 00	6.15 a.m.	3757	1145	26.21	665.7	29.93	760.2	62.4	16.9	87.0						7		24					3		
DANISH SERIES.																															
Copenhagen	N. 55 41	E. 12 36	0.58 p.m.	46	13	29.84	758.0	29.89	759.2	26.6	— 3.0	83.4	4	6	3	6	1	5	2	2	2				6		
Fanöe	N. 55 27	E. 8 24	0.42 p.m.	20	6	29.88	759.0	29.90	759.5	28.2	— 2.1	85.7	1	2		4	1	6	3	5	1				6		
Godthaab	N. 64 11	W. 51 46	8.41 a.m.	36	11	29.98	761.4	30.02	762.4	27.5	— 2.5	77.9	4	2		1	8	1	1	11	3				7		
Stykkisholm	N. 65 05	W. 22 46	10.37 a.m.	36	11	30.09	764.3	30.13	765.3	17.2	— 8.2	90.5			2	2	2	1	13	6	5				6		
Thorshavn	N. 62 02	W. 6 44	11.41 a.m.	29	9	29.84	757.9	29.87	758.8	34.3	1.3	78.9	11		4	3		1	1	8	3				8		
Vestervig	N. 56 47	E. 8 20	0.41 p.m.	82	25	29.79	756.6	29.88	759.0	27.9	— 2.3	92.5		4	3	5	2	1	4	7	5				4		
FRENCH SERIES.																															
Agen	N. 44 12	E. 0 38	0.11 p.m.	604	184	29.19	741.5	30.25	768.3	38.7	8.7	83.6	3	7	2	1	4	11	1	2					7	1.26	31.9
Alençon	N. 48 25	E. 0 06	0.09 p.m.	476	145	29.37	746.1	29.93	760.1	31.8	— 0.1	92.6	6	1	1	5	5		1	12					7	2.83	72.0
Arras *a*	N. 50 17	E. 2 47	0.19 p.m.	239	73	29.63	752.6	29.88	758.9	30.0	— 1.1	90.0	ε3	4	1	6	1	4	3	4							
Avignon	N. 43 57	E. 4 38	0.26 p.m.	65	20	29.79	756.6	29.87	758.6	40.3	4.6	75.3	26	2				2		1					5	4.62	117.3
Bar-sur-Seine	N. 48 06	E. 4 22	0.25 p.m.	517	157	29.33	744.9	29.91	759.7	33.1	0.6	78.4		2			9	5	11	4					7	2.27	57.7
Beauvais	N. 49 26	E. 2 04	0.16 p.m.	246	75	29.63	752.6	29.91	759.7	32.4	0.2	85.1	2	1	5	2	5	5	4	7					7	2.56	65.0
Besançon	N. 47 14	E. 6 01	0.32 p.m.	829	250	28.98	736.1	29.91	759.7	33.6	0.9	90.4	8	1		1	8		2	11					5	3.82	97.0
Bordeaux	N. 44 50	E. 0 32	0.06 p.m.	243	74	29.56	750.9	29.83	757.7	39.2	4.0	78.2	3	3	3	3	3	9	2	5					7	2.40	60.9
Bourges	N. 47 10	E. 2 24	0.17 p.m.	510	156	29.28	743.6	29.85	758.2	35.2	1.8	84.6	12	1	1	1	8	3		5					5	3.38	85.9
Brest	N. 48 23	W. 4 29	11.50 a.m.	213	65	29.62	752.3	29.86	758.4	40.5	4.7	72.8	8	2	1	5		5	1	8	1				5	2.84	72.2
Caen	N. 49 11	W. 0 21	0.07 p.m.	69	21	29.72	755.0	29.82	757.3	39.2	4.0	92.0	1		4	6	10	1	3	5	1				6	2.24	56.9
Châlons-sur-Marne	N. 48 57	E. 4 23	0.25 p.m.	294	90	29.58	751.2	29.92	760.0	32.7	0.4		ε	1	2	1	2	4	3	2	5	6			6	0.60	15.3
Charleville *c*	N. 49 46	E. 4 42	0.27 p.m.	476	145	29.32	744.8	29.85	758.2	32.2	0.1	85.4					5	9	6	6	2				6	1.63	41.5
Clermont-Fd	N. 45 45	E. 3 04	0.20 p.m.	1273	388	28.46	722.8	29.86	758.5	35.1	1.7	69.7	5	6			5	6	3		6				6	1.61	40.8
Cluny	N. 46 26	E. 4 39	0.27 p.m.	787	240	29.02	737.1	29.89	759.2	35.2	1.8	*g*73.6	12		2	1	8			8					5	0.11	2.7
Commercy	N. 48 45	E. 5 35	0.30 p.m.	817	249	29.03	737.3	29.93	760.1	29.5	— 1.4	*f*87.0	3		6	6	2	2	8	4						2.47	62.8
Gap	N. 44 34	E. 6 04	0.32 p.m.	2427	740	27, 28	692.9	29.89	759.1	35.1	1.7	79.1	10	1	4	4	1	3	1	7						2.81	71.4
Gréasque	N. 43 24	E. 5 37	0.31 p.m.	1056	322	28.73	729.7	29.87	758.7	42.4	5.8	71.7	5	8	1	1		2	9	5					7	3.20	81.4
Grenoble	N. 45 11	E. 5 43	0.31 p.m.	715	218	29.04	737.6	29.90	759.4	33.4	0.8			8		6		3	1	7	11					2.82	71.7
Guéret	N. 46 10	E. 1 52	0.16 p.m.	1486	453	28.22	716.8	29.86	758.5	34.5	1.4	80.6			1	1	12		10	6	1				5	1.50	38.2
Lamballe	N. 48 28	W. 2 31	11.59 a.m.	252	77	29.54	750.8	29.82	757.4	37.0	2.8	86.5	6	5	8	1	5	8	6	2					4	2.36	59.9
Lescar	N. 43 21	W. 0 26	0.06 p.m.	525	160	29.24	742.7	29.92	760.0	41.2	5.5	78.5	13	2	5		4		6	1					6	4.76	120.9

Monthly Summary of international meteorological observations, January, 1881—Continued.

Stations.	Latitude.	Longitude.	Local time.	Altitude of barometer above sea.		Result of simultaneous observations for January, 1881.																				Average cloudiness.	Total precipitation.	
						Mean barometer.				Mean temperature.		Mean relative humidity.	Wind.															
						Actual.		Reduced.					Directions.									Total movement.							
				Feet.	Meters.	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.		N.	NW.	W.	SW.	S.	SE.	E.	NE.	C.	Miles.	Kilometer.	0–10.	Inch.	Millimeters.
FRENCH SERIES—Continued.																												
	° ′	° ′																										
Lorient	N. 47 44	W. 3 21	11.55 a.m.	86	26	29.78	756.4	29.88	758.9	39.9	4.4	71.0	5	2	2	3	2	2	2	13	....	....	4	3.46	88.0
Lyons	N. 45 45	E. 4 49	0.27 p.m.	574	175	28.82	732.0	29.88	759.0	33.3	0.7	75.0	10	5	....	1	7	4	1	3	....	....	....	1.10	27.8
Mans	N. 48 01	E. 0 12	0.09 p.m.	265	87	29.57	751.1	29.89	759.3	33.6	0.9	91.8	3	2	1	5	1	3	12	4	....	....	6	3.20	81.2
Marseilles	N. 43 18	E. 5 23	0.29 p.m.	246	75	29.54	750.3	29.81	757.2	47.1	8.4	69.1	....	....	11	4	1	....	3	11	1	....	6	2.70	68.6
Mont-Louis	N. 42 30	E. 2 07	0.16 p.m.	5203	1586	24.55	623.6	29.78	756.4	31.6	— 0.2	72.7	4	3	7	14	2	....	....	1	....	....	6	2.41	61.1
Montpelier	N. 43 36	E. 3 54	0.24 p.m.	102	31	29.74	755.3	29.85	758.2	41.9	5.5	75.5	19	5	2	1	....	....	1	3	....	....	6	7.20	182.8
Nancy	N. 48 41	E. 6 11	0.33 p.m.	712	217	29.13	739.9	29.93	760.3	30.4	— 0.9	81.4	2	12	3	3	3	1	1	6	....	....	6	1.25	31.7
Nantes	N. 47 13	W. 1 33	0.02 p.m.	134	41	29.76	755.8	29.92	760.0	36.7	2.6	83.4	4	2	6	1	4	4	1	9	....	....	7	3.28	83.4
Nice	N. 43 41	E. 7 16	0.37 p.m.	29	9	29.77	756.2	29.81	757.1	49.3	9.6	66.6	5	3	7	2	1	3	8	2	....	....	6	5.76	146.2
Perpignan	N. 42 42	E. 2 53	0.19 p.m.	98	30	29.72	754.9	29.83	757.8	44.8	7.1	67.8	3	5	2	7	2	5	1	6	....	....	6	1.60	40.7
Pic du Midi (Pltde)	N. 42 15	E. 0 08	0.08 p.m.	7763	2366	22.20	563.8	....	....	24.3	— 4.3	....	....	....	....	....	....	....	....	....	....	....	5	11.20	284.4
Privas	N. 44 44	E. 4 35	0.26 p.m.	997	304	28.83	732.2	29.93	760.1	36.5	2.5	77.2	66	1	1	....	3	....	....	1	17	....	7	0.24	6.0
Puy de Dome	N. 45 46	E. 2 58	0.20 p.m.	4813	1467	24.77	629.2	....	....	23.0	— 5.0	84.5	3	2	4	9	1	3	5	4	....	....	7	3.35	85.0
Rochefort	N. 45 56	W. 0 58	0.04 p.m.	29	9	29.82	757.3	29.84	758.0	39.2	4.0	89.1	....	....	1	....	4	4	4	9	9	....	5	9.25	235.0
Roche-sur-Yon	N. 46 40	W. 1 26	0.14 p.m.	198	60	29.63	752.5	29.82	757.5	37.8	3.2	80.0	13	1	4	2	5	1	2	3	....	....	6	2.20	55.9
Rodez	N. 44 21	E. 2 35	0.18 p.m.	2050	625	27.66	702.5	29.89	759.1	35.1	1.7	75.9	c 1	4	5	....	....	....	4	10	4	....	8	1.52	38.7
Rouen	N. 49 26	E. 1 14	0.13 p.m.	80	24	29.80	756.8	29.88	759.0	35.4	1.9	74.5	5	2	....	2	6	11	3	2	....	....	5	0.47	12.0
Saint Lô ð	N. 49 06	W. 1 05	0.04 p.m.	134	41	29.67	753.7	29.83	757.7	35.2	1.8	83.5	c 1	2	2	7	2	....	9	5	....	....	6	2.01	51.1
Saint Maur	N. 48 48	E. 2 21	0.18 p.m.	162	49	29.72	754.9	29.89	759.2	32.5	0.3	82.0	4	2	....	2	8	2	3	10	....	....	8	....	....
Toulouse	N. 43 37	E. 1 27	0.14 p.m.	636	194	29.16	740.6	29.88	758.9	38.3	3.5	88.6	1	11	3	....	1	14	....	1	....	....	7	3.63	92.1
Tours	N. 47 24	E. 0 41	0.11 p.m.	171	52	29.66	753.3	29.85	758.3	....	....	....	3	1	....	5	1	5	2	14	....	....	7	3.10	78.8
Versailles	N. 48 48	E. 2 07	0.16 p.m.	445	136	29.38	746.3	29.87	758.7	31.5	— 0.3	c83.5	1	3	4	6	1	4	3	9	....	....	7	2.26	57.3
Sub-series.																												
Paris, Montsouris	N. 48 50	E. 2 20	0.18 p.m.	213	66	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....

GERMAN SERIES.																										
Bamberg	N. 49 54	E. 10 53	1.51 p.m.	774	236	29.07	738.4	29.91	759.8	26.2	—3.2	83.8	5	8	2	2	1	5	6	2	...	....	....	4	0.76	19.4
Berlin	N. 52 30	E. 13 23	1.02 p.m.	157	48	29.75	755.6	29.93	760.3	26.6	—3.0	76.4	3	5	2	8	1	6	2	4	...	....	....	4	0.97	24.7
Breslau	N. 51 07	E. 17 02	1.17 p.m.	482	147	29.43	747.5	29.97	761.2	24.8	—4.0	77.9	3	5	4	4	5	8	...	1	1	....	....	6	0.08	2.0
Carlsruhe	N. 49 01	E. 8 25	0.42 p.m.	404	123	29.53	750.1	29.97	761.3	30.2	—1.0	79.3	2	...	...	7	7	1	4	10	...	....	....	6	1.79	45.4
Cassel	N. 51 19	E. 9 28	0.46 p.m.	561	171	29.29	744.0	29.90	759.4	25.9	—3.4	82.9	5	1	...	3	10	3	6	3	...	....	....	6	1.19	30.3
Frankfort on the Main	N. 50 08	E. 8 41	0.43 p.m.	338	103	29.65	753.2	30.04	763.0	28.0	—2.2	73.0	11	1	2	4	12	...	...	...	1	....	....	6	1.22	30.9
Friedrichshafen	N. 47 39	E. 9 29	0.45 p.m.	1355	413	28.43	722.2	29.94	760.5	29.1	—1.6	64.8	3	1	8	4	1	2	4	13	...	....	....	6	0.97	24.6
Hamburg	N. 53 33	E. 9 58	0.48 p.m.	66	20	29.86	758.4	29.93	760.2	25.5	—3.6	82.4	2	3	2	8	1	7	5	2	1	....	....	6	0.82	20.7
Kiel	N. 54 20	E. 10 04	0.49 p.m.	26	8	29.89	759.2	29.91	759.6	27.0	—2.8	81.8	2	2	3	7	3	2	4	2	6	....	....	6	0.52	13.8
Leipsic	N. 51 20	E. 12 24	0.58 p.m.	390	119	29.52	749.9	29.97	761.2	24.4	—4.2	84.0	2	1	1	9	4	9	2	3	...	....	....	7	0.74	18.9
Magdeburg	N. 52 09	E. 11 37	0.54 p.m.	210	64	29.70	754.4	29.94	760.5	24.1	—4.4	86.8	1	1	7	1	2	1	6	4	8	....	....	6	0.94	23.9
Memel	N. 55 43	E. 21 07	1.32 p.m.	39	12	29.83	757.6	29.87	758.8	21.4	—5.9	85.7	2	4	9	2	2	8	1	3	...	....	....	7	....	....
Munich	N. 48 09	E. 11 34	0.55 p.m.	1732	528	28.04	712.3	29.90	759.4	26.2	—3.2	72.9	4	3	6	1	1	1	6	6	3	....	....	7	0.79	20.1
Neufahrwasser	N. 54 24	E. 18 40	1.25 p.m.	16	5	29.90	759.5	29.91	759.6	25.0	—3.9	76.5	2	4	5	3	9	5	1	1	1	....	....	7	0.99	25.1
Neustadt	N. 49 21	E. 8 08	0.41 p.m.	479	146	29.34	745.1	29.86	758.5	30.6	—0.8	....	3	2	5	3	4	2	1	7	4	....	....	5	3.04	77.2
Stuttgart	N. 48 47	E. 9 11	0.45 p.m.	879	268	28.94	735.0	29.88	758.9	29.3	—1.5	68.6	11	1	2	5	3	6	4	5	...	....	....	5	0.68	17.2
Thorn	N. 53 01	E. 18 36	1.24 p.m.	171	52	....	....	....	....	....	....	....	...	...	...	...	...	...	...	...	...	....	....	...	....	....
Weissenburg	N. 49 02	E. 10 58	0.52 p.m.	1414	431	28.37	720.6	29.90	759.4	27.0	—2.8	84.7	.....	2	5	1	1	5	2	4	11	....	....	6	0.46	11.8
Wustrow	N. 54 21	E. 12 24	0.58 p.m.	23	7	29.90	759.5	29.93	760.1	26.6	—3.0	92.7	4	1	3	6	...	6	4	7	...	....	....	7	0.65	16.5
GREEK SERIES.																										
Athens	N. 37 58	E. 23 43	1.43 p.m.	266	81	29.56	750.8	29.96	761.0	56.5	13.6	....	.....	2	3	10	6	1	1	8	...	....	....	6	....	....
INDIAN SERIES.																										
Kurachee	N. 24 47	E. 67 04	4.36 p.m.	49	15	30.02	762.5	30.07	763.8	75.6	24.2	45.0	1	...	1	18	6	...	1	4	...	....	....	1	0	0
Deesa	N. 24 16	E. 72 14	4.57 p.m.	474	144	29.52	749.3	30.00	762.0	78.8	26.0	26.2	4	11	2	5	1	2	1	3	2	....	....	2	0	0
Bombay	N. 18 54	E. 72 49	4.59 p.m.	37	11	29.93	760.2	29.97	761.2	78.3	25.7	61.3	.....	25	6	...	...	...	...	...	...	....	....	1	0	0
Poona	N. 18 28	E. 74 10	5.05 p.m.	2000	610	28.10	713.7	29.94	760.5	82.8	28.2	21.4	3	1	4	5	1	4	8	5	...	....	....	2	0	0
Belgaum	N. 15 52	E. 74 42	5.07 p.m.	2550	777	27.41	696.2	29.94	760.5	78.9	26.1	27.6	3	...	...	...	1	2	10	15	...	....	....	2	0	0
Lahore *a*	N. 31 34	E. 74 20	5.41 p.m.	732	223	29.31	744.5	30.08	764.0	64.8	18.2	40.3	.....	...	5	...	...	...	2	3	21	....	....	2	0.03	0.8
Roorkee	N. 29 52	E. 77 56	5.20 p.m.	887	270	29.14	740.1	30.07	763.8	63.8	17.7	49.1	.....	15	5	...	1	...	1	...	9	....	....	2	0.25	6.3
Agra	N. 27 10	E. 78 05	5.20 p.m.	555	175	29.49	749.0	30.08	764.0	70.4	21.3	37.8	4	4	14	1	...	1	3	2	2	....	....	1	0	0
Nagpur	N. 21 09	E. 71 11	4.52 p.m.	1025	312	28.97	735.8	30.02	762.5	78.8	26.0	31.8	.....	...	...	1	3	4	5	4	14	....	....	1	0.03	0.8
Jubulpore	N. 23 09	E. 79 59	5.28 p.m.	1351	412	28.68	728.5	30.06	763.5	70.5	21.4	89.9	4	1	1	...	1	...	3	4	17	....	....	1	0.01	0.3
Lucknow	N. 26 50	E. 81 00	5.32 p.m.	369	112	29.68	753.9	30.07	763.8	65.6	18.7	37.9	6	6	...	...	...	...	...	...	19	....	....	1	0.03	0.8
Alahabad *a*	N. 25 26	E. 81 52	5.36 p.m.	307	94	29.74	755.4	30.07	763.8	64.2	17.9	56.9	.....	...	...	...	...	...	1	...	30	....	....	0	0.18	4.6
Patna	N. 25 37	E. 85 08	5.48 p.m.	179	55	29.86	758.4	30.05	763.3	64.3	17.9	61.0	1	...	27	...	...	...	...	...	3	....	....	1	0.08	2.0
Hazaribagh	N. 24 00	E. 85 24	5.49 p.m.	2010	613	27.09	710.9	30.07	763.8	63.2	17.3	40.8	6	22	1	...	...	...	...	1	1	....	....	0	0.25	6.3
Cuttack	N. 20 29	E. 85 54	5.52 p.m.	80	24	29.95	760.7	30.04	763.0	74.0	23.3	54.4	5	3	3	1	...	1	1	6	11	....	....	1	0	0
Calcutta	N. 22 33	E. 88 21	6.01 p.m.	18	5	30.01	762.2	30.03	762.7	67.4	19.7	59.6	8	9	4	...	...	...	...	1	9	....	....	0	0	0
Goalpara	N. 26 11	E. 90 40	6.11 p.m.	386	118	29.61	752.1	30.03	762.7	67.9	19.9	58.3	.....	1	...	2	...	1	5	4	18	....	....	0	0	0
Chittagong	N. 22 21	E. 91 50	6.15 p.m.	90	25	29.92	760.0	30.02	762.2	69.3	20.7	62.0	3	3	22	1	...	...	...	...	2	....	....	0	0	0
Sibsagar	N. 26 59	E. 94 40	6.27 p.m.	332	101	29.72	754.9	30.07	763.8	60.6	15.9	84.1	.....	...	...	2	4	2	3	19	1	....	....	2	0.18	4.6
ITALIAN SERIES.																										
Udine	N. 46 04	E. 13 14	1.01 p.m.	381	116	29.50	749.2	29.93	760.1	36.7	2.6	66.5	3	...	...	...	...	...	10	3	15	....	....	7	5.82	135.1
Milan	N. 45 28	E. 9 11	0.45 p.m.	482	147	29.39	746.6	29.93	760.2	32.9	0.5	84.1	3	...	6	9	3	5	3	2	...	....	....	4	4.14	105.2
Padua	N. 45 24	E. 11 53	0.56 p.m.	102	31	29.81	757.1	29.92	759.9	36.9	2.7	78.3	14	6	...	...	...	...	1	7	...	....	....	7	3.43	87.1

Monthly summary of international meteorological observations, January, 1881—Continued.

Stations.	Latitude.	Longitude.	Local time.	Altitude of barometer above sea.		Result of simultaneous observations for January, 1881.																				Average cloudiness.	Total precipitation.	
						Mean barometer.				Mean temperature.		Mean relative humidity.	Wind.															
						Actual.		Reduced.					Directions.									Total movement.							
				Feet.	Meters.	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.		N.	NW.	W.	SW.	S.	SE.	E.	NE.	C.	Miles.	Kilometers.			0-10.	Inches.	Millimeters.
ITALIAN SERIES—Continued.																												
	° ′	° ′																										
Moncalieri	N. 44 59	E. 7 41	0.39 p.m.	853	260	28.99	736.4	29.93	760.2	33.4	0.8	74.5	5	5	1	1	2	1	8	8	...	.....	.....			5	4.95	125.7
Genoa	N. 44 25	E. 8 30	0.42 p.m.	157	48	29.65	753.2	29.85	758.1	41.0	5.0	57.1	19	3	1	...	1	...	1	6	...	.....	.....			6	5.18	131.7
Mondovi	N. 44 22	E. 7 48	0.39 p.m.	1824	556	27.95	709.9	29.96	760.9	31.5	—0.3	67.8	1	...	26	...	2	...	2	...	...	.....	.....			5	2.13	54.1
Pesaro	N. 43 55	E. 12 53	1.00 p.m.	46	14	29.84	758.0	29.89	759.2	37.6	3.1	80.4	2	5	18	1	...	1	1	2	1	.....	.....			9	4.92	124.9
Florence	N. 43 46	E. 11 14	0.53 p.m.	240	73	29.57	751.1	29.83	757.8	42.4	5.8	68.0	6	...	1	4	1	...	4	13	...	.....	.....			8	6.10	154.8
Leghorn *a*	N. 43 32	E. 10 18	0.49 p.m.	79	24	29.78	755.3	29.82	757.5	44.1	6.7	70.6	1	3	1	2	1	...	2	20	...	.....	.....			7	12.15	308.7
Rome	N. 41 54	E. 12 29	0.58 p.m.	164	50	29.64	752.8	29.82	757.3	51.8	11.0	68.5	7	2	4	6	4	2	2	1	3	.....	.....			7	7.87	199.9
Lecce	N. 40 21	E. 18 12	1.21 p.m.	236	72	29.63	752.5	29.86	759.0	54.0	12.2	73.2	3	4	...	6	7	7	...	4	...	.....	.....			8	3.83	97.3
Cosenza	N. 39 18	E. 16 15	1.13 p.m.	840	256	29.00	736.7	29.91	759.6	54.5	12.5	68.5	1	8	2	8	...	...	6	...	6	.....	.....			9	18.89	479.7
Cagliari	N. 39 13	E. 9 10	0.45 p.m.	180	55	29.62	752.3	29.82	757.3	57.7	14.3	62.1	2	15	3	...	1	4	1	...	5	.....	.....			6	0.93	23.6
Palermo	N. 38 07	E. 13 22	1.02 p.m.	236	72	29.64	752.8	29.89	759.1	62.1	16.7	54.0	.....	4	8	14	...	2	2	...	1	.....	.....			8	2.44	61.9
Syracuse	N. 37 03	E. 15 18	1.09 p.m.	43	13	29.86	758.4	29.90	759.5	61.3	16.3	68.1	.....	2	4	8	6	5	6	...	...	.....	.....			8	1.38	35.0
Sub-series.																												
Naples	N. 40 52	E. 14 18	1.05 p.m.	489	149	29.32	744.7	29.83	757.7	52.5	11.4	73.4	3	1	3	10	5	2	2	5	...	.....	.....			8	5.60	142.2
Stelvio	N. 46 37	E. 10 32	0.50 p.m.	8343	2543	22.00	558.8	.....	.....	13.1	—10.6	68.7	1	...	1	7	4	2	9	7	...	.....	.....			4	3.27	83.0
Valdobbia	N. 45 47	E. 12 00	0.56 p.m.	8360	2548	21.82	554.2	.....	.....	15.4	—9.2	80.7	4	...	2	1	3	3	12	6	...	.....	.....			6	10.43	265.0
JAPANESE SERIES.																												
Hiroshima	N. 34 20	E. 132 27	8.58 p.m.	14	4	30.07	763.7	30.09	764.2	33.8	1.0	76.4	8	1	...	...	...	...	9	13	...	.....	.....			3	1.55	39.3
Kioto	N. 35 01	E. 135 46	9.14 p.m.	162	49	29.83	757.7	30.02	762.4	32.0	0.0	80.3	.....	...	...	...	...	...	...	...	...	.....	.....			5	1.18	30.0
Nagasaki	N. 32 44	E. 129 51	8.47 p.m.	189	58	29.93	760.1	30.14	765.6	38.5	3.6	76.8	5	6	5	3	...	3	...	...	9	.....	.....			6	4.77	121.1
Tokei	N. 35 40	E. 139 45	9.27 p.m.	63	19	29.81	757.1	29.88	759.0	33.6	0.9	66.7	7	11	4	3	1	2	...	2	...	.....	.....			3	1.74	44.2
Wakayama	N. 34 14	E. 135 09	9.09 p.m.	43	13	29.98	761.6	30.04	763.0	36.5	2.5	71.2	7	11	6	...	2	...	3	1	1	.....	.....			4	1.16	29.5
MAURITIUS SERIES.																												
Mauritius	S. 20 06	E. 57 33	3.58 p.m.	181	55	29.74	755.4	29.93	760.2	79.8	26.6	68.9	7	3	...	1	3	1	8	8	...	.....	.....			7	4.55	115.6

MEXICAN SERIES.																													
Colima	N. 19 00	W. 103 07	5.13 a.m.	1663	507																								
Guadalajara	N. 20 41	W. 103 14	5.15 a.m.	5148	1569																								
Guanajuato	N. 21 01	W. 100 48	4.50 a.m.	6683	2037																								
Leon	N. 21 07	W. 101 35	5.22 a.m.	5902	1799																								
Mazatlan	N. 23 11	W. 106 17	5.03 a.m.	249	76	29.75	755.6	30.01	762.3	64.0	17.8	67.5	9	6	...	...	1	4	11	...				4	0.52	13.2			
Mexico	N. 19 26	W. 99 00	5.32 a.m.	7490	2283																								
Morelia	N. 19 42	W. 100 59	5.24 a.m.	6365	1940																								
Pabellon	N. 22 04	W. 102 04	5.20 a.m.	6312	1924																								
Puebla	N. 19 02	W. 98 03	5.36 a.m.	7113	2168																								
San Luis Potosi	N. 22 10	W. 100 51	5.25 a.m.	6211	1893																								
Tlacotalpam	N. 18 37	W. 95 32	5.46 a.m.	13	4																								
Vera Cruz	N. 19 12	W. 96 00	5.44 a.m.	26	8																								
Zacatecas	N. 22 44	W. 102 26	5.18 a.m.	8189	2496																								
NETHERLANDS SERIES.																													
Flushing	N. 51 24	E. 3 35	0.22 p.m.	0	0	29.83	757.6	29.83	757.6	32.2	0.1	.....	3	3	3	1	8	1	3	8					1.49	37.8			
Groningen	N. 53 12	E. 6 34	0.34 p.m.	0	0	d29.83	d757.7	d29.89	d759.2	c29.1	—1.6	.....	4	...	1	6	8	1	6	5					1.40	35.5			
Helder	N. 52 58	E. 4 45	0.27 p.m.	0	0	29.89	759.2	29.89	759.2	30.9	—0.6	.....	3	2	...	4	4	5	5	8					1.40	35.5			
Hellevoetsluis	N. 51 49	E. 4 80	0.25 p.m.	0	0	29.79	756.7	29.79	756.7	30.7	—0.7	.....	1	...	4	3	6	2	4	8	3				0.81	20.5			
Utrecht	N. 52 05	E. 5 07	0.29 p.m.	43	13	29.86	758.5	29.91	759.7	33.6	0.9	85.5	2	3	3	4	6	2	5	6				5	1.21	30.8			
NORWEGIAN SERIES.																													
Bergen	N. 60 24	E. 5 20	0.29 p.m.	49	15	29.79	756.7	29.84	757.8	29.8	—1.2	76.1	2	4	...	2	2	6	3	...	12			6	2.41	61.3			
Christiania	N. 59 55	E. 10 45	0.51 p.m.	134	41	29.70	754.3	29.85	758.3	19.6	—6.9	75.9	9	1	1	3	2	1	4	7	3			6	0.18	4.7			
Gjæsvær	N. 71 07	E. 25 22	1.49 p.m.	23	7	29.49	749.0	29.51	749.5	19.4	—7.0	.....	1	5	3	3	...	1	...	11	7			6	.....	.....			
Lodingen	N. 68 24	E. 16 01	1.12 p.m.	43	13	29.57	751.0	29.61	752.2	21.0	—6.1	76.9	9	2	6	4	...	3	1	5	1			6	4.87	123.6			
PORTUGUESE SERIES.																													
Angra	N. 38 39	W. 27 14	10.19 a.m.	144	44	29.40	746.8	29.56	750.9	55.9	13.3	84.0	2	4	5	5	2	4	8	1	...			5	14.65	872.0			
Campo Major	N. 39 02	W. 6 59	11.40 a.m.	945	288	28.86	733.1	29.87	758.8	52.5	11.4	75.7	5	...	6	5	7	1	2	5	...			8	10.27	260.9			
Funchal	N. 32 38	W. 16 55	11.00 a.m.	82	25	29.84	753.0	29.93	760.2	65.5	18.6	76.2	.....	...	11	11	4	1	2	1	1			7	9.27	235.4			
Lisbon	N. 38 42	W. 9 08	11.31 a.m.	335	102	29.52	749.9	29.89	759.1	51.4	10.8	81.7	2	1	2	11	3	1	2	9	...			7	10.83	275.1			
Ponta Delgada	N. 37 45	W. 25 41	10.25 a.m.	66	20	29.52	749.9	29.61	752.1	59.0	15.0	75.5	1	1	4	9	7	2	2	3	2			6	13.04	331.2			
RUSSIAN SERIES.																													
Akmolinski	N. 51 03	E. 71 22	4.54 p.m.	?	?	28.93	743.7	30.10	764.5	11.3	—11.5	96.8	2	...	...	11	5	1	3	1	8			3	.....	.....			
Archangel	N. 64 33	E. 40 32	2.50 p.m.	16	5	29.47	748.6	29.49	749.1	0.1	—17.7	84.1	3	5	3	5	6	2	3	2	2			7	.....	.....			
Astrakhan	N. 46 21	E. 48 02	3.20 p.m.	172	122	30.14	765.5	30.06	763.5	28.2	—2.1	77.8	2	3	6	4	3	2	7	3	1			8	.....	.....			
Barnaul	N. 53 20	E. 83 47	5.45 p.m.	482	147	29.68	753.9	30.22	767.7	14.5	—9.7	79.2	.....	...	1	1	15	1	1	...	2	10		7	.....	.....			
Dorpat	N. 58 23	E. 26 43	1.55 p.m.	223	68	29.50	749.3	29.76	755.9	13.5	—10.3	84.2	1	4	5	13	2	1	4	...	1			6	.....	.....			
Ekaterinburg	N. 56 49	E. 60 35	4.11 p.m.	876	267	28.83	732.2	29.87	758.6	5.5	—14.7	74.1	.....	...	1	6	12	1	7	1	...	3		7	.....	.....			
Kasan	N. 55 47	E. 49 08	3.25 p.m.	249	76	29.53	760.0	29.82	757.5	6.1	—14.4	81.4	2	...	...	2	12	6	7	...	...	2		7	.....	.....			
Kertch	N. 45 21	E. 36 29	2.34 p.m.	20	6	29.95	760.8	29.97	761.3	31.5	—0.3	87.0	3	9	8	2	4	1	5	3	1			9	.....	.....			
Kieff	N. 50 26	E. 30 31	2.10 p.m.	600	183	29.24	742.7	29.91	759.7	18.1	—7.7	79.3	2	6	8	2	5	5	3	...	...			7	.....	.....			
Krotkowo	N. 58 47	E. 48 34	3.22 p.m.	436	133	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

‖ Below sea-level.

Monthly summary of international meteorological observations, January, 1881—Continued.

Stations.	Latitude.	Longitude.	Local time.	Altitude of barometer above sea.		Result of simultaneous observations for January, 1881.																				Average cloudiness.	Total precipitation.	
						Mean barometer.				Mean temperature.		Mean relative humidity.	Wind.															
						Actual.		Reduced.					Directions.									Total movement.							
				Feet.	Meters.	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.		N.	NW.	W.	SW.	S.	SE.	E.	NE.	C.	Miles.	Kilometers.			0-10.	Inches.	Millimeters.
RUSSIAN SERIES—Continued.																												
Lugan	N. 48 35	E. 39 20	2.46 p.m.	187	57	29.73	755.2	29.94	760.4	22.1	—5.5	75.8	1	5	6	5	2	5	1	3	3					7		
Moscow	N. 55 46	E. 37 40	2.39 p.m.	512	156	29.18	741.1	29.78	756.5	12.0	—11.1	75.5	3	2		1	18	4			3					6		
Nertchinsk	N. 51 19	E. 119 37	8.07 p.m.	1942	592	27.86	707.7	30.55	775.9	—20.4	—29.1	79.2		4							27					2		
Nikolaiev	N. 46 58	E. 31 58	2.16 p.m.	62	19	29.94	760.5	30.01	762.2	26.8	—2.9	81.2	6	5	1	4	5	2	4	3	1					7		
Nikolaievsk *d*	N. 53 08	E. 140 45	9.31 p.m.	59	18	29.83	757.6	29.91	759.8	—12.6	—24.8	73.6			11						16					4		
Nukuss *a*	N. 42 27	E. 59 37	4.07 p.m.	216	66	30.01	762.2	30.25	768.3	39.2	4.0	77.0	3	5	1	4	5	4	2	5	1					6		
Pekin	N. 39 57	E. 116 29	7.54 p.m.	125	38	30.13	765.2	30.27	768.8	23.5	—4.7	49.3		7		1	1			1	21					1		
St. Petersburg	N. 59 56	E. 30 16	2.09 p.m.	16	5	29.65	753.2	29.67	753.5	11.8	—11.2	82.5	3	3	10	6	1	6		1	1					7		
Tashkend	N. 41 19	E. 69 16	4.45 p.m.	1621	494																							
Tiflis	N. 41 43	E. 44 47	3.07 p.m.	1342	409	28.63	727.2	30.08	763.9	43.3	6.3	56.8	4	11	1		1	1	1		12					5		
Warsaw	N. 52 18	E. 21 02	1.32 p.m.	394	120	29.49	749.0	29.93	760.2	20.5	—6.4	79.5	3	2	10	5	2	8	1							6		
Wilna	N. 54 51	E. 25 18	1.49 p.m.	387	118	29.44	747.8	29.88	759.0	18.0	—7.8	82.3	1	4	7	10		4	1	2	2					7		
Yeniseisk	N. 58 27	E. 92 09	6.16 p.m.	128	39	29.95	760.7	30.29	769.2	0.7	—17.4	82.4				3	2	2	10		3	11				5		
SCOTISH SERIES.																												
Leith	N. 55 58	W. 3 10	11.55 a.m.	83	25			29.95	760.7	32.4	0.2	89.8		1	15	2		2	7	4					6	1.09	27.7
Monach Light-house	N. 57 31	W. 7 42	11.37 a.m.	150	46			29.98	761.5	39.7	4.3	90.5	2	2	1	4	7	7	1	7						8	2.20	55.9
North Unst	N. 60 51	W. 0 53	0.04 a.m.	230	70			29.83	757.7				8	3	8	1	2	3	2	4						9		
SPANISH SERIES.																												
Barcelona	N. 41 23	E. 2 11	0.16 p.m.	98	30	29.72	755.0	29.84	757.8	51.4	10.8	66.5	4	3	9	4	2		1	8						5	3.64	92.5
Bilbao	N. 43 15	W. 2 59	11.56 a.m.	56	17	29.82	757.4	29.88	759.0	48.2	9.0	73.9	1	5	4	2	3	10	6							8	6.16	156.6
Burgos	N. 42 20	W. 3 46	11.53 a.m.	2821	860	26.85	681.9			38.7	3.7	80.6	2		5	6	7	1	2	8						8	7.89	200.5
Madrid	N. 40 25	W. 3 42	11.53 a.m.	2152	656	27.62	701.5	29.89	759.2	45.5	7.5	76.1	4	2	3	9	6	1		6						7	5.15	130.7
Murcia†	N. 37 59	W. 1 10	0.03 p.m.	141	43	29.76	755.8	29.90	759.5	59.7	15.4	68.0		7	7	6		5	1	5						7	1.03	26.2
Santiago	N. 42 53	W. 8 28	11.34 a.m.	863	263	28.82	732.1	29.72	755.0	47.1	8.4	79.7	1	1	1	1	8	2	6	2	10					8	19.57	497.0

Sub-series.																															
Havana	N. 23 08	W. 82 28	7.39 a.m.	62	19	30.01	762.3	30.08	764.1	69.6	20.9	89.3	3			1		6	14	3	4			4	6.85	174.0
Manila	N. 14 36	E. 121 00	8.12 p.m.	103	33	29.96	761.0	30.01	762.2	78.1	25.6	73.9	2			3	2	4	12	8				3	0.16	4.1
San Fernando	N. 36 28	W. 6 13	11.43 a.m.	95	29	29.90	759.4	29.99	761.8	57.2	14.0	80.4	2	1	2	8	9	1	2	4	2			8	11.44	290.5
San Juan de Porto Rico	N. 18 30	W. 66 10	7.44 p.m.	82	25	30.02	762.5	30.11	764.7	74.7	23.7	87.8			2	1	8	15	3	2				6	1.06	27.0
SWEDISH SERIES.																															
Haparanda	N. 65 47	E. 23 15	1.41 p.m.	29	9	29.61	752.1	29.65	753.1	7.0	−13.9	96.1	9	7	2	4		1	3	1	4			7	0.35	9.0
Umea	N. 63 50	E. 20 17	1.29 p.m.	39	12	29.63	752.5	29.69	754.0	13.6	−10.2	87.4	10	3	1	1	1	1		6	8			8	1.13	28.8
Hernosand	N. 62 32	E. 17 57	1.20 p.m.	46	14	29.69	754.1	29.75	755.6	18.5	−7.5	80.0	7	2	4	4	1	1		3	9			7	0.70	17.8
Stockholm	N. 59 20	E. 18 04	1.20 p.m.	144	44	29.60	751.7	29.78	756.4	20.5	−6.4	82.3	6	7	10	4	2		2					6	0.40	10.2
Wisby	N. 57 39	E. 18 18	1.20 p.m.	52	16	29.69	754.0	29.74	755.4	27.1	−2.7	82.4	5	5	7	3	3	5	1	2				7	0.64	16.2
Sub-series.																															
Upsala	N. 59 51	E. 17 37	1.19 p.m.	79	24	29.65	753.1	29.74	755.3	18.3	−7.6	84.5	2	10	3	11	1	1	1	2				6	0.47	12.0
SWISS SERIES.																															
Geneva	N. 46 12	E. 6 08	0.33 p.m.	1338	408	28.43	722.1	29.94	760.5	32.0	0.0	77.6	6	3	1	4	4	1	3	9				8	2.28	57.9
Zurich	N. 47 22	E. 8 33	0.38 p.m.	1542	470	28.23	717.1	29.95	760.8	28.9	−1.7	75.1	1		3	1		1	8		17			6	1.29	32.7
TURKISH SERIES.																															
Constantinople	N. 41 00	E. 28 59	2.02 p.m.	?	?			29.98	761.5	45.1	7.3	77.6	7	4	2	7		2	2	7				9	5.85	148.6
Valona	N. 40 27	E. 19 27	1.25 p.m.	?	?			29.88	758.9	56.7	13.7			6	6	3	9	3	2	2				8	4.37	111.0
Sub-series.																															
Beirut	N. 33 54	E. 35 29	2.30 p.m.	98	30			30.22	767.6	59.9	15.5	64.1		5	2	15		1		7	1			5	4.21	106.9
UNITED STATES SERIES.																															
Albany	N. 42 40	W. 73 45	7.13 a.m.	75	23	30.08	764.0	30.17	763.3	16.2	−8.8	75.3	6	4	3	2	3		4	9		3,807	6,127	7	2.86	72.6
Alpena	N. 45 05	W. 83 28	6.34 a.m.	609	183	29.44	747.8	30.14	765.5	8.9	−12.8	77.2	2	7	10	6	8	1		2		5,497	8,846	7	1.59	40.4
Atlanta	N. 33 45	W. 84 23	6.31 a.m.	1,131	345	28.96	735.3	30.15	765.8	35.1	1.7	78.8	3	11	3	3			9	1	1	6,792	10,930	7	8.35	212.1
Atlantic City	N. 39 22	W. 74 25	7.11 a.m.	13	4	30.15	765.8	30.16	766.1	24.7	−4.1	81.2	11	7	7		2	1	1	2		7,096	11,420	6	7.18	182.4
Attou, Aleutian Islands	N. 52 38	E. 172 30	11.38 p.m.			29.32	744.7			30.6	−0.8	93.1	4	2	1	2	13	8		5	1	9,933	15,985	8	5.19	131.8
Augusta	N. 33 28	W. 81 54	6.41 a.m.	183	56	30.02	762.5	30.22	767.6	37.7	8.2	82.3	1	6	2		1	1	1	8	12	2,510	4,039	7	8.69	220.7
Baltimore	N. 39 18	W. 76 38	7.02 a.m.	45	14	30.14	765.5	30.19	766.8	26.2	−3.2	78.3	4	7	7	4		1	2	2	4	3,673	5,911	5	4.84	122.9
Barnegat	N. 39 48	W. 74 09	7.12 a.m.	20	6	30.12	765.0	30.14	765.5	23.9	−4.5	83.9	8	15	2		3		2		1	9,974	16,051	6	8.43	214.1
Bismarck	N. 46 48	W. 100 38	5.26 a.m.	1,693	516	28.28	718.3	30.14	765.5	−6.7	−21.5	96.8	1	10	3		1	2	2	11	11	5,691	9,159	4	0.69	17.5
Boise City	N. 43 46	W. 116 06	4.24 a.m.	2,750	838	27.29	693.2	30.25	768.8	26.2	−3.2	82.8	3	10	4			11			3	2,790	4,490	8	3.62	91.9
Boston	N. 42 21	W. 71 04	7.23 a.m.	142	43	29.94	760.5	30.11	764.8	17.3	−8.2	70.0	3	8	16	1	1		1	1		8,372	13,473	6	7.21	183.1
Brackettville	N. 29 17	W. 100 51	5.27 a.m.	1,170	356	28.97	735.8	30.08	764.0	34.8	1.6	83.1										4,613	7,424	5	0.35	8.9
Brownsville	N. 26 00	W. 97 30	5.38 a.m.	43	13	30.10	764.5	30.14	765.5	45.9	7.7	90.7	12	2	1		1	2	1	3	8	4,722	7,599	7	2.73	69.3
Buffalo	N. 42 53	W. 78 55	6.52 a.m.	664	202	29.38	746.2	30.14	765.5	16.2	−8.8	81.3		4	4	17			2	4		6,288	10,119	9	2.31	58.7
Burlington	N. 40 49	W. 91 07	7.15 a.m.	268	82	29.88	758.9	30.20	767.1	11.2	−11.6	76.7	2	1	1	1	10	3	7	6		5,665	9,117	7	0.88	22.4
Cairo	N. 37 00	W. 87 12	6.11 a.m.	377	115	29.83	757.7	30.25	768.3	25.0	−3.9	80.6	8	5	3	2		8			5	4,481	7,210	5	3.56	90.4
Campo	N. 32 22	W. 116 08	4.22 a.m.	2,500	762	27.50	698.5	30.06	763.5	31.8	−0.1	75.7		1	4	2	8	1	12	2	1	4,832	7,776	3	1.74	44.2
Camp Thomas	N. 32 04	W. 110 06	4.49 a.m.	2,710	826	27.32	693.9			25.8	−3.4	74.0			2					1	28			2	0.03	0.8
Cape Henry	N. 36 56	W. 76 00	7.04 a.m.	16	5	30.15	765.8	30.17	766.3	33.3	0.7	76.5	10	10	3	5	1			2		7,865	12,657	5	4.08	102.4
Cape May	N. 38 56	W. 74 58	7.08 a.m.	27	8	30.12	766.0	30.16	766.1	27.0	−2.8	79.3	9	10	3	1	2	1	1	4		11,852	19,073	6	7.36	186.9
Castroville	N. 29 25	W. 98 50	5.33 a.m.	780	238	29.35	745.5	30.10	764.5	34.3	1.3	75.7	2	19	1		1	1	4		3	4,611	7,420	5	0.45	11.4

Monthly summary of international meteorological observations, January, 1881—Continued.

Stations.	Latitude.	Longitude.	Local time.	Altitude of barometer above sea.		Result of simultaneous observations for January, 1881.																		Average cloudiness.	Total precipitation.	
						Mean barometer.				Mean temperature.		Mean relative humidity.	Wind.													
						Actual.		Reduced.					Directions.									Total movement.					
				Feet.	Meters.	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.		N.	NW.	W.	SW.	S.	SE.	E.	NE.	C.	Miles.	Kilometers.	0–10.	Inches.	Millimeters.
UNITED STATES SERIES—Contd.	° ′	° ′																								
Cedar Keys	N. 28 12	W. 83 02	6.30 a.m.	22	7	30.12	765.0	30.14	765.5	50.6	10.3	88.8	8	2	..	2	2	3	5	8	1	7,056	11,355	5	9.36	237.7
Champaign	N. 40 07	W. 88 14	6.15 a.m.	767	234	29.31	744.5	30.18	766.6	15.0	—9.4	66.8	2	5	3	6	4	4	1	4	2	7,652	12,318	6	0.89	22.6
Charleston	N. 32 45	W. 79 55	6.49 a.m.	52	16	30.13	765.3	30.19	766.8	43.0	6.1	82.4	14	5	6	2	3	..	..	1	..	5,263	8,470	6	5.98	151.9
Charlotte	N. 35 13	W. 80 51	6.45 a.m.	808	246	29.29	744.0	30.14	765.5	32.2	0.1	79.1	3	1	4	6	2	..	8	11	1	3,884	6,250	6	6.81	173.0
Chattanooga	N. 35 04	W. 85 15	6.27 a.m.	783	239	29.36	745.7	30.20	767.1	31.9	—0.1	82.4	3	5	8	4	4	..	1	8	3	4,607	7,414	8	4.70	119.4
Cheyenne	N. 41 12	W. 104 42	5.09 a.m.	6,089	1,856	23.92	607.6	29.86	758.4	18.2	—7.7	63.3	7	9	7	3	..	2	..	1	2	9,855	15,860	3	0.36	9.1
Chicago	N. 41 52	W. 87 35	6.18 a.m.	661	201	29.40	746.7	30.15	765.8	15.6	—9.1	70.1	7	4	6	4	3	1	2	1	3	5,358	8,623	4	0.87	22.1
Chincoteague	N. 37 55	W. 77 20	7.06 a.m.	18	5	30.15	765.8	30.17	766.3	28.2	—2.1	87.8	4	17	1	3	..	2	..	4	..	9,227	14,849	7	4.04	102.6
Cincinnati	N. 39 06	W. 84 26	6.30 a.m.	620	189	29.52	749.8	30.22	767.6	25.5	—3.6	73.6	1	2	2	7	2	6	3	8	..	4,254	6,840	8	3.76	95.5
Cleveland	N. 41 30	W. 81 47	6.42 a.m.	690	210	29.40	746.7	30.18	766.6	17.5	—8.1	84.3	..	4	5	7	4	8	1	2	..	5,925	9,535	9	1.96	49.8
Coleman City	N. 31 53	W. 99 10	5.32 a.m.	1,750	533	28.32	719.3	30.10	764.5	28.1	—2.2	68.9	7	6	..	9	5	..	..	2	2	9,077	14,608	5	0.36	9.1
Columbus	N. 39 57	W. 83 03	6.36 a.m.	805	245	29.29	744.0	30.19	766.8	20.7	—6.3	81.8	6	2	6	4	7	1	1	4	..	5,446	8,764	7	2.25	57.2
Concho	N. 31 22	W. 100 20	5.26 a.m.	1,900	579	23.18	715.8	29.96	761.0	29.3	—1.5	77.5	5	4	3	11	1	..	..	3	4	7,586	12,208	4	0.22	5.6
Corsicana	N. 32 05	W. 96 30	5.41 a.m.	448	136	29.73	755.1	30.23	767.8	32.4	0.2	74.2	9	3	..	..	9	..	..	..	10	4,910	7,902	5	2.20	55.9
Davenport	N. 41 32	W. 90 30	6.06 a.m.	615	187	29.49	749.0	30.19	766.8	9.0	—12.8	76.7	1	6	7	1	4	1	1	4	6	4,704	7,715	6	1.34	34.0
Dayton	N. 46 23	W. 117 50	4.16 a.m.	1,660	506	28.40	721.3	30.17	766.3	25.3	—3.7	94.3	..	..	..	14	5	1	..	1	10	2,911	4,685	7	5.63	127.8
Deadwood	N. 44 22	W. 103 34	5.14 a.m.	4,600	1,402	25.27	641.8	.....	.....	11.9	—11.2	97.9	.....	.....	.....	.....	.....	.....	.....	.....	.....	3,531	5,682	5	3.10	78.7
Decatur	N. 33 10	W. 97 33	5.38 a.m.	1,150	350	28.94	735.1	30.18	766.6	29.3	—1.5	81.7	a10	3	1	..	5	6	2	2	..	8,426	13,560	a4	0.93	23.6
Delaware Breakwater	N. 38 48	W. 75 05	7.08 a.m.	20	6	30.14	765.5	30.16	766.1	27.2	—2.7	83.8	6	10	6	3	2	1	..	3	..	1,063	1,711	6	4.39	111.5
Denison	N. 33 50	W. 96 49	5.41 a.m.	767	234	29.34	745.2	30.19	766.8	28.1	—2.2	86.2	9	7	1	4	5	2	1	2	..	5,758	9,266	5	0.74	18.8
Denver	N. 39 45	W. 105 04	5.08 a.m.	5,265	1,605	24.71	627.6	29.93	760.2	19.4	—7.0	66.2	2	3	4	3	12	3	1	3	..	4,333	6,973	4	0.49	12.4
Des Moines	N. 41 35	W. 93 40	5.53 a.m.	849	259	29.24	742.7	30.21	767.3	9.1	—12.7	80.2	a9	3	..	3	..	2	..	2	11	3,854	6,202	6	1.55	39.4
Detroit	N. 41 21	W. 83 07	6.36 a.m.	645	197	29.43	747.5	30.15	765.8	14.8	—9.6	84.0	..	3	2	15	..	1	..	3	7	3,484	5,606	6	2.39	60.7
Dodge City	N. 37 39	W. 100 08	5.27 a.m.	2,512	766	27.44	697.0	29.92	760.0	14.8	—9.6	61.9	9	6	4	5	2	1	1	2	1	8,549	13,758	5	0.15	3.8
Dubuque	N. 42 30	W. 90 44	6.05 a.m.	665	203	29.43	747.5	30.20	767.1	5.9	—14.5	81.3	2	7	2	3	3	2	..	..	12	2,810	4,522	6	1.87	47.5
Duluth	N. 46 48	W. 92 08	6.00 a.m.	644	184	29.42	747.3	30.19	766.8	0.6	—17.4	86.9	2	8	2	15	1	..	..	2	1	4,599	7,401	5	1.65	41.9
Eagle Pass	N. 28 40	W. 100 15	5.26 a.m.	780	238	29.40	746.7	30.17	766.3	35.7	2.1	75.8	7	5	1	1	..	10	..	3	4	3,760	6,051	4	1.15	29.2
Eagle Rock	N. 43 30	W. 112 04	4.40 a.m.	4,781	1,457	25.27	641.8	29.92	760.0	10.1	—12.2	80.1	17	1	..	9	1	..	..	3	5	5,877	9,458	8	3.66	93.0
Eastport	N. 44 55	W. 66 54	7.40 a.m.	61	18	29.92	760.0	30.00	762.0	14.2	—9.9	71.3	6	13	4	2	1	2	1	1	1	10,017	16,119	7	1.64	41.7

Edinburg	*N. 26 03*	*W. 98 08*	*5.36 a.m.*	*(?)*	*(?)*	...	...	...	...	*44.6*	*7.0*	*74.7*	*18*	...	...	...	*8*	*1*	...	...	*4*	...	...	*7*	*2.79*	*70.9*
El Paso	*N. 31 46*	*W. 106 32*	*5.02 a.m.*	*3,760*	*1,146*	*26.26*	*667.0*	...	...	*30.4*	*—0.9*	*85.7*	*8*	*9*	*4*	...	*1*	*2*	*2*	*4*	*6*	*3,596*	*5,787*	*2*	*0.35*	*8.9*
Erie	N. 42 07	W. 80 10	6.47 a.m.	681	208	29.37	746.0	30.14	765.5	20.2	—6.6	84.4	...	2	7	6	10	2	...	3	1	6,527	10,504	8	2.10	53.3
Escanaba	N. 45 46	W. 87 14	6.20 a.m.	612	186	29.43	747.5	30.16	766.1	3.0	—16.1	84.5	7	4	4	5	5	...	...	...	6	5,464	8,793	7	1.91	48.5
Florence	N. 33 03	W. 111 17	4.43 a.m.	1,490	454	28.58	725.9	30.18	766.6	36.2	2.3	62.0	3	1	3	3	...	1	4	7	9	1,839	2,960	4	0	0
Fort Apache	N. 33 47	W. 109 58	4.49 a.m.	5,050	1,539	25.02	635.5	30.47	773.9	22.3	—5.4	53.8	3	...	2	1	...	4	6	11	4	4,204	6,[illegible]36	3	0.20	5.1
Fort Assinaboine	N. 48 37	W. 109 43	4.49 a.m.	2,710	826	27.22	691.4	...	...	4.0	—15.6	70.2	9	...	...	13	...	...	...	6	3	7,503	12,075	6	2.29	58.2
Fort Bennett	N. 44 42	W. 100 38	5.26 a.m.	1,510	457	28.52	724.4	...	...	—0.3	—17.9	72.5	8	7	1	...	...	4	1	1	9	5,074	8,166	4	0.82	20.8
Fort Benton	N. 47 51	W. 110 40	4.45 a.m.	2,700	823	27.27	692.6	...	...	5.8	—14.6	82.4	...	...	...	...	...	...	...	...	...	4,585	7,379	7	2.27	57.7
Fort Buford	N. 48 03	W. 103 58	5.12 a.m.	1,900	579	28.12	714.2	30.21	767.3	—7.1	—21.7	88.4	1	4	4	1	1	...	3	2	15	4,118	6,627	5	1.98	50.3
Fort Custer	N. 45 48	W. 107 38	4.58 a.m.	3,040	927	26.87	682.5	...	...	3.9	—15.6	79.9	8	3	2	4	6	5	...	...	3	4,450	7,162	7	2.84	72.1
Fort Davis	N. 30 30	W. 103 45	5.13 a.m.	4,940	1,506	25.16	639.1	30.12	765.0	28.1	—2.2	80.0	...	...	...	...	...	...	...	...	...	6,226	10,020	8	0.50	12.7
Fort Elliot	N. 35 31	W. 100 27	5.28 a.m.	2,650	808	27.26	692.4	29.70	754.4	17.8	—7.9	44.1	7	11	2	3	1	3	...	1	3	8,746	14,075	3	0.47	11.9
Fort Gibson	N. 35 43	W. 95 16	5.48 a.m.	540	165	29.59	751.6	30.17	766.3	22.5	—5.3	76.3	9	3	1	2	3	4	2	1	6	5,217	8,396	6	1.76	44.7
Fort Grant	N. 32 25	W. 109 56	4.49 a.m.	4,860	1,481	25.19	639.8	29.99	761.7	34.0	1.1	52.0	7	2	1	...	...	...	2	15	4	4,918	7,915	3	0.05	1.3
Fort Griffin	N. 32 53	W. 99 21	5.33 a.m.	1,260	384	28.80	731.5	30.15	765.8	29.1	—1.6	66.5	6	4	3	...	7	3	1	1	6	7,231	11,637	5	0.62	15.7
Fort Keogh	N. 46 17	W. 105 55	5.05 a.m.	2,372	723	27.56	700.0	...	...	1.6	—16.9	79.4	4	4	1	6	1	1	2	...	12	3,673	5,911	7	2.85	59.7
Fort Macon	N. 34 42	W. 76 40	7.01 a.m.	11	3	30.14	765.5	30.15	765.8	38.7	3.7	92.1	b13	6	4	3	...	1	...	2	...	8,779	14,128	7	5.66	143.8
Fort Missoula	N. 46 50	W. 114 01	4.32 a.m.	3,140	957	26.76	679.7	...	...	33.3	0.7	94.9	4	3	1	4	2	2	2	1	12	1,976	3,180	7	8.22	208.8
Fort McKavett	N. 30 48	W. 99 58	5.28 a.m.	2.240	683	27.83	706.9	29.86	758.4	29.5	—1.4	76.2	...	...	...	...	...	...	...	...	...	7,347	11,824	4	0.12	3.0
Fort St. Michael	N. 63 48	W. 161 00	1.24 a.m.	(?)	(?)	29.84	757.9	29.87	758.7	16.6	—8.6	100.0	12	1	...	2	9	2	3	2	...	8,695	13,961	6	0.06	1.5
Fort Shaw	N. 47 29	W. 111 46	4.41 a.m.	3,550	1,082	26.38	670.0	...	...	9.0	—12.8	90.9	...	...	...	...	...	...	...	...	...	6,687	10,762	6	2.50	63.5
Fort Sill	N. 34 40	W. 98 30	5.34 a.m.	1,200	366	28.86	733.0	30.05	763.3	21.6	—5.8	78.5	10	3	...	...	3	1	1	1	12	6,213	9,999	5	1.92	48.8
Fort Stevenson	N. 47 36	W. 101 23	5.22 a.m.	1.750	534	28.23	717.0	...	...	—12.5	—24.7	d85.6	...	...	...	...	...	...	...	...	...	5,664	9,115	d4	0.72	18.3
Fort Verde	N. 34 24	W. 111 53	4.38 a.m.	(?)	(?)	...	...	...	...	26.3	—3.2	61.0	10	11	5	1	3	...	1	...	...	...	...	3	0.07	1.8
Fredericksburg	N. 30 20	W. 98 40	5.33 a.m.	1,700	518	28.33	719.6	30.01	762.2	34.1	1.2	81.4	13	2	7	...	...	1	...	2	6	5,635	9,068	4	0.95	24.1
Galveston	N. 29 18	W. 94 50	5.49 a.m.	40	12	30.11	764.8	30.16	766.1	43.8	6.6	83.7	8	4	2	1	4	...	6	6	...	7,654	12,318	4	3.94	100.1
Grand Haven	N. 43 05	W. 86 18	6.23 a.m.	620	189	29.42	747.3	30.13	765.3	17.3	—8.2	82.5	5	1	6	3	...	7	3	6	...	5,989	9,638	7	2.24	56.9
Hatteras	N. 35 14	W. 75 30	7.06 a.m.	19	6	30.12	765.0	30.14	765.5	28.5	3.6	83.7	11	7	4	5	...	1	1	2	...	10,876	17,503	6	7.27	184.7
Helena	N. 46 33	W. 112 02	4.40 a.m.	4,100	1,250	25.82	655.8	...	...	6.9	—13.9	88.6	...	...	...	...	...	...	...	...	...	2,876	4,628	6	2.86	72.6
Henrietta	N. 33 42	W. 98 00	5.36 a.m.	980	300	29.13	739.9	30.13	765.3	25.5	—3.6	75.1	4	9	1	4	4	3	...	4	2	7,661	12,329	5	0.99	25.1
Indianapolis	N. 39 47	W. 86 06	6.24 a.m.	746	227	29.33	745.0	30.17	766.3	19.8	—6.8	74.8	6	5	6	2	3	2	3	2	2	4,091	6,584	7	2.10	53.3
Indianola	N. 28 32	W. 96 38	5.42 a.m.	26	8	30.15	765.8	30.18	766.6	41.0	5.0	84.0	12	6	...	...	4	1	1	5	2	11,107	17,874	5	3.07	78.0
Jacksborough	N. 33 10	W. 98 00	5.35 a.m.	1,120	341	28.96	735.6	30.16	766.1	30.3	—0.9	69.7	6	5	...	6	2	2	...	...	10	5,394	8,681	5	0.48	12.2
Jacksonville	N. 30 24	W. 80 40	6.41 a.m.	43	13	30.13	765.3	30.18	766.6	48.1	8.9	81.8	6	4	3	3	1	1	...	13	...	5,017	8,074	6	9.12	231.6
Keokuk	N. 40 23	W. 91 25	6.02 a.m.	618	188	29.48	748.8	30.19	766.8	14.5	—9.7	75.3	3	4	6	3	3	2	1	4	5	4,341	6,986	6	0.50	12.7
Key West	N. 24 32	W. 81 48	6.41 a.m.	27	8	30.08	764.0	30.11	764.8	68.6	20.3	84.7	4	...	2	1	8	1	6	9	...	7,159	11,521	5	3.65	92.7
Kitty Hawk	N. 36 00	W. 75 23	7.05 a.m.	22	7	30.14	765.5	30.17	766.3	35.2	1.8	82.3	11	5	2	3	...	...	...	9	1	10,740	17,284	5	7.34	186.4
Knoxville	N. 35 56	W. 83 58	6.32 a.m.	980	299	29.15	740.4	30.21	767.3	30.5	—0.8	87.4	7	...	3	5	...	2	2	9	3	3,812	6,135	8	4.41	112.0
La Crosse	N. 43 48	W. 91 23	6.03 a.m.	702	214	29.37	746.0	30.19	766.8	4.5	—15.3	80.9	8	1	3	...	14	1	1	1	2	4,514	7,264	5	1.51	38.4
La Mesilla	N. 32 17	W. 106 48	5.01 a.m.	3,900	1,189	26.14	663.9	30.29	769.4	26.0	—3.3	65.1	10	1	2	1	3	2	1	2	9	1,794	2,887	3	0.04	1.0
Laredo	N. 27 32	W. 99 26	5.30 a.m.	460	136	29.72	754.9	30.07	763.8	40.5	4.7	82.8	9	4	...	...	6	1	1	5	5	3,672	5,909	6	3.15	80.0
Leavenworth	N. 39 19	W. 91 58	5.48 a.m.	842	256	29.28	743.7	30.20	767.1	15.8	—9.3	75.5	9	9	...	...	9	1	...	...	3	5,845	9,406	7	0.44	11.2
Lewiston	N. 46 25	W. 116 59	4.20 a.m.	?619	?188	29.36	745.7	30.05	763.3	27.9	—2.3	76.5	...	1	4	1	3	...	19	2	1	2,564	4,133	8	4.46	113.3
Little Rock	N. 34 40	W. 92 12	5.59 a.m.	298	91	29.86	758.4	30.19	766.8	31.0	—0.6	85.0	8	6	2	...	5	2	8	3	...	4,524	7,280	6	2.07	52.6
Los Angeles	N. 34 03	W. 188 16	4.15 a.m.	371	113	29.76	755.9	30.11	764.8	44.4	6.9	72.1	10	4	...	...	1	2	14	...	...	3,258	5,243	2	1.43	36.3
Louisville	N. 38 18	W. 85 52	6.25 a.m.	530	162	29.58	751.3	30.18	766.6	25.5	—3.6	80.2	9	2	3	5	5	2	1	4	...	5,733	9,226	7	3.24	82.3
Lynchburgh	N. 37 30	W. 79 02	6.52 a.m.	652	199	29.46	748.3	30.18	766.6	28.9	—1.7	79.0	1	3	4	3	1	1	2	3	13	2,134	3,434	6	4.47	113.5
Madison	N. 43 03	W. 89 30	6.10 a.m.	949	289	29.07	738.4	30.16	766.1	7.1	—13.8	74.6	5	5	8	3	6	2	1	1	...	6,506	10,470	5	2.05	52.1
Marquette	N. 46 33	W. 87 36	6.19 a.m.	673	205	29.35	745.5	30.13	765.3	6.7	—14.1	70.2	3	5	11	5	1	1	2	3	...	6,215	10,002	5	1.69	42.9
Mason	N. 30 42	W. 99 02	5.32 a.m.	1,620	494	28.45	722.6	30.30	769.6	32.8	0.4	80.8	5	7	6	2	1	2	4	2	2	6,761	10,881	4	0.37	9.4
Memphis	N. 35 07	W. 90 07	6.08 a.m.	321	98	29.85	758.2	30.21	767.3	29.2	—1.6	81.2	5	6	3	...	1	9	3	1	3	3,857	6,207	7	4.38	111.2

Monthly summary of international meteorological observations, January, 1881—Continued.

Stations.	Latitude.	Longitude.	Local time.	Altitude of barometer above sea.		Result of simultaneous observations for January, 1881.																Average cloudiness.	Total precipitation.	
						Mean barometer.				Mean temperature.		Mean relative humidity.	Wind.											
						Actual.		Reduced.					Directions.									Total movement.			
				Feet.	Meters.	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.		N.	NW.	W.	SW.	S.	SE.	E.	NE.	C.	Miles.	Kilometers.	0-10.	Inches.	Millimeters.
UNITED STATES SERIES—Contd.	° ′	° ′																							
Milwaukee	N. 43 03	W. 87 54	6.17 a.m.	697	212	29.36	745.7	30.16	766.1	11.7	—11.3	81.0	1	14	6	5	3	1	....	1	....	7,419	10,940	6	1.86	47.2
Mobile	N. 30 42	W. 87 59	6.16 a.m.	41	12	30.09	764.3	30.17	766.3	43.2	6.2	86.4	7	6	3	....	6	2	2	5	....	5,305	8,538	7	7.62	193.6
Montgomery	N. 32 22	W. 86 23	6.23 a.m.	219	66	29.95	760.7	30.20	767.1	39.3	4.1	86.3	9	6	3	2	....	4	4	3	....	4,219	6,790	7	3.58	90.9
Morgantown	N. 39 36	W. 79 52	6.48 a.m.	963	293	29.13	739.9	30.17	766.3	28.2	—2.1	72.3	3	....	2	9	....	1	....	2	14	3,736	6,012	8	3.08	78.2
Moorhead	N. 46 52	W. 96 40	5.41 a.m.	923	281	29.15	740.4	30.24	768.1	—8.1	—22.3	71.3	8	7	1	....	10	....	1	....	4	7,575	12,190	4	0.60	15.2
Mount Washington	N. 44 16	W. 71 16	7.22 a.m.	6,272	1,902	23.39	594.1	29.75	755.6	2.2	—16.6	75.0	....	24	1	....	2	1	1	2	....	28,705	46,195	5	3.94	100.1
Nashville	N. 36 11	W. 86 53	6.21 a.m.	507	154	29.64	752.8	30.20	767.1	29.8	—1.2	82.0	4	7	7	2	2	1	1	4	3	3,002	4,831	8	3.54	89.9
New Haven	N. 41 17	W. 72 57	7.16 a.m.	107	32	30.07	763.8	30.13	765.3	16.9	—8.4	73.0	10	6	5	1	1	....	....	7	1	5,700	9,173	5	4.79	121.7
New London	N. 41 22	W. 72 09	7.19 a.m.	47	14	30.06	763.5	30.12	765.0	20.1	—6.6	69.9	9	13	5	1	....	....	1	....	2	4,601	7,469	5	6.76	171.7
New Orleans	N. 29 58	W. 90 07	6.08 a.m.	52	16	30.09	764.3	30.15	765.8	46.0	7.8	78.3	9	3	1	1	4	4	4	5	....	5,804	9,340	6	11.15	283.2
Newport	N. 41 29	W. 71 19	7.23 a.m.	44	13	30.04	763.0	30.09	764.3	22.4	—5.3	79.5	8	7	9	3	1	....	1	2	....	7,828	12,598	4	5.70	144.8
New River	N. 34 30	W. 77 23	6.58 a.m.																							
New Shoreham	N. 41 10	W. 71 37	7.22 a.m.	27	8	30.08	764.0	30.11	764.8	25.9	—3.4	74.4	8	12	2	....	1	1	....	7	....	12,629	21,224	4	2.16	34.9
New York	N. 40 43	W. 74 00	7.12 a.m.	164	50	29.96	761.0	30.15	765.8	22.9	—5.1	87.8	8	9	7	3	1	....	1	2	....	5,873	9,452	6	5.41	137.4
Norfolk	N. 36 51	W. 76 19	7.03 a.m.	30	9	30.12	765.0	30.18	766.6	32.4	0.2	77.4	16	1	4	3	2	1	....	3	1	5,551	8,933	5	3.55	90.2
North Platte	N. 41 08	W. 100 53	5.24 a.m.	2,841	866	27.14	689.3	29.91	759.7	8.0	13.3	78.3	7	9	4	2	1	....	2	5	1	8,462	13,618	5	0.16	4.1
Olympia	N. 47 02	W. 122 56	3.56 a.m.	36	11	30.05	763.3	30.13	765.3	37.6	3.1	76.3	8	2	2	....	9	2	1	6	1	3,277	5,274	1	8.90	226.1
Omaha	N. 41 16	W. 96 00	5.45 a.m.	1,113	339	28.98	736.1	30.20	767.1	7.0	—13.9	82.8	11	6	1	....	8	1	....	....	4	7,223	11,624	6	0.61	15.5
Oswego	N. 43 29	W. 76 35	7.01 a.m.	304	93	29.78	756.4	30.13	765.3	18.8	—7.3	78.8	4	2	....	6	6	9	1	3	....	7,004	11,416	7	4.15	105.4
Pensacola	N. 30 25	W. 87 12	6.19 a.m.	30	9	30.15	765.8	30.19	766.8	45.0	7.2	86.1	7	4	1	....	1	2	8	7	1	5,214	8,391	6	7.49	190.2
Philadelphia	N. 39 57	W. 75 10	7.07 a.m.	62	16	30.11	764.8	30.17	766.3	23.6	—4.7	82.5	7	3	6	1	2	....	3	7	2	7,427	11,952	5	3.66	93.0
Phœnix	N. 33 18	W. 112 00	4.40 a.m.	1,120	341	28.98	736.1	30.90	784.8	31.6	—0.2	68.8	3	2	....	....	1	3	21	....	1	1,797	2,892	2	0	0
Pike's Peak	N. 38 48	W. 104 59	5.07 a.m.	14,134	4,308	17.44	443.0	29.65	753.1	—2.9	—19.4	67.2	6	7	7	5	1	....	....	2	3	17,589	28,306	3	2.58	65.5
Pilot Point	N. 33 20	W. 96 50	5.40 a.m.	800	244	29.31	744.5	30.25	768.3	34.3	1.3	67.2	a1	6	5	1	6	4	....	6	1	6,786	10,921	4	0.75	19.0
Pioche	N. 37 57	W. 114 26	4.30 a.m.	6,110	1,862	24.04	610.6	29.80	756.9	24.0	—4.4	61.5	6	6	....	5	8	1	....	1	4	5,729	9,220	4	0.47	11.9
Pittsburgh	N. 40 32	W. 80 02	6.48 a.m.	776	236	29.31	744.5	30.17	766.3	24.7	—4.1	82.8	1	8	5	5	1	1	3	4	3	4,452	7,165	7	3.55	90.2
Port Huron	N. 42 58	W. 82 29	6.38 a.m.	633	193	29.42	747.3	30.15	765.8	12.5	—10.8	80.3	2	3	6	1	12	2	....	4	1	6,206	9,985	7	3.50	88.9
Portland, Me	N. 43 40	W. 70 16	7.27 a.m.	45	14	30.01	762.2	30.06	763.5	17.4	—8.1	70.3	4	15	7	....	....	....	....	4	1	5,369	8,640	5	4.30	109.2

Portland, Oreg.	N. 45 30	W. 122 28	3.57 a.m.	67	20	30.07	763.8	30.15	765.8	37.0	2.8	83.7	1	6	1	1	5	5	7	4	1	3,835	6,172	7	8.57	217.7
Portsmouth	N. 35 02	W. 76 04	7.04 a.m.	40	12					38.6	3.7	82.4	a6	4	3	5	1			11		11,489	18,489	7	2.72	69.1
Prescott *f*	N. 34 29	W. 112 31	4.38 a.m.	5,300	1,615	24.76	628.9	30.12	765.0	25.8	—3.4	65.0	2	2	2	4	6	2		5	8	3,296	5,304	2	0.16	4.1
Punta Rassa	N. 26 36	W. 82 10	6.40 a.m.	13	4	30.09	764.3	30.11	764.8	60.7	15.0	86.3	6	1		2	1	4	3	14		8,025	12,915	6	4.02	102.1
Red Bluff	N. 40 10	W. 122 16	3.59 a.m.	350	106	29.77	756.1	30.13	765.3	46.5	8.1	80.2	9	7	2	2	6	3		1	1	6,893	11,093	5	9.40	238.8
Rio Grande City	N. 26 22	W. 98 45	5.33 a.m.	230	70	29.97	761.2	30.20	767.1	43.1	6.2	79.8										4,900	7,886	7	3.48	88.4
Rochester	N. 43 08	W. 77 51	6.58 a.m.	589	179	29.46	748.3	30.12	765.0	17.8	—7.9	81.0	1	4	12	7		5	1	1		5,316	9,555	8	4.68	118.9
Roseburgh	N. 43 10	W. 123 16	3.55 a.m.	511	156	29.56	750.8	30.15	765.8	40.5	4.7	92.6	2	1	1	2	3		3	2	17	1,973	3,175	7	11.60	294.6
Sacramento	N. 38 35	W. 121 31	4.02 a.m.	70	21	30.07	763.8	30.15	765.8	45.7	7.6	89.7	7	1			7	11	4	1		5,548	8,928	5	6.14	156.2
Saint Louis	N. 38 37	W. 90 15	6.07 a.m.	568	173	29.58	751.3	30.20	767.2	18.2	—7.7	84.5	7	5	6		7	2	4			7,067	11,373	6	0.49	12.4
Saint Paul	N. 44 53	W. 93 05	5.56 a.m.	811	247	29.23	742.4	30.15	765.8	2.9	—16.2	78.7	3	8	3	2		7	3	1	4	5,570	8,994	4	4.34	110.2
Saint Vincent	N. 48 58	W. 97 63	5.40 a.m.	804	245	29.27	743.4	30.18	766.6	—10.3	—23.5	98.0	1	8	5	3	10	1		2	1	7,665	11,370	3	0.13	3.3
Salt Lake City	N. 41 10	W. 112 00	4.40 a.m.	4,348	1,325	25.68	652.3	30.00	762.0	29.9	—1.2	46.9	5		1	2	7	1			15	3,360	5,407	9	1.24	31.5
San Antonio *f*	N. 29 28	W. 98 22	5.34 a.m.	676	206	29.46	748.3	30.20	767.1	35.6	2.0	80.3	9	6		1	2			4	9	3,571	5,747	5	0.58	14.7
San Diego	N. 32 32	W. 117 08	4.20 a.m.	67	20	30.07	763.8	30.14	765.5	46.4	8.0	70.6	4	1	1		1		6	14	4	4,216	6,785	3	0.52	13.2
Sandusky	N. 41 27	W. 82 43	6.37 a.m.	639	195	29.45	748.0	30.17	766.3	20.1	—6.6	78.8		5		11	8		3	2	2	8,240	13,261	8	1.31	33.3
Sandy Hook	N. 40 28	W. 74 01	7.12 a.m.	28	8	30.11	764.8	30.15	765.8	23.3	—4.8	76.3	6	6	5	5		1	1	6	1	9,214	14,828	5	5.03	127.8
San Francisco	N. 37 48	W. 122 26	3.58 a.m.	60	18	30.07	763.8	30.13	765.3	51.6	10.9	78.4	7	2	1	3	3	8	1	4	2	5,586	8,990	6	8.69	220.7
Santa Fé	N. 35 41	W. 106 10	5.04 a.m.	7,049	2,148	23.18	588.8	29.72	754.9	18.0	—7.8	68.5	13			1				3	14	4,232	6,811	2	0.38	9.7
Savannah	N. 32 05	W. 81 08	6.44 a.m.	87	26	30.10	764.5	30.20	767.1	43.8	6.6	82.9	10	4	5	1	4		2	5		5,067	8,154	8	5.77	146.6
Shreveport	N. 32 30	W. 93 45	5.54 a.m.	227	69	29.93	760.2	30.19	766.8	35.6	2.0	83.3	1	5	4	2	4		2	5	8	3,966	6,286	6	2.24	56.9
Silver City	N. 32 48	W. 108 15	4.55 a.m.	5,890	1,795	24.24	615.7	30.72	780.3	24.5	—4.2	56.7	12	9	2		1				7	2,500	4,023	1	0.02	0.5
Smithville	N. 33 55	W. 78 01	6.56 a.m.	33	10	30.14	765.5	30.18	766.6	30.0	3.9	86.0	17	4	3	2	1	1			3	5,831	9,384	7	6.05	153.7
Socorro *f*	N. 34 05	W. 106 55	5.01 a.m.	4,565	1,391	25.37	644.4	29.43	747.5			56.8	5	9		5	1	2	3	5	1	4,800	7,725	2	0.55	14.0
Springfield, Ill	N. 39 48	W. 89 48	6.10 a.m.	644	196	29.47	748.5	30.20	767.1	17.9	—7.8	77.7	6	6	4	3	6	2	1	3		6,508	10,473	6	0.84	21.3
Springfield, Mass	N. 42 06	W. 72 36	7.18 a.m.	120	37	30.00	762.0	30.14	765.5	15.1	—9.4	67.2	15	4	4	1	2		1		4	3,575	5,753	4	3.16	80.3
Stockton	N. 30 50	W. 102 50	5.16 a.m.	3,010	917	27.02	686.3	30.02	762.5	29.9	—1.2	77.6	9	1	1	10	7		1		2	6,969	11,215	4	0.20	5.1
Thatcher's Island	N. 42 36	W. 70 34	7.26 a.m.	48	15	30.03	762.7	30.09	764.3	22.4	—5.3	70.1	4	8	13			1	2	3		14,102	22,694	7	4.56	115.8
Toledo	N. 41 40	W. 83 32	6.34 a.m.	651	198	29.43	747.5	30.16	766.1	19.5	—6.9	68.2	6	1	10	7	3	1	1	2		5,915	9,519	4	0.54	13.7
Tucson	N. 32 14	W. 110 56	4.44 a.m.	2,369	722	27.59	700.8	30.14	765.5	33.7	0.9	52.5			2	2	21	3	1		2	2,981	4,797	1	0.05	1.3
Umatilla	N. 45 55	W. 119 21	4.11 a.m.	340	103	29.89	759.2	30.43	772.9	22.3	—5.4	86.5	1	5	6	3	2	8	3	2	1	4,667	7,511	7	2.45	62.2
Uvalde	N. 29 13	W. 99 40	5.29 a.m.	930	283	29.21	741.9	30.08	764 0	35.1	1.7	68.6	12	4	1		3	1	1	2	7	3,002	4,830	7	0.43	10.9
Vicksburgh	N. 32 23	W. 90 54	6.04 a.m.	211	74	29.93	760.2	30.20	767.1	47.9	8.8	81.4	10	3	1		5	4	3	3	2	4,958	7,979	7	3.37	85.6
Visalia	N. 36 20	W. 119 16	4.11 a.m.	318	106	29.77	756.1	30.15	765.8	42.9	6.1	88.9	2	5			1	10	11	1	1	1,898	3,054	4	2.71	68.8
Washington	N. 38 53	W. 77 01	7.00 a.m.	106	32	30.06	763.5	30.19	766.8	23.4	—4.8	85.6	5	10	2	1	2	2	1	5	3	3,133	5,042	7	5.14	130.6
Wickenburgh *f*	N. 33 58	W. 112 42	4.37 a.m.	(?)	(?)					31.0	—0.6	68.6	1	18	10	1	1							4	0.07	1.8
Wilmington	N. 34 11	W. 78 10	6.56 a.m.	73	22	30.12	765.0	30.18	766.6	39.4	4.1	76.2	9	2	4	1	2		2	6	5	4,066	6,544	4	5.06	128.5
Winnemucca	N. 41 00	W. 119 21	4.17 a.m.	4,342	1,323	25.65	651.5	30.01	762.2	30.9	—0.6	71.6					12	1	1		16	1	6,712	10,802	3	3.08	78.2
Wood's Holl	N. 41 33	W. 70 40	7.26 a.m.	35	11	30.03	762.7	30.07	763.8	23.5	—4.7	78.4	6	15	3	2		2	1	2		11,267	18,132	5	2.57	65.3
Yankton	N. 42 45	W. 97 30	5.38 a.m.	1,228	374	28.83	732.3	30.28	769.1	1.5	—16.9	73.9	10	6	1	2	1	1		1	9	5,557	8,943	4	1.23	31.2
Yuma	N. 32 44	W. 114 36	4.30 a.m.	141	43	29.95	760.7	30.11	764.8	43.7	6.5	52.5	7	1	1	3	1	3	1	3	1	4,248	6,836	1	0	0
Sub-series.																													
Bogota *a*	N. 4 36	W. 74 14	7.41 a.m.	8,704	2,653	22.00	558.8			50.8	10.4	69.9						1		2		27			4	0.29	7.4
Buff Bay Town, Jamaica ‡	N. 18 15	W. 76 39	7.01 a.m.	(?)	(?)	29.83	759.2	30.20	767.1	68.2	20.1	88.1	*a*		3	3	2	3	19					4		
Havana	N. 23 09	W. 82 22	6.39 a.m.	50	15	30.05	763.3	30.10	764.5	72.4	22.4	81.9	2			1		7		1	20			5	8.77	222.8
Jakobshavn	N. 69 13	W. 50 55	8.44 a.m.	43	13	30.00	762.0	30.06	763.5	18.3	—7.6		3	1	10	4	3	2		8				5	0.67	17.0
Kingston	N. 18 58	W. 76 48	7.01 a.m.	10	3	30.04	763.0	30.05	763.3	67.1	19.5	81.9	10								21	2,439	3,925	1	0.79	20.1
Navassa	N. 19 25	W. 75 03	7.43 a.m.	77	23	29.96	761.0	30.04	763.0	76.4	24.7	72.2							7	24				6	2.03	51.6
Paramaribo	N. 5 50	W. 55 13	8.27 a.m.	6	2	30.01	762.2	30.01	762.2	76.7	24.8	87.7			1				4	26				9	15.05	382.3
Puerto Berrio	N. 6 32	W. 74 28	7.10 a.m.	542	165	29.40	746.7	29.98	761.5	82.0	27.8	87.6			1			1			29			2	0.97	24.6
Rivas	N. 11 26	W. 85 47	6.25 a.m.	150	46					73.4	23.0							11	10	10				2	0.10	2.5

Monthly summary of international meteorological observations, January, 1881—Continued.

Stations.	Latitude.	Longitude.	Local time.	Altitude of barometer above sea.		Result of simultaneous observations for January, 1881.																						Average cloudiness.	Total precipitation.	
						Mean barometer.				Mean temperature.		Mean relative humidity.	Wind.																	
						Actual.		Reduced.					Directions.									Total movement.									
				Feet.	Meters.	Inches.	Millimeters.	Inches.	Millimeters.	Fahrenheit.	Centigrade.		N.	NW.	W.	SW.	S.	SE.	E.	NE.	C.	Miles.	Kilometers.						0-10.	Inches.	Millimeters.
UNITED STATES SERIES—Contd.																														
Sub-series.	° ′	° ′																												
Santiago de Cuba	N. 19 55	W. 75 50	7.04 a.m.	21	6	30.02	762.5	30.05	763.3	73.6	23.1	77.0	11	1						1	16							4	0.18	4.6
Saint Thomas	N. 18 20	W. 64 56	7.48 a.m.	110	33																									
Upernavik	N. 72 47	W. 56 00	8.24 a.m.	10	3	30.02	762.6	30.03	762.7	7.5	—13.6		1		14	1	2	4	1		8							1	1.25	31.8
York Factory	N. 57 02	W. 92 56	5.58 a.m.	45	14	29.85	758.2	29.91	759.7	—32.9	—36.1		3	9	4	7	8											4	0.49	12.4

The following table of ocean mean data, from observations taken at 7.00 a. m., Washington, or 0.08 p. m. Greenwich mean time, is computed from the isobars, isotherms and wind directions of the daily international charts, which latter are based upon the data obtained from the logs of vessels for the month of January, 1881:

Ocean square bounded by—	Barometer.		Temperature.		Prevailing wind.	Force, 0-10.
	Inches.	Millimeters.	Fahrenheit.	Centigrade.		
° ° ° °						
N. 30 and 35, W. 10 and 15	29.97	761.2	64.9	18.3	SW.	3.1
N. 35 and 40, W. 10 and 15	29.87	758.7	58.7	14.8	SW.	4.0
N. 35 and 40, W. 15 and 20	29.80	756.9	60.1	15.6	SW.	4.6
N. 30 and 35, W. 15 and 20	29.89	759.2	65.0	18.3	SW.	3.5
N. 40 and 45, W. 10 and 15	29.75	755.6	51.5	10.8	SE.; NE.	3.8
N. 45 and 50, W. 10 and 15	29.77	756.1	48.2	9.0	NE.	4.7
N. 45 and 50, W. 15 and 20	29.73	755.1	50.4	10.2	NE.; SE.	5.3
N. 40 and 45, W. 15 and 20	29.70	754.4	53.6	12.0	SE.	5.1
N. 50 and 55, W. 10 and 15	29.85	758.2	42.2	5.7	NE.	4.0
N. 55 and 60, W. 10 and 15	29.91	759.7	39.5	4.2	NE.	3.8
N. 55 and 60, W. 15 and 20	29.93	760.2	39.5	4.2	NE.	4.1
N. 50 and 55, W. 15 and 20	29.87	758.7	44.1	6.7	NE.	4.7
N. 10 and 15, W. 20 and 25	29.98	761.5	79.8	26.6	NE.	2.0
N. 15 and 20, W. 20 and 25	30.02	762.5	76.3	24.6	NE.	2.0
N. 15 and 20, W. 25 and 30	30.02	762.5	76.4	24.7	NE.	2.0
N. 10 and 15, W. 25 and 30	30.00	762.0	79.3	26.3	NE.	2.1
N. 20 and 23, W. 20 and 25	30.00	762.0	71.9	22.2	NE.	2.6
N. 25 and 30, W. 20 and 25	29.95	760.7	68.2	20.1	SW.	3.1
N. 25 and 30, W. 25 and 30	29.90	759.4	68.0	20.0	SW.	3.4
N. 20 and 25, W. 25 and 30	29.97	761.2	71.5	21.9	NE.	2.9
N. 30 and 35, W. 20 and 25	29.79	756.7	64.2	17.9	SW.	4.4
N. 35 and 40, W. 20 and 25	29.67	753.6	60.0	15.6	SW.	4.6
N. 35 and 40, W. 25 and 30	29.62	752.3	59.3	15.2	SW.	3.8
N. 30 and 35, W. 25 and 30	29.72	754.9	63.1	17.3	SW.	3.8
N. 40 and 45, W. 20 and 25	29.65	753.1	54.7	12.6	SE.	4.9
N. 45 and 50, W. 20 and 25	29.67	753.6	51.2	10.7	NE.; SE.	5.4
N. 45 and 50, W. 25 and 30	29.61	752.1	51.4	10.8	SW.	5.5
N. 40 and 45, W. 25 and 30	29.58	751.3	54.4	12.4	SE.	4.9
N. 50 and 55, W. 20 and 25	29.80	756.9	45.1	7.3	NE.	4.8
N. 55 and 60, W. 20 and 25	29.92	760.0	37.8	3.2	NE.	4.4
N. 55 and 60, W. 25 and 30	29.90	759.4	38.0	3.3	NE.	4.3
N. 50 and 55, W. 25 and 30	29.79	756.7	44.2	6.8	NE.	4.9
N. 20 and 25, W. 30 and 35	29.96	761.0	71.0	21.7	NE.	2.7
N. 25 and 30, W. 30 and 35	29.86	758.4	67.4	19.7	SW.	3.1
N. 25 and 30, W. 35 and 40	29.87	758.7	67.1	19.5	SW.	3.0
N. 20 and 25, W. 35 and 40	29.97	761.2	71.4	21.9	NE.	2.1
N. 30 and 35, W. 30 and 35	29.70	754.4	62.5	16.9	SW.	3.9
N. 35 and 40, W. 30 and 35	29.60	751.8	58.4	14.7	SW.	3.8
N. 35 and 40, W. 35 and 40	29.62	752.3	57.9	14.4	SW.	3.8
N. 30 and 35, W. 35 and 40	29.71	754.6	61.8	16.6	SW.	3.2
N. 40 and 45, W. 30 and 35	29.53	750.0	54.1	12.3	SW.	4.6
N. 45 and 50, W. 30 and 35	29.54	750.3	50.4	10.2	SE.	5.6
N. 45 and 50, W. 35 and 40	29.52	749.8	49.0	9.4	NE.	5.1
N. 40 and 45, W. 35 and 40	29.41	747.0	52.0	11.1	NE.	4.8
N. 50 and 55, W. 30 and 35	29.73	755.1	43.2	6.2	NE.	5.1
N. 55 and 60, W. 30 and 35	29.86	758.4	36.8	2.7	NE.	4.4
N. 55 and 60, W. 35 and 40	29.84	757.9	35.9	2.2	NE.	3.7
N. 50 and 55, W. 35 and 40	29.72	754.9	40.3	4.6	NE.	4.5
N. 30 and 35, W. 40 and 45	29.77	756.1	61.5	16.4	SW.	3.4
N. 35 and 40, W. 40 and 45	29.67	753.6	58.3	14.6	SW.	3.9
N. 35 and 40, W. 45 and 50	29.73	755.1	54.1	12.3	NW.	4.2
N. 30 and 35, W. 45 and 50	29.82	757.4	61.1	16.2	NW.	4.1
N. 40 and 45, W. 40 and 45	29.55	750.6	49.3	9.6	NE.	4.5
N. 45 and 50, W. 40 and 45	29.54	750.3	43.9	6.6	NE.	4.8
N. 45 and 50, W. 45 and 50	29.61	752.1	37.3	2.9	NE.	4.1
N. 40 and 45, W. 45 and 50	29.62	752.3	41.9	5.5	NW.	4.6
N. 50 and 55, W. 40 and 45	29.71	754.6	37.5	3.1	NE.	4.1
N. 55 and 60, W. 40 and 45	29.84	757.9	33.7	0.9	NE.	3.6
N. 55 and 60, W. 45 and 50	29.84	757.9	31.0	— 0.6	NE.	3.3
N. 50 and 55, W. 45 and 50	29.76	755.9	31.2	— 0.5	NW.	3.6
N. 30 and 35, W. 50 and 55	29.90	759.4	61.0	16.1	NW.	3.7
N. 35 and 40, W. 50 and 55	29.80	756.9	53.0	11.7	NW.	4.2
N. 35 and 40, W. 55 and 60	29.87	758.7	52.3	11.3	NW.	4.1
N. 30 and 35, W. 55 and 60	29.96	761.0	60.8	16.0	NW.	3.6
N. 40 and 45, W. 50 and 55	29.70	754.4	36.7	2.6	NW.	4.2
N. 40 and 45, W. 55 and 60	29.78	756.4	31.9	— 0.1	NW.	4.2
N. 30 and 35, W. 60 and 65	30.03	762.7	60.9	16.1	NW.	3.7

Ocean square bounded by—	Barometer.		Temperature.		Prevailing wind.	Force, 0-10.
	Inches.	Millimeters.	Fahrenheit.	Centigrade.		
° ° ° °						
N. 35 and 40, W. 60 and 65	29.96	761.0	49.6	9.8	NW.	3.9
N. 35 and 40, W. 65 and 70	30.06	763.5	46.0	7.8	NW.	3.9
N. 30 and 35, W. 65 and 70	30.08	764.0	56.5	13.6	NW.	3.7
N. 40 and 45, W. 60 and 65	29.92	760.0	30.0	— 1.1	NW.	4.0
N. 40 and 45, W. 65 and 70	30.01	762.2	24.6	— 4.1	NW.	3.5
N. 25 and 30, W. 70 and 75	30.12	765.0	67.7	19.8	NW.	3.2
N. 25 and 30, W. 75 and 80	30.14	765.5	61.4	16.3	NE.	3.1
N. 30 and 35, W. 70 and 75	30.12	765.0	53.1	11.7	NW.	3.4
N. 35 and 40, W. 70 and 75	30.10	764.5	38.5	3.6	NW.	3.5
N. 30 and 35, W. 75 and 80	30.16	766.1	45.3	7.4	N.	2.8

The following table shows the position of ocean squares, the total number of observations, and the number of days on which observations were taken for each square during the month of January, 1881:

Ocean square bounded by—	Number of days.	Number of observations.
° ° ° °		
N. 55 and 60, W. 5 and 10	1	1
N. 35 and 40, W. 10 and 15	1	1
N. 35 and 40, W. 15 and 20	10	10
N. 30 and 35, W. 15 and 20	12	15
N. 40 and 45, W. 10 and 15	4	4
N. 45 and 50, W. 10 and 15	12	13
N. 45 and 50, W. 15 and 20	7	8
N. 40 and 45, W. 15 and 20	2	2
N. 50 and 55, W. 10 and 15	7	9
N. 55 and 60, W. 10 and 15	1	1
N. 55 and 60, W. 15 and 20	1	1
N. 50 and 55, W. 15 and 20	11	16
N. 10 and 15, W. 20 and 25	1	1
N. 15 and 20, W. 25 and 30	3	3
N. 20 and 25, W. 20 and 25	8	12
N. 25 and 30, W. 20 and 25	7	10
N. 20 and 25, W. 25 and 30	3	3
N. 30 and 35, W. 20 and 25	10	12
N. 35 and 40, W. 20 and 25	8	11
N. 35 and 40, W. 25 and 30	1	1
N. 40 and 45, W. 20 and 25	2	2
N. 45 and 50, W. 20 and 25	8	9
N. 45 and 50, W. 25 and 30	12	14
N. 40 and 45, W. 25 and 30	1	1
N. 50 and 55, W. 20 and 25	10	12
N. 50 and 55, W. 25 and 30	9	10
N. 50 and 55, W. 5 and 10	12	13
N. 35 and 40, W. 30 and 35	2	2
N. 35 and 40, W. 35 and 40	3	3
N. 30 and 35, W. 35 and 40	1	1
N. 40 and 45, W. 30 and 35	1	1
N. 45 and 50, W. 30 and 35	13	15
N. 45 and 50, W. 35 and 40	13	15
N. 40 and 45, W. 35 and 40	1	1
N. 50 and 55, W. 30 and 35	4	5
N. 50 and 55, W. 35 and 40	2	3
N. 35 and 40, W. 40 and 45	1	1
N. 40 and 45, W. 40 and 45	5	5
N. 45 and 50, W. 40 and 45	11	13
N. 45 and 50, W. 45 and 50	14	16
N. 40 and 45, W. 45 and 50	7	7
N. 45 and 50, W. 50 and 55	3	4
N. 45 and 50, W. 55 and 60	1	1
N. 40 and 45, W. 50 and 55	14	17
N. 40 and 45, W. 55 and 60	13	18
N. 30 and 35, W. 60 and 65	2	2

Ocean square bounded by—	Number of days.	Number of observations.
° ° ° °		
N. 35 and 40, W. 60 and 65	[illegible]	2
N. 35 and 40, W. 65 and 70	[illegible]	3
N. 30 and 35, W. 65 and 70	4	4
N. 40 and 45, W. 60 and 65	13	22
N. 40 and 45, W. 65 and 70	11	18
N. 40 and 45, W. 70 and 75	[illegible]	2
N. 30 and 35, W. 70 and 75	[illegible]	2
N. 35 and 40, W. 70 and 75	[illegible]	13
N. 30 and 35, W. 75 and 80	[illegible]	2
N. 45 and 50, W. 5 and 10	11	12
N. 35 and 40, W. 65 and 70	9	13
N. 35 and 40, W. 70 and 75	6	6
N. 25 and 30, W. 15 and 20	4	4
N. 25 and 30, W. 40 and 45	2	2
N. 25 and 30, W. 55 and 60	[illegible]	3
N. 25 and 30, W. 60 and 65	[illegible]	3
N. 20 and 25, W. 45 and 50	[illegible]	2
N. 20 and 25, W. 55 and 60	[illegible]	2
N. 20 and 25, W. 60 and 65	[illegible]	8
N. 15 and 20, W. 30 and 35	[illegible]	2
N. 15 and 20, W. 35 and 40	[illegible]	2
N. 15 and 20, W. 50 and 55	[illegible]	2
N. 15 and 20, W. 55 and 60	[illegible]	3
N. 15 and 20, W. 60 and 65	5	5
N. 10 and 15, W. 20 and 25	1	1
N. 10 and 15, W. 40 and 45	3	3
N. 10 and 15, W. 45 and 50	1	1
N. 10 and 15, W. 50 and 55	1	1
N. 10 and 15, W. 55 and 60	4	6
N. 10 and 15, W. 60 and 65	6	6
N. 10 and 15, W. 70 and 75	1	1

GENERAL REMARKS.

All data which appear in the Daily Bulletin of Simultaneous Meteorological Observations are copied from the regular exchanges of this office. The barometer readings for land stations, in the first and second columns, are reduced to freezing and their respective standards; those in the third and fourth columns to sea-level. When necessary, corrections for instrumental error, temperature and reduction to sea-level are applied at this office. In the Naval and Marine Series, corrections for temperature and reduction to sea-level are always applied, while those for instrumental error only, when such corrections can be ascertained with close approximation, as by comparison when vessels are at or near land stations. Relative humidity generally requires computation from the hygrometrical observations. When rain has fallen, but neither the amount or duration is recorded, the word "blank" is published in the rainfall column. The weather is generally published as given. The following symbols and abbreviations are common to all series, viz: †, aneroid; *, instrumental error not known; ‡, observations taken at 7.35 a. m., Washington mean time; c, cirrus; k, cumulus; s, stratus; n, nimbus; d, scud; f, fracto; p, pallio; hz, haze; fg, fog; sk, smoke; d. clouds, detached clouds. The movement of the air is published as given on the originals, when indicated by velocity in miles per hour, in meters per second, or by force, all variations of the latter being reduced to the common scale of 0 to 10. Those stations reporting the movement in pounds pressure per square foot are reduced to force on the common scale, and those in kilometers per hour, to meters per second and miles per hour. The distinction between upper and lower clouds is carefully made in the United States and a portion of the Canadian series, and the various formations are indicated by the letters heretofore given and their combinations. In the Monthly Summary of International Simultaneous Meteorological Observations the position of stations (latitude and longitude) are obtained from Keith Johnson's Index Geographicus, except where more exact information is furnished. The elevations of stations are obtained either from the annual, semi-annual, and monthly publications of the various meteorological bureaus here represented, or from the original forms, upon which are entered the daily observations. In the United States series the elevations are computed from the latest surveys, and are carefully revised each month, in order to note any change in the elevation of the barometer cistern at any station. It is believed for the most part that throughout the European and other series the elevations as given represent the height of the barometer cistern above sea-level; at least this

should be the case. The local time, where omitted or not given correctly in the originals, is carefully computed at this office. Generally, all conversions are made at this office. A letter placed opposite the name of a station or some portion of the data credited thereto indicates that a certain number of observations are missing, corresponding to the relative position in the alphabet of the letter so used. The following remarks relate to the individual peculiarities in the *methods* of recording and the *times* of taking the international simultaneous meteorological observations, under the auspices of the various Meteorological Bureau:

ALGERIAN SERIES.—The originals give the barometer in millimeters reduced to sea-level; temperature in centigrade. The movement of the air is indicated by force on a scale of 0 to 10. The rainfall is measured at 7 a. m., local time, and the amount indicated in millimeters.

AUSTRALIAN SERIES.—At Melbourne the conversions are published as given in the originals. The movement of the air is indicated by velocity in miles per hour. The kind of clouds is not given except by inference from general weather terms. At Hobart Town the barometer is given in English inches reduced to sea-level. The movement of the air is indicated in pounds pressure per square foot. The kind of clouds is given and indicated by abbreviating the English nomenclature.

AUSTRO-HUNGARIAN SERIES.—The originals give the barometer in millimeters reduced to sea-level, and the temperature in centigrade. At the following stations the rainfall is measured by local time: Lemburg, 7 p. m.; Vienna, 2 p. m.; Trieste, 7 a. m. The weather is given by the Vienna symbols or in general terms. At Gratz observations are made at 2 p. m., local time.

BELGIAN SERIES.—The originals give the barometer in millimeters reduced to sea-level, and the temperature in centigrade. The weather is occasionally given by the Vienna symbols. Except for Brussels, the distinction between upper and lower clouds is not made. At Furnes observations are taken at 12.26 p. m., local time, and at Maeseyck at 1 p. m., local time.

BRITISH SERIES.—In general the originals do not give rainfall or distinction between upper and lower clouds. Relative humidity, except for Bradford and Silloth Rectory is not given on the originals, but is computed from hygrometrical observations. At Cardington, Galway, Oxford, and Sandwick Manse the barometers are given as read off. At Free Town the barometer is reduced to freezing on the originals, but not to sea-level. The movement of the air is indicated by force, on a scale of 0 to 12, except pounds pressure per square foot at Greenwich. At the following stations rainfall is measured by local time: Bradford, 9 a m.; Nottingham, 6 p. m.; and Aberdeen, 10 a. m. The wind directions are given to 32 points and weather by the Beaufort notation.

CANADIAN SERIES.—The originals give the barometer reduced to sea-level in English inches and the temperature in Fahrenheit. The movement of the air is indicated by the Beaufort scale, except at St. Pierre, where it is given on a scale of 0 to 7. Charlottetown, St. Andrews, Windsor, and those stations marked with a star (*) give the clouds on a scale of 0 to 4, while the remainder report them on a scale of 0 to 10.

CAPE COLONY SERIES.—At Cape Town the barometer is given on the original as corrected for temperature only. Upper and lower clouds are given on a scale of 0 to 10, and the kind occasionally indicated by abbreviating Poëy's classification.

CHINESE SERIES.—The originals give the barometer in millimeters reduced to sea-level and the temperature in centigrade. The movement of the air is given in meters per second and the direction to 16 points. The kind of clouds is occasionally given, and the degree of cloudiness on the scale of 0 to 10; distinction between upper and lower clouds is sometimes made. The weather is given in general (French) terms. The rainfall is given in millimeters and measured at the moment of simultaneous observation.

COSTA RICAN SERIES.—At San José the originals give the barometer as corrected for temperature only, and the thermometer in centigrade. Relative humidity is not given on the originals, but is computed from the hygrometrical observations. Upper and lower clouds are given, the amount on a scale of 0 to 10 and the kind by Howard's classification. The rainfall is apparently measured at midnight.

DANISH SERIES.—The originals give the barometer in millimeters reduced to sea-level and the temperature in centigrade. The movement of the air is indicated by force, on a scale of 0 to 6. The weather is occasionally given by the Vienna symbols, but it is not certain that they always refer to the moment of simultaneous observations, except at Copenhagen. No distinction is made between upper and lower clouds, and the direction of movement, together with the rainfall, is entirely omitted.

FRENCH SERIES.—The originals give the barometer in millimeters reduced to sea-level and the temperature in centigrade. The movement of the air is indicated by force on a scale of 0 to 6, except in meters per second, for Mont Louis and Perpignan. In general the rainfall is measured at 9 a. m., local time, but at Lyons at the moment of simultaneous observation. The direction of upper and lower clouds is given, but no

distinction is made in kind. The degree of cloudiness is given on a scale of 0 to 4 at Clermont-Ferrand, Commune de Greasque, and Puy de Dome, while at other stations the scale of 0 to 10 is employed, or general weather terms, from which the amount of cloudiness is inferred. The weather is given in general terms, except occasionally by the Vienna symbols at Mont Louis and Perpignan.

GERMAN SERIES.—The originals give the barometer in millimeters reduced to sea-level and the temperature in centigrade. The movement of the air is indicated by force on a scale of 0 to 10, except at Carlsruhe, where the scale of 0 to 4 is used. No distinction is made between upper and lower clouds; the amount is given on a scale of 0 to 10, but the kind is rarely given. The weather is given in Vienna symbols or in general terms.

GREEK SERIES.—The originals give the barometer corrected for temperature only and the thermometer in centigrade. Hygrometrical observations are not given, and the rainfall is omitted. The kind of clouds is occasionally given, and the amount is inferred from the general weather terms. The movement of the air is indicated by force and is given on the scale of 0 to 10.

INDIAN SERIES.—The barometric observations refer to the Calcutta standard, whic requires a correction of —0.011 inch, or 0.28 m. m. as compared with the Kew standard. The wind-velocity given is the average rate of wind since the observation of the preceding day. All conversions are published as given in the originals, where the data are recorded to an additional decimal. The weather is given by the Beaufort notation, Vienna symbols, or special symbols.

ITALIAN SERIES.—The originals give the barometer in millimeters reduced to sea-level and the temperature in centigrade. The movement of the air is indicated by velocity in kilometers per hour or by force on a scale of 0 to 4 at Mondovi, Florence, and Cagliari. No distinction is made between upper and lower clouds, and the amount is given on a scale of 0 to 10. The weather is given in Vienna symbols.

JAPANESE SERIES.—The rainfall is measured at 9.30 a. m., local time, and the conversions are all published as given in the originals. Distinction is generally made between upper and lower clouds, and the amount is given on the scale of 0 to 10. The weather is given in general terms.

MAURITIUS SERIES.—All conversions are published as given in the originals. The direction of the wind is given to 64 points, and the rainfall is measured at 9.30 a. m., local time.

MEXICAN SERIES.—All conversions (subject to correction at this office) are published as given in the originals. The kind of clouds are given, and also the direction and amount of both upper and lower. The degree of cloudiness is indicated on the scale of 0 to 10.

NETHERLANDS SERIES.—The originals give the barometer in millimeters reduced to sea-level and the temperature in centigrade. The movement of the air is indicated by pressure in kilograms per square meter, except at Hellevoetsluis, which gives force on the scale of 0 to 12. The humidity is not given on the originals, but for two stations it is computed from the hygrometrical observations. The weather is only given for Utrecht, from which the amount of cloudiness at that station is inferred.

NORWEGIAN SERIES.—The originals give the barometer in millimeters reduced to sea-level and the temperature in centigrade. The movement of the air is indicated by velocity in meters per second or by force on a scale of 0 to 6. The weather is occasionally given by Vienna symbols. At Bergen, observations upon the weather and degree of cloudiness are made at 2 p. m., local time.

PORTUGUESE SERIES.—In the originals the barometer is given in millimeters and the temperature in centigrade. The movement of the air is indicated by velocity in kilometers per hour, except at Augra, which gives force on the scale of 0 to 9. The weather is occasionally given by the Vienna symbols. The rainfall is measured at noon of each day.

RUSSIAN SERIES.—The originals give the barometer in millimeters reduced to sea-level and the temperature in centigrade. The movement of the air is indicated by velocity in meters per second. No distinction is made between upper and lower clouds; the amount is given on the scale of 0 to 10, and the kind occasionally. The weather is occasionally given by the Vienna symbols. The rainfall is not given.

SCOTTISH SERIES.—The originals give the barometer as read off and the movement of the air is indicated by force on a scale of 0 to 6. Distinction is made between upper and lower clouds as to degree and the amount of cloudiness is given on a scale of 0 to 10. The direction of upper clouds is given separately. The rainfall and humidity are not given at North Unst. The wind direction is given to 32 points.

SPANISH SERIES.—The originals give the barometer at Barcelona, Bilbao, Burgos, Murcia, and Santiago as corrected for temperature only. The movement of the air, except for subseries, is given in kilometers per hour. The kind of clouds is occasionally

given and the degree of cloudiness on a scale of 0 to 10. The rainfall at San Juan is measured at 4 p. m., local time, and at San Fernando at midnight. The weather is given in general (Spanish) terms.

SWEDISH SERIES.—The originals give the barometer in millimeters reduced to sea-level, and the temperature in centigrade. The movement of the air is indicated by force, on a scale of 0 to 6, except in meters per second for Upsala. The kind of clouds is not given, but the degree of cloudiness is indicated on a scale of 0 to 10. The rainfall is measured at 8 a. m., local time, and the weather is occasionally given by the Vienna symbols.

SWISS SERIES.—The originals give the barometer in millimeters corrected for temperature only and the thermometer in centigrade. The movement of the air is indicated by force on a scale of 0 to 10, and at Zurich on a scale of 0 to 4. The rainfall at Zurich is measured at 9 a. m., local time.

TURKISH SERIES.—The originals give the barometer in millimeters reduced to sea-level. The temperature is given in centigrade. The movement of the air is indicated by force, on a scale of 0 to 7 for Valona, and on a scale of 0 to 12 for Beirut. At Constantinople the velocity is given in meters per second. The kind of clouds is not given, but the amount is indicated on a scale of 0 to 10, except at Valona, at which station it is inferred from the general weather terms.

UNITED STATES SERIES.—The originals generally give the barometer reduced to sea-level and the temperature in Fahrenheit. At Bogota the barometer is corrected for temperature only; at Navassa and Puerto Berrio is given as read off, and at Rivas is omitted. The amount of cloudiness is given on the scale of 0 to 4, except for Rivas, Paramaribo, and York Factory. The movement of the air is generally indicated by velocity in miles per hour, except on a scale of 0 to 10 for Bogota, Paramaribo, and Rivas, and 0 to 12 for Puerto Berrio. The wind-direction is generally given to 16 points, except 8 points for Bogota and 32 points for Rivas. The rainfall at Rivas is given in centimeters and millimeters.

BRITISH NAVAL SERIES.—The originals give the barometer as read off. The wind direction is given to 32 points. The movement of the air is indicated by force on a scale of 0 to 12. The distinction between upper and lower clouds is made as to direction, but not as to amount. The height of sea-disturbance is given on the scale of 0 to 9, and the weather by the Beaufort notation. The direction of movement of wind, clouds, and sea is compass direction, corrected only for deviation caused by the iron in the ship, while the correction for magnetic variation is applied at this office. The humidity is not given, but is computed from the hygrometrical observations.

GERMAN NAVAL SERIES.—No vessels reporting.

PORTUGUESE NAVAL SERIES.—The originals give the barometer in millimeters, corrected for temperature only, and the thermometer in centigrade. The movement of the air is indicated by force on the scale of 0 to 10. The humidity is not given, but is computed from the hygrometrical observations. The kind of clouds is not given, but the amount is indicated on the scale of 0 to 10; the direction of movement is given without distinction between upper and lower. The height of sea disturbance is given on the scale of 0 to 9, and the weather by the Beaufort notation. The rainfall is not measured, but the duration is generally given in hours and minutes.

SWEDISH NAVAL SERIES.—The originals give the barometer as read off. The movement of the air is indicated by force on the scale of 0 to 12, and the direction is corrected for magnetic variation at this office. The humidity is not given, but is computed from the hygrometrical observations. The rainfall is omitted. The height of the sea-swell is given on the scale of 0 to 9, and the weather by the Beaufort notation.

UNITED STATES NAVAL SERIES.—The originals give the barometer as read off. The humidity is not given, but is computed from the hygrometrical observations. The sea-swell and the weather are given in general terms. The direction of the wind is compass direction, corrected for variation.

BRITISH MERCHANT-MARINE SERIES.—Same as the Naval, except that frequently the direction of the wind is given to the true meridian.

GERMAN MERCHANT-MARINE SERIES.—Same as United States Naval, except that the steamship Braunschweig gives the sea-swell occasionally on the scale of 0 to 9, and the steamship Leipsig on the scale of 0 to 12.

SWEDISH MERCHANT-MARINE SERIES.—Same as Swedish Naval.

UNITED STATES MERCHANT-MARINE SERIES.—Same as United States Naval.

ERRATA.

DAILY BULLETIN, JANUARY, 1881.—1st, page 11, White Star Line steamship Germanic, barometer reduced, 744.4, should read, 774.4. Swedish Merchant-Marine Series, barque Adolph Fredholm, should read, barque Adolf Fredholm; make similar correc-

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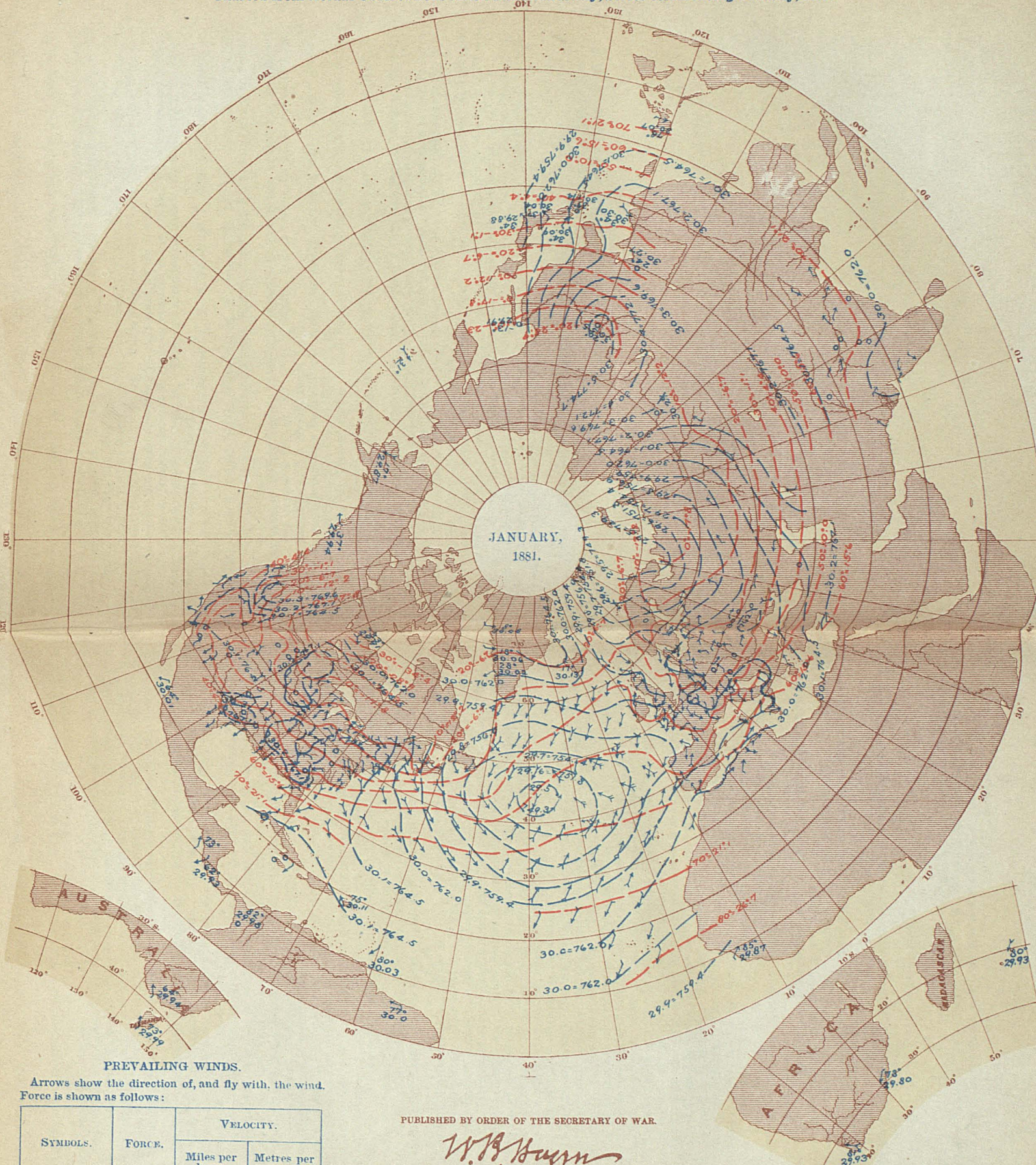
Office of the Chief Signal Officer,

UNITED STATES ARMY.

Charted from Actual Observations taken Simultaneously, Series commencing January, 1877.

No. IV.



PREVAILING WINDS.

Arrows show the direction of, and fly with, the wind.
Force is shown as follows:

Symbols.	Force.	Velocity.	
		Miles per hour.	Metres per second.
O	0	0	0
→	1, 2	0 to 9	0 to 4.0
→	3, 4	9.1 to 22.5	4.1 to 10.1
→	5, 6	22.6 to 40.5	10.1 to 18.1
→	7, 8	40.6 to 67.5	18.1 to 30.2
→	9, 10	67.6 up.	30.2 & over.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

W. B. Hazen

BRIG. & BVT. MAJ. GEN'L, CHIEF SIGNAL OFFICER, U. S. A.

ISOBARS AND ISOTHERMS.

Isobars in *blue*; detached barometer means in English inches.

Isotherms in *red*; detached temperature means in degrees Fahrenheit.

Broken lines, are doubtful.

INTERNATIONAL MONTHLY CHART.

Showing mean pressure, mean temperature, mean force and prevailing direction of winds at 7:35 A. M., Washington mean time, for the month of January, 1881, based on the daily charts of the International Bulletin.

tion on the 2d, 4th, 5th, 6th, 7th, 8th, 10th, 12th, 14th, 16th, 18th, 20th, 22d, 24th, 26th, 28th, 30th.

2d, page 3, German Series, the following stations should read: Thorn, no observations; Wiessenburg, Bavaria, 28.90, &c.; Wustrow, 30.38, &c. Make similar corrections on the 3d, 4th, 5th, 6th, 7th, 8th.

5th, page 4, Italian Subseries, Stelvio. rainfall, 11.811 inches or 300.0 m. m., should read, 1.181 inches or 30.0 m. m. Valdobbia, rainfall, 59.055 inches or 1500.0 m. m.; should read 5.905 inches or 150.0 m. m.; total for 90 hours.

6th, page 4, Italian Subseries, Stelvio, rainfall, 5.118 inches or 130.0 m. m., should read, 0.512 inches or 13.0 m. m. Page 7, United States Series, New River, N. C., insert figure 2 in column for force.

10th, page 9, British Naval Series, H. M. S. Sea-Gull, E. 480° 09′, should read, E. 48° 09′.

13th, page 9, British Naval Series, H. M. S. Superb, W. 15° 18′, should read, E. 15° 18′. Page 11, German Merchant-Marine Series, steamship Köln, rain and s'w, should read, rain and snow.

14th, page 4, Italian Series, Valdobbia, rainfall, 11.811 inches, or 300.0 m. m., should read 1.181 inches or 30.0 m. m. Page 8, British Naval Series, H. M. S. Alexandra, reduced barometer 56.1, should read, 756.1.

15th, page 5, Scottish Series, North Unst, barometer reduced, 29.71 in. or 754.6 m. m., should read, 29.61 in. or 752.1 m. m.

20th, page 10, United States Naval Series, Alert, Hong-Kong, China, barometer reduced, 763.8, should read, 763.5.

24th, page 9, British Naval Series, H. M. S., Tenedos, W. 90° 36′, should read, W. 50° 36′.

MONTHLY SUMMARY, DECEMBER, 1880.—Page 4, Russian Series, Barnaul, barometer reduced, 29.44, should read, 30.44. Kieff, actual barometer, 740.6, should read, 740.9.

Page 5, United States Series, Cleveland, temperature, centigrade, 5.2, should read, —5.2. McKavett, actual barometer, 25.84, should read, 27.84. Jacksborough, total movement, 9584, should read, 8584.

Page 6, United States Series continued, San Diego, relative humidity, 90.3, should read, 80.3. United States Subseries, Rivas, rainfall, 0.16 inches or 4.1 m. m., should read, ——. Santiago de Cuba, rainfall, ——, should read, 0.16 inches, or 4.1 m. m. St. Thomas, rainfall, 0.005 inches or 0.13 m. m., should read, ——. Upernavik, rainfall, 0.26 inches or 6. m. m., should read, 0.005 inches or 0.13 m. m. York Factory, rainfall, ——, should read, 0.26 inches or 6.6 m. m.

Published by order of the Secretary of War.

W. B. HAZEN,
Brig. & Bvt. Maj. Gen'l, Chief Signal Officer, U. S. A.

APPENDIX No. 61.

WAR DEPARTMENT, OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, D. C., May 28, 1882.

To the CHIEF SIGNAL OFFICER:

SIR: In conformity with the plan submitted in February, 1881, by a board appointed to consider the subject of monthly constants for reduction to sea-level, a preliminary set of such constants was prepared in the Study-room. See my report May 14 (1673 Mis.) and August 14 (2827 Mis.), and issued as Signal Service Orders for 1881, No. 30.

The steady progress subsequently made in correcting the approximate altitudes of Signal Service barometers made it proper that the values of these reduction constants for use during 1882 should be based upon an uniform system of temperatures and pressure. Accordingly, the monthly means of simultaneous observations at 7 a. m., 3, and 11 p. m. for the two years, November, 1879–November, 1881, were carefully revised and used in the final improved constants that were submitted in my report December 14, 1881. (4384, Mis. 81.)

I have the honor now to report herewith a complete explanation of the formula and methods adopted by Mr. Winslow Upton in the computation of these monthly constants, from which it will be seen that the accuracy of the adopted constants must depend almost entirely upon the correctness of the assumption that the constant temperature adopted at any station for a given month represents the temperature of the hypothetical column of air between that station and sea-level at any moment of observation. It is, in fact, in our power to attribute to the mass of air which is assumed to replace a plateau or mountain any temperature that we choose. The computed weight of a column of such air is the so-called "reduction to sea-level." If the reduced pressure agrees with the isobars based on much lower stations the reduction is considered to be plausible; but over an extended plateau this criterion fails, and, in fact, for all cases the only natural method of reduction would seem to consist in an attempt to reduce upward through the actually existing atmosphere (whose temperature and moisture can be observed) to a uniform altitude; but even in this case the fluctuations of pressure, temperature, and moisture will render the problem sufficiently difficult.

It is probable that any system of monthly constants will frequently be found to systematically misrepresent the distribution of pressure over North America, and this will principally be due to the assumption of a constant uniform temperature throughout the month, and not to errors in altitudes or formulæ or methods of computation. On the other hand, the attempt to reduce the individual observations at high stations to sea-level by adopting a reduction varying with the individual observed temperatures continually leads to unsatisfactory results, due to the great diurnal changes of observed temperature near the ground, and has as yet only become practically useful after introducing some arbitrary hypotheses as to the general temperature of the mass of air.

The studies of Ruhlmann and Schott show that the diurnal changes of temperature in the mass of air are comparatively small, while the monthly and non-periodic changes are large. It is hoped that further studies will be made as to the temperature proper to be adopted in reduction to sea-level, and that the present approximate method may then be replaced by one more in accordance with nature.

In accordance with Instructions No. 128, of series of 1881, I submit this report in duplicate for use in your forthcoming annual report.

I have the honor to remain very respectfully yours,

CLEVELAND ABBE,
Prof. and Asst. O. C. S. O.

LETTER OF TRANSMITTAL.

WAR DEPARTMENT, OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, D. C., March 31, 1882.

Prof. CLEVELAND ABBE:

SIR: I have the honor to submit herewith a report upon the methods adopted in the

computation of the monthly barometric reduction constants which were issued as Signal Service Orders No. 94, series of 1881.

Very respectfully, yours,

WINSLOW UPTON,
Computer, O. C. S. O.

INTRODUCTION.

The monthly barometric reduction constants published in Signal Service Orders No. 94, series of 1881, were derived according to the processes described in the following pages. In brief, the methods of computation were as follows:

1. For stations below 1,000 feet in altitude, the constants were obtained from the tables published in the work Instructions in the Use of Meteorological Instruments, by Robert H. Scott, London, 1875.

2. For stations above 1,000 feet in altitude, the constants were obtained by subtracting the mean monthly observed pressures from reduced pressures, which were interpolated from charts of monthly isobars. The isobars were projected from the observations at stations of known altitudes, which were reduced by a formula modified from that of Rühlmann (Die Barometrischen Hohenmessungen, &c., Leipzig, 1870.)

The details of the computation are explained in the following sections:

§ 1. Preparation of data.
§ 2. Derivation of Hypsometric Formula.
§ 3. Method of deriving the reduction constants.
§ 4. Diminution of Temperature with Altitude.
§ 5. Mean monthly pressures reduced to sea-level.
§ 6. Reduction constants for elevated stations.
§ 7. Barometric determination of elevations.
§ 8. The accuracy of the reduction constants.

§ 1. PREPARATION OF DATA.

The data required for the computation of monthly barometric reduction constants upon the plan contemplated by the Board which reported February 8, 1881, are for each station, as follows:

(1) Mean monthly pressures.
(2) Mean monthly temperatures.
(3) Mean monthly relative humidity.
(4) Elevation above sea-level.
(5) Approximate latitude.

The meteorological records on file in this office contain the observations made at the several stations for periods varying with the date of the establishment of each station. But the use of all the data at hand would give results for different stations that would not be comparable with each other, since the mean values would hold good for varying periods of time. In addition to this difficulty, the time of making the tri-daily observations was changed upon November 1, 1879, from 7.35 a. m., 4.35, and 11 p. m., Washington time to 7 a. m., 3, and 11 p. m., respectively. In order, therefore, to make use of data strictly homogeneous, and also to adopt a period of time at which there had been continuous observations at the greater number of stations, it was deemed best to employ only the observations for the two complete years, November 1, 1879–November 1, 1881, The following is a list of those stations for which the series of observations during these months is incomplete; at all others the series is complete, or very nearly so: Champaign, Chincoteague, Dayton, Decatur, Delaware Breakwater, Eagle Rock, Fort Assiniboine, Fort Bennett, Fort Benton, Fort Davis, Fort Elliott, Fort Missoula, Fort Maginniboine, Fort Shaw, Helena, Henrietta, Huron, Lewiston, Moorhead, New Shoreham, Port Eads, Saint Vincent, Spokane Falls, Uvalde.

In the preparation of the preliminary constants issued in Signal Service Orders No. 30, series of 1881, the mean monthly pressures, temperatures, and humidities for the year 1880 had been copied from forms 34 for the 7, 3, and 11 observations at each station, and their means taken as explained in the report on that subject. The corresponding data for November–December, 1879, and January–October, 1881, were now copied from forms 22, and the means taken. The whole work has been carefully checked, and since the copying of forms 22 and 34 from the original records and the means there given had apparently not been systematically examined prior to 1881, an examination of all discordant results was made and many errors were thus corrected. It was necessary also in many cases to consult the original records for the psychrometric observations, and to compute therefrom the relative humidities. This computation was made for stations above 1,000 feet in altitude by means of manuscript tables used in the preparation of Signal Service

Orders No. 41, series of 1881. For stations below 1,000 feet no use was made of relative humidities in deducing the reduction constants.

The approximate latitudes of the several stations were obtained from the records for all cases where the altitudes exceeded 1,000 feet.

The elevations of all Signal Service stations for which reliable spirit-level determinations were at hand were furnished for December 15, 1881, by Mr. H. A. Hazen, and are given in the table below. Changes in the elevations prior to this date were taken account of in the computation. The elevations of the stations for which no spirit-level determinations were at hand were determined barometrically as explained in § 7 of this report. They are marked B in the table. The values for stations above 2,000 feet were computed simply to complete this branch of the subject, and do not enter the computation of the constants for those stations in any way, as will be seen by reference to § 6 of this report.

Elevations of Signal Service stations, December 15, 1881.

Station.	Elevation.	Station.	Elevation.	Station.	Elevation.
	Feet.		*Feet.*		*Feet.*
Albany	75	Fort Elliott	2,650B	Olympia	36
Alpena	609	Fort Gibson	540B	Omaha	1,113
Atlanta	1,131	Fort Grant	4,860B	Oswego	304
Atlantic City	13	Fort Griffin	1,260B	Palestine	510*§
Augusta	183	Fort Keogh	2,372	Pensacola	30
Baltimore	45	Fort Macon	11	Philadelphia	52
Barnegat	20	Fort McKavett	2,240B	Phœnix	1,120B
Bismarck	1,722‡	Fort Missoula	3,146B	Pike's Peak	14,134
Boisé City	2,750B	Fort Shaw	3,550B	Pioche	6,110B
Boston	142	Fort Sill	1,200B	Pittsburgh	762
Brackettsville	1,170B	Fort Stevenson	1,750B	Port Eads	7
Bridgetown	28	Fort Stockton	3,646B	Port Huron	633
Brownsville	43	Fort Washakie	6,750B	Portland, Me	45
Buffalo	664††	Fredericksburgh	1,700B	Portland, Oreg	67
Burlington	268	Galveston	40	Prescott	5,340B
Cairo	377	Grand Haven	620	Punta Rassa	13
Campo	2,500B	Hatteras	19	Red Bluff	350B
Camp Thomas	2,710B	Havana, Cuba	50	Rio Grande City	230B
Cape Henry	16	Helena	4,100B	Rochester	621
Cape May	27	Henrietta	980B	Roseburgh	511
Castroville	780B	Huron	1,305§§	Sacramento	70
Cedar Keys	22	Indianapolis	753	Saint Louis	568
Champaign	767	Indianola	26	Saint Paul	811
Charleston	52	Jacksborough	1,120B	Saint Thomas	110
Charlotte	808	Jacksonville	43	Saint Vincent	804
Chattanooga	783	Keokuk	618	Salt Lake City	4,348
Cheyenne	6,089	Key West	27	San Antonio	673
Chicago	661	Kingston	10	San Diego	67
Chincoteague	18	Kittyhawk	22	Sandusky	639
Cincinnati	620	Knoxville	980	Sandy Hook	34
Cleveland	690	La Crosse	725	San Francisco	60
Columbus	805	La Mesilla	3,900B	Santa Fé	7,064
Davenport	615	Laredo	460B	Santiago de Cuba	21
Dayton	1,060B§§	Leavenworth	842	Savannah	87
Deadwood	4,600B	Lewiston	780B	Shreveport	227
Decatur	1,150B	Little Rock	298	Silver City	5,890B
Delaw'e Breakwat'r	20	Los Angeles	371	Sitka	63
Denison	767	Louisville	530	Smithville	34
Denver	5,294	Lynchburgh	652	Spokane Falls	1,910§§
Des Moines	849	Madison	949	Springfield, Ill	644
Detroit	661	Marquette	673	Springfield, Mass	120
Dodge City	2,512	Mason	1,620B	Springfield, Mo	1,412*
Dubuque	665	Memphis	321	Thatcher's Island	48
Duluth	644	Milwaukee	697	Toledo	651
Eagle Pass	780B	Mobile	41	Tucson	2,369
Eagle Rock	4,781‡§§	Montgomery	219	Umatilla	340B
Eastport	61	Moorhead	923	Uvalde	930B
El Paso	3,760B	Morgantown	963	Vicksburgh	244
Erie	681	Mount Washington	6,242§§‡‡	Visalia	348
Escanaba	612	Nashville	507	Washington	106
Florence	1,480B	Navassa Island	77	West Las Animas	3,905§§
Fort Apache	5,050B	New Haven	107	Williamsport	560*
Fort Assininiboine	2,710B	New London	47	Wilmington	52
Fort Bennett	1,510B	New Orleans	52	Winnemucca	4,327
Fort Benton	2,700B	Newport	44	Wood's Holl	35
Fort Buford	1,900B	New Shoreham	27	Yankton	1,228
Fort Concho	1,900B	New York	164	Yuma	141
Fort Custer	3,040B	Norfolk	30		
Fort Davis	4,940B	North Platte	2,841		

* Station not yet occupied; elevation assumed.
† A more recent determination gives for Bismarck 1,693 feet (March 20, 1882).
‡ A more recent determination gives for Eagle Rock 4,650 feet (March 20, 1882).
§ After occupation of station, elevation determined to be 533 feet.
†† Station at Buffalo moved November 1, 1881. New elevation 696 feet.
§§ No elevations were used for these stations in determining the reduction constants.
‡‡ A more recent determination gives for Mount Washington 6,279 feet (March 20, 1882).

§ 2.—Derivation of Hypsometric Formula.

The hypsometric formula, which by inversion becomes the formula for reducing to sea-level any barometric readings made at known elevations, was derived especially for this work, and in some ways is considered to be in some respects an improvement on those that have been published the past few years by Plantamour, Rühlmann, Williamson, Angot, and others. The formula of La Place serves as the basis of its derivation, and the method follows in the main, that of Rühlmann, published in the volume, Die Barometrischen Hohenmessungen und ihre Bedeutung für de Physik der Atmosphäre, Leipzig, 1870.

If we assume the atmosphere to be in static equilibrium, we have (La Place, Mecanique Celeste, Bowditch iv, p. 565), using Rühlmann's notation (p. 36), the following differential equation:

$$dp = -d_r\,(g)\,dr, \text{ in which}$$

p = pressure

d_r = density of the atmosphere

(g) = force of gravity

r = distance from the earth's center,

i. e., the decrement of the pressure p produced by the elevation dr is equal to the small column of air $d_r\,dr$ multiplied by the force of gravity (g). (Mec. Cel. iv, p. 478.)

Let (γ) = force of gravity at sea-level vertically beneath the place where its force = (g). According to the usual rule $\frac{(g)}{(\gamma)} = \frac{r_0^2}{r^2}$, in which r_0 and r = the distances from the earth's center to the points where the force of gravity is (γ) and (g) respectively. In preference to this formula we adopt* the law for the variation of gravity determined by Assistant C. S. Pierce, of the United States Coast and Geodetic Survey, from pendulum observations, and communicated to the Chief Signal Officer by Capt. C. P. Patterson, late Superintendent of United States Coast and Geodetic Survey, in a letter dated April 27, 1881 (1469 Mis., 1881). Mr. Pierce says: "According to my calculations, presented last October to the National Academy of Sciences, the length of the second's pendulum at h feet above the level of the sea, and at latitude ϕ, is

$$991^{mm}\left(1-\frac{h}{11{,}400{,}000}\right)(1+0.0052375\sin^2\phi).$$

This formula applies to continental stations. In the case of insular or nearly insular stations, the whole attraction of the surrounding water is to be allowed for."

Let

$$c = 11{,}400{,}000;$$

Then

$$\frac{(g)}{(\gamma)} = 1-\frac{h}{c}$$

$$dp = -d_r\,(\gamma)\left(1-\frac{h}{c}\right)dr.$$

But

$$dr = dh.$$

Hence

$$dp = -d_r\,(\gamma)\left(1-\frac{h}{c}\right)dh. \quad \ldots\ldots\ldots \quad (1).$$

According to Boyle's law, the volume of a given quantity of gas varies inversely as the pressure, and also as the density. Regnault's observations (Mem. de l'Institute xxi,

*The adoption of this formula is nearly in accordance with the value adopted by Broch in the work of the International Bureau of Weights and Measures (see Travaux et Memoires du Bureau International des Poids et Mesures, tome 1) for the coefficient of $\sin^2\phi$, but it recognizes in the factor $\left(1-\frac{h}{11{,}400{,}000}\right)$ the results obtained by Clarke, Walker, and others (see Clarke's Geodesy, p. 350), which assign less value to the attraction of mountain masses than that given by Poisson, which has usually been accepted.

pp. 374 *et seq.*) show that this law is not rigidly true, and this has been more recently confirmed by Mendelejeff (Comptes Rendus, lxxxii) and Amagat (Comptes Rendus, xc and xci). Regnault's observations have been discussed by G. W. Hill (The Analyst, Des Moines, Iowa, 1876, vol. iv, pp. 98–107), whose results are expressed by the formula—

$$V = \frac{K}{P} x \left(1 + \frac{y}{x} t\right), \text{ in which}$$

$$x = 1 + \alpha P^{\beta} \text{ and } y = \alpha + \alpha'' P^{3}.$$

The values of the constants are—

$$\alpha = -0.002565, \qquad \alpha' = 0.0036445,$$

$$\alpha'' = +0.00001987, \qquad \beta = 0.64776.$$

P denotes the pressure in meters at Regnault's laboratory, and t is the temperature in centigrade degrees. The values of log. x and $\frac{y}{x}$ are tabulated by Mr. Hill from pressures 0 to 21.5 meters. The following are extracted from his table:

m	$\log x$	$\frac{y}{x}$
0.0	0.00000°	0.0036445
0.1	9.999749	511
0.2	607	548
0.3	489	579
0.4	384	607
0.5	288	632
0.6	199	656
0.7	115	678
0.8	035	698

The effect of the deviations thus established are nearly inappreciable under pressures existing in the lower portions of the atmosphere, but as they can be included without complicating the formula, and render it applicable to extreme cases, it seems well to take account of them.

Let p and p' = two pressures at the same temperature (t)

d_r and Δ' = corresponding densities at the same temperature.

m and m' = the corresponding factors of Hill's formula of the form $x\left(1 + \frac{y}{x} t.\right)$

Then

$$p : p' = d_r\, m : \Delta'\, m'.$$

Let

p' = pressure when height of mercury is 0.76^{m},

D = corresponding density of mercury,

γ = force of gravity at the place of observation;

Also let Δ = density of dry air at temperature 0 °C when the barometric pressure is that of a column of mercury 0.76^{m} high.

α = expansion coefficient of air obtained from the above table at the pressure 0.76^{m}.

Then

$$p' = 0.76\, \gamma\, D,$$

$$\Delta' = \frac{\Delta}{1 + \alpha t}$$

$$p : 0.76\, \gamma\, D = d_r\, m : \frac{\Delta}{1 + \alpha t} m'$$

$$d_r = \frac{p\, \Delta}{0.76\, \gamma\, D\, (1 + \alpha t)} \frac{m'}{m}.$$

Assuming that aqueous vapor follows the same law, we have for aqueous vapor,

$$d_r'' = \frac{p'' \Delta''}{0.76\ \gamma\ D\ (1+\alpha'' t)} \frac{m'}{m}.$$

Let

P = total atmospheric pressure.

ϕ = quotient of vapor tension by total atmospheric pressure, then

$$P = p + p'' = p + \phi P,$$

$$p = P\ (1-\phi).$$

Let

$$\vartheta = \text{density of the atmosphere} = d_r + d_r''.$$

Then

$$\vartheta = \frac{P}{0.76\ \gamma\ D} \frac{m'}{m} \frac{1}{1+\alpha t} \left[(1-\phi)\ \Delta + \phi \Delta'' \frac{1+\alpha t}{1+\alpha'' t} \right].$$

Let k = the density of moisture expressed in terms of that of air,

$$\beta = 1 - k.$$

Then

$$\vartheta = \frac{P\ \Delta}{0.76\ \gamma\ D} \frac{m'}{m} \frac{1}{1+\alpha t} \left[(1-\phi) + k\phi \frac{1+\alpha t}{1+\alpha'' t} \right].$$

If $\alpha'' = \alpha$, which we assume in this investigation,

$$\vartheta = \frac{P\ \Delta}{0.76\ \gamma\ D} \frac{m'}{m} \frac{1}{1+\alpha t} (1 - \beta\phi). \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2).$$

Combining (1) and (2), remembering that p and d_r in (1) correspond with P and ϑ in (2), we have

$$\frac{dp}{p} = -\frac{\Delta}{0.76\ D} \frac{m'}{m} \frac{(\gamma)}{\gamma} \frac{1}{1+\alpha t} (1-\beta\phi) \left(1 - \frac{h}{c}\right) d\,h \quad . \quad . \quad . \quad (3).$$

If we integrate between the limits p'' and p' and h'' and h', assuming m and $(1-\beta\varphi)$ to be constant, and substituting h for $h'' - h'$, we have

$$\log. \frac{p''}{p'} = -\frac{\Delta\ M}{0.76\ D} \frac{m'}{m} \frac{(\gamma)}{\gamma} \frac{1}{1+\alpha t} (1-\beta\phi)\, h.$$

Hence

$$h = \frac{0.76\ D}{M\ \Delta} \frac{m}{m'} \frac{\gamma}{(\gamma)} (1+\alpha t)\ (1+\beta\phi) \log. \frac{p'}{p''} \quad . \quad . \quad . \quad . \quad . \quad (4).$$

In this equation, M = modulus of the common logarithms, and h is expressed in meters, as 0.76 is in that unit.

Let b', b'' = the barometric readings corresponding to the pressures p', p'', respectively, and g', g'' the corresponding forces of gravity, then

$$\frac{p'}{p''} = \frac{b'}{b''} \cdot \frac{g'}{g''}.$$

Let g = the force of gravity at sea-level, then by Peirce's formula, quoted above,

$$\frac{g'}{g''} = \frac{g'}{g} \div \frac{g''}{g} = \frac{1 - \frac{h'}{c}}{1 - \frac{h''}{c}} = 1 + \frac{h}{c}.$$

Hence

$$\log. \frac{p'}{p''} = \log. \frac{b'}{b''} + \log. \left(1 + \frac{h}{c}\right) = \log. \frac{b'}{b''} + M \frac{h}{c} \quad . \quad . \quad . \quad . \quad . \quad (5)$$

Combining equations 5 and 4, we have for our final formula—

$$h\ (\text{meters}) = \frac{0.76\ D}{M\ \Delta} \cdot \frac{m'}{m} \cdot \frac{\gamma}{(\gamma)} \cdot (1+\alpha t)(1+\beta\phi) \left[\log. \frac{b'}{b''} + M \frac{h}{c} \right] \quad . \quad . \quad (6).$$

It is now necessary to determine numerical values for the coefficients in equation (6).

1. *Derivation of* $\frac{0.76\ D}{M\ \Delta}$.

The ratio $\frac{D}{\Delta}$ can be obtained by determining the relative weights of the same volume of mercury and of air. According to Regnault (Mem. de l'Institute, xxi, p. 157) the weight of a liter of mercury at his observatory is 13595.93 grammes. Similarly the weight of a liter of dry air is 1.293204 grammes (ibid, p. 138, correcting an error pointed out by Lasch, in Pogg. Annalen, Ergänzungsband, iii, p. 322*).

This value we reduce to sea-level and lat. 45° by Peirce's formula given above, as follows:

Let

G = force of gravity at sea-level and lat. 0°,

g = force of gravity at sea-level and lat. 45°,

g' = force of gravity at elevation h and lat. ϕ,

Δ' = weight of liter of dry air at sea-level and lat. 45°,

Δ'' = weight of liter of dry air at elevation h and lat. ϕ.

By Peircé's formula—

$$\frac{g'}{G} = \left(1 - \frac{h}{c}\right)(1 + \eta \sin^2 \phi) \text{ in which } \begin{pmatrix} c = 11400000 \text{ feet.} \\ \eta = 0.0052375. \end{pmatrix}$$

Or

$$\frac{g'}{G} = \left(1 - \frac{h}{c}\right)\left(1 + \frac{\eta}{2}\right)\left(1 - \frac{\eta}{2+\eta} \cos 2\phi\right)$$

But

$$\frac{g}{G} = 1 + \frac{\eta}{2},$$

Hence

$$\frac{g'}{g} = \frac{\Delta''}{\Delta'} = \left(1 - \frac{h}{c}\right)\left(1 - \frac{\eta}{2+\eta} \cos 2\phi\right).$$

For Regnault's observatory $\phi = 48°\ 50'\ 14''$ and $h = 60$ meters (Mem. de l'Institute, xxi, p. 158), and since $\Delta'' = 1.293204$ grams, we have $\Delta' = 1.2927753$ grams.

To allow for the presence of carbonic acid, we assume 0.04 % as an average amount constantly present in the atmosphere. The relative weights of carbonic acid and dry air are (Wüllner, Lehrbuch der Experimental-Physik, iii, p. 132) 197741 and 129318; hence finally $\Delta = 1.293049$ grammes. The ratio $\frac{D}{\Delta}$ is consequently $\frac{13595.93}{1.293049}$

Hence

$$\frac{0.76\ D}{M\ \Delta} = 18{,}400^{m}.2. \quad \ldots \quad (7).$$

2. *Derivation of* $\frac{m}{m'}$.

By definition m' = Hill's factor of the form $x\left(1 + \frac{y}{x}\ t\right)$ when the pressure $0^{m}.76$.

Or,

$$m' = [9.999067]\ (1 + 0.0036690\ t) \quad \ldots \quad (8).$$

m is a variable, depending upon the pressure. As it was regarded a constant in the derivation of equation (4), its value must be taken from the table for the mean pressure between the upper and lower stations.

3. *Derivation of* $\frac{\gamma}{(\gamma)}$.

[*These values accord with those adopted by Broch in the work of the International Bureau of Weights and Measures. (See Travaux et Mémoires du Bureau International des Poids et Mesures, tome i, p. A. 51).]

By definition—

(γ) = force of gravity at sea-level lat. ϕ,

γ = force of gravity at sea-level lat. 45°;

Let

G = force of gravity at sea-level lat. 0°;

Then by Peirce's formula,

$$\frac{\gamma}{G} = 1 + \eta \sin^2 \phi = \left(1 + \frac{\eta}{2}\right)\left(1 - \frac{\eta}{2+\eta} \cos 2\phi\right).$$

$$\frac{\gamma}{G} = 1 + \frac{\eta}{2}, \text{ in which } \eta = 0.0052375,$$

Hence

$$\frac{\gamma}{(\gamma)} = 1 + \frac{\eta}{2+\eta} \cos 2\phi = 1 + 0.0026119 \cos 2\phi \quad \ldots\ldots \quad (9).$$

4. *Derivation of* α.

By definition α = coefficient of expansion of air at pressure 0^m.76 from Hill's table above given—

Hence

$$\alpha = 0.0036690 \quad \ldots\ldots\ldots\ldots \quad (10).$$

5. *Derivation of* $(1 + \beta\phi)$.

In the Zeitschrift der Österr. Gesellschaft für Meteorologie, Band ix, pp. 193–200 (see the translation published in the Smithsonian Report for 1877), Dr. Julius Hann derives empirically a law for the diminution of the vapor tension with the altitude. Making use of observations on the Himalayas, the Alps, in Armenia, on Teneriffe, and in balloons he finds that the observed vapor tensions at different altitudes are represented with almost perfect accuracy by the formula $p = p_0\, 10^{-\frac{h}{6517}}$. The same author, in a paper entitled "Zur barometrischen Höhenmessungen," published in Sitzungsberichte der k. Akad. der Wiss., Band lxxiv, employs the law thus derived in determining the value of the moisture factor in the hypsometric formula. Following his argument and employing his notation*, we treat the factor $1 + \beta\phi$ as follows:

Let e'' and E = vapor tensions at the upper and lower stations respectively,

b'' and B = the corresponding barometric pressures.

By Hann's law,

$$e'' = \mathrm{E}\, 10^{-\frac{h}{6517}}.$$

The hypsometric formula (6) is approximately

$$h = 18400 \log. \frac{b'}{b''},$$

Whence

$$b'' = \mathrm{B}\, 10^{-\frac{h}{18400}},$$

Hence

$$\frac{\mathrm{E}}{\mathrm{B}} = \frac{e''}{b''}\, 10^{-\frac{h}{10091}} \quad \ldots\ldots\ldots\ldots \quad (11).$$

As ϕ was considered constant in deriving equation (4), and its mean value must therefore be taken for the air column between the two stations, we have—

$$\phi = \frac{1}{2}\left(\frac{e''}{b''} + \frac{\mathrm{E}}{\mathrm{B}}\right) \quad \ldots\ldots\ldots\ldots \quad (12).$$

*We write e'' and b'' to agree with use of the accent (″) in the other factors of our formula.

When the vapor tension and pressure are known for the upper stations only, the value $\frac{E}{B}$ in (12) is to be obtained from (11).

$\beta = 1 - k$, where k = the ratio of the density of moisture to that of dry air. By theory $k = 0.622$, which value is confirmed by Regnault's experiments (Annales de Chimie et de Physique, N. S., xv, pp., 141 et 162).

Hence

$$\beta = 0.378,$$

$$1 + \beta\,\phi = 1 + 0.189\left[\frac{e''}{b''} + \frac{E}{B}\right] \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (13).$$

6. *Simplification of the factor* $\left[\log.\ \frac{b'}{b''} + M\frac{h}{c}\right]$.

Assuming an approximate value of h in (6) we have—

$$h = \frac{0.76\ D}{M\ \Delta}(1 + \alpha\, t)\log.\ \frac{b'}{b''},$$

Hence

$$\left[\log.\ \frac{b'}{b''} + M\ \frac{h}{c}\right] = \log.\ \frac{b'}{b''}\left(1 + \frac{0.76\ M\ D\ (1 + \alpha\ t)}{M\ \Delta\ c}\right).$$

By combination with (7) and (10) we have,

$$\left[\log.\ \frac{b'}{b''} + M\ \frac{h}{c}\right] = \log.\ \frac{b'}{b''}\ (1.002298 + 0.000008438\ t) \quad . \quad . \quad . \quad (14).$$

If now we substitute in (6) the numerical values given in (7), (8), (9), (10), (13), and (14), we have—

$$h\ (\text{meters}) = 18400.2\ m\ (1.004455 + 0.000008456\ t)\ (1 + 0.0026119\cos 2\,\phi) \times$$

$$\times\left(1 + 0.189\left[\frac{e''}{b''} + \frac{E}{B}\right]\right)\log.\ \frac{b'}{b''} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (15).$$

Converting to English measures, we have—

$$h\ (\text{feet}) = 60368.75\ m\ (1.004455 + 0.000004698\ [t - 32])\ (1 + 0.0026119\cos 2\,\phi) \times$$

$$\times\left(1 + 0.189\left[\frac{e''}{b''} + \frac{E}{B}\right]\right)\log.\ \frac{b'}{b''} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (16).$$

Let

$$A = 60368.75\ m\ (1.004455 + 0.000004698\ [t - 32]),$$

$$C = 1 + 0.0026119\cos 2\,\phi,$$

$$D = 1 + 0.189\left[\frac{e''}{b''} + \frac{E}{B}\right],$$

Then

$$h = \log.\ \frac{b'}{b''}\ A.\ C.\ D. \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (17).$$

For reducing barometric readings to sea-level, the formula by inversion becomes—

$$\log.\ b' = \log.\ b'' + \frac{h}{A.\ C.\ D.} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (18).$$

The value of the factors $\frac{1}{A}$, $\frac{1}{C}$, and $\frac{1}{D}$ are readily tabulated for different values of the variables contained in them. Such tables have been prepared and were used in the following application of formula (18) to the computation of the monthly reduction constants:

§3.—Method of Deriving the Reduction Constants.

The formula derived in § 2 gives for low altitudes results identical with those obtained by other formulæ, *e. g.*, the modified formula of La Place, used by Scott in his work, Instructions in the Use of Meteorological Instruments, London, 1875. In this book, pages 84–89, is given a convenient table, by the aid of which the reduction constants are so easily obtained for different elevations and temperatures that this table was used in the derivation of all the reduction constants of stations whose elevations were below 1,000 feet, thus avoiding the necessity of computing tables which would give the same results. The small effects of the latitude and moisture terms of the formula were not taken into account for these stations. The mean monthly temperatures used were those obtained by taking the mean of the two corresponding months in the two years adopted for the computation. In the case of the few stations for which the data were incomplete, the temperatures were obtained approximately by an examination of those at neighboring stations.

The computation of the reduction constants for all stations whose elevations exceed 1,000 was made the subject of special investigation based upon the formula derived in § 2. The use of this formula necessitates an inquiry into the proper values to be assigned to the temperatures designated by t. As t has been regarded constant in the derivation of the formula it must be taken as the mean value for the column of air between the two stations. The researches of Rühlmann and others tend to confirm what has been generally assumed, that the mean of the two temperatures at the stations may be adopted as the mean temperature of the column of air between them. But in the reduction of barometric readings at any one station to sea-level the temperature at sea-level is unknown, and must be determined in some way. This can be done if the law of the diminution of temperatures with altitude is known, or, the mean value for the whole column can at once be derived by reducing with this law the observed value at the station to the place of mean temperature without regard to its value at sea-level. The approximate law of diminution, 1° for each 300 feet, is not applicable universally; a special investigation has therefore been made to determine the law which can be best used for the elevated region between the ninetieth meridian and the Pacific coast.

§4.—Diminution of Temperature with Altitude.

As a first step towards the determination of the law of diminution of temperature with altitude, we may consider that the mean temperatures at different stations vary with their latitudes and altitudes according to some law yet undetermined. If we assume that these variations can be expressed by a linear function we shall have for each station the following equation:

$$t = x + by + cz,$$

in which t = observed mean temperature
x = temp. at lat. 1° and altitude 0. ft.
y = diminution for each degree of latitude.
z = diminution for each 1,000 feet of altitude.

In order to test the application of this formula a preliminary trial was made of the temperatures at nineteen stations situated above lat. 40°. Using the mean annual temperatures for the two years, the following results were obtained by the method of least squares:

$y = 2°.11$ for each degree of lat. above lat. 40°
$z = 1°.83$ for each 1,000 feet in altitude.

The residuals varied from + 5°.0 to — 6°.0.

A second trial with the mean monthly temperatures for January alone at the same stations gave the following results:

$y = 3°.47$, $z = 2°.67$, the residuals being, as might be expected, considerably larger than before.

This preliminary computation having shown that results of sufficient accuracy for a first determination could be obtained by this method, the stations west of the ninetieth meridian were arranged in two groups, according to latitude, above or below 40°. All stations were used for which temperature observations were available, whether their elevations were well determined or not, as it is evident that an approximate knowledge of the elevation is sufficient for the purpose. In the northern group were 36 stations; in the southern 48. Five computations by the method of least squares were made for each group, with the mean annual temperatures and with those for the months of January, April, July, and October. The following tables exhibit the results of these computations:

NORTHERN STATIONS.

	Year.	January.	April.	July.	October.
		°	°	°	°
x = temp. at lat. 40°	54°.94	36.64	56.32	77.51	56.64
y =	1.655	2.754	2.103	1.202	1.532
z =	1.237	1.265	0.993	0.933	1.705

SOUTHERN STATIONS.

		°	°	°	°
x = temp. at lat. 25°	76°.61	60.96	79.54	89.29	77.33
y =	1.354	1.528	1.555	0.943	1.295
z =	2.270	2.525	2.378	1.770	2.354

Table of residuals (v) for the annual temperatures.

NORTHERN STATIONS.

Stations.	Residuals.	Stations.	Residuals.
Saint Vincent	+6.0	Fort Assiniboine	—0.3
Fort Buford	2.5	Fort Benton	2.4
Fort Stevenson	3.9	Fort Shaw	1.9
Duluth	4.0	Olympia	5.2
Bismarck	3.3	Fort Missoula	1.2
Moorhead	5.7	Dayton	3.8
Saint Paul	1.8	Lewiston	5.7
Deadwood	0.9	Helena	0.9
Fort Bennett	3.4	Fort Keogh	0.6
La Crosse	1.0	Umatilla	5.6
Yankton	3.8	Portland	5.5
Dubuque	2.0	Fort Custer	1.7
Des Moines	2.9	Virginia City	1.0
Davenport	3.1	Boisé City	3.7
Omaha	2.1	Roseburgh	2.4
Cheyenne	1.1	Winnemucca	0.2
North Platte	3.0	Salt Lake City	2.0
Keokuk	+0.8	Red Bluff	—7.2

Table of residuals (v) for the annual temperatures.

SOUTHERN STATIONS.

Stations.	Residuals.	Stations.	Residuals.
San Francisco	+4.2	Rio Grande City	+1.2
Visalia	0.1	Brownsville	+2.4
Los Angelos	4.0	Leavenworth	+1.7
San Diego	6.6	Sacramento	+0.4
Campo	7.3	Pioche	4.2
Prescott	0.1	Phœnix	5.4
Fort Apache	1.4	Florence	4.2
Pike's Peak	6.7	Tucson	5.7
Fort Elliott	2.4	Yuma	5.0
Dodge City	1.3	Fort Grant	4.0
Fort Gibson	0.8	Silver City	1.1
Little Rock	0.2	La Mesilla	2.2
Fort Sill	0.9	El Paso	4.4
Fort McKavett	1.6	Santa Fé	0.4
Mason	0.3	Denver	4.2
Corsicana	0.1	Fort Davis	1.0
Fredericksburgh	0.5	Fort Stockton	0.4
Brackettville	0.8	Fort Griffin	0.1
Uvalde	0.4	Jacksborough	2.0
San Antonio	0.6	Decatur	1.2
Castroville	0.3	Denison	0.5
Indianola	1.8	Fort Concho	0.2
Galveston	0.8	Shreveport	0.4
Laredo	+0.1	Eagle Pass	—0.8

The residuals for the monthly temperatures need not be given in this report, as no use was made of them; they were slightly in excess of those for the yearly temperatures.

An examination of the results obtained shows:

1. That the value of z (the diminution of temperature for each 1,000 feet in altitude) is much smaller in the northern than in the southern group of stations.

2. That the values of z are not the same at different seasons, being larger in winter than in summer.

3. That the residuals, especially those of the northern group, indicate that a modification of the law would be advantageous which shall be a function of the longitude. This is shown from the fact that the residuals with the + sign are in general for those stations at the eastward; those with the — sign for those stations at the westward of the one hundred and seventh meridian which nearly bisects this section of the country.

It must be remembered that the computations above described are only the first steps in an investigation that might be made as to the true law of diminution of temperature, and give, therefore, results which might be modified by further study. The object of the investigation, however, in this connection is not to determine accurately the law, but merely to determine it with sufficient accuracy to enable it to be used in computing the value of the mean temperatures (t) which enters the hypsometric formula. This formula is to be used for those stations only whose elevations are well determined. As the time which could be devoted to this portion of this subject had been exhausted, it was determined to adopt the values of z for the annual means above given, having first corrected for longitude according to the following plan:

If $l\,0$ = the correction to z depending upon the longitude of the station and assumed to vary with the longitude (in which $l = 107° -$ long.), then instead of the factor $c\,z$, in the equation above given, should be written $c\,(z + l\,0)$, and the residuals involve the quantity $c\,l\,0$. If $v = c\,l\,0$, then

$$0 = \frac{v}{cl}$$

in which v = the residual for each station,

c = the coefficient of z, or the elevation of the station.

By making use only of those stations whose elevations have been well determined the following was obtained:

For northern stations, $0 = + 0.16$.

For southern stations, $+ 0.04$.

Applying the correction $l\,0$ for each station we have the residuals in every case reduced except those for Winnemucca and Salt Lake City, which were accordingly unchanged.

The following table exhibits the factor for each station for the diminution of temperature with each 1,000 feet of altitude, together with the residuals v as corrected by the addition of the term $l\,0$ to z:

Northern stations.	Factor.	v.	Southern stations.	Factor.	v.
	°			°	
Bismarck	2.26	1.8	Brackettville	2.54	0.3
Cheyenne	1.61	2.3	Decatur	2.67	0.5
Fort Bennett	2.30	1.5	Denver	2.35	0.4
Fort Buford	1.72	0.9	Dodge City	2.55	0.7
Fort Keogh	1.66	1.0	El Paso	2.29	0.1
Fort Stevenson	2.14	1.6	Florence	2.09	0.3
North Platte	2.22	2.8	Fort Concho	2.52	0.5
Omaha	3.00	2.0	Fort Griffin	2.63	0.3
Salt Lake City	1.22	2.0	Fort Sill	2.61	0.4
Winnemucca	1.22	0.2	Fredericksburgh	2.59	0.6
Yankton	2.76	1.9	Jacksborough	2.63	0.4
			Mason	2.59	0.5
			Phœnix	2.07	0.2
			Santa Fé	2.30	0.2
			Tucson	2.11	0.4

§5.—Mean Monthly Pressures Reduced to Sea-Level.

By the method explained above the approximate law for the diminution of temperature with altitude was derived and the factor determined for each station west of the ninetieth meridian, above 1,000 feet in elevation, whose elevation had been well determined. Stations between 1,000 and 2,000 feet whose elevations were determined barometrically (§7) were also included. The formula derived in §2 was then used to reduce the mean monthly pressures observed at the several stations to sea-level, each month being reduced separately. The following is a list of the stations thus discussed: Bismarck,

Brackettsville, Cheyenne, Decatur, Denver, Dodge City, El Paso, Florence, Fort Bennett, Fort Buford, Fort Concho, Fort Griffin, Fort Keogh, Fort Sill, Fort Stevenson, Fredericksburgh, Jacksborough, Mason, North Platte, Omaha, Phœnix, Salt Lake City, Santa Fé, Tucson, Winnemucca, Yankton.

In order to illustrate the application of the formula the following example is given, taken at random from the computation:

Formula:

$$\log. b' = \log. b'' + \frac{h}{\text{A.C.D.}}$$

In which—

$$\text{A.} = 60368.75 \text{ in. } (1.004455 + 0.000004698\ [t - 32].$$

$$\text{C.} = 1 + 0.0026119 \cos 2\phi.$$

$$\text{D.} = 1 + 0.189 \left[\frac{e''}{f''} + \frac{\text{E}}{\text{B}}\right]$$

The values of A., C., and D. are obtained from tables having the following arguments:

	Hor. Arg.	Vert. Arg.	
A	b	t	h = mean pressure, and is obtained by adding 30.0 in. to the observed pressure and dividing by 2.
C	h	$\frac{e''}{f''}$	
D	—	ϕ	

t = mean temperature, obtained from the observed temperature by applying the temperature factor for one-half the elevation (h) of each station, as given in §4. e'', b'', h, ϕ represent the observed vapor tension, pressure, and elevation, and latitude, respectively.

EXAMPLE.

Santa Fé = h = 7,064 ft. ϕ = 35°.7. April, 1880.

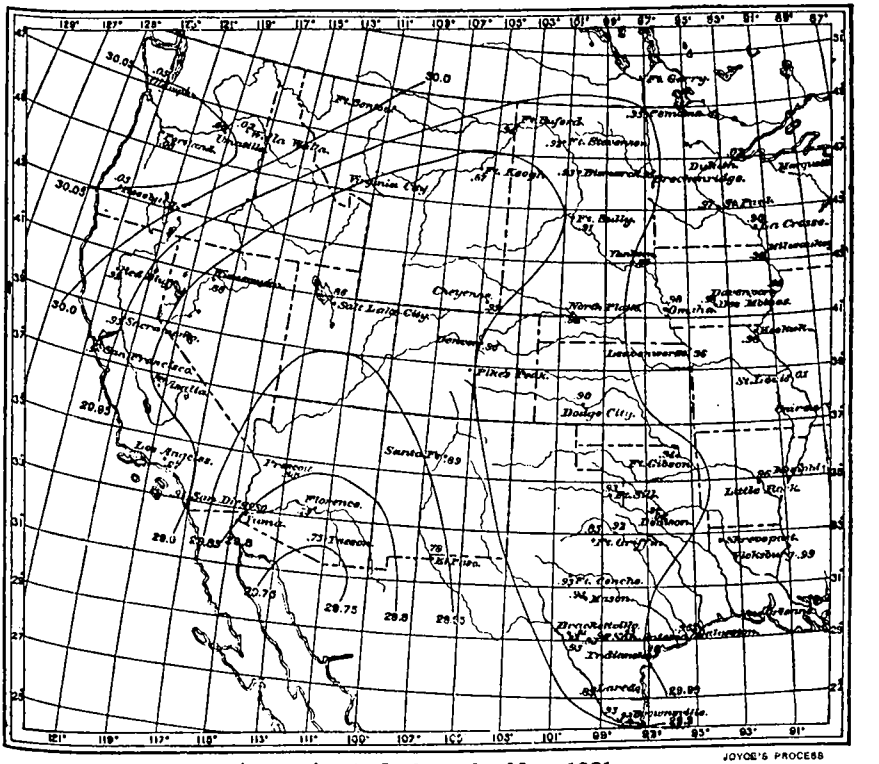
e'' = 0.13 in.		t''	44°.0
b'' = 23.254 in.		Red. for elevation	8.1
$\frac{e''}{f''}$ 5.7 (unit of third dec. place)		t	52.1
log. h	3.84905	$\frac{h}{\text{A.C.D.}}$	0.11172
log. $\frac{1}{\text{H}}$	5.20066	log. b''	1.36650
log. $\frac{1}{\text{C}}$	9.99964	log. b'	1.47822
log. $\frac{1}{\text{D}}$	9.99878	b'	30.076 in.
log. $\frac{h}{\text{A.C.D.}}$	9.04813		

The mean pressure for each month of the two years at sea-level was, in the manner indicated above, obtained for the elevated stations whose elevations are known west of the ninetieth meridian. The corresponding mean pressures at sea-level for all stations below 1,000 feet were then obtained by the use of the reduction constants derived as in §3. The next step in the computation was the plotting of the reduced pressures and the drawing of isobars for each month. The object of this step was twofold: 1. To reduce the reduction constants to a homogeneous system. 2. To furnish the means for obtaining reduction constants for stations whose elevations are as yet undetermined.

In order to illustrate the drawing of isobars there is here given a table of the computed pressures for May, 1881, and a reduced copy of the map containing the isobars:

Mean pressure for May, 1881, reduced to sea-level.

Bismarck	29.93	Fort Sill	29.93	Rio Grande City	29.95
Brackettville	29.92	Fort Stevenson	29.92	Roseburgh	30.05
Brownsville	29.90	Fredericksburgh	29.93	Sacramento	29.93
Castroville	29.94	Galveston	29.96	Saint Louis	30.01
Cheyenne	29.95	Indianola	29.96	Saint Paul	29.97
Davenport	29.99	Jacksborough	29.92	Saint Vincent	29.95
Decatur	29.92	Keokuk	29.98	Salt Lake City	29.86
Denison	29.94	La Crosse	29.96	San Antonio	29.94
Denver	29.86	Laredo	29.89	San Diego	29.91
Des Moines	29.98	Leavenworth	29.96	San Francisco	29.98
Dodge City	29.90	Lewiston	30.02	Santa Fé	29.89
Dubuque	29.99	Little Rock	29.96	Shreveport	29.97
Duluth	30.02	Los Angeles	29.97	Tucson	29.75
Eagle Pass	29.93	Mason	29.94	Umatilla	30.06
El Paso	29.78	Moorhead	29.95	Uvalde	29.91
Florence	29.79	New Orleans	29.98	Vicksburgh	29.99
Fort Bennett	29.91	North Platte	29.94	Visalia	29.88
Fort Buford	29.94	Olympia	30.05	Winnemucca	29.88
Fort Concho	29.93	Omaha	29.98	Yankton	29.95
Fort Gibson	29.94	Phœnix	29.80	Yuma	29.80
Fort Griffin	29.85	Portland, Oreg	30.08		
Fort Keogh	29.87	Red Bluff	29.92		



Approximate Isobars for May, 1881.

All the projections were made upon the large maps used in the indications room. In the circle representing each station was placed in black ink the reduced pressures and by their aid the curves were drawn. After the drawing of the curves the observed pressures for each station were inserted in red ink and the difference obtained between these values and the reduced pressures interpolated from the curves. These differences are the reduction constants for the respective stations.

§6.—Reduction Constants for Elevated Stations.

The reduction constants for all stations above 1,000 feet in elevation, west of the ninetieth meridian, were obtained from the projected curves as above described. For those

stations whose elevations are well determined, the constants agree nearly with the computed values, the difference being due to the fact that the curves necessarily take account of the pressures at several adjacent stations and thus disregard the discordances between them by reducing them to a homogeneous system. As an illustration of the reduction constants thus derived and their relation to the values computed by the rigid formula, the computation for May, 1881, is continued as below.

Reduction constants for May, 1881.

Station.	Adopted from curves.	Computed.	Station.	Adopted from curves.	Computed.
Bismarck	1.79	1.79	Fort McKavett	2.24	.....
Boisé City	2.82	.....	Fort Missoula	3.30	.....
Brackettsville	1.19	1.19	Fort Shaw	3.60	.....
Campo	2.54	.....	Fort Sill	1.23	1.23
Camp Thomas	2.67	.....	Fort Stevenson	1.83	1.82
Cheyenne	5.85	5.90	Fort Stockton	3.02	.....
Dayton	1.75	.....	Fredericksburgh	1.73	1.72
Deadwood	4.52	.....	Helena	4.17	.....
Decatur	1.18	1.17	Henrietta	0.99	.....
Denver	5.16	5.11	Jacksborough	1.15	1.14
Dodge City	2.57	2.51	La Mesilla	3.79	.....
Eagle Rock	4.68	.....	Mason	1.63	1.64
El Paso	3.66	3.61	North Platte	2.86	2.87
Florence	1.49	1.49	Omaha	1.16	1.15
Fort Apache	4.81	.....	Phœnix	1.13	1.13
Fort Assininiboine	2.84	.....	Pike's Peak	12.06	.....
Fort Bennett	1.56	1.56	Pioche	5.87	.....
Fort Benton	2.79	.....	Prescott	5.09	.....
Fort Buford	1.97	1.98	Salt Lake City	4.30	4.29
Fort Concho	1.92	1.91	Santa Fé	6.61	6.63
Fort Custer	3.09	.....	Silver City	5.58	.....
Fort Davis	4.96	.....	Spokane Falls	2.05	.....
Fort Elliott	2.72	.....	Tucson	2.34	2.34
Fort Grant	4.69	.....	Winnemucca	4.32	4.80
Fort Griffin	1.29	1.28	Yankton	1.27	1.27
Fort Keogh	2.45	2.43			

In this way the reduction constants for each of the twenty-four months, November, 1879, to October, 1881, was obtained; the mean of the result for the corresponding months was adopted as the monthly constant for that month.

The results for stations at which the observations were incomplete, a list of which is given in ¾1, were reduced to the above system by comparison with surrounding stations.

An approximate check upon the computation is afforded by comparing the differences between the constansts obtained for the corresponding months of the two years with the differences which the formula would give depending upon the differences in the observed temperatures. This check was applied in all cases, and in a few instances caused a modification of the curves, which had been projected over portions of the country where the observations were few in number.

The following illustrations are given of the results obtained:

CHEYENNE.

	January.	February.	March.	April.	May.	June.
Monthly reduction constants:						
First year	6.18	6.24	6.22	6.01	5.88	5.75
Second year	6.33	6.26	6.15	5.99	5.85	5.73
Differences:						
Second – first	+.15	+.02	–.07	–.02	–.03	–.02
Observed diff. of temperature	–7°.5	+4°.3	+5°.8	+4°.6	+0°.6	+6°.5
Corrections due to temperature	+.09	–.05	–.07	–.06	–.01	–.07

CHEYENNE—Continued.

	July.	August.	September.	October.	November.	December.
Monthly reduction constants:						
First year	5.71	5.73	5.87	6.05	6.13	6.29
Second year	5.67	5.68	5.86	5.99	6.30	6.27
Differences:						
Second − first	−.04	−.05	−.01	−.06	+.17	−.02
Observed diff. of temperature	+4°.5	+4°.4	−2°.9	+0°.8	−13°.3	+1°.6
Corrections due to temperature	−.05	−.05	+.03	−.01	+.16	−.02

FORT SILL.

	January.	February.	March.	April.	May.	June.
Monthly reduction constants:						
First year	1.30	1.30	1.29	1.24	1.21	1.20
Second year	1.36	1.32	1.29	1.25	1.23	1.19
Differences:						
Second − first	+.03	+.02	.00	+.01	+.02	−.01
Observed diff. of temperature	−20°.7	−8°.0	−0°.4	−4°.0	−3°.1	+7°.4
Corrections due to temperature	+.04	+.02	.00	+.01	+.01	−.01

	July.	August.	September.	October.	November.	December.
Monthly reduction constants:						
First year	1.21	1.18	1.23	1.28	1.29	1.33
Second year	1.20	1.17	1.22	1.24	1.33	1.33
Differences:						
Second − first	−.01	−.01	−.01	−.04	+.04	.00
Observed diff. of temperature	+7°.6	+9°.7	+4°.6	+7°.0	+17°.4	−2°.4
Corrections due to temperature	−.02	−.02	−.01	−.01	+.03	.00

The agreement between the third and fifth lines in these examples is a fair illustration of the results obtained at the various stations, the discordances being greater as the elevations increase. This check applies only to the relative values of the constants for corresponding months, and not to their absolute values.

A final check was applied by reducing to sea-level the mean of the observed pressures for the two years, month by month, with their respective constants. The resulting isobars fairly represented the values at the several stations.

There are but two stations east of the ninetieth meridian having an elevation greater than 1,000 feet, Atlanta and Mount Washington. The constants for Atlanta (1,131 feet) were obtained by Scott's tables; for Mount Washington by subtracting the mean observed pressures from the mean of the reduced pressures at Burlington and Portland.

§ 7—Barometric Determination of Elevations.

The method adopted for deriving the reduction constants makes no use of the elevations of stations above 2,000 feet, except those which have been well determined. It is unnecessary for this work, then, to find the approximate elevations of the remaining stations, but they will serve to complete the table of elevations and to show the altitudes for which the reduction constants are applicable. By the aid of the hypsometric formula (§ 2, 17) the elevations of stations not otherwise known have been computed with the data furnished by the two years' observations, the mean values for the whole period being employed. The following table exhibits the results obtained for each station. In general it will be seen that computations have been made with more than one adjacent station as a base and the adopted values deduced therefrom. It will also be observed that the individual results are quite discordant among themselves for the elevated stations in the northwest, comprising

Deadwood, Fort Assinniboine, Fort Benton, Fort Missoula, Fort Shaw, and Helena, and also for Fort Davis and Fort Stockton in the southwest, according to the geographical distribution of the neighboring stations with which comparisons have been made. This discordance is about 100 feet in the case of the northwestern group. A similar result is seen in the case of Campo when compared with San Diego on the one hand, and Yuma or Tucson on the other. These discordances are not due to inaccuracies in the computation, but are real differences depending upon the different meteorological conditions peculiar to each locality. It may be a question, then, just what is meant by the term "sea-level" when applied to the imaginary plane lying beneath the plateau region west of the Mississippi River, to which barometric readings are referred. At the present time quite different results are obtained by reducing to sea-level with the aid of stations east of the Rocky Mountains, from those obtained with the aid of stations west of these mountains. It was this cause which led to the necessity of applying a longitude correction as explained in § 4, in deducing the law of diminution of temperature with the altitude. The reference plane denominated "sea-level," since it has been obtained by equalizing discrepancies between stations east and west of the Rocky Mountains, may therefore be considered as not coincident with the true sea-level, but approaching it as nearly as our present knowledge allows. In adopting the elevations for these stations the mean between the separate results was necessarily chosen, because there is no reason for giving preferences in such cases and because it gives the elevation above that plane of reference that has been adopted in this computation.

Elevation of stations determined barometrically.

Station.	Reference station.	Separate results.	Adopted elevations.
		Feet.	
Boisé City	Portland	2,764	2,750
	Winnemucca	2,735	
Brackettville	San Antonio	1,167	1,170
Campo	San Diego	2,525	2,500
	Yuma	2,461	
	Tucson	2,509	
Camp Thomas	Tucson	2,708	2,710
Castroville	San Antonio	785	780
Dayton	Portland	1,661	1,660
Deadwood	Bismarck	4,562	4,600
	Cheyenne	4,652	
	Fort Keogh	4,550	
Decatur	Denison	1,146	1,150
Eagle Pass	San Antonio	780	780
El Paso	Tucson	3,757	3,760
	Santa Fé	3,760	
Florence	Tucson	1,484	1,480
Fort Apache	Tucson	5,037	5,050
	Santa Fé	5,067	
Fort Assinniboine	Bismarck	2,671	2,710
	Fort Keogh	2,654	
	Winnemucca	2,767	
Fort Bennett	Yankton	1,513	1,510
Fort Benton	Bismarck	2,658	2,700
	Fort Keogh	2,639	
	Winnemucca	2,746	
Fort Buford	Bismarck	1,910	1,900
	Fort Keogh	1,891	
Fort Concho	San Antonio	1,897	1,900
Fort Custer	Bismarck	3,050	3,040
	Fort Keogh	3,030	
Fort Davis	San Antonio	4,975	4,940
	El Paso	4,901	
	Corsicana	4,976	
Fort Elliott	North Platte	2,654	2,650
	Dodge City	2,652	
Fort Gibson	Denison	538	540
Fort Grant	Tucson	4,859	4,860
	Santa Fé	4,857	
Fort Griffith	Denison	1,261	1,260
Fort McKavett	San Antonio	2,238	2,240
Fort Missoula	Portland	3,194	3,140
	Winnemucca	3,199	
	Fort Keogh	3,090	
Fort Shaw	Portland	3,599	3,550
	Winnemucca	3,611	
	Fort Keogh	3,496	

Elevations of stations determined barometrically—Continued.

Station.	Reference station.	Separate results.	Adopted elevation.
		Feet.	
Fort Sill	Denison	1,201	1,200
Fort Stevenson	Bismarck	1,754	1,750
Fort Stockton	San Antonio	3,046	3,010
	El Paso	2,973	
Fredericksburgh	San Antonio	1,702	1,700
Helena	Portland	4,159	4,100
	Winnemucca	4,165	
	Fort Keogh	4,048	
Henrietta	Denison	985	980
Jacksborough	Denison	1,123	1,120
La Mesilla	El Paso	3,912	3,900
	Tucson	3,895	
Laredo	San Antonio	463	460
Lewiston	Portland	781	780
Mason	San Antonio	1,617	1,620
Phœnix	Tucson	1,116	1,120
Pioche	Salt Lake City	6,108	6,110
Prescott	Tucson	5,331	5,340
	Santa Fé	5,356	
Red Bluff	Sacramento	346	350
Rio Grande City	Indianola	229	230
Silver City	Tucson	5,889	5,890
	Santa Fé	5,890	
Umatilla	Portland	341	340
Uvalde	San Antonio	934	930

Of these elevations all under 2,000 feet except that of Henrietta were employed in the derivation of the reduction constants. The constants for the remaining stations were derived as explained in § 6.

§ 8. The Accuracy of the Reduction Constants.

It is impossible to obtain by rigid methods any estimate as to the accuracy of the reduction constants derived as above. A general estimate can, however, be obtained by considering the various sources of error in their bearing upon the computations, and the probable effect upon the final result of uncertainties due to their influence.

The derivation of constants for stations below 100 feet in elevation by the use of Scott's tables may be considered as giving results reliable to the hundredths of an inch. The computation of constants for the more elevated stations is liable to be affected by errors which may be thus classified, viz:

(1.) Errors in the observations.

The examination of the data from the various stations showed many errors in the records of the observations, or in the deduction of the monthly averages. These were corrected as far as discovered, but doubtless many remain undetected. There were also indications that the observations at certain stations, particularly those in the northwest, had been carelessly made and were therefore unreliable. This source of error is hard to detect.

(2.) Incomplete observations.

The errors from this source are unavoidable. Their influence was especially noted in the early months, as some stations in important locations had not been established and at others there were breaks in the continuity of the series.

(3.) Fewness of the stations.

This difficulty was seriously felt. The isobars drawn over the large area west of the ninetieth meridian were based upon the observations at only 64 stations, of which 38 were near the eastern and western limits. Great weight was therefore of necessity given to the 26 remaining stations. In some cases, particularly in the early months and in the northwest, there was great latitude possible, amounting to several hundredths of an inch, in the projection of the curves.

(4.) Uncertainties in the formula and its application.

The chief source of error under this head is found in the assumptions made necessary in deriving the temperature factor. (See § 4.) It is difficult to estimate the absolute errors introduced in this way, but they increase with the elevation of the stations and may amount to several hundredths of an inch.

The cumulative errors from all these sources are, however, considerably lessened by the

methods of obtaining the final constants from the individual results. Thus, the effect of drawing isobars is to average the individual errors of adjacent stations, while the adoption of the mean results for corresponding months in the two years still further reduces their errors. The errors due to source (3), or uncertainties in the isobars themselves, due to an insufficient number of stations, were further reduced by changes in the projection of the curves required by the check computations mentioned in § 6.

It may be estimated, then, that the uncertainties of the constants may amount to 0.01 inch for stations below 1,000 feet, and for stations above 1,000 feet varies from 0.01 inch to 0.06 inch, according to the elevation. These estimates relate wholly to the uncertainties of the computation of the present system of reduction constants, and are independent of any considerations affecting the reliability of the system itself.

ADDENDUM.

[Signal-Service Orders No. 94.]

WAR DEPARTMENT, OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, D. C., December 16, 1881.

On and after January 1, 1882, the reductions of barometric pressures to sea-level during any one month will be made by adding to the actual pressures (*i. e.*, the observed readings corrected for temperature and instrumental error only) the monthly constants given in the following table for each station. The cipher word for the resulting number will be telegraphed as the word for the barometer reduced to sea-level. Observers will note that these constants are given to two decimal places only, and that the third decimal place must be filled by a cipher (0). Example: Boston, constant correction for January is 0.170 inch.

To prevent mistakes, observers will transcribe for each month the constants relating to their stations for that month only (adding the cipher in the third decimal place), and will use the copy thus transcribed in making all barometric reductions to sea-level, and in filling up all forms.

When a change in elevation of any barometer is made, the station constant for each month will be altered as directed in circular letter of May 27, 1881. A full report of all changes in elevations and constants will be immediately made to this office.

The use of the constants given in Signal Service Orders No. 30, current series, will be discontinued after December 31, 1881.

By order of Brig. & Bvt. Maj. Gen'l W. B. Hazen.

LOUIS V. CAZIARC,
First Lieutenant, Second Artillery, Acting Signal Officer.

Monthly constants for the reduction to sea-level of barometric observations made at Signal Service stations.

Station.	Reduction constant for each month.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Albany, N. Y.	0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09
Alpena, Mich.	0.71	0.71	0.70	0.69	0.66	0.65	0.64	0.64	0.65	0.67	0.70	0.71
Atlanta, Ga.	1.23	1.22	1.21	1.19	1.17	1.15	1.15	1.15	1.17	1.19	1.22	1.23
Atlantic City, N. J.	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Augusta, Ga.	0.20	0.20	0.20	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.20	0.20
Baltimore, Md	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Barnegat, N. J.	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Bismarck, Dak.	2.00	1.98	1.92	1.88	1.79	1.76	1.73	1.76	1.80	1.88	1.93	2.02
Boisé City, Idaho	2.93	2.96	2.92	2.84	2.84	2.78	2.72	2.75	2.77	2.86	2.94	2.98
Boston, Mass.	0.17	0.16	0.16	0.16	0.16	0.15	0.15	0.15	0.15	0.16	0.16	0.16
Brackettville, Tex.	1.25	1.24	1.24	1.19	1.17	1.14	1.17	1.15	1.17	1.19	1.24	1.25
Bridgetown, Barbadoes	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Brownsville, Tex.	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05
Buffalo, N. Y.	0.76	0.76	0.75	0.75	0.71	0.70	0.69	0.69	0.70	0.72	0.74	0.76
Burlington, Vt	0.31	0.31	0.31	0.30	0.29	0.29	0.28	0.29	0.29	0.30	0.31	0.31
Cairo, Ill.	0.42	0.42	0.42	0.41	0.40	0.39	0.39	0.39	0.40	0.40	0.42	0.42
Campo, Cal.	2.63	2.64	2.61	2.58	2.53	2.48	2.49	2.50	2.54	2.56	2.62	2.64
Camp Thomas, Ariz.	2.83	2.83	2.78	2.73	2.67	2.63	2.59	2.62	2.64	2.71	2.84	2.82
Cape Henry, Va.	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Cape May, N. J.	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Castroville, Tex.	0.85	0.84	0.83	0.82	0.81	0.80	0.80	0.80	0.81	0.82	0.84	0.84
Cedar Keys, Fla.	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Champaign, Ill.	0.87	0.87	0.86	0.84	0.80	0.79	0.79	0.79	0.80	0.83	0.86	0.87
Charleston, S. C.	0.06	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06
Charlotte, N. C.	0.89	0.89	0.88	0.86	0.84	0.83	0.83	0.83	0.84	0.86	0.88	0.89

Monthly constants for the reduction to sea-level, &c.—Continued.

Station.	Reduction constant for each month.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Chattanooga, Tenn	0.86	0.86	0.85	0.83	0.81	0.81	0.80	0.80	0.81	0.83	0.85	0.86
Cheyenne, Wyo	6.25	6.25	6.18	6.00	5.87	5.74	5.69	5.70	5.86	6.02	6.21	6.28
Chicago, Ill	0.75	0.75	0.74	0.73	0.70	0.69	0.69	0.69	0.69	0.71	0.74	0.76
Chincoteague, Va	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Cincinnati, Ohio	0.69	0.69	0.69	0.67	0.65	0.65	0.64	0.64	0.65	0.66	0.69	0.70
Cleveland, Ohio	0.78	0.79	0.78	0.76	0.73	0.73	0.72	0.72	0.72	0.74	0.77	0.79
Columbus, Ohio	0.90	0.90	0.89	0.87	0.84	0.84	0.83	0.83	0.84	0.86	0.89	0.91
Davenport, Iowa	0.71	0.70	0.69	0.67	0.64	0.64	0.63	0.63	0.65	0.66	0.69	0.71
Dayton, Wash	1.80	1.81	1.81	1.75	1.75	1.74	1.71	1.71	1.74	1.78	1.78	1.83
Deadwood, Dak	4.95	4.92	4.84	4.69	4.52	4.44	4.43	4.44	4.56	4.68	4.84	4.99
Decatur, Tex	1.27	1.27	1.22	1.21	1.16	1.15	1.16	1.14	1.18	1.20	1.24	1.24
Del. Breakwater, Del	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Denison, Tex	0.84	0.84	0.83	0.80	0.79	0.78	0.78	0.78	0.79	0.80	0.84	0.85
Denver, Colo	5.52	5.52	5.44	5.27	5.16	5.04	5.01	5.02	5.11	5.26	5.50	5.52
Des Moines, Iowa	0.97	0.97	0.96	0.93	0.89	0.88	0.88	0.88	0.89	0.92	0.95	0.98
Detroit, Mich	0.76	0.75	0.75	0.73	0.70	0.69	0.69	0.69	0.69	0.71	0.74	0.76
Dodge City, Kans	2.75	2.74	2.73	2.64	2.55	2.61	2.50	2.48	2.55	2.63	2.74	2.80
Dubuque, Iowa	0.77	0.76	0.75	0.73	0.70	0.69	0.69	0.69	0.70	0.72	0.75	0.77
Duluth, Minn	0.76	0.76	0.74	0.72	0.70	0.69	0.67	0.68	0.69	0.71	0.74	0.77
Eagle Pass, Tex	0.84	0.84	0.82	0.81	0.80	0.79	0.79	0.79	0.80	0.81	0.83	0.84
Eagle Rock, Idaho	4.96	4.90	4.87	4.72	4.68	4.59	4.65	4.55	4.68	4.77	4.86	4.92
Eastport, Me	0.07	0.07	0.07	0.07	0.07	0.07	0.06	0.07	0.07	0.07	0.07	0.07
El Paso, Tex	3.88	3.88	3.80	3.74	3.64	3.59	3.60	3.60	3.65	3.74	3.85	3.86
Erie, Pa	0.77	0.77	0.77	0.75	0.72	0.72	0.71	0.71	0.71	0.73	0.76	0.77
Escanaba, Mich	0.72	0.72	0.71	0.69	0.66	0.65	0.64	0.64	0.66	0.67	0.70	0.72
Florence, Ariz	1.58	1.58	1.57	1.50	1.47	1.45	1.44	1.43	1.48	1.51	1.58	1.59
Fort Apache, Ariz	5.12	5.10	5.02	4.92	4.82	4.75	4.74	4.72	4.80	4.90	5.10	5.08
Fort Assiniboine, Mont	3.04	3.04	3.01	2.99	2.84	2.79	2.73	2.75	2.85	2.92	2.98	3.03
Fort Bennett, Dak	1.74	1.73	1.70	1.64	1.56	1.54	1.54	1.54	1.59	1.62	1.69	1.76
Fort Benton, Mont	2.98	3.00	2.98	2.86	2.79	2.77	2.71	2.79	2.84	2.91	2.96	3.00
Fort Buford, Dak	2.20	2.18	2.14	2.07	1.98	1.96	1.91	1.94	1.98	2.05	2.14	2.24
Fort Concho, Tex	2.02	2.02	1.97	1.94	1.90	1.87	1.88	1.86	1.90	1.95	2.01	2.02
Fort Custer, Mont	3.38	3.36	3.33	3.18	3.10	3.06	3.02	3.06	3.12	3.24	3.32	3.40
Fort Davis, Tex	4.98	4.96	4.88	4.79	4.72	4.64	4.64	4.65	4.70	4.85	4.90	4.94
Fort Elliott, Tex	2.93	2.90	2.83	2.78	2.70	2.67	2.64	2.64	2.69	2.79	2.93	2.96
Fort Gibson, Ind. T	0.60	0.60	0.59	0.58	0.56	0.55	0.55	0.55	0.56	0.57	0.59	0.60
Fort Grant, Ariz	4.90	4.86	4.83	4.73	4.61	4.54	4.57	4.57	4.60	4.70	4.84	4.88
Fort Griffin, Tex	1.38	1.37	1.35	1.30	1.28	1.25	1.25	1.24	1.27	1.30	1.36	1.37
Fort Keogh, Mont	2.69	2.68	2.65	2.54	2.45	2.43	2.41	2.43	2.47	2.59	2.67	2.70
Fort Macon, N. C	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Fort McKavett, Tex	2.39	2.38	2.32	2.26	2.24	2.20	2.20	2.21	2.22	2.30	2.38	2.38
Fort Missoula, Mont	3.46	3.43	3.38	3.31	3.30	3.26	3.19	3.22	3.27	3.37	3.41	3.46
Fort Shaw, Mont	3.86	3.85	3.80	3.67	3.60	3.57	3.51	3.53	3.61	3.70	3.82	3.83
Fort Sill, Ind. T	1.33	1.31	1.29	1.24	1.22	1.20	1.20	1.18	1.22	1.26	1.31	1.33
Fort Stevenson, Dak	2.06	2.02	1.98	1.90	1.83	1.80	1.78	1.78	1.84	1.90	1.97	2.06
Fort Stockton, Tex	3.14	3.13	3.08	3.03	3.01	2.92	2.94	2.94	2.96	3.03	3.12	3.14
Fort Washakie, Wyo	6.82	6.78	6.73	6.57	6.50	6.39	6.35	6.36	6.47	6.61	6.77	6.79
Fredericksburgh, Tex	1.82	1.80	1.76	1.72	1.72	1.68	1.70	1.71	1.74	1.76	1.82	1.82
Galveston, Tex	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Grand Haven, Mich	0.71	0.71	0.70	0.69	0.66	0.65	0.65	0.65	0.66	0.67	0.70	0.71
Hatteras, N. C	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Havana, Cuba	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Helena, Mont	4.43	4.40	4.37	4.26	4.17	4.12	4.06	4.09	4.17	4.30	4.38	4.38
Henrietta, Tex	1.07	1.05	1.04	1.03	0.98	0.98	0.98	1.00	1.00	1.00	1.04	1.08
Huron, Dak	1.54	1.52	1.48	1.45	1.35	1.34	1.32	1.34	1.38	1.43	1.48	1.54
Indianapolis, Ind	0.84	0.85	0.84	0.82	0.79	0.78	0.77	0.77	0.78	0.80	0.84	0.85
Indianola, Tex	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Jacksborough, Tex	1.24	1.24	1.21	1.18	1.15	1.12	1.12	1.12	1.14	1.17	1.22	1.24
Jacksonville, Fla	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05
Keokuk, Iowa	0.70	0.70	0.69	0.67	0.65	0.64	0.63	0.63	0.65	0.67	0.69	0.71
Key West, Fla	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Kingston, Jamaica	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Kittyhawk, N. C	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Knoxville, Tenn	1.08	1.08	1.06	1.04	1.02	1.01	1.00	1.01	1.02	1.04	1.07	1.08
La Crosse, Wis	0.84	0.84	0.82	0.80	0.76	0.76	0.75	0.75	0.77	0.79	0.82	0.85
La Mesilla, N. Mex	4.03	4.01	3.95	3.88	3.76	3.72	3.74	3.72	3.77	3.85	4.00	4.00
Laredo, Tex	0.46	0.46	0.45	0.44	0.44	0.43	0.43	0.44	0.44	0.45	0.46	0.46
Leavenworth, Kans	0.96	0.95	0.94	0.91	0.88	0.87	0.86	0.86	0.88	0.90	0.94	0.96
Lewiston, Idaho	0.87	0.87	0.86	0.85	0.84	0.82	0.81	0.81	0.83	0.85	0.87	0.88
Little Rock, Ark	0.33	0.33	0.33	0.32	0.31	0.31	0.31	0.31	0.31	0.32	0.33	0.33
Los Angeles, Cal	0.40	0.40	0.40	0.40	0.40	0.39	0.39	0.39	0.39	0.40	0.40	0.40
Louisville, Ky	0.59	0.59	0.59	0.57	0.55	0.55	0.55	0.55	0.55	0.57	0.59	0.60
Lynchburgh, Va	0.72	0.72	0.72	0.71	0.68	0.67	0.67	0.67	0.68	0.69	0.72	0.73
Madison, Wis	1.09	1.09	1.07	1.04	1.00	0.99	0.98	0.98	1.00	1.03	1.07	1.10
Marquette, Mich	0.78	0.78	0.77	0.75	0.72	0.72	0.71	0.71	0.72	0.74	0.77	0.78
Mason, Tex	1.74	1.73	1.69	1.65	1.63	1.60	1.63	1.58	1.61	1.66	1.73	1.74

Monthly constants for the reduction to sea-level, &c.—Continued.

Station.	Reduction constant for each month.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Memphis, Tenn	0.36	0.35	0.35	0.34	0.33	0.33	0.33	0.33	0.34	0.34	0.35	0.36
Milwaukee, Wis	0.80	0.80	0.79	0.77	0.74	0.74	0.73	0.73	0.74	0.76	0.79	0.81
Mobile, Ala	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Montgomery, Ala	0.24	0.24	0.24	0.23	0.23	0.23	0.22	0.23	0.23	0.23	0.24	0.24
Moorhead, Minn	1.11	1.10	1.08	1.03	0.98	0.97	0.96	0.97	0.99	1.02	1.06	1.11
Morgantown, W. Va	1.06	1.07	1.06	1.04	1.01	1.00	1.00	1.00	1.00	1.03	1.06	1.07
Mount Washington, N. H	6.63	6.62	6.52	6.41	6.18	6.12	6.07	6.08	6.15	6.34	6.56	6.63
Nashville, Tenn	0.56	0.56	0.56	0.54	0.53	0.52	0.52	0.52	0.53	0.54	0.56	0.57
Navassa Island, W. I	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
New Haven, Conn	0.12	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.12	0.12	0.12
New London, Conn	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
New Orleans, La	0.06	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06
Newport, R. I	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
New Shoreham, R. I	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
New York, N. Y	0.19	0.19	0.18	0.18	0.18	0.17	0.17	0.17	0.17	0.18	0.18	0.19
Norfolk, Va	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
North Platte, Nebr	3.12	3.10	3.06	2.96	2.87	2.80	2.80	2.80	2.88	2.96	3.08	3.15
Olympia, Wash	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Omaha, Nebr	1.27	1.27	1.25	1.21	1.16	1.14	1.13	1.14	1.17	1.20	1.24	1.29
Oswego, N. Y	0.35	0.35	0.34	0.34	0.33	0.32	0.32	0.32	0.32	0.33	0.34	0.35
Palestine, Tex	0.56	0.56	0.55	0.54	0.53	0.52	0.52	0.52	0.53	0.54	0.55	0.56
Pensacola, Fla	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Philadelphia, Pa	0.06	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06
Phœnix, Ariz	1.20	1.20	1.20	1.15	1.12	1.10	1.10	1.10	1.14	1.15	1.20	1.22
Pike's Peak, Colo	12.70	12.72	12.59	12.28	12.06	11.82	11.78	11.79	11.98	12.28	12.66	12.66
Pioche, Nev	6.20	6.16	6.14	5.99	5.92	5.80	5.73	5.70	5.78	5.92	6.14	6.17
Pittsburgh, Pa	0.85	0.86	0.85	0.83	0.80	0.79	0.79	0.79	0.79	0.82	0.85	0.86
Port Eads, La	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Port Huron, Mich	0.73	0.73	0.72	0.70	0.68	0.67	0.66	0.66	0.67	0.69	0.72	0.73
Portland, Me	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Portland, Oreg	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Prescott, Ariz	5.38	5.36	5.34	5.22	5.10	5.02	4.99	4.98	5.10	5.16	5.34	5.37
Punta, Rassa, Fla	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Red Bluff, Cal	0.38	0.38	0.38	0.37	0.37	0.36	0.36	0.36	0.36	0.37	0.38	0.38
Rio Grande City, Tex	0.25	0.25	0.24	0.24	0.24	0.23	0.23	0.24	0.24	0.24	0.25	0.25
Rochester, N. Y	0.71	0.71	0.70	0.69	0.66	0.65	0.65	0.65	0.65	0.67	0.70	0.71
Roseburgh, Oreg	0.57	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.55	0.56	0.57	0.57
Sacramento, Cal	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.08	0.08	0.08
Saint Louis, Mo	0.64	0.64	0.63	0.61	0.59	0.59	0.58	0.58	0.59	0.60	0.63	0.65
Saint Paul, Minn	0.95	0.94	0.92	0.89	0.85	0.85	0.84	0.84	0.86	0.88	0.92	0.95
Saint Thomas, W. I	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Saint Vincent, Minn	0.98	0.97	0.94	0.91	0.86	0.85	0.84	0.85	0.87	0.90	0.93	0.99
Salt Lake City, Utah	4.57	4.56	4.52	4.37	4.32	4.22	4.18	4.19	4.25	4.40	4.57	4.54
San Antonio, Tex	0.73	0.72	0.71	0.70	0.70	0.68	0.68	0.69	0.69	0.70	0.72	0.72
San Diego, Cal	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Sandusky, Ohio	0.72	0.72	0.72	0.70	0.67	0.67	0.66	0.66	0.67	0.69	0.72	0.73
Sandy Hook, N. J	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
San Francisco, Cal	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Santa Fé, N. Mex	7.01	7.04	6.94	6.72	6.57	6.47	6.46	6.45	6.63	6.78	7.00	6.95
Santiago de Cuba, W. I	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Savannah, La	0.10	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.10
Shreveport, La	0.25	0.25	0.25	0.24	0.24	0.23	0.23	0.23	0.24	0.24	0.25	0.25
Silver City, N. Mex	5.86	5.85	5.78	5.68	5.55	5.50	5.46	5.46	5.54	5.65	5.84	5.84
Sitka, Alaska	0.07	0.07	0.07	0.07	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07
Smithville, N. C	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.04	0.04	0.04	0.04	0.04
Spokane Falls, Wash	2.14	2.13	2.13	2.06	2.05	2.04	1.98	2.00	2.04	2.08	2.08	2.13
Springfield, Ill	0.73	0.73	0.72	0.70	0.67	0.67	0.66	0.66	0.67	0.69	0.72	0.73
Springfield, Mass	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.14	1.14
Springfield, Mo	1.58	1.57	1.56	1.52	1.48	1.46	1.45	1.45	1.48	1.51	1.57	1.59
Thatcher's Island, Mass	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06
Toledo, Ohio	0.74	0.74	0.73	0.71	0.68	0.68	0.67	0.67	0.68	0.70	0.73	0.74
Tucson, Ariz	2.50	2.48	2.46	2.39	2.34	2.30	2.32	2.34	2.38	2.40	2.46	2.50
Umatilla, Oreg	0.39	0.38	0.38	0.37	0.37	0.36	0.36	0.36	0.36	0.37	0.38	0.39
Uvalde, Tex	1.00	1.00	0.98	0.97	0.95	0.94	0.94	0.94	0.95	0.97	0.97	1.00
Vicksburgh, Miss	0.27	0.27	0.26	0.26	0.25	0.25	0.24	0.24	0.25	0.26	0.27	0.27
Visalia, Cal	0.39	0.38	0.38	0.37	0.37	0.37	0.36	0.36	0.37	0.37	0.38	0.38
Washington, D. C	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.12
West Las Animas, Colo	4.14	4.13	4.08	3.96	3.86	3.78	3.76	3.75	3.83	3.94	4.12	4.15
Williamsport, Pa	0.63	0.63	0.63	0.61	0.60	0.60	0.58	0.58	0.59	0.60	0.63	0.63
Wilmington, N. C	0.06	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06
Winnemucca, Nev	4.54	4.52	4.50	4.40	4.35	4.26	4.22	4.23	4.29	4.40	4.53	4.53
Wood's Holl, Mass	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Yankton, Dak	1.42	1.42	1.39	1.34	1.28	1.28	1.27	1.27	1.29	1.33	1.38	1.43
Yuma, Ariz	0.15	0.15	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.15	0.15	0.15

APPENDIX No. 62.

List of merchant marine vessels from which simultaneous meteorological reports have been received at the office of the Chief Signal Officer during the fiscal year ending June 30, 1882.

Line or company.	Name and character of vessel.	Name of captain or master.	Months for which reports were received.
Allan Line	S. S. Buenos Ayrean	Neil McLean	June, July, August, September, and October, 1881.
Do	S. S. Circassian	W. H. Smith	July, August, September, October, November, and December, 1881; January, February, March, April, and May to June 6, 1882.
Do	S. S. Grecian	C. E. Le Gallais	June 16 to June 30, 1882.
Do	S. S. Nova Scotian	W. Richardson	July, August, September, October, November, and December, 1881; January 1 to 6, March 3 to April 5, and April 14 to June 30, 1882.
Do	S. S. Peruvian	Joseph Ritchie	February 4 to March 31, 1882.
Do	S. S. Polynesian	Robert Brown	December 10 to 31, 1881; January, February, March, and April, 1882.
Do	S. S. Prussian	John G. Stephen	December 15 to 31, 1881; January 1 to June 30, 1882.
Do	S. S. Scandinavian	John Park	March 4 to June 30, 1882.
Do	S. S. Waldensian	R. P. Moore	January 11 to May 31, 1882.
American Steamship Br	S. S. British Crown	E. H. Freeth	February, March, and April, 1882.
American Steamship Company	S. S. Illinois	J. W. Schackford	July 1 to December 31, 1881; January, February, March, April, May, and June, 1882.
Do	S. S. Indiana	R. W. Sargent	July, August, September, October, November, and December, 1881; January February, March, April, May, and June, 1882.
Do	S. S. Ohio	Henry Morrison	July, August, September, October, November, and December, 1881; January, February, March, April, May, and June, 1882.
Do	S. S. Pennsylvania	George H. Dodge	July, August, September, October, November, and December, 1881; January, February, March, April, May, and June, 1882.
Anchor Line	S. S. Assyria	James Brown	January 15 to 29, March 23 to April 5, April 13 to 26, 1882.
Do	S. S. Bolivia	James Donaldson	April, May, and June, 1882.
Do	S. S. Devonia	H. Young	February, March, April, May, and June, 1882.
Do	S. S. Elysia	Aug. Lindquister	May 1 to 12, 1882.
Do	S. S. Ethiopia	Archibald Campbell	April, May, and June, 1882.
Do	S. S. Galatia	J. D. Allison	February 26 to March 14, and March 23 to April 30, 1882.
Do	S. S. India	John Jameson	April 3 to May 1, and May 17 to June 9, 1882.
Do	S. S. Utopia	A. McRitchie	January 5 to 18, March 16 to 29, April 24 to June 30, 1882.
Arrow Line	S. S. Crane	G. J. Robinson	November 12 to 30, 1881.
Atlas Steamship Company	S. S. Ailsa	J. W. Sansom	March, April, May, and June, 1882.
Do	S. S. Alps	Seiders	November 16 to December 20, 1881, and January 5 to February 2, 1882.
Do	S. S. Alvena	W. Peploe Forwood	November 26 to 30, 1881, and May 27 to June 30, 1882.
Do	S. S. Alvo	D. Williams	November 12 to December 19, 1881, and January 1 to June 30, 1882.
Do	S. S. Andes	W. P. Gladwin	January, February, and March, 1882.
Do	S. S. Antillas	R. de Echevarrieta	May and June, 1882.
Do	S. S. Arden	R. de Echevarrieta	December 3 to 31, 1881; January, February, March, and April, 1882.
Do	S. S. Athos	C. G. Pearce	December 18 to 31, 1881; January, February, March, April, May, and June, 1882.
Do	S. S. Claribel	C. P. Krause	April 7 to May 17, 1882.
Do	S. S. Lovaine	Unknown	October 17 to November 3, 1881.

List of merchant marine vessels from which simultaneous meteorological reports have been received at the office of the Chief Signal Officer during the fiscal year ending June 30, 1882—Continued.

Line or company.	Name and character of vessel.	Name of captain or master.	Months for which reports were received.
Boston and Halifax Line	S. S. Carroll	S. E. Wright	January, February, March, April, May, and June, 1882.
Bristol City Line	S. S. Brooklyn City	Samuel Windham	January, February, and March, 1882.
California and Mexican Steamship Company.	S. S. Newbern	E. Rogers	July 1 to November 28, and December 7 to 26, 1881, and January 7 to 25, 1882.
Cromwell Line	S. S. Hudson	H. R. Freeman	January 11 to June 30, 1882.
Do	S. S. New Orleans	T. P. C. Halsey	December 11 to 28, 1881, and February 2 to March 31, 1882.
Cunard Line	S. S. Bothnia	Wm. McMickan	February 2 to 9, April 6 to 14, May 15 to 23, June 1 to 9, and June 19 to 28, 1882.
Do	S. S. Gallia	W. H. P. Hains	July, August, September, October, November, and December, 1881, January, February, March, April, May, and June, 1882.
Do	S. S. Marathon	B. Woolfenden	April, May, and June, 1882.
Do	S. S. Parthia	Horatio McKay	April and May, 1882.
Do	S. S. Scythia	M. Murphy	August 4 to 12, 1881, March, April, May, and June, 1882.
General Transtlantic Steamship Company.	S. S. Canada	E. Franguel	November 24 to December 31, 1881, January 5 to February 15, March 1 to 29, and April 5 to May 2, 1882.
Do	S. S. France	Périer d'Hauterive	February, March, April, May, and June, 1882,
Do	S. S. St. Germain	S. Delaplane	April and May, 1882.
Do	S. S. St. Laurent	Adéa Servan	December 1 to 31, 1881, January 1 to 31, May 20 to 29, and June 8 to 17, 1882.
Do	S. S. Ville de Marseille	Tal. Cahour	May and June, 1882.
Guion Line	S. S. Arizona	Samuel Brooks	April, May, and June, 1882.
Do	S. S. Wisconsin	C. L. Rigby	April, May, and June, 1882.
Hamburg American Line	S. S. Bohemia	O. Pezold	March, April, May, and June, 1882.
Do	S. S. Cimbria	C. Ludwig	December 1 to 30, 1881, April, May, and June, 1882.
Do	S. S. Gellert	W. Kühlewein	December 18 to 24, 1881, January, February, March, April, May, and June, 1882.
Do	S. S. Herder	F. Tischbein	June 1 to 30, 1882.
Do	S. S. Lessing	B. Voss	March, April, May, and June, 1882.
Do	S. S. Silesia	A. Albers	January, February, March, April, and May, 1882.
Do	S. S. Wieland	Julius Hansen	December 24 to 31, 1881, January, February, March, April, May, and June, 1882.
Inman Line	S. S. City of Berlin	R. Leitch	December 25 to 31, 1881, June 2 to 11, and from June 18 to 25, 1882.
Do	S. S. City of New York	T. Tayler	April 7 to 18, May 26 to June 5, 1882.
Johnston Line	S. S. Thanemore	John Inch	November 7 to December 22, 1881, February, March, April, May, and June, 1882.
Lamport and Holt's Steamship Line of Liverpool.	S. S. Hevelius	John Carroll	December 1 to 13, 1881, January, February, April, and May, 1882.
Do	S. S. Humboldt	Arthur W. Jeffery	April 9 to 26, May 2 to 27, and June 9 to 20, 1882.
Leyland Line	S. S. Iberian	E. Parry	December 24 to 31, 1881, January, February, March, April, May, and June, 1882.
Merchants' Express to Havre	S. S. Freja	Andr. Chr. Struckmann	February, March, April, and May, 1882.
Do	S. S. Hermod	V. T. Hein	March, April, and June, 1882.
Merchants' Steamship Company to Brazil.	S. S. Glenfyne	Stephen I. Rains	December 3 to 15, 1881, March 2 to 10, and May 20 to June 30, 1882.
National Line	S. S. Canada	John Robinson	April 6 to 16, May 4 to 17, May 26 to June 5, June 25 to June 30, 1882.
Do	S. S. Denmark	W. Tyson	April 20 to June 30, 1882.
Do	S. S. England	T. P. Heeley	January, March, April, May, and June, 1882.
Do	S. S. Erin	W. Arthur Griffiths	March, April, and May, 1882.
Do	S. S. Greece	Wm. Pearce	May and June, 1882.

Do	S. S. Helvetia	Rodgers	April 10 to May 8, 1882.
Do	S. S. Holland	John Milligan	December 19 to 30, 1881, April 2 to 14, and June 2 to 14, 1882.
Do	S. S. Italy	R. P. Williams	March 19 to 30, April 7 to 17, April 23 to May 4, May 12 to 23, 1882.
Do	S. S. The Queen	George Cochrane	June 14 to 26, 1882.
Netherland Steamship Company.	S. S. P. Caland	T. H. Boujer	June 15 to 25, 1882.
Do	S. S. Schiedam	E. M. Chevalier	March, April, May, and June, 1882.
Do	S. S. W. A. Scholten	G. I. Vis	January, February, March, May, and June, 1882.
New York and Cuba Mail Steamship Company.	S. S. Niagara	J. B. Baker	January, February, March, April, and part of May, 1882.
Do	S. S. Santiago	F. M. Faircloth	December 7 to 27, 1881, January, February, March, April, May, and June, 1882.
Do	S. S. Saratoga	Thos. S. Curtis	May 31 to June 10, and June 18 to 30, 1882.
New York, Havana and Mexican Mail Steamship Company.	S. S. City of Alexandria	F. Timmerman	March, April, May, and June, 1882.
Do	S. S. City of Puebla	John Deaken	April, May, and June, 1882.
Do	S. S. City of Washington	J. W. Reynolds	May 26 to June 20, 1882.
North German Lloyd	S. S. America	F. Hamelmann	June 24 to 30, 1882.
Do	S. S. Braunschweig	K. Pohle	July, August, September, October, to November 3, 1881.
Do	S. S. Donau	R. Bussius	November 20 to December 23, 1881.
Do	S. S. Elbe	W. Willigerod	March, April, May, and June, 1882.
Do	S. S. General Werder	H. Christoffers	December 5 to 20, 1881, January 23 to February 7, June 8 to 17, 1882.
Do	S. S. Graf Bismark	A. Hagemann	April, May, and June, 1882.
Do	S. S. Habsburg	F. Warnkes	April, May, and June, 1882.
Do	S. S. Hermann	H. Baur	July 1 to November 2, 1881, February, March, April, May, and June, 1882.
Do	S. S. Hohenzollern	R. Sander	July 1 to August 3, 1881, January 14 to 27, February 15 to April 21, May 26 to June 8, and June 14 to 29, 1882.
Do	S. S. Köln	G. H. Meier	July 1 to November 15, 1881, March and April, 1882.
Do	S. S. Kronprinz Friederich Wilhelm.	A. Meier	March, April, and May, 1882.
Do	S. S. Leipzig	F. Pfeiffer	September 17 to December 23, 1881, January, February, March, April, May, and June, 1882.
Do	S. S. Main	Julius Barre	December 18 to 31, 1881, January, February, March, April, and May, 1882.
Do	S. S. Mosel	F. Hesse	January, February, March, April, May, and June, 1882.
Do	S. S. Necker	K. Pohle	January, February, March, April, May, and June, 1882.
Do	S. S. Nürnberg	Jacob Jaeger	January, February, March, and April, 1882.
Do	S. S. Oder	Carl Undeutsch	January, February, March, April, May, and June, 1882.
Do	S. S. Ohio	G. Meyer	January, February, March, April, and May, 1882.
Do	S. S. Rhein	H. A. F. Neynaber	April, May, and June, 1882.
Do	S. S. Salier	A. Jaeger	March, April, May, and June, 1882.
Do	S. S. Strassburg	H. Heincke	July 1 to November 21, 1881, February, March, April and May, 1882.
Occidental and Oriental Steamship Company.	S. S. Arabic	W. G. Pearne	May and June, 1882.
Do	S. S. Belgic	H. Davison	July, August, September, and October, 1881, January, February, March, April, May, and June, 1882.
Do	S. S. Gaelic	E. O. Hallett	July, August, September, October, November, and December, 1881, January, February, March, May, and June, 1882.
Do	S. S. Oceanic	John Metcalfe	July, August, September, October, November, and December, 1881, January, February, March, April, and May, 1882.
Ocean Steamship Company	S. S. City of Augusta	K. S. Nickerson	December 4 to 31, 1881, January, February, March, April, May, and June, 1882.
Do	S. S. City of Columbus	W. H. Fisher	May and June, 1882.
Oregon Improvement Company.	S. S. Mississippi	E. W. Holmes	October 15 to December 18, 1881, January, February, March, and April, 1882.

List of merchant marine vessels from which simultaneous meteorological reports have been received at the office of the Chief Signal Officer during the fiscal year ending June 30, 1882—Continued.

Line or company.	Name and character of vessel.	Name of captain or master.	Months for which reports were received.
Oregon Improvement Company.	S. S. Williamette	L. Meyer	December 19 to 31, 1881, January, February, March, April, May, and June, 1882.
Oregon Railway and Navigation Company.	S. S. City of Chester	James Carroll	September, October, November, and December, 1881, January, February, March, April, and May, 1882.
Do	S. S. Columbia	Frederick Bolles	July 1 to December 31, 1881, January, February, March, April, May, and June, 1882.
Do	S. S. Oregon	E. Polemann	July 1 to December 31, 1881, January, February, March, April, May, and June, 1882.
Pacific Coast Steamship Company.	S. S. Ancon	John N. Ingalls	July 1 to August 31, and October 1 to December 31, 1881, January, February, March, April, May, and June, 1882.
Do	S. S. Dakota	H. G. Morse (during May and June, 1882).	July 1 to October 23, 1881, May and June, 1882.
Do	S. S. Geo. W. Elder	H. M. Hayward and H. G. Morse (during latter part of 1881).	December 19 to 31, 1881; January, February, March, April, May, and June, 1882.
Do	S. S. Idaho	Carroll	July 1 to December 31, 1881; January, February, March, April, May, and June, 1882.
Do	S. S. Orizaba	Chas. B. Johnson	July 1 to December 31, 1881; January, February, March, May, and June, 1882.
Do	S. S. Senator	Thos. Wallace	July 1 to December 31, 1881; January and February, 1882.
Do	S. S. State of California	G. Debney	July 1 to December 31, 1881; January, February, March, April, May, and June, 1882.
Do	S. S. Victoria	H. M. Hayward (during latter part of 1881 and first 6 months of 1882).	July 1 to December 31, 1881; January, February, March, April, May, and June, 1882.
Pacific Mail Steamship Company.	S. S. Australia	Campbell	July 4 to December 31, 1881; January 1 to 25 and February 17 to May 16, 1882.
Do	S. S. City of New York	W. B. Cobb	July 1 to December 31, 1881; January, February, March, April, May, and June, 1882.
Do	S. S. City of Panama	D. S. Austin	July 1 to November 30, 1881.
Do	S. S. City of Peking	G. G. Berry	July 1 to November 10, 1881; March 12 to April 30, and May 17 to June 30, 1882.
Do	S. S. City of Rio de Janeiro	J. M. Caverly	July 1 to December 31, 1881, and January 1 to June 30, 1882.
Do	S. S. City of Sydney	H. C. Dearborn	July 1 to December 28, 1881; January 17 to April 18, and May 9 to June 30, 1882.
Do	S. S. City of Tokio	Jefferson Maury	July 1 to December 26, 1881; January 7 to March 26, and April 9 to June 30, 1882.
Do	S. S. Clyde	D. S. Austin	March, April, May, and June, 1882.
Do	S. S. Colima	Thomas Chapman	July 1 to December 31, 1881; January, February, March, May, and June, 1882.
Do	S. S. Colon	Thos. H. Morton	December 4 to 23, 1881; March 2 to June 30, 1882.
Do	S. S. Granada	M. Connolly	July 1 to December 31, 1881; January, February, March, April, May, and June, 1882.
Do	S. S. South Carolina	W. J. Russel	October 20 to December 31, 1881; January, February, March, April, May, and June, 1882.
Do	S. S. Zealandia	Henry Webber	July 1 to December 31, 1881; January 1 to March 21, and April 11 to June 30, 1882.
Quebec Steamship Company	S. S. Bermuda	A. S. Owen	December 1 to 31, 1881; February 20 to March 21, and May 28 to June 30, 1882.
Do	S. S. Muriel	G. S. Locke	November 23 to 30, 1881; January, February, March, April, May, and June, 1882.

Red Star Line	S. S. Belgenland	Joseph Stokes	January, February, March, April, and May, 1882.
Do	S. S. Nederland	J. Ueberweg	July 1 to December 11, 1881; February, March, April, May, and June, 1882.
Do	S. S. Pennland	R. Weyer	June 25 to 29, 1882.
Do	S. S. Rhynland	W. G. Randle	July 1 to December 31, 1881; January, February, March, April, May, and June, 1882.
Do	S. S. Switzerland	John C. Jameson	February 26 to June 30, 1882.
Do	S. S. Vaderland	W. A. Beynon	November 27 to December 31, 1881; January, February, March, April, May, and June, 1882.
Do	S. S. Waesland	H. Nickels	January, February, March, April, May, and June, 1882.
Savannah Line	S. S. Seminole	H. K. Hallet	January, February, March, April, May, and June, 1882.
State Line	S. S. State of Florida	D. H. Johnston	April, May, and June, 1882.
Do	S. S. State of Georgia	G. Moodie	April, May, and June, 1882.
Do	S. S. State of Indiana	John W. Sadler	April, May, and June, 1882.
Texas Line	S. S. Colorado	M. B. Crowell	February, March, April, May, and June, 1882.
Thingvalla Steamship Company.	S. S. Thingvalla	S. T. H. Laub	January, March, April, May, and June, 1882.
Warren Line	S. S. Iowa	Samuel Walters	December 17 to 31, 1881; January, February, March, April, May, and June, 1882.
White Cross Line	S. S. Hermann	George Eyler	April 12 to 25, 1882.
Do	S. S. Plantyne	Robert Scott	April, May, and June, 1882.
White Star Line	S. S. Adriatic	J. W. Jennings	July 1 to December 31, 1881, January; February, March, April, May, and June, 1882.
Do	S. S. Baltic	H. Parsell	April, May, and June, 1882.
Do	S. S. Britannic	H. Perry	August 20 to December 25, 1881; January, February, March, April, May, and June, 1882.
Do	S. S. Celtic	Benj. Gleadell	July 1 to December 31, 1881; January, February, March, April, May, and June, 1882.
Do	S. S. Germanic	C. W. Kennedy	July 1 to November 15, December 16 to 31, 1881; January, February, March, April, May, and June, 1882.
Do	S. S. Republic	P. J. Irving	December 22 to 30, 1881; January, February, March, May, and June, 1882.
Wilson Line	S. S. Otranto	R. Potter	March, April, May, and June, 1882.
Do	S. S. Romano	Jos. Mitchell	December 13 to 30, 1881; January, February, March, April, May, and June, 1882.
Do	S. S. Salerno	Thos. Potter	March and April, 1882.
Winsor Line	Catherine Whiting	John Horton Briggs	March and April, 1882.
Do	S. S. Norman	H. W. Googins	March and April, 1882.

List of merchant marine vessels not belonging to any particular steamship line or company.

Name.	Name of captain or master.	Months for which reports were received.
S. S. Alfonzo XII	Eugenio Bayona	December 26, 1881, to January 10, 1882.
S. S. Compton	John Thos. Eggers	March, April, and May, 1882.
S. S. Glenapp	A. B. Macdougall	April 19 to June 30, 1882.
S. S. Lamports	G. H. Jones	March 1 to 18, April 22 to May 25, June 18 to June 30, 1882.
S. S. Laurel	P. L. Cosgrove	April, May, and June, 1882.
S. S. Lord Clive	P. Urquhart	May and June, 1882.
S. S. Lord Gough	E. M. Hughes	June 17 to 28, 1882.
S. S. Malabar	John Dixon	March, April, May, and June, 1882.
S. S. Mallard	Chas. L. Calloway	April, May, and June, 1882.
S. S. Nebo	R. H. Lightbody	March 19 to May 21, 1882.
S. S. Ponca	A. Kempton	May and June, 1882.
S. S. Radnorshire	D. Davies	April 3 to 19, 1882.
S. S. Victoria J. Peed	O. S. Baker	February, March, April, May, and June, 1882.

List of merchant marine vessels from which simultaneous meteorological reports have been received at the office of the Chief Signal Officer during the fiscal year ending June 30, 1882, *through the co-operation of the New York Herald Weather Service.*

Line or company.	Name.	Name of captain or master.	Months for which reports were received.
Pacific Mail Steamship Company.	S. S. Acapulco	W. G. Shackford	January 1 to June 30, 1882.
Amsterdam Line	S. S. Amsterdam	Th. M. Lucas	January 1 to June 30, 1882.
Atlas Steamship Company	S. S. Atlas	W. P. Gladwin	January 1 to June 30, 1882.
Not known	S. S. Leibnitz	Fred. H. Brown	January 1 to June 30, 1882.
Morgan's Louisiana and Texas Steamship Company.	S. S. Lone Star	Robt. Quick	January 1 to June 30, 1882.
Wilson Line	S. S. Lepanto	J. Rogers	January 1 to June 30, 1882.
Netherland Steamship Company.	S. S. Maas	Bakker	January 1 to June 30, 1882.
Liverpool, Brazil, and River Platte Steam Navigation Company.	S. S. Olbers	Jas. Clarke	January 1 to June 30, 1882.
Guion Line	S. S. Wyoming	John Douglas	January 1 to June 30, 1882.

List of sailing vessels received during the fiscal year ending June 30, 1882.

Name.	Name of captain or master.	Months for which reports were received.
Brig Abbie Clifford	David W. Storer	April, May, and June, 1882.
Schooner Addie Fuller	Jas. Jorgensen	July 1 to August 15 and December 16 to 31, 1881; January, February, March, April, May, and June, 1882.
Bark Adelaide	Thos. Bailey	February 10 to June 12, 1882.
Schooner Ajax	H. C. Northup	April, May, and June, 1882.
Bark Alpha	O. Grönn	November 10 to December 31, 1881; January, February, March, April, May, and June, 1882.
Schooner Annie Lewis	J. M. Corson	April, May, and June, 1882.
Schooner Annie R. Lewis	L. L. Lewis	January 16 to March 11, 1882.
Ship Annie M. Law	Freeman S. Crosby	December 11 to 31, 1881; January 1 to 3, February 10 to 28, March 1 to 17, 1882.
Bark Antioch	H. J. Hemingway	February 1 to March 2, April 1 to May 30, 1882.
Schooner Arthur Burton	J. C. Coombs	June 21 to 28, 1882.
Schooner Asa Eldridge	Geo. H. Bocker	April and June, 1882.
Bark Bergenseren	Jacob Mortensen	February 23 to April 13 and May 11 to June 24, 1882.
Bark Carrie Heckle	B. F. Woodbury	April 5 to 30, 1882.
Bark Celestina	G. Carniglia	February 23 to April 30, 1882.
Bark Champion	Gardiner	March 31 to April 30, 1882.
Schooner C. R. Flint	M. B. Cook	May 27 to June 30, 1882.
Bark Dom Pedro II	C. E. Coffin	October 23, 1881, to January 31, 1882.
Ship Dora	H. Meyer	April 9 to 30, 1882.
Schooner Edith R. Seward	Wilbur K. Tall	May and June, 1882.
Ship E. J. Spicer	Geo. D. Spicer	December 3 to 31, 1881; January, February, March, April, May, and June, 1882.
Bark E. L. Pettengill	A. J. Pettengill.	December 19, 1881, to April 23, 1882.
Ship Enoch Train	Henry D. Chapman	December 26, 1881, to May 15, 1882.
Ship Frank N. Thayer	Geo. D. Morrison	December 1, 1881, to February 12, 1882.
Brig Follia	G. Gramcnuda	December 8, 1881, to February 7, 1882.
Bark Freya	Blaouw	October 27 to December 31, 1881; January, February, March, April, May, and June, 1882.
Bark Gamaliel	David J. Anthony	November 4, 1881, to February 28, 1882.
Brig George	Wm. H. Champlin	July 1 to December 14, 1881.
Bark George Booth	David Williams	February 1 to March 31, 1882.
Bark Godefroy	C. H. Sinning	May 17 to June 9, 1882.
Bark Hattie G. McFarland	Robert McFarland	April, May, and June, 1882.
Ship Hedwig	Th. Minssen	December 25, 1881, to January 18; March 15 to May 5, and June 3 to 30, 1882.
Schooner Henry Denison	John Fehring	October 27 to December 28, 1881; February, March, April, and May, 1882.
Bark Horace Scudder	J. L. Sears	May 7 to 17; June 3 to 14, 1882.
Ship Iron Cross	Unknown	July 2 to October 31, 1881.
Schooner James Slater	James L. Tooker	May 20 to June 24, 1882.
Schooner Jennie N. Huddell	William Henderson	June 1 to 30, 1882.
Schooner John L. Thomas	James S. F. McLeod	April 3 to June 30, 1882.
Brig John Wesley	John H. Hines	March, April, and June, 1882.
Bark Jona	C. C. Ivanceich	April 1 to 30, 1882.
Bark Josephine	Charles Brown	March 12 to May 31, 1882.
Bark Julia H	Leonard C. Dart	May 6 to June 10, 1882.
Bark Kate Cann	George E. Cann	February 23 to May 26, 1882.
Bark Kryolith	Adam Smith	February 21 to 28; March 1 to 25; April 20 to 30, and May 1 to 27, 1882.
Ship Lake Erie	Edw. Pilcher	April 6 to May 1, 1882.
Bark Liberia	John Peterson	March 23 to April 25, 1882.
Schooner Maggie Abbott	D. C. McIntosh	March, April, May, and June, 1882.
Bark Matilda C. Smith	E. C. Smith	June 15 to 30, 1882.
Brig Medina	Edwin Grafton	March 29 to May 22, and May 31 to June 3, 1882.
Ship Minnie H. Gerow	E. D. Lordly	May 23 to June 19, 1882.
Schooner Moravian	George T. L. Compte	February, March, April, May, and June, 1882.
Bark New York	J. E. Sorensen	December 22, 1881 to January 31, 1882; February 1 to 21, and April 8 to 30, 1882.
Bark Orpheus	G. Meyer	June 18 to 30, 1882.
Ship Paramita	M. A. Humphrey	May and June, 1882.
Bark Pawashick	Edwin Fry	September 16 to October 15, and December 1 to 20, 1881; February 1 to March 8, and May 15 to June 9, 1882.
Bark Peppina	Giov. S. d'Ancona	December 9 to 31, 1881; January, February, March, April, May, and June, 1882.
Bark Pilgrim	James Connolly	January 8 to April 8, 1882.
Brig Potomac	H. E. Klages	November 11 to 27, and December 6 to 25, 1881; March 22 to May 15, and June 1 to 23, 1882.
Bark Prinsessen	T. Andersen	December 19, 1881, to January 7, 1882; May 7 to 31, and June 1 to 17, 1882.
Bark Rosebud	John Collis	December 7 to 31, 1881, May 3 to June 30, 1882.
Schooner S. B. Hubbard	H. R. Mehaffy	February, March, and April, 1882.
Bark Spotless	C. E. Coffin	March 11 to June 24, 1882.
Bark Sunbeam	Joseph Hand	July 1 to November 6, and December 5 to 31, 1881; January, February, and March, 1882.
Brig Teneriffe	Nathan S. Tracy	January, February, March, April, May, and June, 1882.
Bark Truro	S. H. Swan	May and June, 1882.
Schooner Viola Reppard	Lewis Ogier	May and June, 1882.

List of sailing vessels received during the fiscal year ending June 30, 1882—Continued.

Name.	Name of captain or master.	Months for which reports were made.
Bark Wandering Jew	A. F. Ulmer	June 15 to 30, 1882.
Bark Warden-Law	Thomas Graham	June 3 to 30, 1882.
Ship Washington	George Martin	April 11 to May 23, 1882.
Brig Waubun	I. W. Covert	December 1 to 31, 1881; January, February, March, April, May, and June, 1882.
Bark Winifred	N. P. Dutton	January 14 to May 27, 1882.
Ship William Woodbury	H. T. Schmidt	February, March, April, and May, 1882.

Total number of merchant vessels from which simultaneous meteorological reports were received at the office of the Chief Signal Officer during the fiscal year ending June 30, 1881, sixty-eight (68), and during the fiscal year ending June 30, 1882, two hundred and fifty-nine (259), which shows an increase of one hundred and ninety-one (191) vessels during the past fiscal year.

APPENDIX No. 63.

Stations of the United States Signal Service.

Stations.	Latitude.	Longitude.	Height of barometer above mean tide, January 1, 1881.	Changes during 1881.
	° ′	° ′	*Feet.*	
Albany, N. Y.	42 39	73 45	75	
Alpena, Mich.	45 5	83 30	609	
Atlanta, Ga.	33 45	84 23	1,131	
Atlantic City, N. J.	39 23	74 25	13	
Augusta, Ga.	33 28	81 54	183	
Baltimore, Md.	39 18	76 37	45	
Barnegat, N. J.	39 46	74 6	20	
Bismarck, Dak.	46 47	100 48	1,693	
Boisé City, Idaho	43 37	116 8	2,750 B	
Boston, Mass.	42 21	71 4	142	
Brackettville, Tex.	29 17	100 25	1,170 B	
Brownsville, Tex.	25 53	97 26	43	
Buffalo, N. Y.	42 53	78 53	664	Office moved November 1, 1881; new height, 696 feet.
Burlington, Vt.	44 29	73 12	268	
Cairo, Ill.	37 0	89 11	377	
Campo, Cal.	32 37	116 25	2,500 B	
Camp Thomas, Ariz.	33 4	110 2	2,710 B	
Cape Henry, Va.	36 55	76 1	16	
Cape Lookout, N. C.	34 36	76 36	15	Discontinued January 8, 1881.
Cape May, N. J.	38 56	74 58	27	
Castroville, Tex.	29 25	98 50	780 B	
Cedar Keys, Fla.	29 6	83 4	22	
Champaign, Ill.	40 8	88 14	767	
Charleston, S. C.	32 47	79 56	52	
Charlotte, N. C.	35 13	80 51	808	
Chattanooga, Tenn.	35 4	85 15	783	
Cheyenne, Wyo.	41 8	104 48	6,089	
Chicago, Ill.	41 52	87 38	661	
Chincoteague, Va.	37 55	75 23	18	
Cincinnati, Ohio	39 6	84 30	620	
Cleveland, Ohio.	41 30	81 42	690	
Coleman City, Tex.	31 53	99 18	1,709	
Columbus, Ohio.	39 58	83 0	805	
Concho, Tex.	31 25	100 24	1,900 B	
Corsicana, Tex.	32 6	96 27	448	Discontinued December 3, 1881.
Davenport, Iowa.	41 30	90 38	615	
Dayton, Wash.	46 19	117 56	1,660 B	
Deadwood, Dak.	44 23	103 43	4,660 B	
Decatur, Tex.	33 12	97 35	1,150 B	Office moved October 22, 1881; new height, 1,129 feet.
Delaware Breakwater, Del.	38 48	75 6	20	
Denison, Tex.	33 48	96 32	767	
Denver, Colo.	39 45	105 0	5,265	Office moved June 13, 1881; new height, 5,294 feet.
Des Moines, Iowa	41 35	93 37	849	
Detroit, Mich.	42 20	83 3	645	Office moved February 7, 1881; new height, 661 feet.
Dodge City, Kans.	37 45	100 0	2,512	
Dubuque, Iowa	42 30	90 45	665	
Duluth, Minn.	46 48	92 6	644	
Eagle Pass, Tex.	28 44	100 29	780 B	
Eagle Rock, Idaho	43 32	111 55	4,650	
Eastport, Me.	44 54	66 59	61	
El Paso, Tex.	31 47	106 30	3,760 B	
Erie, Pa.	42 7	80 5	681	
Escanaba, Mich.	45 48	87 5	612	
Florence, Ariz.	33 3	111 19	1,480 B	
Fort Apache, Ariz.	33 48	109 57	5,050 B	
Fort Assiniboine, Mont.	48 32	109 42	2,710 B	
Fort Bennett, Dak.	44 43	100 39	1,510 B	

Stations of the United States Signal Service—Continued.

Stations.	Latitude.	Longitude.	Height of barometer above mean tide, January 1, 1881.	Changes during 1881.
	° ′	° ′	*Feet.*	
Fort Benton, Mont	47 50	110 40	2,700 B	
Fort Buford, Dak	48 0	163 56	1,900 B	
Fort Custer, Mont	45 42	107 34	3,040 B	
Fort Davis, Tex	30 38	103 56	4,940 B	
Fort Elliott, Tex	35 30	100 21	2,650 B	
Fort Gibson, Ind. T	35 50	95 20	540 B	
Fort Grant, Ariz	32 39	109 57	4,860 B	
Fort Griffin, Tex	32 56	99 13	1,260 B	
Fort Keogh, Mont	46 22	105 56	2,372	
Fort Macon, N. C	34 42	76 40	.....	Established January 3, 1881; height, 11 feet.
Fort McKavett, Tex	30 48	100 7	2,210 B	
Fort Missoula, Mont	46 58	114 7	3,140 B	
Fort Shaw, Mont	47 31	111 48	3,550 B	
Fort Sill, Ind. T	34 40	98 23	1,200 B	
Fort Stevenson, Dak	47 35	101 28	1,750 B	
Fort Verde, Ariz	34 33	111 52	.....	No barometer.
Fort Washakie, Wyo	43 1	108 54	.....	Established Dec. 1, 1881; height, 5580 B feet.
Fredericksburgh, Tex	30 17	98 52	1,700 B	
Galveston, Tex	29 18	94 47	40	
Grand Haven, Mich	43 5	86 18	620	
Hatteras, N. C	35 15	75 40	19	
Helena, Mont	46 34	112 4	4,100 B	
Henrietta, Tex	33 46	98 12	980 B	
Huron, Dak	44 21	98 9	.....	Established July 1, 1881; height, 1305 feet.
Indianapolis, Ind	39 45	86 8	746	Office moved April 30, 1881; new height, 753 feet.
Indianola, Tex	28 32	96 31	26	
Jacksborough, Tex	33 12	98 10	1,120 B	
Jacksonville, Fla	30 20	81 39	43	
Keokuk, Iowa	40 22	91 26	618	
Key West, Fla	24 34	81 49	27	
Kittyhawk, N. C	36 0	75 42	22	
Knoxville, Tenn	35 56	83 58	980	
La Crosse, Wis	43 49	91 15	702	Office moved May 12, 1881; new height, 725 feet.
La Mesilla, N. Mex	32 16	106 49	3,900 B	
Laredo, Tex	27 31	99 30	460 B	
Leavenworth, Kans	39 19	94 58	842	
Lewiston, Idaho	46 27	117 0	780 B	
Little Rock, Ark	34 45	92 13	298	
Los Angeles, Cal	34 3	118 15	371	
Louisville, Ky	38 15	85 45	530	
Lynchburgh, Va	37 30	79 2	652	
Madison, Wis	43 5	89 24	949	
Marquette, Mich	46 34	87 24	673	
Mason, Tex	30 43	99 14	1,620 B	
Memphis, Tenn	35 9	90 0	321	
Milwaukee, Wis	43 2	87 54	697	
Mobile, Ala	30 41	88 2	69	Office moved Nov. 1, 1881; new height, 41 feet.
Montgomery, Ala	32 23	86 18	219	
Moorhead, Minn	46 52	96 44	923	
Morgantown, W. Va	39 40	79 50	963	
Mt. Washington, N. H	44 16	71 16	6,279	
Nashville, Tenn	36 10	86 52	507	
New Haven, Conn	41 18	72 56	107	
New London, Conn	41 21	72 5	47	
New Orleans, La	29 58	90 4	52	
Newport, R. I	41 29	71 19	44	
New Shoreham, R. I	41 10	71 33	27	
New York City	40 43	74 0	164	
Norfolk, Va	36 51	76 17	55	Office moved June 1, 1881; new height, 30 feet.
North Platte, Nebr	41 8	100 45	2,841	
Olympia, Wash	47 3	122 53	36	
Omaha, Nebr	41 16	95 56	1,113	
Oswego, N. Y	43 29	76 35	304	
Palestine, Tex	31 45	95 40	.....	Established December 3, 1881; height 523 feet.
Pensacola, Fla	30 25	87 13	39	
Philadelphia, Pa	39 57	75 9	52	
Phœnix, Ariz	33 28	112 0	1,120 B	
Pike's Peak, Colo	38 50	105 2	14,134	
Pilot Point, Tex	33 30	96 45	860	
Pioche, Nev	37 56	114 26	6,110 B	
Pittsburgh, Pa	40 32	80 2	776	Office moved June 1, 1881; new height 766 feet.
Port Eads, La	29 9	89 15	7	
Port Huron, Mich	43 0	82 26	633	

Stations of the United States Signal Service—Continued.

Station.	Latitude.	Longitude.	Height of barometer above mean tide, January, 1881.	Changes during 1881.
	° ′	° ′	*Feet.*	
Portland, Me	43 39	70 15	45	
Portland, Oreg	45 32	122 40	67	
Prescott, Ariz	34 33	112 28	5,340 B	
Punta Rassa, Fla	26 36	82 10	15	
Red Bluff, Cal	40 10	122 15	350	
Rio Grande City, Tex	26 23	98 48	230 B	
Rochester, N. Y	43 8	77 42	589	Office moved October 11, 1881; new height 621 feet.
Roseburgh, Oreg	43 13	123 20	511	
Sacramento, Cal	38 35	121 30	70	
Saint Louis, Mo	38 38	90 12	568	
Saint Paul, Minn	44 58	93 3	811	
Saint Vincent, Minn	48 56	97 14	804	
Salt Lake City, Utah	40 46	111 54	4,348	
San Antonio, Tex	29 25	98 25	676	Office moved July 30, 1881; height 673 feet.
San Diego, Cal	32 43	117 10	67	
Sandusky, Ohio	41 25	82 40	639	
Sandy Hook, N. J	40 28	74 0	28	Office moved January 5, 1881; new height 34 feet. Office moved March 23, 1881; new height 28 feet.
San Francisco, Cal	37 48	122 28	60	
Santa Fé, N. Mex	35 41	105 57	7,049	Office moved July 26, 1881; height 7,064 feet.
Savannah, Ga	32 5	81 5	87	
Shreveport, La	32 30	93 40	227	
Silver City, N. Mex	32 46	108 14	5,890 B	
Smithville, N. C	33 55	78 1	33	Office moved June 1, 1871; height 34 feet.
Socorro, N. Mex	34 4	106 55	4,565	
Spokane Falls, Wash	47 39	117 24	1,910	
Springfield, Ill	39 48	89 39	644	
Springfield, Mass	42 5	72 35	120	
Stockton, Tex	39 53	102 53	3,010 B	
Thatcher's Island, Mass	42 38	70 34	48	
Toledo, Ohio	41 40	83 34	651	
Tucson, Ariz	32 14	110 53	2,369	
Umatilla, Oreg	45 55	119 17	340 B	
Uvalde, Tex	29 14	99 42	930 B	
Vicksburg, Miss	32 22	90 50	244	
Visalia, Cal	36 20	119 17	348	
Washington, D. C	38 54	77 2	106	
West Las Animas, Colo	38 4	103 12		Established October 1, 1881; height 3,905 feet.
Wilmington, N. C	34 14	77 57	52	
Winnemucca, Nev	40 57	117 43	4,327	
Wood's Holl, Mass	41 33	70 40	35	
Yankton, Dak	42 52	97 20	1,228	
Yuma, Ariz	32 45	114 36	141	

APPENDIX No. 64

Table showing the colleges and scientific schools situate in towns and cities where there are stations of the Signal Service, U. S. Army.

Name.	Location.	Number of instructors.	Number of students.
Spring Hill College	Near Mobile, Ala	28	147
Saint John's College	Little Rock, Ark	3	2
Sacred Heart College	San Francisco, Cal	20	†750
Saint Ignatius College	San Francisco, Cal	22	†671
Saint Mary's College	San Francisco, Cal	30	103
Colorado College*	Colorado Springs, Colo	.....	54
Mining Institute	Colorado Springs, Colo	2	28
Yale College*	New Haven, Conn	97	827
Sheffield Scientific School	New Haven, Conn	26	197
Columbian University	Washington, D. C	10	46
Georgetown University	Georgetown, D. C	17	151
Atlanta University	Atlanta, Ga	6	26
Clark University	Atlanta, Ga	3	150
Saint Ignatius College	Chicago, Ill	16	66
University of Chicago	Chicago, Ill	18	94
Smithson College	Logansport, Ind	8	20
Griswold College	Davenport, Iowa	9	.....
University of Des Moines	Des Moines, Iowa	5	15
Leland University	New Orleans, La	5	93
New Orleans University	New Orleans, La	5	163
Straight University	New Orleans, La	7	242
Johns Hopkins University*	Baltimore, Md	25	123
Loyola College	Baltimore, Md	2	20
Baltimore City College	Baltimore, Md	.....	.....
Boston College	Boston, Mass	.....	.....
Boston University*	Boston, Mass	.....	.....
Harvard College*	Cambridge, Mass	62	884
Bussey Institution	Jamaica Plains, Mass	7	8
Lawrence Scientific School	Cambridge, Mass	25	22
Massachusetts Institute of Technology*	Boston, Mass	39	264
Christian Brothers College	Saint Louis, Mo	30	53
Saint Louis University	Saint Louis, Mo	21	350
Washington University*	Saint Louis, Mo	21	69
Polytechnic School of Washington	Saint Louis, Mo	13	42
Canisius College	Buffalo, N. Y	13	121
College of City of New York*	New York City	37	496
Saint Joseph's College	Buffalo, N. Y	16	237
Saint Francis Xavier's College	New York City	25	479
Columbia College*	New York City	20	246
School of Mines	New York City	27	243
Manhattan College	New York City	44	108
University of City of New York*	New York City	16	135
Scientific Department of New York	New York City	.....	.....
Cooper Union Free Night School of Science.*	New York City	.....	1,162
University of Rochester	Rochester, N. Y	9	146
Biddle University	Charlotte, N. C	6	141
Capital University	Columbus, Ohio	6	28
Ohio State University	Columbus, Ohio	12	28
Hebrew Union College	Cincinnati, Ohio	4	23
Saint Xavier College	Cincinnati, Ohio	16	48
University of Cincinnati*	Cincinnati, Ohio	20	469
Toledo University of Arts and Trades	Toledo, Ohio	.....	.....
La Salle College	Philadelphia, Pa	16	150
Saint Joseph's College	Philadelphia, Pa	13	166
University of Pennsylvania*	Philadelphia, Pa	14	148
Towne Science School	Philadelphia, Pa	19	119
Polytechnic College of State of Pennsylvania.	Philadelphia, Pa	8	69
Wagner Free Institute of Science	Philadelphia, Pa	.....	1,500
Franklin Institute	Philadelphia, Pa	.....	.....
Western University of Pennsylvania	Pittsburgh, Pa	16	85
College of Charleston	Charleston, S. C	5	36
Central Tennessee College	Nashville, Tenn	9	6
Vanderbilt University	Nashville, Tenn	13	180
Christian Brothers College	Memphis, Tenn	11	61
Tennessee University	Knoxville, Tenn	14	94
Saint Joseph's College	Brownsville, Tex	10	70
University of Saint Mary's	Galveston, Tex	9	.....
University of Deseret	Salt Lake City, Utah	5	†325
University of Vermont*	Burlington, Vt	10	84
University of West Virginia	Morgantown, W. Va	14	50
University of Wisconsin*	Madison, Wis	32	284

* Indicates institutions which give some attention to science. † Including inferior grades.

Note.—The above list is arranged alphabetically according to States.

APPENDIX No. 65.

SCIENTIFIC OUTFIT OF THE INTERNATIONAL POLAR STATIONS.

LADY FRANKLIN BAY.

[Latitude 81° 40′ north; longitude 64° 30′ west.]

12 exposed thermometers, mercurial.
12 exposed thermometers, alcohol.
12 minima thermometers, mercurial.
12 minima thermometers, spirit.
12 maxima thermometers, mercurial.
12 maxima thermometers, spirit.
6 maxima thermometers, radiation.
6 minima thermometers, radiation.
6 wet-bulb thermometers, mercurial.
6 wet-bulb thermometers, spirit.
6 water thermometers and cases.
6 attached thermometers for barometers.
2 Casella-Miller thermometers for deep-sea temperatures.
2 thermometers and frames for surface-water temperatures.
2 psychrometers complete.
2 hair-hygrometers, Klinkerfues.
1 dew-point apparatus, Regnault.
4 barometers, mercurial, Green.
2 barometers, mercurial, marine.
6 barometers, aneroid.
1 barometer, Goldschmidt's aneroid.
1 barometer, Beck's self-registering aneroid, and supply of sheets for record.
12 barometer tubes.
20 lbs. of pure mercury.
6 anemometers.
1 anemometer, self-registering.
2 telescopic rods for anemometers.
6 sets of anemometer spindles.
2 anemometer registers, double.
6 sets of anemometer cups.
1 wind-vane, large size.
3 wind-vanes, small size.
1 electrical attachment for wind-vane.
6 rain-gauges.
1 astronomical transit.
4 mean-time chronometers.
2 sidereal chronometers.
1 pocket chronometer.
1 instrument shelter, wooden.
1 instrument shelter, galvanized iron.
1 Fauth magnetometer with extra magnets for observing horizontal force and declination.
1 Casella altazimuth.
1 Kew dip-circle.
1 engineer's transit, Buff & Berger.
2 pocket sextants.
2 Grugan's heliostats.
4 prismatic compasses.
1 artificial horizon.
1 set of drawing instruments.
1 electroscope.
1 Thompson's orograph as used in geological survey.
4 automatic hand-lamps.

1 collection of tools for lathe.
1 steam-launch, built by the Navy Department.
1 list of occultations agreed upon by several observatories as subjects of mutual observations for longitude.
1 lot of cans and auxiliary conveniences for collecting objects of natural history.
1 supply of blank star-charts for observations of meteors, auroras, &c.

POINT BARROW.

[Latitude 71° 27′ north; longitude 156° 15′ west.]

12 mercurial thermometers.
12 spirit thermometers.
6 mercurial thermometers maxima.
6 spirit thermometers, minima.
6 water thermometers and cases for surface temperatures.
3 pairs of solar radiation thermometers; black and ordinary both in vacuo (the Marie Davy conjugate thermometers).
3 pairs of terrestrial radiation thermometers, alcohol.
4 psychrometers, complete.
2 thermometers for deep-sea temperatures.
6 special thermometers for measuring low temperatures. These were made by the Yale College thermometric bureau and were filled with alcohol, carbon disulphide and ethyl-oxide. Others made in precisely the same manner were retained by that bureau for investigation.
6 extra attached thermometers for barometers.
1 dew-point apparatus, Regnault.
1 instrument shelter, open wooden louvre work.
1 instrument shelter, open louvre work of galvanized iron.
4 mercurial barometers, Green.
2 mercurial barometers, marine.
3 aneroid barometers, by Negretti and Zambra and Casella.
6 empty tubes for barometers.
20 pounds pure distilled mercury.
4 rain-gauges, with sticks for measuring.
2 self-registering anemometers and vanes complete, Signal Service pattern.
4 Robinson anemometers.
4 sets of arms and cups to replace breakages.
2 vanes.
10 eagle cells for battery, and supplies for three years.
1,000 yards of insulated wire for battery.
100 vacuum tubes for sealing up specimens of air (derived by Professor Morley, of Cleveland, Ohio).
1 blow-pipe and alcohol lamp for sealing up tubes.
1 complete self-registering tidal apparatus (supplied by the U. S. Coast Survey).
1 Brooks's differential apparatus complete, three magnets, &c., for observing minute variations in magnetic declination, horizontal force, and inclination. This was made over by mechanicians of the U. S. Coast Survey according to plans provided by Mr. Schott, so as to allow convenient eye and ear observations, instead of the original photographic process.
3 brick piers and auxiliary apparatus for the proceeding.
1 Fauth magnetometer with attached altazimuth for determining absolute declination and horizontal force.
1 Kew dip-circle made by Casella.
1 astronomical transit.
1 sextant and artificial horizon.
6 mean time chronometers.
2 sidereal chronometers.
2 apothecary's scales, large and small size.
2,000 yards of kerite wire.
2 spools of fine and coarse German silver insulated wire, with telephones for observing earth currents according to the method of Professor Trowbridge.
2 delicate galvanometers for observing earth currents, ordinary methods.
4 copper plates for grounds.
1 divided steel tape, 100 feet.

1 engineer's level and staff.
4 telephones.
4 Morse sounders.
1 supply of blank star-charts for observations of meteors, auroras, &c.
1 list of occultations.

Outfit of Lieutenant Powell, in Charge of the Supply Expedition to Point Barrow.

In addition to duplicates of some of the apparatus above enumerated the supply expedition was provided with the following in order to make its own special observations:

1 sextant.
4 marine chronometers.
1 barometer, mercurial.
1 barometer, aneroid.
4 thermometers for surface sea-water temperatures.
1 psychrometer.

San Diego, California.

[Latitude 32° 43′ north; longitude 117° 10′ west.]

The magnetic apparatus at this station consists of what is known as the Adie self-recording photographic magnetic apparatus. The needles are hollow cylinders, weighing about fifteen grammes, instead of one or two pounds, as in the older forms of the apparatus. The photographic records are continuous.

APPENDIX No. 66.

REPORT UPON THE BALLOON ASCENSION MADE FROM MINNEAPOLIS, MINN., SEPTEMBER 12, 1881, BY WINSLOW UPTON.

INTRODUCTION.

The balloon voyage under the management of Prof. Samuel A. King, which was to be made from Minneapolis in September, 1881, and for which extensive preparations had been made, was but partially successful for reasons explained in the accompanying pages. As the observations made were few the report of the expedition consists mainly of a brief narrative and of a statement of the scientific objects of the voyage and the preparations therefor. A detailed statement of the latter is given for possible future reference. The report contains also a discussion of the hourly observations made at various Signal Service stations in connection with those proposed for the balloon voyage.

I.—NARRATIVE.

In August, 1881, the Chief Signal Officer was informed that a balloon ascension was to be made from Minneapolis, Minn., on or about September 7, 1881, by Prof. Samuel A. King, and was invited to send an observer. The voyage as planned offered an unusual opportunity for making observations in the air, and accordingly elaborate preparations were made to secure valuable results. In response to an offer of my services on this occasion, the Chief Signal Officer issued the following instructions:

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, D. C., Aug. 29, 1881.

SIR: The Chief Signal Officer directs that you proceed from this city to Minneapolis, Minn., and make a balloon voyage with Prof. Samuel A. King, on or about September 7, proximo. You will be furnished with the necessary outfit, and make the observations specified in the accompanying memorandum.

On your arrival at Saint Paul, Minn., previous to the ascent, you will compare your instruments with those at the United States signal office in that city, and after the descent you will make a similar comparison at the Signal Service station most convenient to the place of landing.

During the voyage you will give special attention to the direction and velocity of air currents, and to the distribution of temperature and moisture.

After having complied with the above instructions you will immediately return to this city, and submit in writing to the Chief Signal Officer, a full report of your voyage.

I am, very respectfully, your obedient servant,

JAMES ALLEN,
First Lieutenant, 7th Cavalry, A. S. O.

Mr. WINSLOW UPTON,
Computer, O. C. S. O.

MEMORANDUM.

A.—OUTFIT.

1. Two aneroid barometers.
2. One Signal Service mercurial thermometer.
3. One minimum spirit thermometer.
4. One Regnault's dew-point apparatus, with two extra thermometers, one of which to be used as a wet-bulb.
5. One pair of conjugate thermometers.
6. One Casella air meter.
7. One pocket compass.
8. One sextant and artificial horizon.
9. One pocket chronometer.

B.—OBSERVATIONS.

A series of observations will be made as frequently as possible of the aneroid barometers, exposed thermometer, dew-point apparatus, wet-bulb thermometer, conjugate thermometer, air-meter, and of vertical currents by means of a fan fastened to the car or held in the hand.

Special observations are to be made at the successive maximum and minimum altitudes of the voyage. If the balloon is above the clouds for any length of time, attempts will be made to determine the location of the balloon with the sextant. When the balloon is below the clouds, frequent records will be made of the location of the balloon upon the map, the times of observations being noted. Miscellaneous phenomena are to be recorded as occasion offers.

In obedience to these instructions, after first conferring with Professor King in Philadelphia, I left Washington, August 31, and arrived at Minneapolis on September 5, having stopped at New York and Saint Paul to complete preparations for the trip. The ascension had been announced for the 7th, in connection with the exercises of the exposition held under the auspices of the Minnesota Agricultural and Mechanical Association September 5–9. Professor King and the five journalists of the party were all on hand when I arrived, and the ascension could have been made on the day first appointed, but rain, which accompanied a high pressure and a great fall of temperature, interfered with all the exercises of the exposition, and the ascension was postponed by the managers to the 9th, then to the 10th, and again to the 12th. The wind was especially favorable on the 10th, and great disappointment was felt by the balloon party at the last postponement.

As the expedition was not planned directly for scientific purposes, and the Signal office representative was a member of the party wholly through the courtesy of Professor King, it may be well to state the proposed objects of the voyage as planned by him. These were:

1. To show that a balloon can be constructed of such a material as to retain gas for many days, the material being light and strong.

2. To prove that a long voyage or a continuous series of short voyages is possible. It was determined to travel only in an easterly direction, and if the winds were unfavorable to descend and await a favorable wind before continuing the voyage.

3. To gain experience in the management of a large balloon at low altitudes, preparatory to attempting at some future time a voyage across the Atlantic if the first two conditions justify the attempt.

Professor King had no intention of visiting the higher regions of the atmosphere in order to investigate the existence of an easterly current. Indeed, the objects above given required that care should be exercised not to lose gas unnecessarily. At the inflation the balloon must be filled nearly full, and during the early stages of the voyage must be kept near the ground. Later, after much of the gas has escaped by leakage and by the constant fluctuations of the voyage, a greater altitude would be possible without detriment. The possibility of a voyage across the Atlantic on this plan depends upon the general easterly movement of the lower atmosphere.

In furtherance of these objects Professor King constructed his balloon of a special rubber cloth, his own invention. It was light, but extremely strong, as the result showed. The diameter of the balloon, when inflated, was about 60 feet, its cubic capacity above 90,000 feet, and its height from the base of the car to the top of the envelope about 90 feet. Since hydrogen was used in the inflation the lifting power was above 6,000 pounds, and was on this expedition divided as follows: Weight of balloon, car, and equipment, about 2,000 pounds; seven passengers, 1,100 pounds; stores, clothing, instruments, &c., 900 pounds; sand ballast, 2,000 pounds.

The valve in the top of the envelope was 3 feet in diameter, and weighed about 50 pounds. A collapsing cord was also sewed into the envelope, by which a rent could be made in one of the gores, if for any reason it might be necessary to release the gas suddenly. Commissary stores sufficient for two weeks were provided, and the balloon equipment included two drag-ropes, four anchors, besides the large amount of sand ballast given above. As it was possible the route might lie in the vicinity of the lakes, a life-preserver made of cans hermetically sealed and with an estimated sustaining power of 1,000 pounds was secured beneath the car, and each member of the party supplied himself with a life-preserver. The gas was generated in large tanks, was purified by passing through water, and required the expenditure of 24,000 pounds of sulphuric acid and a like amount of iron. The car was of willow, of dimensions 6 by 5 feet, but had been drawn out of shape by previous use. It was of great durability, and was secured to the netting by a double set of ropes. Both of these sets of ropes were woven into the frame of the car

when it was constructed, and their upper ends were secured to the two iron concentrating rings which received the lower ends of the netting ropes.

The inflation was begun on the morning of the 12th and completed early in the afternoon. The labor of securing the car and of stowing away the luggage, the greater part of which was fastened to the upper of the concentrating rings, occupied several hours. I had telegraphed the hour of starting as 6 p. m., Washington time. At this hour we were nearly ready, and I placed my instruments temporarily in position on the ground near the balloon and made the observations. The ascension was made at 6.43, and was very successfully accomplished. The balloon rose slowly, without the slightest jar or irregularity of motion, and moved under the influence of a light wind towards the southeast. As the final preparations had been hurriedly made the contents of the car were not well arranged. One end of the car had been assigned to me, and the projecting shelf upon which the instruments were to be placed had been secured in position just before the start. The electric lamp, with its battery, occupied the seat; the wooden box containing the sextant and miscellaneous articles was in the body of the car, with the basket of instruments near by. As soon as we had attained an elevation of a few hundred feet, I placed on the shelf the Pike aneroid and began to arrange for the other instruments. But at this juncture a shower-bath of a sticky black fluid, consisting of glue and glycerine, with which the interior of the balloon had been coated, descended upon us and prevented my opening the basket for the time. I was thus unable to make the 7 o'clock observations. At about 7 the balloon reached its highest altitude, 2,600 feet, when Professor King released a little gas to check the ascent. At 7.03 the Mississippi was crossed, the balloon moving slowly and at the same time descending. Though the dripping of the fluid was still very annoying, I took from the basket the air-meter and was adjusting it to the shelf when I observed that the balloon was rapidly descending towards the tree tops. On account of a failure to pour out sand in time the balloon struck a tree, and my projecting shelf, which contained the brass bases of the supports for the dew-point apparatus and conjugate thermometers and the mounting of the air-meter, was carried away. I saved the barometer, which was the only instrument on the shelf, though it received some jarring. The balloon immediately rose from the tree and the rest of the voyage was without special interest. We arranged our luggage in more convenient shape, and I determined to make a new shelf from the cover of the box in which some of the instruments were carried, as I had a few tools with me. The wind died down completely at sunset, and the balloon remained nearly stationary, with the end of the drag rope, 350 feet long, resting on the ground. At 8 o'clock I attached a thermometer to one of the ropes of the balloon and read it and the Pike aneroid for the observation at that hour. It was then decided to descend and wait for a favoring wind. We were pulled to the ground by several men, the car was loaded with stones and anchored, and we passed the night on the premises of Mr. Rudolph Knapheide, Reserve Township, Ramsey County, Minnesota, four miles from Saint Paul. We had journeyed about 4 to 6 miles from the fair grounds. During the night a magnificent display of aurora borealis was observed, which is specially described in § III, 4. I devoted the portion of the night assigned me for watch duty to making a new shelf for the instruments.

The morning of the 13th brought a wind from the southwest, and as this would not convey us in a desirable direction, a second start was not made. I succeeded in finding the projecting shelf which had been carried away, and readily repaired the slight damage to it. The wind rose very high, at 4.40 p. m. the air-meter held in the hand indicating 963 feet a minute, or 11 miles an hour. The balloon was nearly carried away in this gale, and from the continual beating had lost about 10 per cent. of its gas by the morning of the 14th, when rain began to fall. During the 14th the barometer, which had been continually falling, became stationary, and the wind shifted through the west to the northwest. The continuation of the voyage was at once planned, but the aeronaut decided to wait a few hours, since the upper clouds, which were still moving from the southwest, showed that the strata in which the northwest wind prevailed were too limited to admit of safely guiding so large a balloon in a strong wind. Rapidly moving scuds soon after heralded a continuation of the storm, the wind again increased to a gale, and night came on with a diminished prospect of our renewing the journey. The securing of the balloon required constant attention, and the two iron rings, which received all the strain, were both broken at their welding points, while the basket was wrenched out of shape, badly chafed on the ground, and many of the ropes weakened. The envelope, however, showed no signs of a rent, fully justifying the opinion which Professor King entertained of its strength. But the continual beating of the wind caused it to lose much gas through the neck, which could not be kept tied, and also through the valve, which in spite of its springs and the pressure of the gas was occasionally forced open by the slashing about of the valve-rope. By the morning of the 15th fully one-half of the gas had escaped. Professor King then announced that the expedition must be abandoned, but that if the wind died down he should continue the voyage, either

alone or at the most with one companion, who would be myself. This decision showed the desire of Professor King to make the voyage of some scientific value if possible. But the wind showed no signs of abating, and early in the afternoon of the 15th it was decided to release the gas still remaining and land the balloon. This was with great difficulty at last accomplished. I remained until the 17th in order to pack my instruments and to assist Professor King with the balloon, when I secured return transportation from Saint Paul, and after comparing the Pike aneroid with the barometer at the Signal station, returned to Washington, arriving on the 19th.

Reviewing this expedition in the light of its history, it is evident that the preparations for the voyage were carefully made, that Professor King was eminently successful in the construction of his balloon, and that the failure was due wholly to two causes: 1. The unfavorable meteorological conditions. 2. The undesirable situation of Minneapolis for the place of starting, for a balloon voyage from this city is safe only in a southeasterly or southerly direction. The selection of a more southerly point of departure would largely increase the chances of success should a similar expedition be undertaken in the future. A long voyage or a series of short voyages is possible under favorable conditions of the weather, but when they are unfavorable its possibility is much affected and may be reduced to nothing, as in this instance.

This expedition also shows that great confidence should be placed in the prudence as well as the skill of Professor King as an aeronaut. During the lull on the 14th it would have been possible to continue the journey and the surface winds were favorable. But though urged to start by some of the party and by considerations affecting his reputation, for the local press spoke very harshly of him, he would not take the risk, knowing the difficulty of keeping a balloon near the ground during a gale of wind, and the direction of the wind as shown by the clouds forbidding the ascent to a high altitude. By this prudence he saved the expedition from what might have been fatal disaster, as the balloon would almost certainly have been carried towards the lakes and encountered the severe storm which raged there on the 16th. As long as we could have remained in the air all might have been well, but when the ballast had been used up it would have been necessary to make a landing wherever we found ourselves. The danger of attempting a landing under such circumstances would have been exceedingly great.

II.—Preparations for the Observations Contemplated.

The outfit furnished me has been given above. In addition to the instruments mentioned I was furnished with the following articles: Magnifying-glass, hygrometer brush, engineer's map, 1879, sheets 1–3, American Ephemeris, 1881, Bowditch's useful tables, Chauvenet's Astronomy, two cans sulphuric ether, four brass thermometer shelters, balanced fan for vertical currents, Davy safety-lamp, twelve electric lamps from Edison Manufacturing Company, one field-glass, one clinical thermometer, loaned by Dr. William M. Cate of this city, record books, and pencils.

Before leaving Washington I tested the working of the dew-point apparatus and made some experiments to determine the value of the brass thermometer shelters. These shelters were about 3 inches cube, the sides made of brass louvre work, in imitation of the large wooden shelters used at signal stations. The thermometer was secured by a cork inserted in the top of the shelter, its stem projecting into the air. The experiments made to determine the merits of this method of exposure were unsatisfactory, for they showed that heat was probably radiated from the brass to the bulb, since the thermometer read higher than one exposed to full sunlight, and much higher than the thermometer in the large station shelter. I therefore thought it unwise to trust all the thermometers to the brass shelters, and decided upon three different methods of exposure. The first was to sink the bulb below the projecting shelf in which the instruments were to be placed, and to shield the bulb on the outside by a hanging board secured to the outer edge of the shelf. The car itself furnished shelter on the opposite side, and the two ends through which alone sunlight could reach the bulb could be covered with a cloth if desired. The wet and dry bulbs were exposed in this way. A second dry bulb was secured to the top of the shelf, its bulb in a brass shelter as explained above. Since a question might arise as to whether the readings might not be affected by proximity to the car itself, I procured a pole 6 feet long and suspended a third thermometer at its outer end. From these three methods interesting results were expected, as the proper exposure of thermometers in a balloon has not hitherto received due attention.

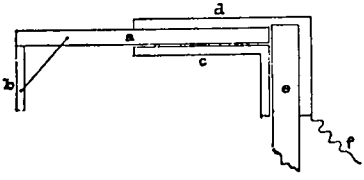
The balanced fan was made from designs by Professor Abbe, and consisted of a Japanese fan pivoted so as to remain horizontal when at rest, and to rise or fall with the vertical motion of the balloon. A little weight, consisting of a short brass rod, was fastened vertically beneath the balancing point, so that the angle of elevation or depression might approximately indicate the rapidity with which the balloon was falling or rising. Both the balanced fan and the air-meter were secured to rods which could be fastened to the projecting shelf.

The Davy lamp was intended for use only in case of accident to the electric lamp, or for duty near the balloon when anchored.

Through the kindness of Professor Edison twelve small, pear-shaped lamps were sent to Minneapolis. Mr. Vernon Bell, of Minneapolis, electrician, was employed to furnish the batteries and connections for the lamp. It was found by experiment that three bichromate cells were all that the lamp would stand, a greater number causing the fusion of the fine platinum wire. But after the wire became heated an increased battery was needed to keep the light from dying down. Accordingly a battery of five cells was so arranged that any number of cells, from one to five, could be employed. A flexible wire connected the battery with the lamp, which was carefully packed in a wooden box with an opening for the light. As thus arranged the electric lamp gave excellent promise.

On arriving at Minneapolis and examining the car of the balloon I determined upon a projecting shelf for the support of the instruments, to be braced against the rim of the car, and removable in case of necessity. A shelf was accordingly made of ¾-inch pine, 3 feet long, 6 inches wide. It was secured by braces, as in the accompanying sketch, which gives an end view of the arrangement.

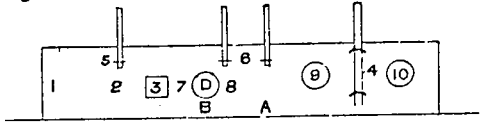
Fig. 45. Appen. No. 66.



a shelf.
b hanging board for projecting bulbs.
c brace under the shelf.
d brace over the shelf.
e rim of balloon car.
f rope for additional security.

The braces *c* and *d* were firmly screwed to the shelf, but not to the car, in order that the whole attachment might be quickly lifted off. Upon this shelf the instruments were arranged as follows:

Fig. 46. Appen. No. 66.



1 = wet bulb } Bulbs beneath the
2 = dry bulb } shelf.
3 = dry bulb in brass shelter
D = dew-point apparatus, with 7, 8, its thermometers.
9,10 = conjugate thermometers.
4 = pole, 6 feet long, for suspending dry-bulb thermometer.
5, 6 = supports for balanced fan and air-meter, respectively.
A = Pike aneroid barometer.
B = Höttinger aneroid barometer.

All the instruments could be easily removed from the shelf. Nos. 1, 2, 3, 7, and 8 were kept in position by corks inserted in the shelf and easily removable; the pole, 4, by lifting a hook could be drawn in and the thermometers unhung, while the thermometers, 9 and 10, could be lifted quickly from their supports. The rods, 5 and 6, with the instruments attached, could be unhooked, and the barometers, A and B, were removable by a snap catch.

With regard to the preparations described above, I beg leave to offer the following comments, which may be of use in planning some future expedition:

The number of instruments carried was too great for one man to take care of under the varied contingencies of a balloon voyage at very low altitudes. Could the observer be free to give all his attention to observing his instruments, with no thought of protecting them from danger, he could without difficulty make a large number of observations. But when the balloon is journeying near the ground the observer must be on the alert to save his instruments from breakage; and the continual rising and falling of the balloon cause him constant uneasiness, which an observer on the ground cannot appreciate. A very few instruments is all he can manage at such time, though a larger number can be cared for during a high voyage.

No improvement has occurred to me in the arrangement of the instruments on the shelf and their mounting or protection. This shelf, however, while hardly of sufficient size to contain all the instruments designated, was too large to be easily managed if occasion required its immediate removal, since the ropes of the car would interfere with the observer's effort to lift it quickly. A better arrangement would be two smaller shelves, if two observers are allowed in the party.

The conjugate thermometers taken in a balloon should not be maximum thermometers, as in this instance.

It is of doubtful expediency to attempt to use the Regnault dew-point apparatus on a balloon voyage. It is not easy to observe with under the most favorable circumstances, and in a balloon the surroundings are not promotive of ease in its manipulation.

The instruments taken on a balloon voyage should be as few as is consistent with the

objects of the expedition, and as compact as possible. The balanced fan could be dispensed with, since the air-meter quickly shows all changes in vertical motion, both in direction and intensity. It might be of advantage to mount two air-meters, set in opposite directions, as a mutual check, so that when one is increasing its readings the other will be diminishing them. The observations of an air-meter require much attention, as it changes the direction of its motion at every fluctuation of the balloon. The time at the disposal of the observer or observers should determine whether the instrument should be carried or not. Unless special attention to the velocity of vertical currents is a prominent object of the expedition, which was the case in this voyage, it would be well to omit the instrument from the list of those taken, as its readings must be seriously affected by the disturbances in the air currents caused by the proximity of the car and the envelope above.

III.—Record of Observations.

1. *Comparison of instruments.*

At the signal office in Saint Paul, Minn., the instruments were compared with those of the station on September 5, 6, 7, and 17. As no use has been made of these comparisons they are not reproduced.

A test of the errors of the Pike aneroid was made under the air-pump by Messrs. J. & H. J. Green, in New York, on September 1. They showed that no large errors were present except at very low pressures. The following table gives the reduction of the comparisons of this instrument made at Saint Paul with the mercurial barometer Green, 1765:

Instruments.	September 5.	September 6.	September 7.	September 17.
Green, 1765	29.095	29.135	29.450	29.20
t	76.0	61.6	57.3	73.8
Red. for t	.123	.086	.076	.118
Corrected reading	28.972	29.049	29.374	29.082
Aneroid reading	29.10	29.18	29.49	29.27
Corrected	—.13	—.13	—.12	—.19

The comparisons made in the instrument room at Washington, after the return of the instrument, show a correction of —.20. It is shown from these comparisons that the barometer received a jar during the balloon voyage, probably at the time the shelf was carried away upon which it had been resting.

2. *Observations in connection with the voyage and accompanying notes.*

Date.	Time.	Aneroid barometers, Hottinger, 3241.			Thermometers.			Conjugate.		Remarks.
		Pike.	T.	B.	Wet-bulb.	Dry-bulb.		White.	Black.	
	P. M.									
Sept. 12	4.52	29.32	74	29.33	45.89	45.90	72.9	.....	.....	On ground, clear.
12	6.00	29.32	74	29.32	61.3	73.4	.....	92.8	96.4	On ground, bulbs 1 foot from ground. Exposure about 8 minutes.
12	6.43	.....	.....	.....	.....	.....	.....	.....	.....	Balloon started.
12	7.00	27.05	.....	.....	.....	.....	.....	.....	.....	Car so crowded that it is impossible to get other instruments in position.
12	.....	26.60	.....	.....	.....	.....	.....	.....	.....	Highest altitude attained. Time immediately after preceding reading.
12	7.10	.....	.....	.....	.....	.....	.....	.....	.....	Shelf carried away.
12	8.00	29.13	.....	.....	.....	.....	67.5	.....	.....	Thermometer hung on rope near observer's head. Exposed about 5 minutes.
12	8.05	8.80	.....	.....	.....	.....	.....	.....	.....	Balloon landed.
14	8.00	29.04	66	29.00	59.2	61.7	61.8	.....	.....	On ground, light rain, high wind. Observations made in expectation of second ascent.

Observations with the air-meter were made during the high winds prevailing September 13, 14; the instrument being held in the hand away from the body.

September 13, 4.40–4.45 p. m.: Feet per minute, 850, 963, 750.

September 14, 4.15 p. m.: 7.10. Wind high, but gusty.

3. *Record of the errors of the Rockford watch movement.*

In order to keep the time with as great accuracy as possible, one of the best of th Rockford traveling watch movements, which have an excellent reputation, was procured from Mr. J. Karr, of this city. I paid considerable attention to its rate, and append the results as a matter of interest.

NOTES.

Watch received August 29, with statement that it had no error.

August 30, 31. Watch carried in Washington.

September 1–4. Watch carried in cars to Saint Paul, Minn.

September 4–12. Watch carried in Saint Paul and Minneapolis, and on nearly daily railroad rides between these cities. Barometer high, temperature low, and rain part of the time.

September 12. Watch carried in balloon for 1½ hours. Highest altitude attained 2,600 feet.

September 13–17. Watch carried in Saint Paul and vicinity; a few miles of railroad travel only.

September 17–19. Watch carried in cars to Washington.

September 20–23. Watch carried in Washington.

The watch was carried all the time in a vertical position in the pocket, and wound daily within a few minutes of 7 a. m. It is not known that it was jarred at any time, but the wearer engaged in violent exercise for about an hour on the 15th instant, in connection with landing the balloon. At night the watch was always kept in the vest pocket, in a vertical position.

Table of watch corrections and rates.

+ Shows that watch is slow; —shows that it is fast.

Date.	Hour of comparison.	Correction.	Daily rate.	Authority.
		s.		
August 30	12.0	+ 2	.....	Washington Time-ball.
August 31	12.0	+ 9	+7	Washington Time-ball.
September 1	11.8	+14	+5	Washington signals, New York City.
September 2	2.2	+17.5	+3	Allegheny Observatory signals, Pittsburgh, Pa.
September 3	9.6	+16.2	—1	Dearborn Observatory signals, Chicago, Ill.
September 5	10.9	+20	.....	Myers & Finch regulator, Saint Paul—corrected by Carleton College signals.*
September 6	8.7	+19	—1	
September 7	1.1	+12.0	—7	Carleton College signals.
September 8	1.0	+ 4		Myers & Finch regulator.
September 9	1.4	+ 4		Railroad despatcher's watch at Minneapolis, regulated 20 minutes before by Carleton College signals.
September 10	1.1	— 2.7	—5	
September 12†	1.0	—12.2		Carleton College signal.
September 19	8.0	—29.0	.....	Allegheny Observatory signals.
September 20	12.0	—24	+5	Washington Time-ball.
September 21	12.0	—18	+6	Washington Time-ball.
September 22	12.0	—12	+6	Washington Time-ball.
September 23	12.0	— 7	+5	Washington Time-ball.

*Owing to poor telegraphic corrections, Myers & Finch received their signals only occasionally. Their time is uncertain by several seconds.

†Balloon voyage and stormy weather with low barometer.

4. *Observations of the aurora borealis of September* 12, 1881.

The following notes were made during the night of September 12–13 after the descent of the balloon, 4 miles from Saint Paul, pasture of Mr. Klotch, near residence of Rudolph Knapheide, esq., Reserve Township, Ramsey County, Minnesota. Records in Washington time.

Descended about 8.05–8.30, being towed by six or more men. On landing observed a fine aurora, extending from north point of horizon 50° east; an arch 20 high, with six pillars of light, which at times became very brilliant, particularly one due north. At 9.07, very long streamers, reaching 45° from the horizon. At 12.20 very fine, in spite

of strong moonlight; stretches 40° west, 60° east of north point of horizon. At 12.45, reaches 50° above horizon; less extended in the east. At 12.56 display very marked; reaches from western horizon 50° beyond zenith, and characterized by strong motion, resembling the passage of waves, which always moved from the north horizon upward; the line of motion inclined about 45° to the horizon towards the west. Fully half the sky covered, the uncovered portion being east and south; the changes occur very rapidly. At 2.45 display fully as marked as before, but extended south of zenith not so far as above noted.

Messrs. E. R. Johnstone and W. G. Nichols observed, 2.45–5, and report continuation of phenomena as above, the pillared appearance being very marked. At 5 the aurora was not so bright, but still very fine. They describe the pulsations as regular and apparently governed by some definite law.

Messrs. J. Creelman and C. M. Faye observed from 5 to daybreak, and report continuation of the phenomena, with no features not before noted. As daylight increased the aurora apparently receded to a low arch in the north, and a brilliant pillar of light shot up in the east.

This remarkable aurora was very extensively observed at stations of the Signal Service, as may be seen by reference to the Monthly Weather Review of September, 1881.

IV.—Discussion of Hourly Observations at Signal Service Stations.

In order to make the proposed observations in the balloon available for comparison with the corresponding conditions upon the earth, the Chief Signal Officer decided to have hourly observations made at all Signal Service stations east of the Mississippi River, and north of latitude 37°. Accordingly the following circular was issued to the observers at these stations.

War Department,
Office of the Chief Signal Officer,
Washington, D. C., August 29, 1881.

Sergt. ——— ———

Signal Corps, U. S. A.:

Sergeant: It is anticipated that on or about September 7, 1881, a balloon ascension will be made from Minneapolis, Minn., by Professor King, accompanied by a representative of the Signal Service. It is desirable that every exertion should be put forth by the observers at the Signal Service stations from Dakota to Maine and south to Virginia to derive the utmost possible advantage from this rare opportunity for observing interesting meteorological and other phenomena. To this end it is proposed, if the plan be practicable, that hourly observations of barometer, thermometers, and wind velocity be taken at the indicated stations, of which yours is one, simultaneously with those taken in the balloon, these observations to commence at an hour to be indicated to you and continued for eighteen hours. All observations will be taken on Washington mean time. You will be informed further and by wire at what hour to commence your observations.

The balloon is expected to travel in an easterly direction. Stations along the northern part of the United States will be on the alert and note its appearance, if seen.

A full report of the meteorological observations taken will be sent to this office not later than four days from the time of commencing them.

WM. E. BIRKHIMER,
First Lieut. 3d U. S. Artillery, Acting Signal Officer.

On the afternoon of September 12 a telegram was sent to the several stations, ordering the beginning of the observations at 6 p. m. and their continuance until further orders. The order for their discontinuance was sent on the 15th, when it became evident that the voyage would not be resumed. In compliance with these orders, hourly observations were made at 59 stations, beginning September 12, 6 p. m., and continuing for from 59 to 94 hours, according to the time when the order for their discontinuance was received. The observations were in many cases simply those of pressure, temperature, and wind velocity, while in others a complete set of observations was made at each hour. Since these observations cannot be used for the purpose designed and are not sufficiently extended to be available for a vigorous discussion of those meteorological conditions which are revealed by a study of a long series of hourly observations, it seems unnecessary to here reproduce them in detail. I therefore limit myself to a statement of results, which I have obtained from a careful tabulation and charting upon hourly maps.

1. *General meteorological conditions upon September* 12–15, 1881.

In the afternoon of September 12 the pressure was nearly normal in New England, and above the normal in the other districts, being high in the Upper Mississippi Valley.

On the 13th the pressure rose in New England, the Middle Atlantic States, and Lower Lakes, remained nearly stationary in the Ohio Valley, and fell in the Upper Lakes, Missouri and Upper Mississippi Valleys, a depression existing in the Missouri Valley at the close of the day. On the 14th the pressure rose rapidly in New England, slowly in the Middle Atlantic States, but fell in the other districts except the Missouri Valley, where the depression of the 14th passed away. On the 15th the pressure continued to rise in New England, but fell in all other districts, in connection with a violent storm which moved with great velocity northward from the Gulf, and will be especially discussed below. The temperature conditions were about normal during these days, with the exception that in the northwest the temperature fell rapidly upon the 14th and 15th. The force of the wind was small in the eastern districts, but increasingly great in the western, as the influence of the storm of the 15th and 16th was felt.

2. *Comparison of daily means.*

The tabulation of the hourly observations of pressure and temperature furnished an opportunity of determining the mean daily values. It is of interest to compare the daily means obtained from hourly observations with those obtained by taking the means of the regular 7 a. m., 3 and 11 p. m. (Washington time) observations. The following table contains a summary of the results for the several districts. In determining them the following stations are included under their respective districts:

New England: Block Island, Boston, Burlington, Eastport, New Haven, New London, Newport; Portland, Me.; Springfield, Mass.; Thatcher's Island, Wood's Holl—eleven stations.

Middle Atlantic States: Albany, Atlantic City, Baltimore, Barnegat, Chincoteague, Delaware Breakwater, Lynchburgh, New York, Norfolk, Sandy Hook—ten stations.

Lower Lakes: Buffalo, Cleveland, Detroit, Erie, Oswego, Port Huron, Rochester, Sandusky, Toledo—nine stations.

Upper Lakes: Chicago, Duluth, Escanaba, Grand Haven, Marquette, Milwaukee—six stations.

Ohio Valley: Champaign, Cincinnati, Columbus, Indianapolis, Louisville, Morgantown, Pittsburgh—seven stations.

Upper Mississippi Valley: Davenport, Des Moines, Dubuque, Keokuk, La Crosse, Madison; Springfield, Ill.; Saint Louis, Saint Paul—nine stations.

Missouri Valley: Huron, Omaha, Yankton—three stations.

Table giving the mean daily values of pressure and temperature in the districts named, obtained from hourly observations and from the mean of those taken at 7 a. m., 3 and 11 p. m., Washington time:

SEPTEMBER 13, 1881.

Districts.	Pressure.			Temperature.		
	Hourly mean.	Mean of 7, 3, and 11.	Difference.	Hourly mean.	Mean of 7, 3, and 11.	Difference.
New England	30.061	30.076	−0.015	63.3	63.5	−0.2
Middle Atlantic	30.076	30.088	−0.012	71.7	71.4	+0.3
Lower Lakes	30.146	30.166	−0.020	62.4	60.9	+1.5
Upper Lakes	30.146	30.134	+0.012	59.2	59.2	0.0
Ohio Valley	30.130	30.121	+0.009	67.1	66.1	+1.0
Upper Mississippi Valley	30.144	30.129	+0.015	66.4	65.8	+0.6
Missouri Valley	30.053	30.010	+0.043	68.5	68.9	−0.4
SEPTEMBER 14, 1881.						
New England	30.237	30.263	−0.026	62.3	62.0	+0.3
Middle Atlantic	30.180	30.191	−0.011	70.2	70.0	+0.2
Lower Lakes	30.133	30.109	+0.024	63.5	63.7	−0.2
Upper Lakes	29.934	29.906	+0.028	63.7	63.3	+0.4
Ohio Valley	30.045	30.024	+0.021	68.5	68.6	−0.1
Upper Mississippi Valley	29.927	29.897	+0.030	67.4	66.7	+0.7
Missouri Valley	29.979	30.012	−0.033	63.7	60.9	+2.8
SEPTEMBER 15, 1881.						
Lower Lakes	29.949	29.919	+0.030	70.5	71.2	−0.7

In obtaining the mean results of this table, observations of temperature only were used at Norfolk, Detroit, Escanaba, and Champaign, those of pressure at these stations being incomplete. An examination of the residuals given above shows that in temperature they are small, and there seems no special law affecting the plus and minus signs. The pressure residuals, however, are of some magnitude and there seems to be a similarity of signs in adjacent districts. An examination of the temperature and pressure conditions on these days shows that the fluctuations of the former were about normal, but of the latter were unusually large on account of the storm in the Northwest on the 13th, and also that which traveled from the Gulf northward on the 15th. The plus residuals are found when the pressure is falling, the minus when it is rising.

In order to exhibit the results at the separate stations, the following table is given for those which made a complete series upon the 15th. Two columns are added, giving the observed differences in pressure and temperature between the first and last observation at the respective stations, or the change in twenty-four hours:

Table giving the mean daily values of pressure and temperature at the stations named, obtained from hourly observations and from the mean of those taken at 7 a. m., 3, and 11 p. m., Washington time, September 15, 1881.

Station.	Pressure.				Temperature.			
	Hourly mean.	Mean of 7, 3, and 11.	Difference.	Observe change in 24 hours.	Hourly mean.	Mean of 7, 3, and 11.	Difference.	Observe change in 24 hours.
Boston	30.410	30.422	—0.012	+0.08	58.8	58.7	+0.1	0
Eastport	30.446	30.470	— .024	+ .13	54.9	55.7	—0.8	+ 4
Portland	30.435	30.456	— .021	+ .13	57.9	57.5	+0.4	+ 1
Albany	30.317	30.329	— .012	+ .09	66.3	65.2	+1.1	— 1
Atlantic City	30.198	30.199	— .001	— .01	70.6	71.2	—0.6	+ 5
Baltimore	30.147	30.137	+ .010	— .06	70.6	71.0	—0.4	+ 4
Barnegat	30.105	30.107	— .002	.00	69.5	69.3	+0.2	+ 1
Chincoteague	30.103	30.104	— .001	— .02	73.2	73.7	—0.5	+ 2
Delaware Breakwater	30.138	30.126	+ .012	— .02	72.1	72.0	+0.1	+ 1
New York	30.282	30.282	.000	+ .02	65.5	65.2	+0.3	0
Norfolk					75.1	75.8	—0.7	+ 2
Philadelphia	30.219	30.212	+ .007	.00	68.5	68.2	+0.3	+ 2
Sandy Hook	30.236	30.262	— .026	+ .01	67.6	67.3	+0.3	— 1
Buffalo	30.038	30.011	+ .027	— .13	71.1	71.7	—0.6	+ 8
Cleveland	29.878	29.848	+ .030	— .24	73.0	72.9	+0.1	+ 2
Detroit					71.4	71.7	—0.3	+ 5
Erie	29.950	29.927	+ .023	— .18	70.7	71.0	—0.3	+ 3
Oswego	30.145	30.140	+ .003	— .04	68.3	68.9	—0.6	+ 7
Port Huron	29.863	29.826	+ .037	— .24	69.0	71.0	—2.0	+ 7
Rochester	30.101	30.082	+ .019	— .07	69.1	69.7	—0.6	+ 8
Sandusky	29.821	29.777	+ .044	— .29	72.3	73.6	—1.3	+ 5
Toledo	29.798	29.744	+ .054	— .33	69.1	70.3	—1.2	+ 5
Chicago	29.647	29.591	+ .056	— .38	64.0	61.8	+2.2	— 8
Escanaba					62.4	61.7	+0.7	— 2
Grand Haven	29.708	29.643	+ .065	— .43	64.7	65.5	—0.8	+ 1
Marquette	29.789	29.769	+ .020	— .14	60.4	59.0	+1.4	— 8
Milwaukee	29.654	29.588	+ .066	— .41	61.5	60.7	+0.8	— 8
Cincinnati	29.741	29.704	+ .037	— .29	68.8	69.1	—0.3	+ 8
Indianapolis	29.644	29.618	+ .026	— .26	65.1	64.2	+0.9	— 5
Louisville	29.657	29.616	+ .041	— .21	66.3	65.3	+1.0	— 8
Pittsburgh	29.989	29.966	+ .023	— .18	71.7	71.3	+0.4	+ 2
Des Moines	29.880	29.842	+ .038	— .20	49.8	48.0	+1.8	—14
Springfield, Ill	29.722	29.703	+ .019	— .14	58.6	56.7	+1.9	—19
Saint Louis	29.776	29.744	+ .032	— .08	59.5	56.7	+2.8	—20
Omaha	30.015	29.983	+ .032	— .18	50.6	48.7	+1.9	— 9

An examination of these residuals gives results similar to those mentioned above. As far as these observations, covering so few days, are concerned, it may be said that the mean of the 7, 3, and 11 observations gives a fair representation of the true daily mean under normal conditions of temperature and pressure. If, however, these conditions are abnormal, as for example if the pressure falls at a uniform rate during the twenty-four hours, then evidently the mean of the 7, 3, and 11 observations will differ from the hourly mean, in the case cited being lower. This is the explanation of the correspondence between the residuals, both as to amount and sign, with the observed changes in twenty-four hours indicated in the preceding table.

The theoretical relation between the true daily mean and that obtained from the mean of the 7, 3, and 11 observations (Washington time) must be derived separately for each place, the constants being furnished by a long series of observations. This has not been done, as far as known, for any place in this country.

3. *The storm of September* 15 *and* 16.

During the days under discussion there were several depressions of importance which may be noted. On the 12th, a depression of light extent prevailed in the Upper Lake region, and on the 13th a depression of much greater extent was located in the Extreme Northwest, and moved in an easterly direction upon the 14th, but too far north of the United States to be traced. The ascension was made in the period of time between the influence of these two depressions, the storm of the 13th and 14th being coincident with the latter. After its passage the winds, as is usual, shifted to the northwest, and it was at this time that the continuation of the voyage was planned, and seemed to be practicable, from all ordinary considerations depending upon the winds and weather following a depression. But at this time a storm of great energy had developed in the Gulf, and upon the 15th was moving in the unusual direction of north. Its influence was felt in Minnesota upon that day, and was the cause of the final failure of the expedition. The hourly observations made on the 15th furnish means for studying several characteristics of this storm.

a. Its direction and velocity.

This was almost due north between the 11 p. m. observation of the 14th, when the center was near New Orleans, and the 11 p. m. observation of the 15th, when the center was near Grand Haven. Its greatest velocity was between the 7 a. m. and 3 p. m. observations on the 15th.

The following table contains the approximate latitude and longitude of the position of the storm center and the hourly velocity, which it will be seen averaged 48 miles.

Table giving position of storm center and hourly velocity.

Date.	Hour.	Latitude.	Longitude.	Hourly velocity.	Remarks.
				Miles.	
September 14.....	7 a. m.	28.5	97.0	.....	From tri-daily observations.
	8 p. m.	28.8	93.3	.....	
	11 p. m.	29.2	90.7	.....	
September 15.....	7 a. m.	32.5	88.0	.....	
	11 a. m.	35.0	87.5	.....	
	12 m.	35.8	86.8	69	From hourly observations in connection with balloon ascension.
	1 p. m.	36.7	86.3	69	
	2 p. m.	37.4	86.2	65	
	3 p. m.	38.1	86.0	48	
	4 p. m.	38.8	86.2	48	
	5 p. m.	39.5	86.4	48	
	6 p. m.	40.2	86.4	41	
	7 p. m.	41.0	86.5	48	
	8 p. m.	41.5	86.7	34	
	9 p. m.	42.0	87.0	41	
	10 p. m.	42.7	87.5	41	
	11 p. m.	43.0	87.8	41	
	12 p. m.	43.5	88.3	41	
Mean velocity.....	.....	.....	.....	48	

b. The direction and velocity of the wind.

The stations which continued observations through the 15th were mostly confined to the Middle Atlantic, Lower and Upper Lakes, with a few in the Missouri Valley. The charting of the wind observations at these stations shows that in the Middle Atlantic and Lower Lake regions the directions of the winds were nearly tangential to the isobars, and in a few instances directed towards the central depression. The persistence of the southeasterly direction in the Lower Lake region is quite marked, and may be the result of the existence of the depression of the 14th at the northward. The winds at the northwest blew almost directly towards the center. In the immediate vicinity of the center the directions were tangential in the opposite direction of watch-hands. It has been stated that in general the winds blow more and more directly towards the center of a depression as we advance towards it; but in this country it has been noted that the directions are more nearly directed towards the center at stations situated at a distance, and become more tangential as we approach the center. The evidence of this storm is not

satisfactory, but it favors the former statement for stations situated east and northeast of the center and the latter for stations situated at the northwest, except for those in the immediate vicinity of the center.

The velocities of the wind in a few cases exceeded 30 miles per hour. The following table shows the average velocity in the districts named for successive days:

District.	September 13.	September 14.	September 15.
New England	5	5	.....
Middle Atlantic	5	9	.....
Lower Lakes	7	8	18
Upper Lakes	4	10	.....
Ohio Valley	3	5	.....
Upper Mississippi Valley	5	8	.....
Missouri Valley	9	16	.....

The relation of the velocity of the wind to the barometric gradient is an interesting subject of inquiry. Professor Loomis, in the American Journal of Science and Arts for January, 1878, gives a table of the relation between the velocity of the wind and the distance between isobars drawn a tenth of an inch apart, which he has derived from his meteorological researches. M. Peslin, in a paper published in the Bulletin International de l'Observatoire de Paris (translated by Professor Abbe in Smithsonian Report for 1877), has also published an approximate table of the same import, but derived from a theoretical formula. The hourly observations here discussed are in part only available for comparison with these tables, because of the uncertainty of the isobars drawn. However, in the Lower Lake region some results have been obtained which are given in the following table:

Table giving the mean distance in miles between successive isobars drawn one-tenth of an inch apart and the observed wind velocities compared with the tables of Loomis and Peslin.

Date.	Time.	Distance.	Velocity per hour.	Velocity from—	
		Miles.	*Miles.*	*Loomis.*	*Peslin*
September 15	11 a. m.	111	16	13	13
	12 m.	113	17	12	13
	1 p. m.	104	18	15	14
	2 p. m.	109	18	13	13
	3 p. m.	102	19	16	14
	4 p. m.	100	19	16	15
	5 p. m.	102	21	16	14
	6 p. m.	99	20	16	15
	7 p. m.	90	18	27	16
	8 p. m.	80	19	30	17
	9 p. m.	84	20	29	17
	10 p. m.	86	20	28	16
	11 p. m.	74	22	32	19
	Mean.	96	19	20	15

The observed values of distance and velocity are the mean results from the nine stations in the Lower Lake region. The values according to Peslin are the results which his approximate table would give, adopting values half-way between the limiting values of his table. It will be seen from this table that the observed velocities do not increase as rapidly with a diminution of the distance between the isobars as is given by Loomis' table. The progression is more nearly that of Peslin's table, but the absolute values differ by a constant quantity, the mean of all agreeing closely with Loomis's value. The above results are those which have been derived from a study of the hourly observations. It is much to be regretted that on account of the failure of the balloon voyage these observations were not available for their intended purpose.

APPENDIX No. 67.

CHICAGO, ILL., *November* 17, 1881.

SIR: In compliance with instructions of your office, dated 6th ultimo, I have the honor to submit herewith the following narrative and a record of aerial meteorological observations in connection with the balloon voyage from Chicago, Ill., October 13 and 14, 1881:

§ 1.—NARRATIVE.

On account of the limited time for preparation and few instruments sent me the data collected is not as complete as could be desired, being confined mostly to the barometric pressure and the determination of temperature and hygrometrical condition of the air at different elevations above the surface of the earth; in addition, the suddenness of our ascent, together with the necessary assistance rendered the aeronaut, attendant upon such occasions, reduced considerably that time which the observer considers so precious.

It is much regretted that a safety lamp was not sent, as every opportunity was had for a valuable series of nocturnal observations.

Your observer takes the liberty of entering into some details which, though of no importance to those familiar with aerial ascents, may be of interest to the inquirer, and for comparative purposes in the near future, when it is hoped there will have been sufficient data collected for the deduction of some principles which will contribute towards the advancement of meteorology.

The ascent took place on the lake front, at the foot of Randolph street, Chicago, in the balloon A. J. Nutting, formerly the Great Northwest. The balloon was inflated with carburetted hydrogen gas, and had a capacity of 100,000 cubic feet; it was 60 feet in diameter, and stood, when inflated, and with car attached, about 90 feet high. The material was composed of a rubber cloth, invented by the aeronaut, Prof. S. A. King, and consisted of two layers of cloth with 120 coatings of rubber varnish intervening. This material was very light but surprisingly strong. A life-preserver made of hermetically sealed cans was girded around the car and a cork preserver was secured by the observer for his use.

The car attached to the balloon was a slightly oblong basket of wicker-work, about 5 feet in diameter, with a seat of same material about one foot wide extending the outer circumference of the basket.

The instruments were compared with those of the signal office in Chicago for two days previous to the ascent and were found very accurate; the barometer used, Pike's aneroid, compensated, was the same which was used in the Saint Paul, Minn., ascension, and which, when compared with the Saint Paul instrument (cistern barometer), was found to be in good adjustment.

It was proposed to make the ascension on the morning of the 11th October, but on account of the threatening weather and southerly wind it was postponed to the morning of the 12th, and further postponed to 11 a. m. of the 13th, when, rather than acknowledge a failure after so much trouble and expense, despite the heavy northeast wind then prevailing the trip was determined upon. The heavy strata clouds which covered the sky for nearly three days began breaking early in the afternoon of the 13th, and cirro-stratus, upper cumulus, cirrus, and lower cumulus were moving in every direction with different velocities. The inflation was completed at 5.20 p. m. and the car attached. While arranging the ballast and testing the buoyancy of our aerostat, a gust of wind tore it from the friendly hands that held it, and parting the 1¼-inch anchor rope which moored it to the ground, away we flew, skimming the ground for about 20 rods, sweeping before us a score or two of those whose curiosity overcame their prudence. The action of the balloon was so rapid and unexpected that it was impossible to fix the instruments in position before leaving the earth, and the sudden shooting into space, the magnificent view, and the novelty of the position all so entranced your observer that it was fully five minutes before he was fully prepared to take observations. On account of the suddenness of the ascent, the instruments were not exposed as I had intended, but were suspended from the concentric ring and kept in position by means of cords. At starting, the balloon moved toward the southwest until about 5.35 p. m., when, at about 3,820 feet above sea-level, it reached a current moving more from the east. The velocity of

this current was comparatively slight, and we seemed to be drifting instead of sailing, as in the surface current. A few flat-bottomed rounded cumulus clouds which were on our level seemed to partake of the same motion. At about 8 p. m. we reached a small city, and seemed becalmed, swinging in a circle for an hour or so. It was too dark to see my chronometer, but I judged from the location that it was Aurora, Ill. Our height was approximately 3,960 feet.

Tired of the loneliness of the position, and, on account of the darkness, prevented from taking any observations, at about 9 p. m. I stretched myself on the ballast and fell asleep, the aeronaut standing watch. At 4.30 a. m., Friday, I was awakened by the professor, who announced that we were among the cliffs. We had been sailing in a valley when the wind changed to southwest, carrying us directly for a mass of solid rock which loomed up in the dusk like an immense black phantom. A few pounds of ballast carried us over this obstacle, only to stumble us about like a drunken man among the mounds. While in this section, and also while crossing Flambeau River, the balloon showed a tendency to fall in the valleys, or low ground, which was probably due in a great measure to gravitation, condensation of the gas by cold air circulating in the valleys, or inequality of atmospheric pressure, while on level ground the motion was undulatory. At 6.15 a. m. we passed over Spring Valley, Wis., startling the natives by dragging our drag-rope over their roofs. By the light of early dawn the coming day did not appear propitious. At 8 o'clock we were surrounded by dense cumulo-stratus clouds, through which we passed. At an elevation of about 5,000 feet we were eleven minutes passing through a detached cumulus.

At 7.15 a. m. we passed over what I concluded were the Platte Mounds. These mounds are 1,281 feet above sea-level. They are of various colors and fantastic forms, which, with the variegated colors of the surrounding foliage, gives a picturesqueness almost unequaled. The balloon circulated among these mounds as though drawn by the force of inspiration, and kept us dancing in circular attendance for about half an hour, when we were compelled to use ballast to escape. This attraction was probably due to the currents of cold air circulating in the valleys. * * * While passing over a Scandinavian settlement in this neighborhood we were greeted with a load of shot which could be distinctly heard as it passed. In passing over Little Falls, Monroe County, Wisconsin, moving westward, at 8.30 a. m. we came in contact with trees; one would suppose the buoyancy of the aerostat would help us over such obstacles, and that it would rebound from contact; but the force of the wind was such as to withstand any such resistance, and the balloon was shot with such velocity that the limbs of trees which would require the strength of 2 or 3 men were easily broken and a portion of one carried away with us. When we neared the ground we were greeted with a beautiful view of the verdure in every variety of form; when nearing villages, dogs were hushed, horses whipped up, and country matrons stood in their doors with arms akimbo with the utmost look of astonishment depicted on their countenances. The delusions of aerial travel about dawn are something certainly wonderful. At times the earth appears to rise to meet you, and a beautiful pattern of carpet, like green velvet, with handsome figures, is shown to the eye. Again, in passing over rocky sections, the stones assume a variety of colored geometrical figures on a large scale, reminding one of the views of a kaleidoscope, with less intense color. In fact this early morning travel is so full of delusion that one could not certify to the identity of a single thing seen.

At 9 a. m. we passed over Tutlow (probably Templeau). At 10.40 a. m. we passed over Tomah, Wis. At 11 a. m. we began ascending in the midst of a slight rain, completely enveloped in the clouds. At 12.45 p. m. our highest known elevation was reached, being 8,640 feet above sea-level, all the while immersed in cloud which boiled and surged, its vapory, tenacious appearance much resembling masses of sea-island cotton. In our progress toward the upper limit the rain at times poured in torrents, flowing down the sides of the aerostat, completely saturating everything and rendering it painful to keep the eyes open. This continued from 10.50 a. m. to 12.20 p. m., and was accompanied by a marked rise in temperature. From 2,100 to 8,000 feet the rainfall was heaviest, decreasing as we rose until at 8,000 feet, when it ceased altogether. The temperature remained nearly stationary during the whole voyage, as will be seen from the observations given below (paper No. 1). The exposed thermometer at an elevation of 920 feet was 40°; at 8,200, 43°, and at intermediate elevations ranged from 35.8° to 39.1°. The range during the whole voyage was only 8.3°. The minimum temperature, 35.8°, was reached at an elevation of 3,720 feet October 14, and the maximum, 44.1°, at an elevation of 3,860 feet on 13th October. The highest temperature of October 14, 43°, was reached at an elevation of 8,200 feet, and the lowest, 35.8°, was reached at 3,720 feet. The temperature of the water flowing down the sides of the balloon was taken at an elevation of 8,200 feet, and found to read 1° higher than the temperature of the external air.

From the direction in which we were moving when near the earth, and the relative

position of our landing place, it appears that the wind for Friday, October 14, was variable, blowing mostly from a southeast point. Sounds at the surface of the earth can be heard at great heights; at 8,000 feet, through a solid mass of cumulo-stratus clouds, a steam-whistle was heard as plainly as though a few rods distant.

The range in relative humidity for all elevations did not exceed 11 per cent., as will be seen by table given below (paper No. 2). The observations herewith were taken during the ascent only, as the rapidity of our descent was so great (10 feet per second) that all our time and energy were devoted in effecting a safe landing, and no opportunity was had for recording the readings.

At 11.50 a. m., the wind increasing carried us at a rapid rate, probably 30 or 40 miles, and not being able to discern stationary objects we could not tell where we were or what course pursuing. Rain began at 9.45 a. m. and ended about 1.45 p. m. At 1 p. m. it poured in such a torrent that observations were necessarily discontinued. At 1.30 p. m. we found ourselves floating over a small, swift-running river, and could plainly hear the roar of the falls below us. The high pines on either side of the river formed walls hemming in the current of air, so that we sailed up the middle of the stream about 10 or 15 feet above the water. After sailing in this manner for about a quarter mile an opening on the left bank was reached, into which the balloon sailed. Not more than a half-mile from the river was a cranberry bog, into which we descended and collapsed the balloon. From the last person spoken (10.30 a. m.) while in the balloon we found we were at that time about 40 miles from Saint Paul, Minn., and when we descended at 2.15 p. m., Washington time, on the west bank of the river, concluded that we were in the State of Minnesota, and probably 30 or 40 miles north of Saint Paul on the Mississippi River. With this supposition in mind we stepped out of the car into about 18 inches of ice-water, found we were in a cranberry bog, and had nothing to do but get out. A few things, together with the instruments, were taken from the car and we started to reconnoiter. A half-hour was lost in this manner, when we concluded to go down the river. *En route* a hedgehog was killed and put in a safe place for future emergency. Night found us three miles from the balloon near the river bank, occupying what had at one time been a stout hog-pen; over one end was placed several decayed logs, which did not prevent the rain from falling through. In this place we made a fire and spent the night, soaked to the skin and steaming like a kettle. After considering the situation it was resolved to abandon all property which was not essential to our safety, retrace our steps the next day, obtain ropes from the balloon with which to construct a raft if it should be necessary, obtain a water-proof shelter by cutting out a piece of the balloon cloth and to put afloat on the river something which should attract attention and convey information as to our situation.

At daybreak next morning (Saturday), before starting out, the satchel containing the meteorological instruments was suspended from the top of a pole in full view of the river; an explanatory note was also left. On our route back to the balloon the hedgehog was found and dressed, much to the distress of our stomachs. After a great deal of fatigue and loss of time the balloon was found. With a piece of cloth 10 feet square, cut from our balloon, the wicker seat of the basket, and necessary ropes, we once more set out. Having reached the river the basket was put afloat, with a sealed bottle attached (flask which contained the water for hygrometer), which gave the details of our situation, &c., and requested assistance; besides this a red handkerchief tied to a stick, firmly fastened to the wicker-work, served as a flag to attract attention. After the completion of this we concluded to camp where we were for the night. Here we boiled the hedgehog and placed it aside for the expected emergency. With the howling of the wolves and the cold night air, sleep was out of the question, although badly needed. At daybreak next morning (Sunday), after leaving an explanatory note, we started south, tramped all day through the overflowed swamps, with the water half of the time up to our knees. Late in the afternoon we arrived at what appeared to have once been an extensive logging camp. After an hour spent in prospecting, we concluded that we had arrived at the proper place for building our raft. Five decayed log cabins, with falling sides and tumbled-in roofs, offered us shelter for the night. In one of these we made our fire and managed to doze through the night. The next morning (Monday) we began work on the raft. All the logs lying around were so decayed that they were useless, but we found plenty of material in the flooring of one of the cabins, which we tore up and burned, instead of sawed, to the proper lengths. By night the raft was finished and ready to be launched. While contemplating our treasure a fierce battle among the wolves caused us to beat a hasty retreat to our camp. This night your observer had the misfortune to be compelled to eat hedgehog.

The next morning (Tuesday) found us poling our raft. An hour and a half brought us to the end of what appeared to be a lake, and although the place had at one time been used to float logs to the river, we could find no outlet. This was a sad disappointment, as all our hopes of getting out of this swamp were placed on the raft and river, and we

had now nothing to do but unknot the cords and resume the tramp. This unknotting was not so pleasant when the knots were swollen and the water ice cold. About 10 a. m. we resumed the tramp, going southwest, and at times making circuits of 3 or 4 miles to avoid an impassable swamp or lake. At noon we came upon a cranberry bog, from which we obtained a handful of berries, after standing an hour up to our knees in the water. A little later we reached a patch of wintergreen berries and obtained a handful more. About 3 o'clock p. m. we found an old logging road, which we followed. While walking this road we heard the tinkle of a cow-bell; following the sound we reached the river and followed the bank; in a short time we discovered a cabin on the opposite side and a boat with two men in it. After hallooing for some time we attracted their attention and were rowed across the river. Here we found friends and plenty to eat, and discovered that we were on the Flambeau River, in Chippewa County, Wisconsin, 65 miles from the town of Chippewa Falls, Wis. The party at whose place we stopped owns the last house (log cabin) on the Upper Flambeau, and nearest to our place of descent. From our description and a sketch I had made he was enabled to locate the position of the balloon. Next morning (Wednesday) he, with a party of ten men and a boat, found the balloon, but was unable to move it, and was compelled to return, bringing back only the valve and Signal Service instruments. That night we slept at same place as previous night, and next morning (Thursday) employed Bruno Vinette to take us to Chippewa Falls, 30 miles by water and 35 miles by road. At 8 o'clock Friday morning we arrived at the falls. Leaving on the 4.40 p. m. train, escorted by citizens in carriages and a band of music, we arrived in Chicago, Saturday 22d, at 7 o'clock a. m., when your observer took advantage of a ten days' leave of absence for recuperation, having been absent eight days and nine nights. The distance traveled in this voyage was about 550 miles, which was accomplished in 19¾ hours, during the whole of which time no difficulty was experienced by motion, dizziness, or in respiration.

The success of this ascension demonstrates with certainty the feasibility of meteorological observations while in mid-air, while, with reasonable amount of prudence and proper packing of the instruments, there is no reason why in the majority of ascensions the instruments should not be returned in as perfect order as when taken away. The great obstacles to the success of such voyages are rainy weather and badly selected points of ascension. In the first named the rain blinds the eyes, rendering it inconvenient, painful, and sometimes impossible to read the instruments or note the approach of danger, and at the same time affects the reading of the instruments. In the latter the possibility of contact with surrounding objects prevents the proper exposure of the instruments at the most important period. In taking aerial voyages the proper equipment of the balloon is almost as essential as a perfect aerostat. In this particular instance the days of anxiety and suffering we endured would have been avoided if we had had the forethought to provide ourselves with a package of condensed food and a pair of marine glasses. Your observer would recommend that in future ascensions the following articles be provided in addition to the usual balloon outfit, viz: 1 package of condensed soup, or other food; 1 pair marine glasses; 1 large jack-knife, and 1 rubber suit and gloves; also that in future ascensions, when possible, only an observer who has made one or more ascensions be designated for aerial observations; such an observer can more fully appreciate the different phenomena, and his former experience in handling instruments will enable him to do double the amount of service.

§ 2.—OBSERVATIONS.

The elevations reached by the balloon at different times may be computed from the observations, but it is necessary also to know the temperature and pressure at the earth's surface immediately under the balloon at the several times of observation. These cannot be obtained directly, but the records of Signal Service stations in the vicinity furnish the means of obtaining them by interpolation from the daily observations. The records of the following stations were used for this purpose, viz: Champaign, Springfield, Chicago, Ill.; Dubuque, Iowa; Milwaukee, La Crosse, Wis.; Escanaba, Mich.; Madison, Wis.; Marquette, Mich.; Duluth and Saint Paul, Minn. In order to obtain the barometric pressures the observed pressures reduced to sea-level were plotted on the same chart for the 3, 7, and 11 p. m. observations of October 13, and the 7 and 11 a. m. and 3 p. m. observations of October 14. Curves were then drawn connecting these points, which accordingly represent approximately the fluctuations of pressure at each of these stations. The course of the balloon was next laid down upon a small map, and its position at the times of observation inferred as nearly as possible. It was now possible to obtain by interpolation the pressures reduced to sea-level immediately beneath the balloon by interpolation from the pressure curves of the adjacent stations at the several times of observation. The temperatures were obtained in a similar way, though it was found unnecessary to draw curves of temperature, as the changes were small.

The following chart gives the curves as obtained by above method. (Paper No. 3.)

The following table contains the observed temperatures and pressures in the balloon, together with the assumed pressures and temperatures at sea-level obtained as above, and the resulting elevations. (Paper No. 4.)

The velocity of the balloon, compared with the velocity of the wind on the earth's surface, as shown by observations of the several Signal Service stations lying in the course of the balloon, is quite interesting. It will be seen by the observations below that the velocity at any of the eight stations did not equal that of the balloon; that the maximum observed hourly velocity did not equal the mean velocity of the balloon by about ten miles; that the mean hourly velocity of the 13th and 14th does not equal the velocity of the balloon by about eighteen miles; that the mean daily velocity of the eight stations for the 13th and 14th (48 hours) does not equal the velocity attained by the balloon in 19¾ hours. (Paper No. 5.)

PAPER No. 1.

Temperature table.

Date.	Washington time.	Temperature.	Elevation in feet.
1881—			
October 13	5.35 p. m		3,820
October 13	6.00 p. m	44.1	3,860
October 13	7.00 p. m		3,960
October 14	7.00 a. m	37.0	4,520
October 14	7.11 a. m	36.0	4,390
October 14	7.30 a. m	35.8	3,720
October 14	8.00 a. m	36.3	2,660
October 14	8.30 a. m	40.0	920
October 14	9.00 a. m	37.0	2,010
October 14	9.30 a. m	36.1	3,800
October 14	10.00 a. m	39.1	2,830
October 14	10.30 a. m	37.5	1,470
October 14	11.50 a. m		5,290
October 14	12.15 p. m		6,270
October 14	12.30 p. m	43.0	8,200
October 14	12.45 p. m		8,640
October 14	1.00 p. m	36.0	6,800

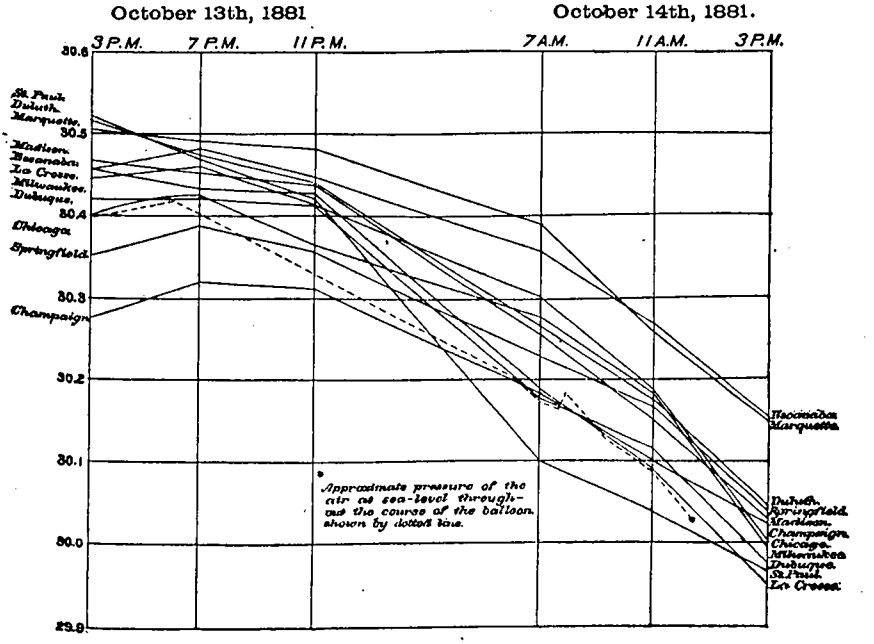
TABLE No. 2.

Humidity table.

Date.	Elevation in feet.	Relative humidity.	Dew point.	Vapor tension.
1881—		*Per cent.*		
October 14	920	96	38	.225
October 14	1,470	100	37.5	.224
October 14	2,010	96	36	.207
October 14	2,660	96	35	.205
October 14	2,830	92	37	.218
October 14	3,720	92	34	.194
October 14	3,800	100	36	.211
October 14	4,520	92	35	.201
October 14	6,800	100	38	.219
October 14	8,200	100	(?) 43	(?) .276

CHART No. 20. APPENDIX No. 79.

Barometric pressure at Signal Service Stations adjacent to the path of balloon "A. J. Nutting," (formerly The Great Northwest,) during its passage from Chicago, Ill., to Flambeau River, Wis., on October 13th, and 14th, 1881.



PAPER No. 4.

Time.	Observed pressure.	Observed temperature.	Approximate pressure at sea-level.	Approximate temperature at sea-level.	Difference in pressure.	Resulting elevation.
1881.						
October 13, 5.35 p. m.	26.40	.....	30.42	47.0	4.02	3,820
6.00 p. m.	26.36	44.1	30.42	47.0	4.06	3,860
7.00 p. m.	26.25	.....	30.40	48.0	4.15	3,960
October 14, 7.00 a. m.	25.50	37.0	30.17	47.7	4.67	4,520
7.11 a. m.	25.61	36.0	30.17	47.7	4.56	4,390
7.30 a. m.	26.25	35.8	30.16	48.0	3.91	3,720
8.00 a. m.	27.32	36.3	30.18	47.4	2.86	2,660
8.30 a. m.	29.16	40.0	30.17	47.4	1.01	920
9.00 a. m.	27.95	37.0	30.13	48.0	2.18	2,010
9.30 a. m.	26.14	36.1	30.12	48.0	3.98	3,800
10.00 a. m.	27.10	39.1	30.11	48.0	3.01	2,830
10.30 a. m.	28.50	37.5	30.10	48.0	1.60	1,470
11.50 a. m.	24.70	.....	30.05	48.0	5.35	5,290
12.15 p. m.	23.82	.....	30.04	49.0	6.22	6,270
12.30 p. m.	22.15	43.0	30.03	46.2	7.88	8,200
12.45 p. m.	21.80	.....	.....	.....	.....	8,640
1.00 p. m.	.....	.....	30.05	.....	.....	6,800

PAPER No. 5.

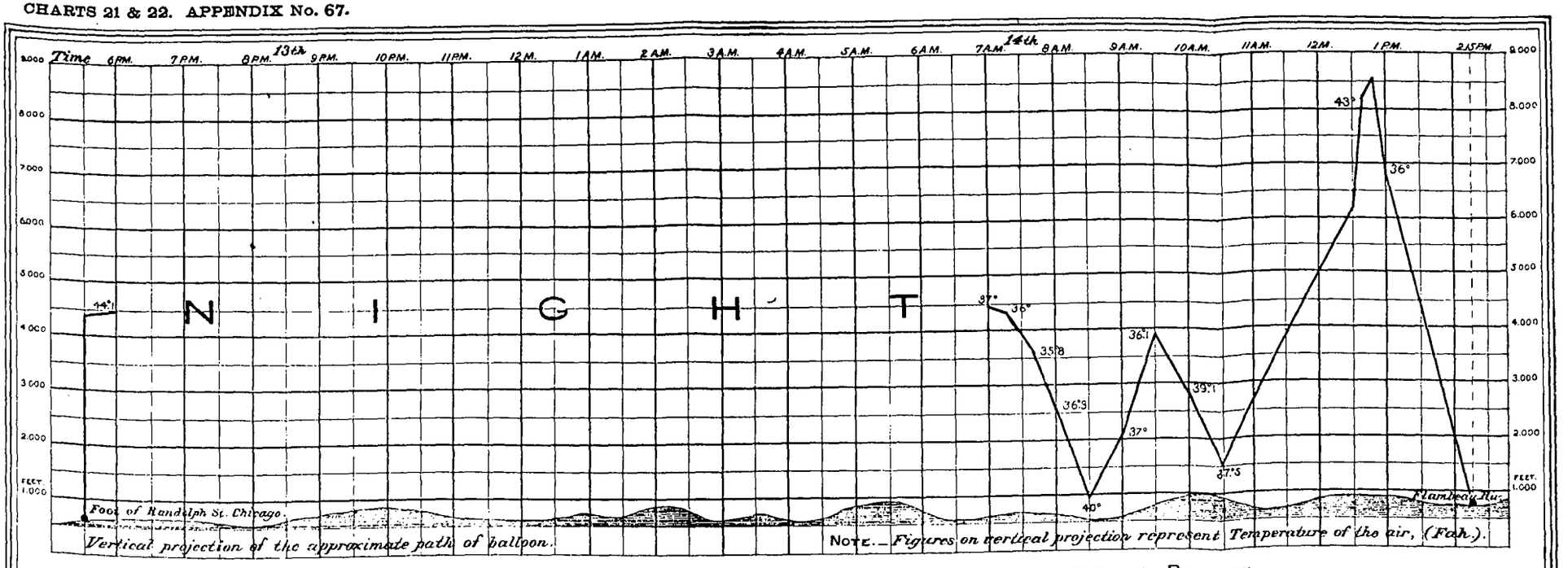
Wind table.

Stations.	October 13.		October 14.			Daily velocity.		Max. velocity.	
	7 p.m.	11 p.m.	7 a.m.	11 a.m.	3 p.m.	Oct. 13.	Oct. 14.	Oct. 13.	Oct. 14.
Chicago	12	16	12	10	7	298	195	18	15
Milwaukee	16	15	23	26	18	309	391	24	32
Madison	11	9	10	12	6	330	211	22	16
La Crosse	8	3	4	2	5	289	98	25	9
Saint Paul	3	3	6	10	12	168	185	16	14
Duluth	4	1	4	3	4	213	114	24	15
Escanaba	16	6	5	11	10	260	176	20	15
Marquette	6	4	4	11	5	279	162	20	11

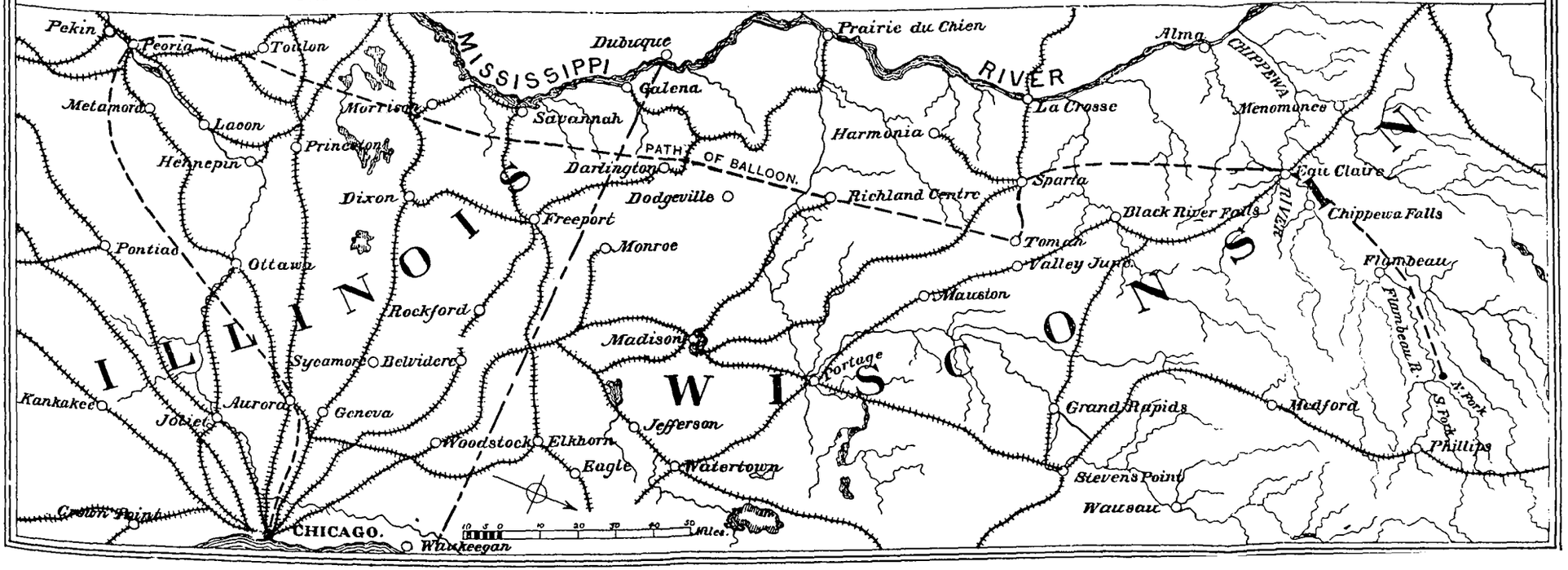
To the CHIEF SIGNAL OFFICER OF THE ARMY,
Washington, D. C.

Course of Balloon "A. J. Nutting," (formerly The Great Northwest,) from Chicago, Ill., to Flambeau River, Wis., Oct. 13th and 14th, 1881.
Samuel A. King, Aeronaut.

CHARTS 21 & 22. APPENDIX No. 67.



SKETCH OF PORTIONS OF THE STATES OF ILLINOIS AND WISCONSIN, SHOWING PATH OF BALLOON.



APPENDIX No. 68.

PROPOSED OCEAN BALLOON.

[Copy of Signal Report 92, 1882.]

1538 OGDEN STREET, PHILADELPHIA,
June 2, 1882.

DEAR SIR: I am desirous, as you know, of contributing what I can to the advancement of meteorological investigation, and I believe, therefore, you will readily understand that what I am about to offer is prompted by that desire.

The grandest of all instruments (and the most neglected) for meteorological research is the balloon. There are possibilities of execution with it not even guessed at. One of these possibilities is the subject of this letter. The subject of a voyage across the ocean has often been discussed, and is, in fact, a very popular theme, but no one seems to have thought of the wonderful opportunities offered for observation and discovery by a prolonged voyage above the waters of the Atlantic. From continent to continent is of secondary importance, in my estimation, though the value of such a demonstration cannot be guessed. My proposition is to make an aerial voyage above the ocean's surface, for the purpose of studying meteorological phenomena of the lesser altitudes, say from one to three thousand feet elevation above the sea. To accomplish this it will be necessary to construct a very powerful balloon of exceedingly strong and impermeable materials, which, when above the water by means of the appendage known as the "drag-rope," may be kept afloat for thirty days or more. We should thus be enabled to make a continuous series of observations, day and night. With no guide but the wind, we should constantly be thrown into the vicinity and midst of storms, when cognizance could be taken of all their actions, from the first gathering of the ropes to the dissipation of the last cloud.

Enlarging upon this portion of my subject to one so well versed as yourself in what is known and yet wanting in the science of meteorology would seem to be superfluous; ten thousand chances of gaining the most valuable information must occur to you. I have long contemplated this extraordinary undertaking, and am fully aware of its requirements. I feel able and equal to emergencies now. Whether this may be so in after years or not is a question which makes me anxious to avoid further delay. It would seem to be utterly useless to attempt such a voyage without at least the co-operation of the United States Signal Service, and if it were possible for it to control the matter entirely greater results might be anticipated. You have herein and herewith the substance of all my plans, together with the estimate of actual expenses necessary for the complete outfit of the expedition. My judgment is that the starting point should be located as far south as possible, certainly not farther north than the city of Washington. Your counsel in this matter will be invaluable. How to obtain the necessary funds is of course the leading question; this settled, all others are easily answered.

Should you consider this communication sufficiently complete for presentation I would ask you to present it to General Hazen with my respects.

Very truly, yours,

SAMUEL A. KING,
1538 *Ogden street, Philadelphia.*

Prof. CLEVELAND ABBE.

THE OCEAN BALLOON.

The balloon for an ocean voyage should have a capacity of about 300,000 cubic feet. The material for its construction should be a fine, strong cotton cambric. This should be made three-fold, and cemented together by intervening layers of India rubber, besides being coated on the outside and inside with other gas-proofing and water-proofing materials. The seams must be strongly sewed and then cemented and covered with rubber strips to prevent leakage through the needle holes. The net-work should be made of cotton cord, of sufficient strength to bear the great strain to which it will be subjected. A seaworthy boat would be suspended beneath the balloon, and so rigged as to serve as a comfortable car in the air or as a navigable vessel, or float upon the

water. Other appliances would of course be necessary, but these are matters of course which need not be mentioned here, with one exception: this is (for want of a better name) the "drag-rope," which is to be used for the purpose of keeping the balloon poised at or near the required altitude in the air. It should be made so that the portion floating in the water may offer the least possible resistance to the free movement of the balloon, but that part suspended between the balloon and the water should be made of materials or in such manner as to make it the best possible non-conductor of electricity.

Estimated cost of balloon-materials.

8,000 yards cambric, at 18 cents	$1,440 00
600 pounds kneaded India rubber, at $1.25	750 00
1,300 pounds cotton net cord, at 30 cents	390 00
500 pounds manila cordage, at 14 cents	70 00
Valve	100 00
Boat	800 00
Sand-bags, anchors, and other incidentals	500 00
	4,050 00

Estimated cost of making balloon.

1,600 gallons naphtha, at 10 cents	$160 00
Wages of 10 men coating and uniting cambric, 60 days	1,200 00
Wages of 12 sewing-girls six weeks, at $6 per week	432 00
Wages of 10 men four weeks making net, at $9 per week	360 00
Rent of a large hall for cutting and sewing	50 00
Sewing materials and other incidentals	500 00
	2,702 00

Estimated cost of inflating with hydrogen gas.

21 large tanks, 10 feet diameter, of 2-inch white pine	$2,100 00
21 small, at $10 each	210 00
Connecting pipes, &c	500 00
80,000 pounds sulphuric acid, at 2 cents	1,600 00
75,000 pounds iron turnings, at 1 cent	750 00
21 men three days, at $2	120 00
50 men one day	100 00
Incidentals	200 00
	5,586 00

Estimated cost of outfit for the voyage.

Provisions, say	$300 00
Life-preserving suits, say, for 3 persons	300 00
Five water-anchors, at $25	125 00
Instruments, say	300 00
Electric light, say	75 00
Heating apparatus	100 00
Add for other incidentals	200 00
	1,400 00

RECAPITULATION.

Materials composing balloon	$4,050 00
Making	2,702 00
Inflating with hydrogen gas	5,586 00
Outfit for voyage	1,400 00
Total cost of expedition	13,738 00

Weight of balloon appendages and outfit.

	Pounds.
Gas envelope	3,000
Netting	1,300
Ropes	500
Drag-ropes and poising cable	2,000
Boat and car	1,000
Three men and outfit	1,000
Total weight	8,800

BUOYANCY OF THE BALLOON.

Hydrogen gas is the only gas to be thought of in this connection, and it must be as pure as possible. The maximum lifting power for 1,000 cubic feet of hydrogen is 70 pounds; admit then a probable loss of 5 pounds per 1,000 from impurities, and we can then safely estimate the buoyancy as follows:

	Pounds.
300,000 cubic feet of hydrogen, lifting 65 pounds per 1,000	19,500
Deduct weight of balloon, &c	8,800
Total	10,700

In the ordinary detached ascension such an amount of sand ballast would not be equal to keeping the balloon in the air for more than three days, but the voyage here proposed is of the nature of the "captive" ascension, where no gas is lost from overflow. The captive balloon of the Paris exposition may be cited as one example. The sole loss then will be through leakage. This will not exceed 1 per cent. for every 100,000 cubic feet of gas in the balloon, say 3,000 cubic feet per diem, average. A loss of 90,000 cubic feet of hydrogen in thirty days would require to maintain the equipoise a discharge of 5,850 pounds of sand, after which there would still remain 4,850 pounds of sand, with which the voyage could be extended if necessary.

In conclusion, I would say that the main difficulty to be apprehended is to be found at the commencement of the voyage. If the balloon can be sent well to sea at once I should have no fears of the result, and with a wind from west on the morning after the inflation, and an early start, we should soon be out of reach of land influences and fairly embarked on the voyage.

SAMUEL A. KING.

APPENDIX No. 69.

ALLEGHENY, PA.,
Allegheny Observatory, July 8, 1882.

GENERAL: In reply to your request, I have the honor to inclose an abstract of the result of the Mount Whitney expedition in advance of the final publication. As the voluminous reductions are still incomplete you will understand that the results given here by anticipation are offered only as approximations to the final statements. I may premise that the Allegheny Observatory has been engaged for many years particularly in the study of the sun, and of those processes of absorption of its heat by our atmosphere on which almost every phenomenon of meteorology depends. The fundamental problem is the determination of the amount of heat which the sun sends the earth, called in technical language "the solar constant." To obtain this with absolute exactness it would be necessary to ascend above our atmosphere, since the latter absorbs part of the solar heat, and since this absorption is measured by the difference of radiant heat outside it and within it.

There are indirect means for obtaining this result without ascending above the earth's surface, and they had long been practiced at Allegheny, but none are so satisfactory as the direct ascent of a very high mountain, for by the comparison of the radiant heat observed at its summit with that at its base the absorption of a very considerable part of the air may be directly measured and that of the remainder inferred. The previous work at Allegheny having indicated that the received values of this solar constant by Herschel and Pouillet, and even the later ones of Crova and Violle, were imperfect, it became desirable to verify this conclusion by direct mountain measurements, particularly as new processes have been devised and practiced here which enable us to study the absorption selectively, not only in its totality that is, but on each separate ray. Accordingly, with the consent of the trustees of this observatory, I very gladly accepted your offer to facilitate an expedition for this purpose, the funds for the considerable special apparatus of which had, it is proper to say, been already supplied by the private generosity of a citizen of Pittsburgh. After consultation with officers of the Army and Coast Survey, Mount Whitney, in the Sierra Nevada of Southern California, was proposed as a site, combining the requisites of great altitude, extreme dryness, and abrupt rise from the plain, and on its approval by you preparations were pushed forward for departure. This was to have been at the close of June, with the expectation of being on the mountain by the end of July, but owing to delays beyond the writer's control the party did not depart till the 7th July. The journey across the continent was made with added facilities through the courtesy of Mr. Frank Thompson, general manager of the Pennsylvania Company, which enabled us to take our special apparatus, weighing between two and three tons, through in a private car without change. At San Francisco we were detained by delays in the provision of a military escort ten days, a time which the kindness of General McDowell and his officers aided us to pass agreeably, but which was a fatal obstacle to our first purpose to be on the mountain in July.

The party, consisting of Capt. O. E. Michaelis, of two Signal Service non-commissioned officers, and six soldiers, acting as escort, with four civilian assistants and the writer, left San Francisco on the 22d July, by railroad, for Caliente, at which point the transportation by wagon over the desert began, and it was reunited after a tedious journey at Lone Pine, at the foot of Mount Whitney, on the 1st of August. Here a meteorological station was established, where observations were regularly taken with the bolometer, spectrometer, actinometer, the solar comparator, and other special instruments, as well as those with the barometer, hygrometer, and ordinary meteorological apparatus.

This Lone Pine camp, with part of the apparatus, was then left in charge of Sergeant Dobbin with a portion of the escort, while the main party, with the bolometer, spectrometer, siderostat, actinometers, and other pieces, were transported to the mountain. This rose immediately above Lone Pine, presenting the appearance of a wall of granite, which it was necessary to make a long detour to surmount, the mule trains occupying from seven to ten days to a point whose actual distance was sixteen miles. The journey lay through a literally trackless wilderness, over country of the roughest kind, and the transportation of the elaborate and delicate apparatus involved great difficulties. It

reached its destination with unexpected safety, however; but so much time was consumed in this slow transportation that it was not until the last days of August that systematic work commenced on the mountain and observations were made simultaneous with those below. The actual summit proving impossible to occupy permanently and effectively in the time now left at our disposal, observations were taken there at intervals, but the principal and consecutive ones were at the camp, at an altitude of between twelve and thirteen thousand feet and above the snow line. We struck our tents on the mountain and descended on the 11th of September, and breaking camp at Lone Pine also, retraced our steps across the desert, reaching the railroad on the 21st.

At Lone Pine and on the mountain the regular Signal Service observations were made three times daily, with thermometer, hygrometer, and barometer, independently of the special observations of the expedition. These latter consisted of:

1. Observations with the bolometric spectrometer.
2. Three series of observations daily with the actinometers.
3. Of daily photometric observations at Lone Pine with the comparator.
4. Of observations with special nocturnal radiation apparatus (on twelve nights).
5. Of daily observations for time or latitude.
6. Of observations of high and low stars, for atmospheric transmission, whenever practicable.
7. Of chemical observations of the amount of carbonic-acid vapor in the atmosphere at Lone Pine and on the mountain.

Of observations with the actinometer alone, 120 complete series were taken, each series consisting of thirteen readings of the solar thermometer in sunshine and in shade, and of observations with the bolometer. The galvanometer readings numbered several thousand. These observations were taken under all circumstances and in temperatures varying from 160° F. (in the dark tent at Lone Pine) to 20° F. upon the summit.

There were none of the conveniences for observation which are obtainable at permanent stations. Those at the very summit, at an altitude of nearly 15,000 feet, were chiefly due to Captain Michaelis, who volunteered that specially trying service, and a life under canvas in such temperatures and at such an altitude, with the rarefied air and concomitant mountain sickness, made continuous observations difficult. Such difficulties were what we had calculated on, however, and I allude to them only to speak of the excellent spirit of all concerned, and which carried us through all obstacles.

We found Mount Whitney all that could be wished for such a purpose, except for the delays now involved in reaching it, and I have elsewhere expressed the hope that it may be occupied as a permanent station.

Pending the completion of the reduction of the experiments of the expedition, I am able to give as an approximative estimate of the solar constant from 2.6 to 3.0 calories, by which it is meant that the direct solar radiation, before absorption by the earth's atmosphere, would in falling for one minute normally upon an area of one square centimeter, raise the temperature of one gramme of water 2°.6 or 3°.0 centigrade. A more adequate idea of the true amount of heat involved may be obtained by considering that this implies its ability to melt annually a crust of ice covering the whole earth and over 150 feet thick. This value is one-half greater than the received value of Pouillet, and greater than the latest determinations of Messrs. Crova and Violle. The Mount Whitney observations lead us, then, to increase the value hitherto accepted for the solar heat. The result given implies the statement that the heat received directly from the sun is nevertheless but a small part of that we experience at the earth's surface, owing to the storage of that heat by the atmosphere. It has long been surmised that without our air the sun's radiant heat would seem greater but that the earth's surface, as a whole, would be colder. We may see, in part, what the effect would be in the absence of an atmosphere by noting the actual experience of our party in climbing to those high altitudes where a considerable part of the atmosphere lay below us. As we ascended and the air grew colder the radiant heat nevertheless grew greater, so that the skin peeled away from face and hands. As we climbed higher and the air grew still colder, the members of the party presented the appearance of suffering from severe burns, and the radiant heat still increased till near the summit the ordinary black-bulb thermometer in vacuo once showed the extraordinary excess of 130° F. above the surrounding air, and the temperature in a blackened copper vessel, covered by two sheets of common window-glass, rose above the boiling point at the snow line. It is therefore certain that with such a vessel water can be boiled among the snowfields of Mount Whitney by the direct solar rays. These striking facts lead us to ask what the limit of this heat may be, and the answer appears at first paradoxical. The value already given of the sun's heat in calories enables us to compute that a thermometer exposed to the sun outside the earth's atmosphere would reach a temperature certainly not greater than 50° C. above that of surrounding space. This remarkable fact, which is in consonance with the work of previous observers, may be variously interpreted. According to the writer's judgment we are at any rate justi-

fied in saying that in the absence of our atmosphere the surface temperature of the earth, even under the tropics, would not rise in full sunshine as high as the lowest actually recorded degree of arctic cold. The temperatures we actually experience are, then, it appears, due very much less to the direct solar radiant heat than to the quality of selective absorption in our atmosphere which makes it act a like part to that of the glass cover in the experiments just cited, and store the heat within till the earth's surface rises to the temperatures we live under. Without this quality of selective absorption it appears probable that human life would cease on this planet, even though the air remained fit for breathing. Accordingly the spectral study of the action of special components of the air in hindering the radiation into space of the heat the planet has received has been made a prominent object of these researches. In this connection it may be mentioned that the method used at Mount Whitney enables us for the first time in the history of such experiments to study this selective absorption in its special effect on each spectral ray. We find that as we ascend the spectrum shows not merely a gain in heat and light but a very unequal gain, the shorter wave lengths increasing in energy far more than the longer, so that there is upon the mountain-top a different spectral distribution of heat, light, and color from that which obtains at the bottom. Those observations with other previous ones by the writer establish the remarkable fact that, viewed without an atmosphere, the sun's light would appear no longer white, but blue. This conclusion, with others which may appear of interest to meteorology, I trust to establish beyond dispute by the evidence of recorded observations and experiments made by the Mount Whitney expedition, in the fuller memoir I shall shortly be prepared to submit.

I have the honor to be, General, very respectfully, your obedient servant,

S. P. LANGLEY,
Director of the Allegheny Observatory,
Consulting Specialist to the U. S. Signal Service.

General W. B. HAZEN,
Chief Signal Officer, U. S. A.,
Washington, D. C.

APPENDIX No. 70.

MEMORANDUM.

As the work of the Signal Service consists in precautionary warnings against the unnecessary exposure of life and property to the risk of injury by wind and weather, it is only possible to fully present the benefits derived therefrom by means of statistics showing what would have been the loss if the service were not in existence.

In a few instances such as "the metropolis storm," January 31, 1878, we can point to the direct saving of life and property already apparently doomed to destruction, but the greater part of our work is, on the one hand the prevention of accidents and on the other hand the increase of health and prosperity due to the dissemination of knowledge in every household throughout the land.

Without attempting too much detail, the following suggestive list is given, showing some of the ways by which it is known that the community profits directly by the work of the Weather Bureau.

Artists, photographers, regulate their plans according to the predictions of sunshine and cloud.

Builders strengthen or remove their scaffolding when high winds are predicted.

Canals, navigation on, in the fall depends on the predictions of freezing weather.

Grasshoppers, movements of swarms predicted for the benefit of farmers.

Frontier settlements made more secure from Indians by Signal Service telegraph lines.

Insurance rates, especially marine, are diminished for vessels that heed the signals.

Farmers both plant and harvest their crops according to the predictions of favorable weather.

Engineering structures are planned according to the statistics furnished by the Signal Service, *e.g.*, aqueducts, sewers, and drains depend upon rainfall and evaporation; bridges, chimneys, and other buildings are erected; levees, jetties, and harbors of safety are planned with reference to force of currents, winds, tornadoes, &c.

Health of individuals is preserved by timely changes of clothing based upon prediction of sudden changes in temperature or unexpected rain.

Hygiene in general is promoted by studies into the connection between weather and disease leading to the deduction of generalizations useful to the physician and the public.

Laborers, all out-door, regulate their plans for the coming day according to the prediction of weather, especially navvies, masons, carpenters, painters, farmers, &c.

Merchants regulate the exposure of their goods.

Law courts recognize the Signal-Service records as authority.

Herders drive their flocks from the lowlands when river floods are predicted, and to shelter when "northers," "blizzards," snow, &c., are predicted.

Newspapers have their circulation increased by publication of weather reports.

Navigation made *more secure* along the coast by frequent consultation with the Signal Office at Washington by means of our telegraph stations.

Also navigation *made more rapid* by catching favorable winds predicted by the Signal Office, and by studying or taking advantage of the laws of storms deduced from observations of the Signal Office; navigation *made safer* by due regard to the cautionary signals; *navigation on rivers* made safer and more certain and more expeditious by Signal Service reports of stages of water.

Packers of *pork* and *beef* kill when favorable weather is predicted.

Police reports as to the state of society during times of great excitement, general strikes, &c., collected tri-daily from every State for the use of the President.

Public meetings, games, fairs, &c., appointed or postponed according to the weather predictions.

Railroad superintendents arrange and dispatch trains according to the predictions of snow-storms, winds, &c.

Planters', cotton, "watch predictions most carefully;" *sugar*, "development of the sugar plantations in portions of Texas, Louisiana, &c., is wholly dependent upon your predictions."

Tobacco: "Planters in central Virginia are unanimous as to the value of the predictions."

Orange groves: "The predictions of frosts and northers are of incalculable value."

Shippers save perishable goods, *fruit, oysters, fish,* &c., from injury by awaiting predictions of favorable weather.

Superstition and ignorance in regard to weather and climate has been largely dispelled by the conviction that this department of nature can be made subservient to the intelligence and necessities of man, and that all phenomena obey immutable laws.

Travelers regulate their journeys according to the predictions.

Wholesale dealers and *brokers*, especially in great staples, regulate prices according to the predicted character of the remainder of the season as affecting the crops.

United States Fish Commission determines the adaptability of rivers and lakes to the cultivation of specific species of fish by the Signal Service reports of water temperature and in all this work utilizes the Signal Service predictions. The Signal Service predictions are disseminated throughout Canada and the West Indies, where their usefulness is recognized as generally as in the United States.

APPENDIX No. 71

MEMORANDUM.

DESTRUCTIVE FORCES ATTENDING TORNADOES.

From the examination of the data contained in the works referred to in Memorandum No. 2 it appears that during the passage of a tornado, buildings and other objects are subject to the following destructive forces, viz:

A.—Velocity, or force of the wind.

1. From the destruction of bridges wind pressures of from 18 to 27 pounds per square foot have been demonstrated.
2. From the destruction of brick buildings wind pressures of from 58 to 84 pounds per square foot have been demonstrated.
3. From the lifting up and transportation and destruction of loose objects, such as a barrel of tar, a locomotive, a stave, a heavy log, cattle, &c., wind pressures of 52, 93, 31, 112, and 58 to 83 pounds per square foot respectively have been demonstrated.
4. The upward pressures are occasionally shown to be as great, if not greater, than the horizontal pressures.
5. Downward pressures or downward movements of the wind have not been clearly demonstrated.
6. Upward velocities of 60 meters per second (135 miles per hour) are not unusual, if we may judge from the effects produced.
7. From observations of the Robinson anemometer horizontal wind velocities of 80 miles per hour (36 meters per second) have been recorded during tornadoes, subject to a reduction to about 65 miles per hour for possible instrumental errors. But as velocities of 180 miles per hour (reducing as before to 140) have been recorded in hurricanes, there is no apparent reason why the latter should not also be attained in tornadoes.

B.—Area exposed to destructive winds.

That the destructive wind velocities previously enumerated are confined to very small areas, such as 10, 20, or 100 feet square, is shown.

1. By the narrowness of the path of greatest destructiveness, the destruction of fences, trees, &c., is frequently visible over a path many miles long, but only a few hundred yards wide; but the path of greatest violence is very much narrowef than this. The excessive cases above enumerated are observed only in small isolated spots less than 100 feet square, unequally distributed along the central portion of the track; hence in very large buildings, bridges, &c., only a small portion is liable to be subjected to destructive wind in the passage of a storm.

2. In the different portions of this area of maximum severity the winds are simultaneously blowing from different, perhaps even opposite directions; so that the total resultant of the winds at any moment is not so much to overturn or carry off, or crash in, but rather to twist around a vertical axis. Thus trees are found twisted off, and buildings are generally lifted up and turned around immediately before being torn to pieces. Numerous instances of this last action are given in the tornadoes investigated by Sergeants Finley and Mackintosh.

3. As the central area of maximum intensity is comparatively narrow and the chances are very small that a building will be exposed to the violent twisting action, it is evident that the average velocity of rectilinear winds within the general path of moderate destruction is the one most necessary to provide against in ordinary structures. These winds may attain a velocity of 80 miles per hour over an area 1,000 feet broad, and generally blow from the southwest; those next in frequency blow from the northwest. Of course the tendency of such a wind upon an object whose center of inertia does not coincide with the center of figure will be, first of all, to turn it around through an arc sufficient to bring these two centers into the line of the direction of the wind, which partial rotation may occur anywhere within the path of the tornado, and is to be distin-

guished from the destructive twist that is experienced by bodies that lie in the path of maximum intensity. A similar problem occurs in the case of monuments, stones, &c., disturbed by earthquake shocks, as was first pointed out by Mallet.

C.—The duration of the exposure.

1. The time during which an object is exposed to these destructive winds varies from 6 to 60 seconds; the general average of a large number of cases is 16 seconds. It is therefore probable that the maximum winds at the tornado center rarely continue longer than the lower of these limits. A building exposed to these winds experiences but one stroke, like the blow of a hammer, and the destruction is done. In the case, therefore, of a suspension bridge, a chimney, or other structure liable to be set into a system of rhythmic vibrations, destructive to its integrity, the effect of the maximum winds in inducing such vibrations is reduced to a minimum.

2. The duration of the heavy southwest and northwest winds prevailing over the area of moderate destruction nearly exceeds two minutes.

D.—Vertical wind currents.

At the spot over which the center of a tornado stands at any moment or immediately beneath the funnel or spout that is seen descending from the clouds there is experienced a strong vertical current, whose tendency to destroy and carry upward is greatly assisted by a local diminution in the barometric pressure within the funnel by virtue of which the air previously confined within a dwelling exerts an outward pressure that is not counterbalanced by the exterior atmosphere. The amount of this unbalanced pressure is, as shown by Ferrel, frequently much more than one inch of mercury or a half-pound to the square inch, and may easily amount to ten times this quantity; of course the interval during which this expansive force is exerted is but a few seconds, corresponding to the time occupied by the central spout in passing along its path, which motion of translation is, on the average, at the rate of 30 miles per hour.

E.

The relative frequency of tornadoes during the months of the year is as follows, beginning with the month of greatest frequency: July, May, June, August, April, March, September, February, October, November, January, and December.

F.

The geographical distribution of 247 tornadoes from 1794 to 1878 was as follows, viz:

New York	24	North Carolina	7	Connecticut	4
Indiana	20	Alabama	6	Michigan	4
Illinois	20	Minnesota	6	New Hampshire	3
Ohio	16	Mississippi	5	Arizona	2
Georgia	16	Maryland	5	Louisiana	2
Iowa	11	Virginia	5	Kentucky	2
Kansas	11	South Carolina	5	Rhode Island	1
Pennsylvania	10	Massachusetts	5	Colorado	1
Tennessee	9	New Jersey	5	Indian Territory	1
Missouri	9	Dakota	4	Maine	1
Nebraska	8	Wisconsin	4	Wyoming Territory	1
Texas	8	Florida	4	Montana	1
				New Mexico	1
	162		61		24
Total					247

Doubtless the irregularity in this geographical distribution is largely due to the imperfection of our fragmentary records.

G.

The distribution with reference to the time of day is about as follows:

Between 11 a. m. and noon	4
Between noon and 1 p. m	27
Between 1 and 2 p. m	7
Between 2 and 3 p. m	7

Between 3 and 4 p. m ---------- 5
Between 4 and 5 p. m ---------- 24
Between 5 and 6 p. m ---------- 12
Between 6 and 7 p. m ---------- 7

The remainder are equally distributed at the rate of about two per hour throughout the other hours of the day.

MEMORANDUM No. 2.

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APPENDIX No. 72.

EXTRACTS RELATIVE TO ELECTRICITY, FROM PIKE'S PEAK MONTHLY ABSTRACT JOURNALS.

November 23, 1873: Atmospheric electricity manifested itself when line was broken by a crackling sound, when binding-screws were touched, and bright sparks drawn when stove-pipe was touched by my fingers.

December 7, 1873: While line was broken I heard relay working; thinking line had been repaired, I hastened to adjust; received a severe shock, which convinced me that something stronger than our battery had charged the wire. Instrument cut out and lightning-arrester screwed closer. In a few minutes a continuous stream of electricity passed between the two plates of the arrester with a loud noise, resembling that produced by a child's rattle; the fluid passed not in sparks, but in five or six continuous streams of light as thick as a pencil lead, for two or three minutes at a time, with short intervals between. This continued for over an hour.

December 11, 1873: On retiring I accidentally touched my drawers with two fingers of my hand and drew two sparks from them.* This is a common phenomenon after a snow-storm.

January 12, 1874: Electric shocks.

January 24, 1874: Received electric shock when opening stove-door; as usual, it was not repeated.

February 25, 1874: Same as January 24.

May 11, 1874: During the entire day severe shocks were felt by any one touching the wire; and the line being open I could make plain signals with the key for about ten minutes.

May 20, 1874: P. m. report could not be sent on account of atmospheric electricity (a thunder-storm).

May 21, 1874: A flash of fire about two feet long leaped from arrester into the office, illuminating the rooms.

May 24, 1874: A heavy thunder-storm passed slowly and directly over the Peak, large sparks passed constantly through the arrester, while a strange crackling of the snow could be heard at times. While making the 2 p. m. observation I heard the snow crackle as above-mentioned, and felt at the same time on both temples, directly below the brass buttons of my cap, a pain as if from a slight burn. Putting up my hands there was a sharp crack, and all pain had disappeared.

May 29, 1874: At 6.20 a terrific storm commenced; blinding flashes of fire came into both rooms from the lightning arrester and stoves; loud reports followed in rapid succession.

July 1, 1874: A party of visitors were caught in a thunder-storm not far from the summit, and all state that they experienced peculiar burning sensations on face and hands and heard a hissing sound proceeding from hair and whiskers.

July 9, 1874: Heavy thunder-storm; large sparks passed through the arrester during its continuance. Mr. Copley telegraphed me this forenoon that he twice got knocked down, while repairing the line, by electric shocks.

July 14, 1874: Thunder-storm; lightning in beginning very severe; I received a very painful shock while working over the line by my fingers accidentally touching the metal of the key.

July 15, 1874: Thunder heard in the distance throughout the evening, while strong ground currents passed through the arrester.

July 16, 1874: Severe thunder-storm; sharp flashes and reports came through the arrester to the terror of several lady visitors; outside the building the electric effects were still more startling. The strange crackling of the hail mentioned before was again heard, and at the same time my whiskers became strongly electrified and repellant and gave quite audible hissing sounds. In spite of the cap I wore, my scalp appeared to be pricked with hundreds of red-hot needles, and a burning sensation was felt on hands and face. Several of the visitors who were outside had the same experience. A large dog who had followed his master outdoors became terrified and made for the door with a pitiful howl. Lightning was seen in all directions in the evening, and ground currents passed incessantly through the arrester.

July 19, 1874: A severe thunder-storm passed close over the Peak between 1.30 and 2.30 p. m.; lightning struck wire between 2d and 3d poles from the house; for a moment the wire resembled a rope of fire, and vibrated violently for some minutes after the discharge; no damage done; frequent loud discharges took place along the ground wire between it and the rocks on which it rests; hair and whiskers of any one outdoors were electrified by each discharge.

July 21, 1874: Heaviest thunder-storm of the season to-day; lightning terrific; constant crackling of fallen hail and peculiar clattering of the rocks, as if shaken by subterranean convulsions, indicated the highly electrified state of the summit.

August 2, 1874: I was obliged to keep the telegraphic instruments cut out during the greater part of the day.

August 3, 1874: The lightning rendered the line almost useless the entire afternoon. I got severely shocked when sending my report.

August 13, 1874: Seventeen visitors to-day; some of them made the ascent during a severe thunder-storm and were much alarmed by the effects of the electricity upon their hair; one of them declared that his hair stood up so stiffly as to lift off his hat!

October 5, 1874: Severe thunder-storm below summit in afternoon; observer severely shocked whilst calling Fenlon at lower station.

May 22, 1875: During storms to-day (hail and snow) electricity quite strong.

May 23, 1875: Electricity strong at intervals during day and night.

May 24, 1875: Hail from 3.55 p. m. till midnight, accompanied by very strong electricity, decreasing and increasing in intensity, a notable fact in all hail-storms.

May 25, 1875: Electricity has shown itself nearly all day with variable force; hail frequent during the day.

May 29, 1875: Hail about midday, accompanied by electricity. In all our hail-storms the fall of hail entirely ceases for about a half a minute following a heavy electric discharge, and the hailfall is considerably heavier for some little time following the discharge than before.

July 5, 1875: Terrible electric storm in afternoon; at first its effects were felt only by the line, but about 2 p. m. its presence was evident everywhere on the summit; a constant stream of flame from the arrester; a constant crackling noise heard out of doors as though made by small pistols.

May 11, 1876: During hail-storm at 7.30 I was compelled to cut out the wires, owing to intensity. This I attempted with ungloved hands, and learned a lesson that was an impressive one; luckily I escaped with a slightly bruised head and a fearful scare.

May 25, 1876: During a thunder-storm the wire outside, at two or three places, kept up a peculiar singing noise, resembling the singing cricket. I have previously noticed that the singing noise is never heard except when the atmosphere is very damp and rain, hail, or snow is falling.

June 16, 1876: At 5.20 p. m., as I was sitting on a rock near the monument on the eastern edge of the summit, a blinding flash of lightning darted from a cloud, seemingly not more than 500 feet NE. of me, and was accompanied by a sharp, quick, deafening report, and at the same time I felt the electricity dart through my entire person, jerking my extremities together as though by a most violent convulsion and leaving tingling sensations in them for a quarter of an hour afterward. Straine, who was sawing wood in the shed at the time, received a similarly violent shock, and says that a ball of lightning appeared to pass through the storm-room and wood-shed in which he was working, leaving behind a strong sulphurous smell.

July 13, 1876: Singing on the wire; it also seemed to come from the instrument shelter and the house as well as from the wire. Thunder loud and continuous during the afternoon.

July 23, 1876: The anemometer stopped working on account of the electric storm. Privates Straine and O'Keefe were shocked while trying to fix it, so that they had to give it up until the storm had subsided somewhat.

August 18, 1876: A beautiful phenomenon was observed by myself, Private Greenwell, and four visitors. The peculiar singing noise (or sizzing noise) was heard again, always before in day but this time at night, but the line for an eighth of a mile was distinctly outlined in brilliant light, which was thrown out from the wire in beautiful scintillations.

Near as we could observe these little jets of flame very plainly, they were invariably in the shape of a quadrant, and the rays concentrated at the surface of the line in a small mass about the size of a currant, which had a bluish tinge. These little quadrants of light were constantly jumping from one point of the line to another, now pointing in one direction, then in another. There was no heat to this light, and when I touched the wire I could only feel the slightest tingling sensation; not only was the wire outlined in this manner, but every exposed metallic point and surface was similarly tipped or covered. The caps of the anemometer appeared as four balls of fire, revolving slowly round

a common center. The wind-vane was outlined with the same phosphorescent light, and one of the visitors was much alarmed by sparks which were plainly visible in his hair, though none appeared in ours. At the time of this phenomenon snow was falling.

March 27, 1877: Singing noise heard upon the wire to-day.

May 12, 1877: Hail-storm accompanied by intense electricity.

May 24, 1877: Sergeant Hobbs and Private Greenwell received severe shocks during the day.

August 6, 1877: Intense electricity; all metal objects were tipped with sparks.

November 25, 1877: Snow-storm all day, attended by intense electricity, which could be heard crackling in a person's hair continuously, although no reports of thunder were heard.

December 26, 1877: The atmospheric electricity was very intense during the day, and at times would crackle on various objects in the room.

January 25, 1878: Several thunder-storms occurred in the surrounding parks and gulches. The electricity on the summit was very intense, causing a continuous snapping of the lightning-arrester.

May 12, 1878: A snow-storm commenced during the night, and 1 p. m. was drifting furiously by a rising gale. The electricity varied with wind-gusts, and was so intense at times as to render our position exceedingly dangerous. The telegraph wires were cut out, but violent sparks would still jump six inches between the disconnected windows. One violent discharge seemed to have occurred in the chimney, for a terrible commotion was caused in the soot and ashes.

May 24, 1878: At 8 p. m. snow commenced, attended with severe electricity, lasting for an hour. The wires had to be cut out and parted, and a vivid glaring was continuous in the windows. A lamp set in the north window would, with its flame, cast a shadow on the opposite wall for several seconds.

July 1, 1878: During afternoon sleet fell, accompanied by intense electricity; at 3.20 a violent explosion occurred in the room near the stove, scattering the wood and knocking down the stovepipe.

April 10, 1879: The telegraph wire heavily charged with a ground current of electricity this evening, and it was with difficulty that signal was transmitted. The current at times was entirely reversed.

June 16, 1879: Light sleet, accompanied by thunder; only a few peals were heard, when it gave way to a strong, steady current over the wire, and for twenty minutes one of those electric storms peculiar and common to Pike's Peak prevailed. A queer hissing sound issued from the telegraph line, the wind-vane post, and other posts standing in a deep snow-drift near by. I stepped out to view the phenomenon, but was not standing in the snow-drift long when the same buzz started from the top of my head; my hair became restless, and feeling a strange creeping sensation all over my body, I made quick steps for the station. Once inside upon the dry floor the effects soon left me. After getting inside I opened the telegraph key and found a continuous bright spark passing between the key and the anvil, even when they were separated one-eighth of an inch, and by putting two thicknesses of writing-paper in this space it was scorched and perforated by numerous burnt holes. By accident I completed the circuit with both hands, when I received a shock that set me back on the floor.

June 29, 1879: Thunder-storm (very severe) 11.10 to 11.30 a. m., during which time a bolt passed through the arrester with a report exceeding that of a rifle, and threw sparks all over the office. The suddenness and violence of the shock stunned me, so that it was a little while before I could realize what had happened.

August 11, 1879.—During passage of a thunder-storm over the peak a great amount of atmospheric electricity was manifested.

August 12, 1879.—Heavy snow and sleet began falling at 5.30 p. m.; at 5.40 p. m. a bolt of lightning went through the arrester with the report of a rifle, throwing a ball of fire across the room against the stove and thin sheathing. The wood packers, Messrs. Wade and McDonald, had taken refuge in the station for a few minutes, but concluded that this was rather an uncomfortable place during a storm and left immediately. Their dog, however, was far in advance in seeking shelter outside. Mr. Wade declared that the lightning struck him in his feet and legs. At 6 p. m. the lightning struck the wire and building at the north end, where the wires come through the window, and arrester with a crash equal to any 40-pounder. It burned every one of the four wires coming in at the window into small pieces, throwing them with great force in every direction, and filled the room with smoke from the burned gutta percha insulation; the window-sash was splintered on the outside, one pane of glass broken and another coated with melted copper. The anemometer wires were also burned up, and the dial of the anemometer burned and blown to pieces. Private Sweeny was about deaf for some time afterwards. One piece of the wire was thrown with such force that when it struck the barometer, three feet distant, it was wound around it, without, however, doing any damage to the barometer.

July 2, 1880.—Line works poorly on account of storm, each flash of lightning causing the instrument to be thrown out of adjustment; the signals at midnight were gotten off with great difficulty.

July 19, 1880.—Atmospheric electricity quite prevalent during the evening.

July 21, 1880.—Hail in afternoon and night, accompanied by heavy flashes of lightning, which played around the arrester and exploded with great force.

July 23, 1880.—Hail, rain, and snow during the day; ended at 5.40 p. m. Intense ground currents during prevalence of storm.

June 23, 1881: A light fall of hail accompanied by terrific flashes of lightning, which snapped on the lightning arrester and exploded with great violence.

July 4, 1881: During the progress of the rain-storm it was accompanied by the heaviest discharges of lightning and thunder that I ever witnessed in all my experience at this station. The lightning snapped on the arrester and exploded with great violence in the office; several times during the evening I was certain that the station building would be struck and demolished, as the lightning was almost continuous.

August 21, 1881: Heavy hail began falling at 12.30 p. m.; continued at intervals until 4.15 p. m., when it ceased. The hail was accompanied by the heaviest discharges of lightning that I ever witnessed in all my experience at this station. It was impossible to remain in the office during the progress of the hail-storm, as the lightning was almost continuous and snapped and exploded in all directions, so that I was compelled to retreat to the kitchen for safety. The southwest portion of the station building was struck by lightning, but no damage of any consequence was done, nor was the station building impaired by the shock. The lightning-arrester and ground wires were badly damaged, but the worst feature of the storm was the fact that both the station and extra barometers were also struck and the cisterns of both cracked. During this storm a sheep herder was killed by lightning, and when found was stripped of his clothing and boots; he had taken refuge under a tree.

APPENDIX No. 73.

ON THE RETARDATION OF THE MAXIMA AND MINIMA OF AIR-PRESSURE AT HIGH STATIONS; BY H. A. HAZEN, A. M.

In his tenth paper, published in the American Journal of Science for January, 1879, Professor Loomis advanced certain evidence to show that, apparently, the progress of a storm center was much more rapid at the surface of the earth than at elevations above it. Many arguments have been advanced by others for and against this theory. It is the purpose of this article to put forth certain facts which have come to light, and which it is hoped will tend to elucidate the subject.

Many years ago it was noticed from hourly observations at Zurich and at the summit of the Rigi that while the morning maximum in the diurnal range of air-pressure occurred at the lower station at 10, it did not occur at the summit of the mountain until 2 p. m. Professor Loomis writes (American Journal of Science, January, 1879, pp. 11 and 12): "Over the United States both the maxima and minima" [of accidental fluctuations] "of atmospheric pressure generally occur first near the surface of the earth, and they occur later as we rise above the surface, the retardation amounting to one hour for an elevation of from 900 to 1,300 feet." He says again (pp. 13 and 14): "The diurnal movements of the barometer exhibit a peculiarity similar to that found for the accidental fluctuations. The principal maximum occurs at the base at half-past 8, but on the summit it does not occur until noon, being a retardation of three and a half hours, which is almost identically the same as we have found by a comparison of the accidental fluctuations." He says further (p. 19): "The low center at the height of Mount Washington sometimes lags behind the low center at the surface of the earth apparently as much as 200 miles."

The Rev. Clement Ley, of England, in a paper published in the Quarterly Journal of the Meteorological Society for July, 1879, adopts this statement advanced by Professor Loomis in support of his hypothesis that the storm center lags behind at elevations as shown by his own observations of cirrus clouds. Mr. Strachan in discussing this point as brought out by Mr. Ley has shown that, taking the average velocity of a storm center as 20 miles per hour, and a retardation of one hour per each thousand feet of ascent, the axis of the storm center must be inclined 89°.5 to the vertical, or, in other words, lie almost parallel with the earth's surface.

Professor Ferrel, in his paper, "Meteorological Researches for the use of the Coast Pilot, Part II," has advanced the theory that a storm center lags behind at the earth's surface, and, speaking of the apparent contradiction of the researches of Professor Loomis, says: "These results of Professor Loomis show too much for this hypothesis" [that the axis of a "low" is retarded at elevations], "for they show that there is a similar retardation of just about the same amount in the times of the maxima and minima of the diurnal changes of barometric pressure at the summits of mountains, and we cannot reasonably explain this by means of cyclones with reclining axes. When we shall have a satisfactory explanation of this retardation in this latter case we shall probably have one in the other."

In discussing the probable cause for this retardation, the influence of high winds and of variations in temperature will be considered, and the theory that it can be caused by the lagging of the axis of a "low" abandoned as untenable, for this, if for no other reason, that, unless a secondary force acts, it is exceedingly difficult to conceive how any fall of pressure at the summit of a mountain would not make itself felt at the same time at the base through the superincumbent atmosphere.

If a strong current of air can produce a depression of the mercurial column of a barometer, as has been shown by using a blower for the air current and an air tight receiver for the barometer (a condition of things, however, which, it should be borne in mind, can never occur in nature), then why may not the high wind which nearly always accompanies a storm cause a fall in air-pressure, which shall continue as long as the wind is strong at the summit and some time after the storm center has passed the base?

It is exceedingly desirable that special experiments be made under natural conditions, directly testing the influence or non-influence of high winds on the indications of the barometer. In the absence of such experiments we may indirectly ascertain such influence by comparing observations made at the same moment of time at the summit and base of mountains. The materials for such comparison exist in manuscript copies of

hourly observations at the base and summit of Mount Washington during May, 1872, and in the hourly observations of May and June, 1873, made at the same stations. The latter have been published in the annual report of the Chief Signal Officer for 1873. These stations lie three miles apart in a horizontal direction, and hence we may compute with a near approach to accuracy, from the observations for pressure and temperature, the difference of level between them, by the use of Guyot's hypsometric formula.

In order to show that varying temperature does not appreciably affect the relative results of such computation, the following comparisons are given.

At a recent meeting of the Washington Philosophical Society, Prof. G. K. Gilbert, of the United States Geological Survey, gave a method for determining differences of elevation where air-pressures are observed at three or more neighboring stations having different heights, which may be outlined as follows: Let P, P′ and P″ represent the observed air-pressure at stations A, B, and C, then will the formula

$$H = C\,(\log P - \log P')\,f(t)\,f(O)f(m) \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

express the difference in height between A and B, and

$$H' = C\,(\log P - P'')f(t)f(O)f(m) \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

the same for A and C; dividing (1) by (2) we have

$$\frac{H}{H'} = \frac{\log P - \log P'}{\log P - \log P''} + D:$$

if now we have either H or H′ given, we may compute the other without referring to temperature, latitude, or moisture.

During the month of June, 1873, hourly observations were made at the base and summit of Mount Washington and at two intermediate stations. Considering forty-three cases taken at random, I find twenty-three of them in which the mean height of the summit above the base is too small, by Gilbert's and Guyot's formulæ, 46 and 55 feet respectively; while the remaining twenty cases give a value too great by 51 and 48 feet. We may, therefore, in comparing relative heights, neglect the effect of varying temperature as introduced by computations with Guyot's formula.

If the wind affects the pressure directly, we would expect that the computed difference of level would be the same as the true difference when there was no wind, and would gradually increase as the wind increased, unless there were some causes beside pressure, temperature, and wind affecting the computation. I have grouped these computed differences in elevation according to the force of the wind, as may be seen in Table I.

In the following table for May, 1872, all winds under 10 and above 40 miles per hour are included, and in May, 1873, all the cases except a few which were omitted because of serious errors in the observations. The table shows this remarkable peculiarity, that, though with winds above 61 miles per hour, the mean computed difference in height is too great by 66 feet, with winds under 10 the mean difference is too small by 35 feet. We conclude, then, that some other cause must produce the results or must act in conjunction with the wind. Taking winds above 61 miles per hour, I have found ten cases in which the height was too small by about 15 feet; also, a great number of cases in which, though the wind continued strong from the same direction, yet the computed height continually became less, showing that the wind does not produce a direct effect upon the indications of the barometer.

TABLE I.—*Mean amount to be added to the true difference in height between the summit and base of Mount Washington to give the computed difference.*

[Wind force in miles per hour.]

Date.	0 to 10.		11 to 20.		21 to 30.		31 to 40.		41 to 50.		51 to 60.		Above 61.	
	Cases.	Amount.	Cases.	Amount.	Cases.	Amount.	Cases.	Amount.	Cases.	Amount.	Cases.	Amount.	Cases.	Amount.
		Feet.		*Feet.*		*Feet.*		*Feet.*		*Feet.*		*Feet.*		*Feet.*
May, 1872..	77	−27.1	25	−18.6	30	−3.1	43	+13.8	65	+10.5	32	+33.9	50	+51.4
May, 1873..	104	−43.5	134	−22.0	183	+4.1	135	+15.0	99	+34.9	61	+52.4	27	+80.1

On projecting the curves of pressure in connection with the computed elevations, we find that there is a striking uniformity in the occurrence of small and large differences of elevation with the maxima and minima of pressure, the least coinciding with high pressure and the greatest with low. Grouping a second time, then, with respect to the maxima and minima of pressure, we have Table II.

TABLE II.—*Mean amounts to be added to the true difference in height between the summit and base of Mount Washington to obtain the computed difference.*

Date.	Locality.	Maxima of pressure.		Minima of pressure.	
		Cases.	Amount.	Cases.	Amount.
			Feet.		*Feet.*
May, 1872	Mount Washington and base..	81	—32.5	70	+57.4
May, 1873	Mount Washington and base..	102	—61.6	137	+67.3
January, February, March, October, November, December, 1880.	Mount Washington and mean of B. and P.	119	—29.1	120	+127.0

In the above table, as the first two horizontal rows of figures apply only to observations for the month of May, I have added a third set of figures for the summit of Mount Washington compared with the mean of Burlington and Portland as the base, and computed for observations taken at 7 a. m., 3 p m., and 11 p. m., Washington time, during January, February, March, October, November, and December, 1880. Burlington and Portland, near sea-level, lie on opposite sides of Mount Washington and at distances altogether too great to give the best results; if, however, we take the mean of the two we shall obtain an approximate value for the base of the mountain.

It is evident from Table II that during the prevalence of relatively high pressure elevations, computed barometrically, will in general be too small, and, on the other hand, when the pressure is low the computed heights will be too great. This fact also explains the coincidence of too great computed heights with high winds, for the reason that the highest winds always occur with relatively low pressure; on the contrary, when the wind is light the pressure is generally high. We may conclude, then, that the same cause which produces the maxima and minima of pressure controls also the different values of computed elevations, and that high winds are rather an accompaniment than a direct cause of the same variations.

May not the apparent lagging of the axes of "highs" and "lows" be due to the effect of varying temperature. The general tendency of high temperature being to expand the air and force it from the lower levels, above the summits of mountains, and of low temperature to produce an opposite effect, we should expect at elevated stations high pressure with high temperature and low pressure with low temperature. This principle is well illustrated by the Signal Service observations of pressures on Mount Washington and Pike's Peak. In January the mean pressures are 23″.393 and 17″.512 at the two points respectively, while in July they are 23″.894 and 18″.078. The same results would follow the accidental fluctations, whenever there might be a steady, gradual rise or fall in temperature for a sufficient period of time. When a "low" has passed a station at sea-level, the temperature frequently falls steadily with a west wind and the result is a contraction of the air, which causes its withdrawal from the upper atmosphere and a further fall in pressure there. This process will continue until the fall caused by the low temperature is counterbalanced by the rise due to the advancing high. The reverse of this may take place at the passing of a "high." In order to ascertain the influence of varying temperature as suggested above, I have projected the pressure curves for a singular case at Pike's Peak, in which the minimum occurred forty hours earlier at Denver than at Pike's Peak; also for a case in which the minimum for Burlington and Portland occurred twenty-four hours earlier than on Mount Washington.

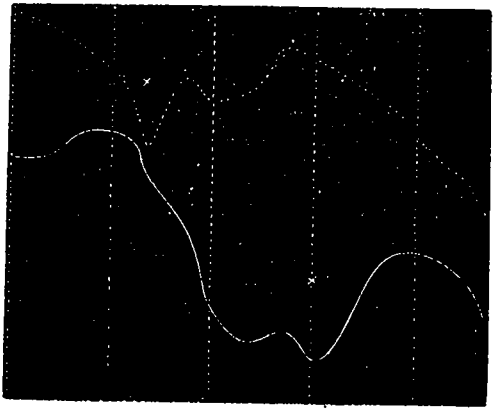
Referring to the curves and the temperatures at Pike's Peak, we see that on November 14, at the 7 a. m. observation, the mean temperature of the air column was comparatively low and the pressure at a maximum at Denver; the temperature gradually increased to 3 p. m. of the 15th, and though there was a steady fall in pressure at Denver, yet it rose on Pike's Peak until 7 a. m. of the 15th; from this point the pressure rose

steadily at Denver under the influence of an extraordinary cold wave; this same cold wave reduced the pressure on Pike's Peak, which did not reach its minimum till 7 a. m. of the 17th, or forty hours later than at Denver. On a comparison of the curves at Mount Washington, we see another illustration of the same nature.

If now we apply the same reasoning to the maxima and minima of the diurnal range of pressure at the base and summit of mountains, we shall find that it affords a satisfactory explanation of the retardation at the summits. For the purpose of comparison I have taken the hourly observations at Mount Washington and base in May, 1872 and 1873, and in June, 1873; also, a manuscript copy of hourly observations made by the observers of the United States Signal Service at Pike's Peak and Colorado Springs during August and September, 1874. The means for each hour have been embodied in Table III. The difference in level between the base and summit of Mount Washington is 3,590 feet, and between Pike's Peak and Colorado Springs it is 8,100 feet.

Retardation of the minimum of pressure at Pike's Peak, November 15 *and* 16, 1880.

14_1	14_2	14_3	15_1	15_2	15_3	16_1	16_2	16_3	17_1	17_2	17_3	18_1	18_2	18_3	Date.
6°	20	19	22	31	16	6	1	−6	−20	−10	−12	−6	7	6	Mean Temperature.



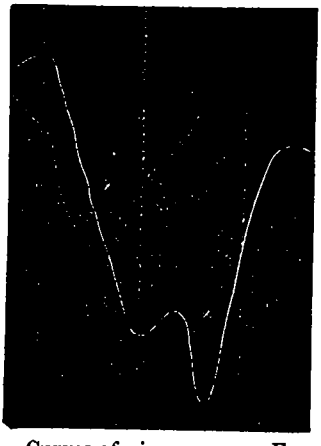
Colorado Springs.

Pike's Peak.

Curves of air-pressure.—FIG. 47.

***Mount** Washington and mean of Burlington and Portland, November*, 1880.

17_3	18_1	18_2	18_3	19_1	19_2	19_3	20_1	20_2	20_3	Date.
36°	37	44	36	10	3	−2	−4	6	13	Mean Temperature.



Base.

Summit.

Curves of air-pressure.—FIG. 48.

TABLE III.—*Diurnal range of air pressure, and the mean temperature of the air column at Mount Washington and Pike's Peak.*

Hour of day.	May, 1872. Air pressure. Mount Wash.	May, 1872. Air pressure. Base.	May, 1872. Mean temp. Air column.	May and June, 1873. Air pressure. Mount Wash.	May and June, 1873. Air pressure. Base.	May and June, 1873. Mean temp. Air column.	August and September, 1874. Air pressure. Pike's Peak.	August and September, 1874. Air pressure. Colo. Springs.	August and September, 1874. Mean temp. Air column.
	"	"	°	"	"	°	"	"	°
1 a. m				23.759	27.163	37.4			
2 a. m				.755	.158	38.8			
3 a. m				.751	.158	38.4			
4 a. m				.747	.160	38.0			
5 a. m				.750	.165	38.1			
6 a. m	*23.675	†27.098	36.2	.756	.174	38.7	17.982	24.199	41.5
7 a. m	.670	.100	37.8	.762	.180	40.5	17.988	.202	45.4
8 a. m	.671	.101	38.7	.768	.181	42.0	17.995	.204	48.4
9 a. m	.673	.097	39.6	.775	.181	44.1	18.002	.204	51.8
10 a. m	.683	.099	40.6	.780	.180	45.5	18.009	.198	53.8
11 a. m	.689	.096	41.9	.786	.176	46.7	18.009	.189	56.2
Noon	.690	.093	42.6	.787	.169	48.1	18.007	.174	57.8
1 p. m	.691	.085	43.3	.785	.163	49.0	18.005	.162	58.4
2 p. m	.688	.081	43.6	.782	.157	49.2	18.002	.150	58.1
3 p. m	.688	.076	44.0	.777	.152	48.8	17.998	.144	57.4
4 p. m	.686	.078	43.8	.775	.150	48.6	17.994	.142	55.9
5 p. m	.684	.078	44.0	.770	.152	47.6	17.992	.146	54.6
6 p. m	.690	.084	43.2	.770	.156	46.4	17.992	.152	52.4
7 p. m				.773	.164	44.4	17.997	.163	49.8
8 p. m				.774	.167	42.5	18.001	.180	47.9
9 p. m	.683	.101	38.5	.778	.172	41.7	18.003	.189	46.6
10 p. m				.776	.172	41.1			
11 p. m				.770	.172	40.3			
Midnight	.675	.096	37.3	.766	.167	40.0			

		Uncorrected barometer.	Att. ther.		Att. ther.
		"	°		
*	6 a. m	23.730	55.1	†	50.4
	7	.730	57.8		49.5
	8	.739	60.7		49.4
	9	.750	64.6		49.7
	10	.762	65.7		49.8

The figures in this table have been computed from the original observations. Unfortunately the hourly observations of 1872 and 1874 were continued only during the day hours; they, however, give satisfactory results for the principal morning maximum and afternoon minimum. A marked peculiarity will be noticed in column two in the means of the observations for 7 and 8 a. m., namely, a steady fall during these hours. This is due not to natural causes at all, but to the fact that at the midnight observation the barometer was pushed into its case and locked up. In this position the temperature indicated by the attached thermometer was lower than that of the room, consequently, by the time of the second observation the next morning, after the barometer had been suspended for an hour in the room, the temperature of the air in the room would be indicated by the attached thermometer, while the mercury and scale of the barometer would change their temperature much more slowly, and the correction for temperature being too great, the readings of the barometer were made too small, until the different parts of the instrument had attained a common temperature. The attached thermometer at the base indicates that the observations there were not made in the living room, or else that the fire in the room was very low. (See note at foot of Table III.) It will be noticed that in each case after the morning maximum of pressure was reached at the base, the mean temperature of the air column was rising, and, in consequence, the pressure did not begin to fall at the summit till some time had elapsed. For the afternoon minimum a reverse of the conditions and effects is noticeable. One interesting circumstance should not be overlooked: while at Mount Washington the lagging in the morn-

ing was three hours and a half for 3,590 feet, or one hour to 1,000 feet; at Pike's Peak it was only two hours for 8,100 feet, or one hour to 4,000 feet. This is due in part to the fact that after the morning maximum the fall in pressure was much more rapid at the lower western station than at the eastern, and this counterbalanced the rise in pressure at the summit due to the increase of temperature.

Again, we see that in the single case we have of observations through the night, there is little or no retardation in the morning minimum and night maximum. This is precisely what we might conclude from the fact that during this time the temperature changes only slightly, though little stress can be laid upon this because the oscillation is correspondingly small.

Another cause for a portion of the retardation may be considered to be the sluggishness in action of the summit barometers, or again, to be the slowness with which the air at the maxima and minima of pressure would enter and leave the room where the observations were made, undoubtedly less accessible to the atmosphere at the summit than at the base. These last two causes, however, would be of little consequence in producing the results noted.

May we not be enabled, by a sufficient number of carefully conducted observations, extending over a year, at the base and along the side of Pike's Peak or some other isolated mountain, to determine the cause of the diurnal range of air pressure, which has been characterized as the most persistent of all meteorological phenomena and never as yet satisfactorily accounted for? If the above discussion assigning varying temperature as the cause of the apparent retardation of the axis of a "low" at high stations prove satisfactory, it will also show the great difficulty which inevitably attends any attempt made in comparing pressures observed at elevations above the earth with those observed at the same time at sea-level.

As many errors have been pointed out by Professor Gilbert in the previously published hourly observations, and as the observations at Pike's Peak and Colorado Springs have never been published, it has been deemed best to publish them at the present time.

Hourly observations, Mount Washington, New Hampshire (base), 1872.

PRESSURE.

[26 inches+the figures in the table.]

Date.	6 a. m.	7 a. m.	7.57 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	4.57 p. m.	6 p. m.	9 p. m.	11.57 p. m.
May 1	1.294	1.274	1.266	1.264	1.262	1.257	1.252	1.237	1.219	1.227	1.229	1.209	1.212	1.219	1.182
May 2	1.088	1.080	1.075	1.083	1.055	1.033	1.043	1.031	1.030	0.998	1.008	1.042	1.048	1.063	1.088
May 3	1.060	1.045	1.040	1.010	1.010	0.990	1.000	0.980	0.977	0.972	0.962	0.952	0.967	1.092	0.997
May 4	0.995	0.982	0.994	0.992	1.002	1.002	1.022	1.012	1.019	1.019	1.039	1.039	1.062	1.105	1.120
May 5	1.152	1.162	1.159	1.169	1.159	1.159	1.147	1.127	1.127	1.107	1.087	1.087	1.080	1.087	1.022
May 6	1.009	1.022	1.022	1.022	1.034	1.042	1.057	1.057	1.067	1.075	1.085	1.105	1.100	1.122	1.112
May 7	1.160	1.160	1.170	1.160	1.170	1.160	1.162	1.150	1.150	1.130	1.140	1.136	1.151	1.162	1.166
May 8	1.198	1.210	1.210	1.210	1.244	1.232	1.229	1.229	1.228	1.228	1.250	1.247	1.257	1.270	1.254
May 9	1.193	1.195	1.208	1.145	1.143	1.123	1.083	1.058	1.056	1.036	1.011	1.001	1.004	0.979	0.946
May 10	1.041	1.078	1.098	1.111	1.133	1.168	1.210	1.242	1.265	[b]1.274	1.282	1.300	1.322	1.365	1.405
May 11	1.400	1.399	1.389	1.377	[a]1.379	1.377	1.364	1.344	1.329	1.297	1.309	1.287	1.272	1.235	1.208
May 12	1.090	1.080	1.080	1.080	1.080	1.083	1.073	1.061	1.058	1.056	1.041	1.031	1.039	1.074	1.053
May 13	1.033	1.040	1.048	1.048	1.058	1.068	1.068	1.068	1.060	1.060	1.065	1.088	1.088	1.152	1.170
May 14	1.249	1.279	1.286	1.284	1.281	1.279	1.276	1.274	1.282	1.282	1.289	1.307	1.314	1.344	1.344
May 15	1.359	1.351	1.361	1.361	1.351	1.336	1.339	1.319	1.299	1.289	1.306	1.304	1.294	1.302	1.279
May 16	1.237	1.222	1.182	1.182	1.142	1.129	1.119	1.119	1.109	1.129	1.129	1.129	1.127	1.145	1.149
May 17	1.147	1.149	1.159	1.149	1.149	1.137	1.122	1.122	1.129	1.129	1.115	1.125	1.122	1.144	1.144
May 18	1.140	1.132	1.140	1.140	1.125	1.122	1.098	1.080	1.070	1.046	1.041	1.028	1.023	1.018	1.020
May 19	0.968	0.958	0.935	0.935	0.923	0.896	0.891	0.876	0.856	0.836	0.811	0.771	0.751	0.718	0.702
May 20	0.697	0.711	0.711	0.711	0.731	0.731	0.721	0.721	0.718	0.708	0.708	0.716	0.723	0.768	0.781
May 21	0.850	0.850	0.873	0.893	0.925	0.935	0.963	0.963	0.960	0.983	1.010	1.050	1.078	1.123	1.148
May 22	1.195	1.205	1.225	1.215	1.209	1.225	1.215	1.190	1.185	1.183	1.171	1.160	1.160	1.148	1.056
May 23	0.963	0.955	0.943	0.943	0.935	0.923	0.930	0.920	0.896	0.901	0.911	0.913	0.911	0.956	0.976
May 24	1.031	1.048	1.053	1.061	1.076	1.068	1.046	1.033	1.028	1.026	1.024	1.011	1.024	1.028	1.026
May 25	0.998	0.976	0.974	0.971	0.969	0.979	0.969	0.961	0.951	[c]0.946	0.936	0.936	0.944	0.986	1.031
May 26	1.090	1.103	1.105	1.103	1.123	1.130	1.148	1.138	1.138	1.136	1.131	1.133	1.148	1.160	1.148
May 27	1.100	1.090	1.078	1.066	1.046	1.043	1.018	1.006	0.981	[d]0.969	0.961	0.951	0.968	0.971	0.948
May 28	0.900	0.903	0.903	0.893	0.895	0.903	0.913	0.910	0.910	0.910	0.926	0.936	0.940	0.980	0.990
May 29	1.080	1.088	1.095	1.092	1.105	1.102	1.105	1.115	1.122	1.135	1.145	1.155	1.155	1.185	1.202
May 30	1.225	1.245	1.245	1.244	1.262	1.242	1.230	1.215	1.202	1.198	1.203	1.193	1.193	1.173	1.138
May 31	1.093	1.093	1.093	1.085	1.088	1.088	1.078	1.088	1.083	1.083	1.080	1.090	1.113	1.155	1.180
	1.0979	1.0995	1.1006	1.0967	1.0988	1.0955	1.0933	1.0854	1.0808	1.0764	1.0776	1.0785	1.0835	1.1013	1.0961

[a] Recorded as 1.359. [b] Recorded as 1.294. [c] Recorded as 0.926. [d] Recorded as 0.949.

Hourly observations, Mount Washington, New Hampshire (base), 1872.

TEMPERATURE.

Date.	6 a. m.	7 a. m.	7.67 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	4.67 p. m.	6 p. m.	9 p. m.	11.57 p. m.
May 1	42	46	49	51	50	53	55	54	54	52	50	49	50	47	51
May 2	45	46	44	43	46	48	48	51	51	56	53	46	43	41	39
May 3	36	38	37	38	36	37	35	36	35	35	37	43	44	32	33
May 4	34	35	35	35	34	36	34	34	34	34	33	32	31	32	31
May 5	26	29	32	32	33	36	38	39	39	38	39	42	41	33	33
May 6	30	30	31	31	33	34	35	37	41	41	43	44	45	35	38
May 7	41	41	43	45	48	49	51	52	56	57	56	59	58	44	44
May 8	43	43	48	50	51	53	55	57	59	59	59	58	55	43	44
May 9	44	47	46	50	56	59	62	63	62	62	63	65	61	62	62
May 10	49	48	48	47	48	50	48	46	47	50	52	54	58	39	40
May 11	40	42	44	47	53	54	55	55	56	58	59	56	55	54	49
May 12	50	53	54	57	58	60	60	63	63	64	66	68	63	48	43
May 13	37	43	48	51	51	50	50	49	48	49	49	47	47	41	38
May 14	36	39	44	45	48	49	50	52	51	53	53	54	54	39	39
May 15	39	42	45	43	44	47	47	48	47	45	43	48	45	37	34
May 16	30	30	32	36	39	41	43	42	42	41	40	41	41	38	35
May 17	35	36	39	40	41	47	50	51	51	50	50	51	50	40	38
May 18	36	41	47	47	50	51	55	58	58	60	61	61	61	46	44
May 19	44	50	54	56	58	59	58	54	52	51	51	51	50	48	46
May 20	46	47	48	47	48	50	49	50	52	55	54	56	54	46	45
May 21	43	44	44	46	46	49	48	48	49	50	48	50	50	40	38
May 22	40	44	48	50	52	54	58	58	59	59	60	58	55	50	48
May 23	45	46	48	49	51	53	51	52	55	54	53	52	51	50	50
May 24	45	50	46	46	47	48	53	60	60	60	61	62	58	53	51
May 25	55	57	60	60	61	64	63	62	62	63	62	60	60	49	45
May 26	42	43	43	48	51	54	56	58	61	64	63	62	59	49	46
May 27	47	53	58	59	60	60	63	65	63	62	64	61	57	50	47
May 28	42	44	46	45	47	48	48	49	51	53	52	53	50	43	38
May 29	40	41	43	43	41	42	43	42	43	42	41	41	42	40	38
May 30	41	40	45	46	44	50	54	53	55	55	52	50	49	46	45
May 31	44	44	49	49	50	48	50	50	49	49	50	50	48	44	44
	40.9	42.9	45.1	46.2	47.6	49.5	50.5	51.2	51.8	52.3	52.2	52.4	51.1	43.8	42.5

Hourly observations, Mount Washington, New Hampshire (summit), 1872.

PRESSURE.

[23 inches + the figures in the table.]

Date.	6 a. m.	7 a. m.	7.57 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	4.57 p. m.	6 p. m.	9 p. m.	11.57 p. m.
May 1	.938	.920	.917	.909	.896	.898	.893	.872	.863	.839	.819	.800	.798	.758	.750
May 2	.725	.708	.677	.671[a]	.669	.642	.617	.624	.625	.612	.649	.660	.647	.638	.670
May 3	.630	.609	.607	.582	.587	.567	.566	.533	.525	.514	.522	.520	.532	.548	.580
May 4	.563	.551	.551	.533	.530	.523	.535	.551	.556	.574	.571	.580	.593	.589	.620
May 5	.612	.605	.612	.608	.611	.618	.601	.610	.611	.593	.570	.574	.528	.461	.428
May 6	.522	.541	.532	.547	.557	.574	.586	.600	.624	.622	.622	.624	.654	.661	.625
May 7	.692	.670	.676	.692	.705	.710	.730	.749	.774	.765	.776	.787	.798	.821	.815
May 8	.819	.817	.801	.816	.820	.827	.829	.847	.841	.870	.864	.877	.881	.902	.878
May 9	.841	.811	.783	.766	.757	.761	.747	.742	.719	.706	.681	.666	.677	.602	.565
May 10	.540	.540	.550	.569	.633	.665	.705	.740	.751	.759	.833	.853	.882	.931	.982
May 11	.966	.981	.992	.983	.979	.995	.969	.955	.949	.951	.933	.911	.900	.858	.784
May 12	.739	.722	.728	.707	.693	.675	.685	.700	.723	.723	.708	.737	.729	.740	.707
May 13	.666	.665	.671	.669	.682	.695	.700	.689	.705	.717	.684	.685	.701	.720	.720
May 14	.769	.785	.810	.827	.832	.847	.853	.864	.876	.872	.880	.882	.885	.885	.896
May 15	.892	.900	.904	.892	.892	.882	.876	.879	.865	.852	.857	.813	.824	.792	.780
May 16	.626	.604	.605	.550	.550	.588	.592	.590[b]	.587	.574	.561	.556	.616	.634	.655
May 17	.665	.664	.679	.685	.691	.696	.710	.714	.714	.734	.742	.718	.728	.733	.724
May 18	.723	.718	.718	.734	.737	.739	.729	.750	.718	.732	.704	.697	.668	.680	.664
May 19	.639	.623	.621	.618	.595	.585	.572	.541	.512	.449	.449	.419	.400	.365	.365
May 20	.318	.311	.294	.301	.315	.328	.332	.301	.296	.319[d]	.323	.329	.375	.382	.381
May 21	.445	.456	.505	.529	.557	.578	.582	.596	.591	.592	.601	.605	.652	.663	.733
May 22	.798	.800	.808	.817	.832	.851	.852	.840	.844	.841	.825	.815	.807[e]	.782	.735
May 23	.563	.545	.530	.569	.585	.588	.607	.592	.585	.586	.598	.588	.594	.565	.616
May 24	.684	.692	.702	.711	.723	.724	.717	.716	.707	.707	.708	.708	.710	.688	.672
May 25	.661	.653	.645	.627	.635	.635	.640	.627	.618	.616	.614	.599	.586	.581	.544
May 26	.551	.549	.588	.620	.680	.698	.732	.772	.786	.798	.809	.804	.798	.831	.819
May 27	.791	.767	.745	.757	.732	.726	.676	.686	.652	.644	.626	.626	.620	.607	.535
May 28	.578	.534	.529	.525	.535	.556	.549	.555	.542	.571	.571	.571	.589	.571	.569
May 29	.605	.603	.610	.621	.656	.658	.658	.673	.663[c]	.661	.674	.677	.679	.661	.662
May 30	.689	.711	.723	.739	.806	.845	.843	.831	.833	.833	.823	.816	.808	.779	.742
May 31	.680	.698	.684	.682	.702	.695	.692	.688	.682	.694	.684	.700	.722	.734	.719
	.6752	.6693	.6709	.6728	.6830	.6890	.6898	.6909	.6883	.6877	.6865	.6838	.6897	.6833	.6753

[a] Recorded as .701. [b] Recorded as .565. [c] Recorded as .633. [d] Recorded as .349. [e] Recorded as .837.

Hourly observations, Mount Washington, New Hampshire (summit), 1872.

TEMPERATURE.

Date.	6 a. m.	7 a. m.	7.57 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	4.57 p. m.	6 p. m.	9 p. m.	11.57 p. m.
May 1	37	37	39	42	42	40	41	42	42	40	38	39	39	39	36
May 2	40	39	38	37	36	36	36	38	37	38	38	37	34	32	33
May 3	30	30	31	31	30	30	30	29	29	28	28	28	28	24	23
May 4	24	22	23	23	23	23	22	22	23	23	23	23	23	22	21
May 5	17	17	17	17	18	20	21	22	22	22	22	22	21	18	16
May 6	20	20	22	23	23	23	25	25	25	26	26	26	27	25	26
May 7	32	33	33	34	35	35	36	36	37	37	37	38	38	37	37
May 8	38	38	38	39	37	39	40	40	40	40	40	40	40	38	36
May 9	39	39	39	41	42	42	44	45	45	46	46	47	46	46	45
May 10	37	35	34	32	32	31	31	31	31	31	32	33	34	33	33
May 11	38	41	41	41	41	41	40	41	42	43	43	44	45	42	46
May 12	43	43	43	43	43	41	41	43	42	44	45	45	44	41	39
May 13	36	36	37	39	38	38	37	35	34	33	32	32	31	28	26
May 14	25	25	26	27	28	30	31	32	33	34	34	34	34	29	28
May 15	27	27	27	28	28	29	30	30	31	31	29	29	28	26	24
May 16	16	15	15	17	18	20	21	23	24	24	22	23	23	22	22
May 17	22	23	24	25	25	27	29	30	31	32	32	32	32	29	28
May 18	28	29	30	32	33	36	36	39	38	40	41	41	41	40	37
May 19	35	37	38	39	42	44	43	41	40	39	39	39	38	38	37
May 20	36	35	35	35	36	35	35	35	34	34	34	36	35	35	34
May 21	33	33	33	34	35	35	36	35	35	35	34	33	32	31	29
May 22	28	29	30	32	33	34	37	38	39	39	39	39	38	35	34
May 23	32	32	34	35	37	39	38	42	39	44	44	44	44	42	39
May 24	36	38	40	44	45	45	47	48	46	45	45	45	44	40	42
May 25	44	44	44	44	44	43	43	43	43	43	43	42	41	35	31
May 26	28	28	29	30	31	32	33	35	36	37	39	40	40	38	38
May 27	36	38	39	40	42	43	43	43	44	42	39	38	37	36	35
May 28	30	31	31	31	32	33	33	33	34	35	35	35	35	32	29
May 29	26	26	27	28	29	30	29	31	31	31	31	31	30	28	28
May 30	31	31	31	31	32	35	36	36	36	36	36	35	35	34	34
May 31	32	32	32	33	33	34	34	33	33	34	34	34	34	33	31
	31.5	31.7	32.3	33.1	33.6	34.3	34.8	35.4	35.4	35.7	35.5	35.6	35.2	33.2	32.1

Hourly observations, Mount Washington, New Hampshire (base), 1873.

PRESSURE.

[26 inches + the figures in the table.]

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	7.57 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	4.57 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11.22 p. m.	Midnight.
May 1	1.287	1.280	1.280	1.282	1.289	1.304	1.329	1.327	1.326	1.306	1.289	1.271	1.265	1.251	1.226	1.220	1.207	1.215	1.227	1.230	1.223	1.230	1.215	1.213
May 2	1.185	1.188	1.180	1.175	1.175	1.176	1.176	1.161	1.166	1.154	1.129	1.123	1.101	1.096	1.071	1.070	1.051	1.043	1.018	1.003	0.988	0.961	0.932	0.913
May 3	.881	.855	.855	.845	.845	.850	.851	.840	.850	.839	.842	.820	.835	.838	.855	.863	.848	.860	.872	.892	.915	.918	.916	.923
May 4	.920	.924	.950	.953	.968	.995	1.001	1.010	1.027	1.037	1.040	1.039	1.045	1.041	1.036	1.052	1.067	1.079	1.107	1.103	1.102	1.098	1.090	1.089
May 5	1.073	1.056	1.058	1.066	1.068	1.066	1.083	1.084	1.098	1.114	1.122	1.143	1.157	1.166	1.179	1.192	1.200	1.228	1.250	1.280	1.297	1.322	1.354	1.357
May 6	1.354	1.355	1.374	1.390	1.397	1.419	1.440	1.449	1.455	1.461	1.454	1.448	1.438	1.431	1.432	1.426	1.430	1.435	1.435	1.463	1.470	1.477	1.491	1.495
May 7	1.485	1.487	1.485	1.495	1.506	1.525	1.532	1.530	1.535	1.537	1.536	1.532	1.518	1.504	1.495	1.496	1.491	1.498	1.510	1.510	1.515	1.525	1.525	1.523
May 8	1.512	1.525	1.525	1.526	1.542	1.540	1.547	1.540	1.542	1.533	1.523	1.505	1.491	1.486	1.471	1.455	1.454	1.455	1.463	1.473	1.477	1.470	1.467	1.456
May 9	1.442	1.427	1.422	1.412	1.402	1.402	1.407	1.405	1.413	1.413	1.414	1.411	1.404	1.401	1.395	1.382	1.375	1.351	1.350[a]	1.353	1.340	1.341	1.320	1.314
May 10	1.290	1.275	1.238	1.235	1.251	1.239	1.245	1.225	1.219	1.223	1.227	1.223	1.199	1.209	1.209	1.213	1.195	1.219	1.228	1.237	1.241	1.225	1.227	1.229
May 11	1.217	1.220	1.207	1.174	1.176	1.175	1.168[b]	1.157	1.126	1.124	1.117	1.095	1.080	1.052	1.017	1.016	1.021	1.014	1.008	0.984	0.961	0.954	0.927	0.924
May 12	.902	.874	.871	.859	.857	.866	.874	.881	.875	.879	.884	.874	.869	.863	.856	.861	.869	.882	.897	.911	.913	.918	.923	.915
May 13	.916	.891	.873	.874	.863	.851	.811	.792	.750	.741	.716	.680	.664	.654	.655	.685	.720	.746	.753	.776	.786	.794	.794	.795
May 14	.796	.800	.813	.810	.816	.818	.816	.808	.799	.801	.792	.786	.786	.779	.781	.780	.793	.787	.784	.785	.788	.779	.768	.767
May 15	.762	.762	.767	.790	.802	.820	.823[c]	.851	.865	.872	.901	.909	.905	.924	.928	.934	.956	.970	.997	.998	.998	.988	.996	.999
May 16	.993	.986	.983	.981	.976	.984	.989	.994	.996	.994	.993	.996	.996	.998	.999	.996	1.008	1.022	1.029	1.034	1.032	1.031	1.023	1.023
May 17	1.016	1.003	0.999	0.996	0.994	1.000	1.006	1.011	1.021	1.018	1.018	1.031	1.023	1.016	1.016	1.027	1.040	1.047	1.060	1.063	1.071[d]	1.076	1.081	1.076
May 18	1.063	1.053	1.046	1.040	1.038	1.050	1.053	1.076	1.081	1.074	1.066	1.095	1.090	1.094	1.086	1.099	1.106	1.127	1.143	1.150	1.156	1.155	1.152	1.137
May 19	1.115	1.113	1.103	1.090	1.078	1.086	1.096	1.104	1.108	1.115	1.126	1.139	1.147	1.153	1.168	1.180	1.209	1.230	1.257	1.278	1.295	1.310	1.317	1.323
May 20	1.322	1.322	1.332	1.342	1.355	1.379	1.396	1.404	1.405	1.406	1.410	1.410	1.406	1.403	1.388	1.381	1.399	1.405	1.418	1.420	1.438	1.445	1.456	1.456
May 21	1.453	1.453	1.455	1.460	1.462	1.464	1.470	1.480	1.475	1.466	1.453	1.443	1.440	1.412	1.415	1.405	1.402	1.400	1.405	1.395	1.403	1.399	1.385	1.375
May 22	1.365	1.355	1.354	1.340	1.336	1.337	1.335	1.335	1.338	1.330	1.326	1.316	1.306	1.291	1.297	1.294	1.300	1.292	1.295	1.292	1.302	1.291	1.277	1.260
May 23	1.240	1.240	1.240	1.225	1.220	1.222	1.227	1.222	1.220	1.217	1.213	1.203	1.190	1.178	1.164	1.137	1.131	1.105	1.091	1.091	1.081	1.057	1.030	0.997
May 24	.987	.974	.964	.944	.946	.929	.924	.909	.899	.887	.877	.847	.822	.842[e]	.838	.832	.866	.891	.913	.917	.915	.916	.934	.934
May 25	.939	.939	.964	.981	.999	1.024	1.052	1.074	1.079	1.105	1.116	1.119	1.124	1.130	1.129	1.155	1.172	1.192	1.214	1.236	1.249	1.255	1.267	1.270
May 26	1.270	1.270	1.290	1.295	1.300	1.320	1.337	1.346	1.336	1.338	1.314	1.308	1.284	1.295	1.288	1.288	1.273	1.276	1.268	1.253	1.265	1.272	1.270	1.272
May 27	1.274	1.255	1.255	1.243	1.239	1.235	1.228	1.210	1.206	1.189	1.182	1.161	1.146	1.141	1.133	1.113	1.101	1.097	1.098	1.092	1.090	1.090	1.085	1.074
May 28	1.067	1.042	1.040	1.037	1.039	1.039	1.031	1.034	1.041	1.052	1.021	1.021	1.021	1.012	1.000	0.988	0.990	0.996	1.023	1.020	1.037	1.039	1.057	1.066
May 29	1.069	1.082	1.084	1.092	1.114	1.136	1.141	1.166	1.186	1.187	1.183	1.173	1.171	1.168	1.170	1.163	1.171	1.149	1.140	1.129	1.133	1.114	1.123	1.114
May 30	1.129	1.131	1.131	1.134	1.139	1.173	1.206	1.222	1.219	1.216	1.225	1.224	1.230	1.232	1.242	1.250	1.273	1.301	1.317	1.332	1.356	1.376	1.384	1.384
May 31	1.396	1.413	1.415	1.417	1.451	1.461	1.490	1.496	1.500	1.493	1.495	1.491	1.472	1.468	1.464	1.460	1.456	1.458	1.468	1.472	1.464	1.464	1.467	1.460
	1.1523	1.1468	1.1469	1.1453	1.1498	1.1576	1.1640	1.1660	1.1663	1.1652	1.1621	1.1560	1.1492	1.1461	1.1420	1.1424	1.1475	1.1539	1.1625	1.1668	1.1710	1.1706	1.1695	1.1656

[a] Recorded as 1,330.

[b] Recorded as 1,188.

[c] Recorded as 0.808.

[d] Recorded as 1.091.

[e] Recordedas 0.862.

Hourly observations, Mount Washington, New Hampshire (base), 1873.

TEMPERATURE.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	7.57 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	4.57 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11.22 p. m.	Midnight.
May 1	36	33	32	31	30	30	34	40	44	46	48	48	51	53	53	52	50	50	44	38	37	37	36	36
May 2	35	35	35	35	35	37	39	44	44	49	48	46	46	46	40	38	35	33	33	33	33	33	33	33
May 3	33	32	32	32	32	32	32	32	34	36	37	37	36	36	35	33	33	33	32	34	32	31	33	33
May 4	31	29	26	24	23	24	28	34	36	39	41	43	44	47	48	48	46	44	36	34	34	36	37	36
May 5	38	39	38	37	37	37	34	34	34	36	39	40	42	44	44	45	41	41	37	35	32	29	27	27
May 6	27	26	25	24	23	24	30	34	35	38	40	42	44	45	45	45	44	42	39	33	32	31	31	31
May 7	31	29	29	28	28	28	34	39	42	44	46	48	50	52	54	54	52	50	41	38	35	35	33	34
May 8	35	35	36	33	33	32	39	45	49	50	53	55	56	57	58	56	53	50	40	38	37	35	33	32
May 9	33	35	39	40	41	40	44	45	46	46	49	50	51	50	49	47	47	47	43	45	45	44.	45	45
May 10	44	41	42	42	41	42	44	46	48	50	53	54	58	52	49	52	51	48	42	41	40	39	40	37
May 11	37	38	37	39	38	40	41	43	48	53	48	56	57	59	51	46	42	44	42	42	42	42	41	40
May 12	40	39	39	39	40	39	41	42	43	42	43	47	48	48	50	49	50	46	43	38	39	36	35	35
May 13	36	34	35	34	34	37	45	46	51	52	48	51	52	47	48	43	39	38	35	33	32	32	32	32
May 14	32	31	30	30	30	30	31	32	34	34	34	35	34	34	33	33	32	31	30	27	28	28	28	28
May 15	28	28	26	26	26	26	28	29	32	34	34	37	39	41	40	39	37	36	36	35	35	34	32	32
May 16	33	34	34	34	34	35	38	40	42	44	44	44	46	48	46	46	44	43	41	39	37	37	37	36
May 17	36	36	36	36	36	36	37	40	41	42	44	42	45	44	44	42	43	43	42	41	37	35	35	35
May 18	36	36	36	36	34	34	34	36	37	39	39	40	44	44	45	42	44	41	39	34	33	32	31	32
May 19	32	33	34	34	34	37	39	41	44	46	46	48	47	49	49	47	47	44	39	38	35	33	33	32
May 20	31	31	31	30	30	31	38	42	44	47	49	52	58	58	56	57	55	54	49	44	40	38	37	36
May 21	35	36	34	34	35	35	42	48	50	52	56	55	57	59	56	55	53	52	48	48	43	42	40	40
May 22	41	42	42	43	44	41	44	44	46	49	50	52	53	53	50	49	47	46	45	44	46	45	45	45
May 23	46	45	45	46	45	46	49	50	52	57	60	63	63	64	64	63	62	58	58	54	54	53	54	54
May 24	53	51	50	49	50	48	51	58	64	66	67	69	67	56	53	63	63	58	55	53	53	53	51	51
May 25	51	50	50	49	48	46	48	49	54	57	57	61	65	67	67	66	65	63	52	47	45	44	43	44
May 26	43	43	43	43	44	44	50	49	63	67	68	72	71	71	71	70	69	59	56	52	53	51	50	50
May 27	50	50	51	51	50	52	56	56	62	70	70	74	74	65	69	71	72	70	63	54	53	52	52	52
May 28	53	53	53	52	52	54	54	65	70	70	70	68	68	68	70	70	68	60	64	57	60	59	58	58
May 29	57	55	54	54	51	54	54	56	58	61	63	62	64	68	68	68	65	66	57	52	51	51	51	54
May 30	50	48	46	43	40	37	37	38	39	41	43	46	50	50	50	49	48	42	42	41	40	39	36	32
May 31	30	30	30	29	29	30	35	37	40	44	46	50	54	54	56	55	55	54	50	44	42	42	42	41
	38.5	38.0	37.7	37.3	37.0	37.4	40.3	43.0	46.0	48.4	49.5	51.2	52.7	52.5	52.0	51.4	50.1	47.9	44.3	41.5	40.5	39.6	39.1	38.8

Hourly observations, Mount Washington, New Hampshire (summit), 1873.

PRESSURE.

[23 inches + the figures in the table.]

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	7.57 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	4.57 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11.22 p. m.	Midnight.
May 1	.799	.788	.792	.791	.790	.808	.835	.840	.824	.816	.788	.788	.782	.775[a]	.742	.750	.758	.760	.767	.744	.758	.748	.750	.762
May 2	.764	.758	.746	.746	.748	.755	.751	.754	.755	.758	.725	.707	.695	.689	.656	.633	.612	.605	.590	.574	.572	.543	.508	.512
May 3	.488	.465	.452	.435	.435	.442	.444	.431	.429	.419	.415	.395	.398	.390	.400	.400	.401	.391	.410	.398	.395	.424	.445	.449
May 4	.447	.452	.481	.484	.477	.488	.490	.499	.515	.534	.535	.543	.559	.590	.594	.607	.593	.577	.597	.597	.598	.576	.543	.536
May 5	.534	.527	.518	.516	.510	.524	.552	.547	.560	.568	.568	.594	.597	.640	.665	.662	.687	.683	.701	.720	.752	.773	.776	.767
May 6	.763	.763	.776	.777	.807	.814	.824	.836	.856	.880	.885	.893	.899[b]	.901	.891	.866	.870	.892	.900	.892	.901	.912	.915	.905
May 7	0.945	0.958	0.961	0.966	0.984	1.005	1.033	1.025	1.047	1.056	1.061	1.082	1.078	1.078	1.080	1.080	1.074	1.070	1.070	1.072	1.085	1.087	1.099	1.097
May 8	1.074	1.082	1.082	1.082	1.096	1.098	1.110	1.112	1.105	1.106	1.114	1.102	1.089	1.080	1.072	1.047	1.059	1.044	1.047	1.047	1.049	1.033	1.012	0.997
May 9	.970	.966	.961	.950	.942	.940	.951	.945	.935	.950	.952	.958	.967	.967	.934	.933	.899	.897	.908	.902	.883	.871	.868	.867
May 10	.844	.826	.823	.811[c]	.807	.792	.788	.782	.779	.790	.812	.822	.818	.827	.845	.847	.846	.841	.835	.851	.875	.887	.867	.869
May 11	.863	.853	.839	.805	.810	.816	.814	.797	.782	.760	.747	.725	.703	.682	.640	.648	.659	.661	.649	.636	.621	.598	.580	.570
May 12	.547	.526	.495	.489	.466	.447	.449	.455	.475	.468	.447	.447	.439[d]	.423	.423	.413	.427	.428	.455	.458	.445	.453	.463	.454
May 13	.448	.458	.449	.432	.433	.443	.420	.418	.396	.378	.361	.332	.294	.285	.244	.232	.180	.147	.159	.156	.202	.244[e]	.264	.272
May 14	.270	.291	.293	.279	.246	.251	.234	.241	.233[f]	.227	.275	.264	.245	.227	.239	.249	.257	.224	.197	.208	.195	.163	.138	.113
May 15	.071	.110	.118	.123	.152	.172	.195	.269[g]	.331	.336	.376	.389	.399	.429	.456	.465	.493	.505	.517	.549	.547	.543	.563	.563
May 16	.568	.553	.543	.525	.519	.504	.507	.543	.542	.557[h]	.569	.557	.569	.575	.555	.573	.575	.576	.576	.570	.586	.575	.561	.549
May 17	.542	.536	.523	.530	.528	.514	.496	.499	.503	.523	.556	.577	.560	.548	.562	.565	.573	.569	.576	.578	.605	.610	.610	.612
May 18	.588	.592	.564	.563	.574	.555	.561	.570[i]	.588	.588	.610	.623	.632	.626	.614	.627	.614	.621	.648	.637	.653	.656	.651	.633
May 19	.624	.599	.586	.594	.586[k]	.592	.595	.605	.617	.644	.658	.676	.695	.696	.729	.751	.763	.774	.810	.817	.827	.833	.825	.830
May 20	.836	.847	.851	.858	.879	.893	.913	.928	.952	.964	.972	.993	.998	.998	1.001	0.998	1.004	1.005	1.004	1.010	1.018	1.013	1.013	1.017
May 21	1.018	1.023	1.018	1.023	1.033	1.032	1.036	1.039	1.055	1.053	1.049	1.044	1.025	1.018	1.005	0.999	0.991	0.980	0.990	0.979	0.975	0.975	0.961	0.954
May 22	.946	.942	.938	.929[l]	.901	.901	.887	.882	.908	.901	.903	.902	.893	.894	.887	.882	.883	.863	.879	.887	.903	.904	.889	.894
May 23	.880	.875	.873	.874	.874	.868	.865	.852	.855	.865	.866	.863	.860	.846	.836	.829	.822	.799	.795	.782	.781	.762	.706	.662
May 24	.657	.594	.588	.582	.576	.576	.594	.611	.618	.609	.589	.543	.533	.521	.453	.435	.422	.454	.476[m]	.510	.515	.489	.464	.489
May 25	.512	.528	.565	.604[n]	.625	.643	.661	.709	.724[o]	.742	.770	.787	.802	.823	.840	.856	.860	.873	.893	.899	.911	.930	.918	.942
May 26	.947	.951	.951	.958	.969	.987	.999	1.020	1.029	1.027	1.006	1.015	0.997	1.010	0.992	0.988	0.976	0.970	0.965	0.947	0.955	0.944	0.922	0.947
May 27	0.935	.937	.929	.921	.926	.921	.919	.916	.912	.907	.896	.892	.891	.867	.860	.837	.832	.820	.830	.816	.796	.791	.781	.769
May 28	.715	.703	.700	.688	.713	.715	.727	.719	.719	.716	.718	.725	.700	.699	.691	.690	.702	.698	.652	.656	.631	.644	.644	.641
May 29	.645	.684	.701	.712	.715	.723	.748	.766	.768	.776	.781	.818	.835	.833	.830	.833	.839	.825	.838	.819	.788	.788	.735	.721
May 30	.707	.675	.667	.615	.607	.626	.623	.653	.648[p]	.651	.680	.716	.732	.728	.745	.764	.765	.788	.812	.806	.805	.814	.830	.800
May 31	.821	.804	.803	.803	.832	.869	.890	.925	.927[q]	.936	.976	.966	.978	.997	1.000	1.001[r]	0.999	1.001	1.014	1.018	1.011	1.015	1.006	1.015
	0.7022	0.6989	0.6963	0.6924	0.6955	0.7005	0.7068	0.7157	0.7221	0.7260	0.7310	0.7335	0.7310	0.7310	0.7252	0.7245	0.7237	0.7207	0.7277	0.7269	0.7303	0.7290	0.7196	0.7164

[a] Recorded as .795.
[b] Recorded as .879.
[c] Recorded as .791.
[d] Recorded as .459.
[e] Recorded as .194.
[f] Recorded as .213.
[g] Recorded as .219.
[h] Recorded as .537.
[i] Recorded as .550.
[k] Recorded as .556.
[l] Recorded as .829.
[m] Recorded as .446.
[n] Recorded as .554.
[o] Recorded as .704.
[p] Recorded as .628.
[q] Recorded as .887.
[r] Recorded as 1.021.

Hourly observations, Mount Washington, New Hampshire (summit), 1873.

TEMPERATURE.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	7 57 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	4.57 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11.22 p. m.	Midnight.
May 1	24	24	23	22	22	22	23	24	24	25	25	25	25	24	24	24	24	24	23	23	24	24	24	24
May 2	25	24	24	24	24	25	27	28	30	32	32	32	31	31	30	29	29	29	28	27	27	27	25	25
May 3	25	25	25	24	24	24	25	24	25	24	24	25	25	25	25	24	22	21	20	20	20	20	19	19
May 4	20	20	20	21	21	20	20	20	22	23	24	24	24	23	23	23	23	23	22	22	22	22	22	22
May 5	22	22	22	22	22	22	22	22	22	23	23	23	23	23	23	23	23	22	22	22	21	21	20	20
May 6	20	19	19	19	19	19	20	21	21	22	22	22	22	22	21	21	21	21	21	20	20	20	20	20
May 7	20	20	19	19	19	19	21	22	23	24	28	29	32	30	30	30	29	28	28	27	27	27	26	26
May 8	25	25	25	25	26	27	27	30	32	34	36	36	35	36	35	35	34	34	32	33	32	31	30	30
May 9	28	27	26	25	25	24	24	26	27	27	28	29	29	29	28	27	27	29	29	29	28	28	27	27
May 10	30	29	28	28	29	31	32	33	33	34	35	37	38	38	37	36	35	35	32	32	32	34	33	33
May 11	33	33	33	32	34	34	34	34	35	35	36	37	37	38	35	36	37	35	35	34	34	34	35	35
May 12	33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	31	32	32	32	31	29	29	29
May 13	28	27	28	28	29	29	30	29	31	32	32	33	34	32	32	32	31	31	29	29	28	27	27	26
May 14	26	26	25	25	25	24	25	23	22	23	24	23	23	23	22	23	22	22	22	21	22	22	19	19
May 15	19	19	20	20	21	21	20	22	22	22	24	24	25	25	25	25	25	25	25	24	24	24	24	23
May 16	24	24	24	24	25	26	26	26	27	27	28	28	29	29	29	28	28	28	28	28	27	27	27	27
May 17	27	27	27	26	25	24	23	23	25	26	25	26	26	26	27	26	27	27	26	26	26	26	26	26
May 18	25	25	25	26	26	25	25	22	24	24	24	24	26	26	25	25	25	24	23	23	23	23	24	24
May 19	24	24	24	23	24	24	24	24	26	26	25	25	25	25	26	26	26	26	26	26	26	26	26	26
May 20	26	25	25	25	25	26	26	26	27	28	30	31	32	33	34	34	33	33	32	31	31	30	30	30
May 21	30	28	28	29	29	29	29	30	31	32	32	33	32	33	32	32	32	31	30	31	31	31	31	32
May 22	32	32	33	33	33	34	34	34	33	33	32	33	33	33	33	33	33	33	33	32	33	32	32	36
May 23	37	37	37	37	37	37	36	38	36	38	39	39	40	40	42	41	42	42	43	43	42	41	41	41
May 24	40	39	39	38	37	36	36	35	36	36	36	37	37	41	41	39	38	37	37	37	37	37	37	37
May 25	37	37	36	36	35	35	35	35	36	36	37	40	40	40	41	42	41	40	39	38	37	36	37	37
May 26	37	36	36	36	37	40	41	43	43	44	46	47	46	46	46	47	45	44	46	45	44	42	44	44
May 27	44	45	45	45	45	45	45	45	45	47	46	48	50	49	49	49	49	49	48	47	47	47	47	47
May 28	47	47	48	48	47	48	49	48	48	47	48	47	47	47	47	47	47	47	46	45	44	42	41	41
May 29	41	40	40	40	40	40	40	40	39	39	39	40	41	41	41	42	42	42	42	42	42	42	41	40
May 30	40	40	40	36	34	32	28	26	26	26	27	27	27	27	28	28	27	26	24	24	24	24	24	24
May 31	24	18	18	18	18	18	19	21	24	26	28	30	31	32	33	33	33	32	31	31	31	32	31	31
	29.5	28.9	28.8	28.6	28.7	28.8	29.0	29.2	29.9	30.5	31.2	31.8	32.2	32.2	32.1	32.0	31.6	31.4	30.8	30.5	30.2	29.9	29.6	29.7

Hourly observations, Mount Washington, New Hampshire (base), 1873.

PRESSURE.

[26 inches + the figures in the table.]

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	7.57 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	4.57 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11.22 p. m.	Midnight.
June 1	1.446	1.442	1.412	1.408	1.410	1.408	1.402	1.384	1.359	1.357	1.333	1.296	1.285	1.265	1.234	1.220	1.210	1.218	1.233	1.228	1.233	1.233	1.243	1.245
June 2	1.267	1.276	1.285	1.286	1.339	1.363	1.364	1.365	1.369	1.364	1.351	1.349	1.348	1.331	1.328	1.323	1.325	1.353	1.368	1.371	1.388	1.392	1.392	1.387
June 3	1.384	1.389	1.399	1.394	1.414	1.414	1.427	1.427	1.427	1.414	1.395	1.382	1.362	1.345	1.325	1.317	1.313	1.298	1.297	1.295	1.283	1.265	1.270	1.253
June 4	1.247	1.219	1.209	1.193	1.189	1.139	1.106	1.091	1.058	1.022	0.989	0.968	0.930	0.907	0.869	0.841	0.818	0.810	0.792	0.788	0.788	0.770	0.760	0.737
June 5	0.741[a]	.756	.777	.791	.791	.808	.835	.821	.841	.862	.859	.855	.841	.837	.835	.847	.853	.858	.882	.886	.902	.915	.912	.914
June 6	.921	.931	.948	.947	.974	.973	.973	.973	.978	.982	.969	.977	.974	.977	.964	.987	.982	.982	.992	1.012	1.017	1.029	1.017	1.022
June 7	1.031	1.027	1.030	1.031	1.036	1.056	1.070	1.076	1.084	1.085	1.082	1.098	1.095	1.103	1.108	1.104	1.117	1.128	1.157	1.170	1.186	1.193	1.211	1.213
June 8	1.222	1.235	1.246	1.258	1.277	1.307	1.321	1.341	1.355	1.366	1.372	1.373	1.374	1.373	1.371	1.375	1.386	1.388	1.386	1.381	1.388	1.388	1.371	1.370
June 9	1.372	1.373	1.371	1.384	1.393	1.392	1.387	1.368	1.362	1.356	1.339	1.324	1.295	1.271	1.238	1.233	1.206	1.201	1.216	1.200	1.200	1.193	1.175	1.165
June 10	1.179	1.182	1.185	1.185	1.186	1.190	1.180	1.181	1.161	1.155	1.150	1.146	1.135	1.121	1.116	1.107	1.098	1.103	1.108	1.102	1.093	1.085	1.075	1.060
June 11	1.061	1.055	1.048	1.046	1.020	1.007	1.012	1.009	1.017	1.022	1.028	1.044	1.067	1.076	1.104	1.093	1.092	1.123	1.137	1.142	1.155	1.178	1.188	1.193
June 12	1.202	1.205	1.209	1.218	1.238	1.258	1.262	1.263	1.280	1.282	1.282	1.296	1.304	1.302	1.303	1.316	1.349	1.352	1.357	1.380	1.371	1.383	1.407	1.392
June 13	1.404	1.412	1.427	1.430	1.427	1.426	1.415	1.418	1.412	1.420	1.407	1.399	1.383	1.367	1.347	1.338	1.328	1.334	1.338	1.333	1.324	1.338	1.320	1.307
June 14	1.315	1.309	1.297	1.287	.....	1.286	1.292	1.291	1.273	1.276	1.274	1.249	1.240	1.213	1.212	1.197	1.181	1.163	1.173	1.166	1.174	1.165	1.154	1.144
June 15	1.158	1.141	1.119	1.121	1.124	1.124	1.125	1.119	1.115	1.104	1.089	1.079	1.066	1.068	1.068	1.068	1.067	1.050	1.067	1.051	1.052	1.055	1.057	1.054
June 16	1.042	1.032	1.045	1.045	1.057	1.069	1.080	1.076	1.074	1.058	1.063	1.053	1.044	1.042	1.013	0.996	0.995	0.999	1.005	0.988	0.981	0.992[b]	1.016	1.002
June 17	.962	.952	.957	.957	.979	.990	1.014	1.036	1.065	1.070	1.068	1.084	1.085	1.082	1.075	1.071	1.071	1.079	1.093	1.103	1.107	1.102	1.094	1.089
June 18	1.101	1.092	1.110	1.098	1.118	1.136	1.134	1.138	1.137	1.131	1.120	1.106	1.081	1.069	1.060	1.037	1.017	1.001	1.003	0.998	0.990	0.977	0.959	0.952
June 19	.944	.919	.914	.924	.931	.934	.957	.970	.967	.962	.976	.971	.970	.975	.997	.965	.957	.942	.936	.923	.925	.907	.886	.871
June 20	.819[c]	.798	.798	.840	.838	.844	.816	.829	.823	.829	.840	.834	.829	.826	.835	.843	.863	.880	.902	.916	.941	.939	.964	.972
June 21	.979	.964	.951	.936	1.001	1.011	1.015	1.013	1.003	1.004	1.009	0.990	1.014	0.994	1.014	1.026	1.041	1.055	1.070	1.083	1.099	1.103	1.123	1.124
June 22	1.126	1.120	1.131	1.151	1.168	1.186	1.202	1.220	1.226	1.234	1.238	1.238	1.246	1.252	1.260	1.278	1.287	1.301	1.314	1.322	1.336	1.344	1.358	1.352
June 23	1.348	1.352	1.362	1.367	1.380	1.390	1.408	1.408	1.420	1.425	1.412	1.402	1.393	1.397	1.388	1.386	1.383	1.386	1.392	1.384	1.384	1.396	1.403	1.403
June 24	1.365	1.353	1.353	1.361	1.375	1.377	1.398	1.393	1.385	1.390	1.389	1.390	1.399	1.392	1.389	1.385	1.389	1.400	1.413	1.432	1.458	1.460	1.487	1.488
June 25	1.460	1.478	1.498	1.505	1.513	1.537	1.558	1.568	1.574	1.582	1.578	1.571	1.564	1.558	1.543	1.551	1.552	1.561	1.563	1.573	1.570	1.569	1.562	1.560
June 26	1.543	1.543	1.553	1.558	1.565	1.567	1.578	1.575	1.574	1.576	1.560	1.527	1.506	1.482	1.466	1.451	1.448	1.433	1.421	1.417	1.410	1.392	1.393	1.394
June 27	1.375	1.363	1.353	1.353	1.355	1.353	1.330	1.315	1.302	1.280	1.266	1.245	1.231	1.193	1.171	1.151	1.132	1.124	1.112	1.103	1.101	1.091	1.080	1.076
June 28	1.037	1.012	1.000	0.983	0.997	1.008	1.009	1.006	1.007	1.017	1.012	1.008	1.005	1.006	1.006	1.006	1.007	1.011	1.018	1.040	1.056	1.057	1.049	1.052
June 29	1.063	1.065	1.046	1.049	1.066	1.069	1.081	1.085	1.099	1.103	1.106	1.086	1.072	1.069	1.064	1.074	1.060	1.056	1.068	1.071	1.100	1.104	1.114	1.110
June 30	1.117	1.105	1.105	1.103	1.106	1.116	1.135	1.139	1.140	1.139	1.144	1.146	1.167	1.152	1.136	1.143	1.138	1.139	1.144	1.157	1.182	1.188	1.180	1.177
	1.1744	1.1700	1.1713	1.1753	1.1816	1.1913	1.1962	1.1966	1.1962	1.1956	1.1900	1.1829	1.1768	1.1682	1.1613	1.1576	1.1555	1.1576	1.1652	1.1672	1.1729	1.1734	1.1740	1.1693

[a] Recorded as 0.781.

[b] Recorded as 0.962.

[c] Recorded as 0.919.

Hourly observations, Mount Washington, New Hampshire, (base), 1873.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	7.57 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	4.57 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11.22 p. m.	Midnight.
June 1	40	39	39	38	39	42	47	51	54	57	59	62	63	65	66	66	64	62	60	58	56	56	55	53
June 2	47	45	40	38	37	38	42	44	46	49	51	54	57	57	58	58	56	52	50	46	42	40	40	41
June 3	39	38	36	37	36	40	43	46	48	52	55	56	58	59	59	59	57	54	53	46	46	44	44	44
June 4	40	44	44	44	43	46	46	47	47	48	52	52	58	60	66	65	61	58	55	55	58	59	57	58
June 5	55	53	51	51	51	50	50	53	54	57	60	60	64	65	64	57	58	56	54	50	50	49	47	46
June 6	45	46	44	45	46	48	52	54	58	59	62	63	63	65	64	62	61	58	57	53	50	50	47	46
June 7	44	45	44	45	46	48	51	51	53	54	56	56	54	54	52	53	49	52	49	48	48	48	48	48
June 8	48	48	48	48	48	48	48	48	53	55	58	61	62	62	62	62	60	59	56	50	48	46	46	45
June 9	44	43	42	42	42	43	50	50	58	60	62	66	68	69	71	70	70	66	60	55	52	50	47	46
June 10	46	48	48	48	46	46	50	58	63	66	68	70	73	74	74	73	72	70	66	57	60	62	62	62
June 11	62	59	58	57	57	58	60	60	60	63	64	64	64	65	62	65	63	61	59	57	56	54	52	52
June 12	50	50	48	46	45	44	47	47	50	52	53	56	57	54	49	59	52	50	49	46	43	42	41	40
June 13	40	39	39	39	39	40	48	52	56	58	60	62	65	65	64	63	61	59	57	54	53	49	46	45
June 14	48	44	43	42	.....	46	49	48	57	58	60	61	64	62	62	61	58	57	51	44	45	44	44	43
June 15	42	45	44	46	46	50	53	57	58	60	63	67	69	70	66	65	64	66	63	56	55	55	53	54
June 16	57	57	57	58	58	58	60	65	66	67	70	72	75	74	74	73	69	66	64	57	57	56	52	52
June 17	52	52	52	51	51	52	52	50	51	52	53	54	56	57	58	58	56	54	51	49	47	46	45	43
June 18	41	38	37	36	36	39	44	47	51	53	56	59	61	62	63	63	64	61	60	57	55	54	54	56
June 19	59	55	54	54	53	56	58	62	64	67	71	74	73	71	64	65	68	70	66	69	70	69	66	67
June 20	69	68	66	56	55	54	58	60	63	64	66	68	70	69	67	68	64	62	58	56	55	53	49	48
June 21	45	45	43	44	43	43	47	50	52	54	54	57	47	49	50	51	50	49	48	47	45	44	40	39
June 22	40	38	36	36	36	39	43	46	49	51	52	53	56	56	57	56	56	52	50	48	44	42	40	40
June 23	40	40	40	40	40	42	48	52	55	58	62	63	67	67	68	66	64	60	58	55	52	50	48	48
June 24	48	46	46	46	47	48	53	58	63	64	65	68	68	70	71	70	64	60	63	56	54	52	50	50
June 25	51	50	50	49	50	51	56	62	67	69	71	74	77	76	76	76	73	72	63	61	58	57	55	55
June 26	55	55	54	54	54	55	59	64	67	69	70	74	75	78	76	76	73	72	66	62	58	57	56	56
June 27	55	54	52	52	51	51	58	63	66	69	71	73	74	76	76	75	74	73	67	65	62	62	61	61
June 28	65	63	62	62	62	64	62	63	63	65	69	71	70	73	74	74	72	68	66	61	59	56	54	53
June 29	53	53	52	53	52	54	58	65	66	72	72	76	78	78	78	77	78	74	70	68	68	70	69	64
June 30	64	62	61	60	61	65	69	69	70	71	69	69	70	71	71	70	70	68	68	68	67	66	65	65
	49.5	48.7	47.7	47.2	47.2	48.6	52.0	54.7	57.6	59.7	61.7	63.8	65.2	65.7	65.4	65.2	63.4	61.4	58.6	55.1	53.8	52.7	51.1	50.7

Hourly observations, Mount Washington, New Hampshire (Station No. 3), 1873.

PRESSURE.

[25 inches + the figures in the table.]

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	7.57 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	4.57 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11.22p. m.	Midnight.
June 1	1.230	1.222	1.205	1.195	1.195	1.195	1.182	1.168	1.160	1.159	1.141	1.119	1.104	1.094	1.082	1.044	1.034	1.036	1.047	1.055	1.045	1.046	1.055	1.054
June 2	1.055	1.060	1.065	1.085	1.101	1.105	1.121	1.129	1.130	1.146	1.143	1.137	1.136	1.126	1.119	1.118	1.116	1.131	1.142	1.156	1.169	1.166	1.160	1.155
June 3	1.158	1.154	1.152	1.176	1.184	1.189	1.185	1.199	1.200	1.192	1.181	1.173	1.162	1.149	1.133	1.108	1.113	1.111	1.089	1.085	1.082	1.066	1.057	1.047
June 4	1.043	1.011	0.978	0.977	0.955	0.930	0.918	0.890	0.867	0.841	0.815	0.794	0.766	0.741	0.713	0.689	0.667	0.665	0.653	0.634	0.629	0.619	0.611	0.613
June 5	.606	.594	.593	.600	.620	.632	.655	.649	.669	.679	.682	.683	.678	.673	.673	.673	.678	.704	.706	.711	.729	.754	.745	.736
June 6	.732	.740	.736	.735	.756	.766	.778	.790	.791	.801	.796	.802	.802	.806	.804	.807	.810	.817	.817	.835	.839	.856	.843	.848
June 7	.826	.830	.833	.844	.858	.864	.868	.877	.884	.880	.883	.886	.891	.904	.901	.901	.923	.943	.958	.969	.979	.981	.998	.993
June 8	.991	.997	.999	1.028	1.057	1.071	1.101	1.123	1.132	1.157	1.168	1.171	1.171	1.174	1.190	1.182	1.187	1.195	1.191	1.195	1.197	1.195	1.184	1.185
June 9	1.171	1.171	1.169	1.171	1.176	1.181	1.173	1.171	1.171	1.165	1.164	1.137	1.125	1.099	1.085	1.065	1.050	1.052	1.046	1.042	1.032	1.032	1.014	1.004
June 10	1.000	.996	.980	.990	.984	.996	1.008	.996	.996	.987	.987	.979	.972	.960	.960	.952	.950	.949	.955	.951	.945	.925	.915	.893
June 11	.896	.875	.856	.848	.821	.826	.840	.839	.851	.855	.862	.869	.897	.903	.920	.924	.932	.950	.969	.964	.972	.981	.991	.993
June 12	.988	.991	1.000	1.009	1.017	1.026	1.037	1.049	1.064	1.067	1.072	1.076	1.080	1.079	1.092	1.114	1.128	1.142	1.148	1.166	1.147	1.161	1.176	1.184
June 13	1.189	1.197	1.205	1.192	1.188	1.193	1.196	1.203	1.210	1.214	1.210	1.200	1.190	1.178	1.168	1.154	1.151	1.146	1.151	1.156	1.148	1.144	1.127	1.126
June 14	1.107	1.105	1.098	1.098	1.086	1.080	1.086	1.084	1.072	1.074	1.074	1.065	1.041	1.024	1.014	1.015	0.992	0.992	0.994	1.003	1.002	0.987	0.967	0.966
June 15	.948	.931	.916	.928	.924	.931	.929	.928	.925	.917	.910	.906	.896	.896	.897	.896	.903	.891	.893	.887	.901	.902	.891	.895
June 16	.894	.887	.890	.891	.895	.903	.912	.917	.909	.898	.901	.905	.898	.897	.873	.847	.822	.815	.813	.808	.799	.774	.789*	.799
June 17	.771	.757	.756	.767	.774	.785	.812	.829	.843	.853	.850	.861	.864	.854	.862	.863	.862	.866	.875	.862	.879	.870	.874	.872
June 18	.876	.877	.874	.882	.891	.901	.915	.912	.913	.913	.891	.891	.885	.864	.860	.840	.822	.814	.818	.814	.814	.803	.784	.771
June 19	.774	.764	.759	.752	.757	.767	.775	.780	.782	.784	.800	.805	.804	.807	.814	.782	.785	.775	.778	.775	.765	.756	.736	.702
June 20	.667	.640	.635	.665	.656	.642	.647	.655	.647	.647	.668	.656	.660	.653	.660	.667	.678	.693	.705	.728	.758	.751	.754	.758
June 21	.758	.760	.759	.761	.770	.790	.805	.791	.781	.786	.790	.771	.778	.782	.781	.794	.812	.826	.839	.854	.876	.882	.886	.890
June 22	.901	.906	.910	.927	.936	.960	.980	.989	1.009	1.001	1.005	1.013	1.018	1.021	1.033	1.055	1.050	1.071	1.083	1.091	1.109	1.117	1.121	1.129
June 23	1.131	1.129	1.139	1.139	1.148	1.171	1.175	1.182	1.189	1.206	1.197	1.188	1.188	1.186	1.183	1.178	1.163	1.171	1.168	1.166	1.179	1.188	1.183	1.183
June 24	1.171	1.156	1.152	1.158	1.163	1.174	1.183	1.183	1.181	1.187	1.190	1.198	1.198	1.195	1.198	1.190	1.194	1.200	1.209	1.226	1.243	1.255	1.281	1.281
June 25	1.286	1.286	1.291	1.298	1.320	1.333	1.350	1.360	1.367	1.380	1.377	1.375	1.379	1.361	1.356	1.366	1.359	1.363	1.359	1.370	1.372	1.360	1.357	1.352
June 26	1.358	1.359	1.368	1.374	1.389	1.379	1.377	1.373	1.362	1.370	1.352	1.332	1.307	1.292	1.272	1.269	1.259	1.252	1.231	1.230	1.222	1.217	1.201	1.208
June 27	1.192	1.185	1.167	1.160	1.162	1.155	1.133	1.127	1.109	1.094	1.083	1.062	1.049	1.020	1.005	0.980	0.965	0.957	0.941	0.935	0.938	0.927	0.915	0.905
June 28	.876	.874	.849	.849	.846	.841	.821	.829	.829	.837	.836	.834	.834	.839	.836	.835	.835	.831	.839	.858	.870	.875	.872	.873
June 29	.868	.877	.866	.866	.872	.888	.899	.901	.918	.926	.929	.922	.906	.901	.904	.916	.904	.900	.903	.909	.922	.924	.931	.934
June 30	.934	.940	.936	.928	.944	.948	.949	.963	.961	.956	.966	.953	.969	.969	.953	.959	.955	.947	.955	.977	.971	.988	.979	.981
	0.9799	0.9757	0.9712	0.9764	0.9815	0.9874	0.9937	0.9962	0.9974	0.9991	0.9974	0.9921	0.9883	0.9816	0.9780	0.9728	0.9706	0.9735	0.9758	0.9804	0.9844	0.9834	0.9799	0.9777

* Recorded as 0.819.

Hourly observations, Mount Washington, New Hampshire (Station No. 3), 1873.

TEMPERATURE.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	7.57 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	4.57 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11.22 p. m.	Midnight.
June 1	38	37	38	38	39	39	41	45	47	50	52	54	53	54	57	58	56	54	54	51	49	50	48	45
June 2	43	40	38	36	34	32	33	36	37	41	44	46	47	48	49	48	47	44	42	39	39	39	39	39
June 3	39	38	36	36	36	38	39	40	42	44	45	47	49	51	52	51	53	48	46	43	43	42	44	44
June 4	44	45	44	43	43	44	44	45	44	46	48	50	52	55	59	58	57	56	55	55	54	54	53	52
June 5	50	48	46	46	44	43	44	46	48	48	50	52	56	56	56	51	49	49	49	46	47	46	45	45
June 6	45	45	45	45	44	46	47	50	52	53	54	54	54	58	55	54	55	54	51	49	48	47	45	45
June 7	44	42	44	43	43	44	44	44	44	44	46	45	45	44	44	44	43	43	42	42	42	41	41	41
June 8	42	43	42	42	42	42	42	42	45	47	50	52	54	55	57	56	56	54	54	48	47	46	46	45
June 9	45	45	46	44	43	44	47	49	53	54	56	59	62	64	64	64	64	62	60	54	51	50	48	48
June 10	48	48	49	47	47	48	53	56	58	61	63	65	65	68	65	71	70	69	65	58	58	57	57	57
June 11	58	57	55	56	56	56	55	56	55	56	56	56	56	55	54	55	54	53	52	50	49	48	46	45
June 12	44	43	42	41	39	38	39	40	42	45	46	49	48	47	54	48	44	42	46	43	42	41	41	42
June 13	43	42	42	42	42	43	45	47	50	54	56	57	59	62	62	62	61	58	56	49	48	46	45	44
June 14	44	44	43	43	43	44	46	49	52	54	56	57	60	62	62	61	59	54	50	46	46	47	46	46
June 15	46	48	48	48	48	49	50	52	53	57	57	62	64	64	60	59	58	58	57	55	54	54	54	54
June 16	55	56	56	56	56	56	56	58	60	62	65	66	69	67	67	68	64	62	60	57	56	55	48	46
June 17	46	46	46	46	46	47	46	44	42	44	46	47	49	51	51	51	54	51	46	43	42	42	41	40
June 18	39	38	37	37	38	38	40	42	45	48	53	53	56	59	60	60	58	58	56	54	54	54	56	56
June 19	54	54	52	50	52	54	55	56	57	58	63	66	64	64	59	64	67	66	66	64	64	63	63	64
June 20	63	63	59	50	50	51	52	54	56	57	58	60	61	60	60	61	56	56	53	50	49	46	44	42
June 21	40	40	39	38	37	37	38	42	43	44	44	47	39	41	41	41	42	41	44	40	40	40	39	39
June 22	38	37	36	35	36	37	39	40	41	43	44	45	46	48	51	46	46	45	44	43	42	42	42	41
June 23	42	42	42	42	41	42	44	47	50	55	55	56	57	62	60	60	60	55	54	53	51	49	49	48
June 24	49	48	47	47	47	47	50	57	57	58	58	60	61	62	62	63	63	63	63	56	54	54	54	53
June 25	53	53	52	52	53	53	55	59	61	65	65	65	69	69	72	68	71	68	68	61	60	59	58	58
June 26	57	56	50	54	55	55	57	59	61	63	65	67	71	72	73	73	72	70	68	62	61	60	59	58
June 27	55	55	52	52	52	53	55	58	62	65	66	67	70	72	73	73	72	70	67	62	62	61	61	60
June 28	61	61	61	60	59	59	58	58	58	59	59	62	62	62	67	63	63	62	60	58	57	56	54	53
June 29	54	54	54	54	54	54	56	59	61	63	66	69	71	73	74	71	71	68	64	63	62	63	64	64
June 30	63	62	62	61	60	61	61	62	63	64	62	62	63	64	66	64	64	63	63	63	61	61	60	60
	48.1	47.7	46.8	46.1	46.0	46.5	47.7	49.7	51.3	53.4	54.9	56.6	57.7	59.0	59.5	58.9	58.3	56.5	55.2	51.9	51.1	50.4	49.7	49.1

Hourly observations, Mount Washington, New Hampshire (Station No. 2), 1873.

PRESSURE.

[24 inches + the figures in the table.]

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	7.57 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	4.57 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11.22 p. m.	Midnight.
June 1	.733	.719	.698	.684	.681	.672	.658	.637	.640	.626	.616	.601	.599	.587	.552	.551	.528	.516	.548	.550	.556	.564	.569	.571
June 2	.569	.574	.569	.578	.586	.589	.581	.624	.625	.635	.629	.620	.617	.621	.622	.621	.624	.644	.661	.656	.662	.671	.656	.657
June 3	.650	.650	.649	.657	.663	.667	.677	.704	.694	.690	.688	.674	.666	[illegible]	.643	.644	.626	.669	.669	.596	.586	.595	.595	.568
June 4	.548	.538	.518	.495	.464	.441	.416	.460	.369	.368	.369	.315	.290	.267	.250	.216	.216	.187	.181	.159	.155	.151	.163	.172
June 5	.158	.141	.148	.137	.153	.165	.166	.185	.211	.226	.223	.223	.233	.233	[illegible]	.221[a]	.228	.258	.257	.274	.294[b]	.267	.281	.269
June 6	.266	.263	.275	.283	.288	.297	.312	.322	.330	.336	.340	.342	.343	[illegible]	.356	.369	.374[c]	.370	.379	.389	.396	.393	.387	.381
June 7	.366	.373	.371	.367	.380	.385	.388	.403	.410	.412	.422	.416	.430	[illegible]	.453	.429	.447	.444	.450	.474	.486	.503	.517	.502
June 8	.497	.502	.496	.511	.546	.555	.585	.626	.647	.662	.669	.679	.701	[illegible]	.700	.702	.700	.711	.707	.715	.709	.717	.704	.698
June 9	.696	.688	.682	.683	.689	.695	.699	.680	.688	.674	.670	.683	.675	[illegible]	.633	.616	.603	.601	.597	.572	.579	.575	.562	.542
June 10	.538	.528	.527	.533	.538	.538	.543	.545	.539	.545	.539	.542	.531	[illegible]	.529	.516	.506	.516	.515	.518	.493	.483	.447	.433
June 11	.429	.427	.402	.378	.352	.351	.367	.363	.371	.381	.380	.407	.415	.431	.434	.443	.457	.480	.488	.480	.484	.492	.506	.509
June 12	.516	.517	.508	.534	.531	.542	.540	.549	.551	.553	.564	.574	.577	.575	.595	.606	.624	.631	.659	.654	.659	.668	.684	.685
June 13	.702	.719	.719	.726	.709	.706	.712	.714	.714	.731	.726	.721	.715	[illegible]	.696	.676	.679	.674	.670	.660	.666	.656	.648	.638
June 14	.625	.628	.620	.602	.597	.601	.609	.605	.601	.595	.596	.589	.579	.563	.563	.557	.546	.532	.531	.536	.526	.513	.501	.493
June 15	.489	.492	.477	.476	.492	.487	.478	.476	.480	.473	.460[d]	.453	.451	.452	.447	.448	.438	.437	.437	.442	.451	.443	.442	.440
June 16	.438	.445	.436	.444	.438	.434	.466	.465[e]	.461	.461	.469	.471	.448	.450	.430	.404	.386	.381	.369	.367	.376	.366	.373	.348
June 17	.299	.298	.302	.316	.342	.334	.350	.353	.378	.378	.391	.398	.399	.396	.399	.401	.391	.396	.401	.402	.411	.402	.404	.407
June 18	.407[f]	.406	.406	.405	.427	.438	.452[g]	.465	.445	.444	.435	.435	.421	.410	.412	.404	.388	.371	.370	.373	.375	.339	.323	.319
June 19	.322	.306	.309	.289	.306	.301	.318	.327	.339	.357	.367	.370	.357	.396	.399	.365	.362	.369	.355	.351	.333	.365	.285	.254
June 20	.209	.174	.203[h]	.206	.213	.197	.185	.184	.174	.187	.193	.198	.191	.204	.201	.201	.227	.243	.260	.278	.290	.292	.299	.293
June 21	.283	.284	.268	.275	.293	.301	.299	.300	.297	.307	.293	.290	.288	.290	.314	.346	.338	.355	.373	.381	.396	.402	.412	.407
June 22	.422	.424	.427	.425	.454	.478	.486	.501	.516	.524	.530	.530	.551	.558	.576	.590	.587	.600	.612	.620	.627	.641	.654	.656
June 23	.652	.656	.659	.655	.665	.691	.698	.697	.741	.747	.737	.748	.739	.743	.738	.747	.732	.733	.735	.727	.730	.739	.733	.733
June 24	.723	.702	.699	.689	.701[i]	.706	.706	.729	.734	.739	.745	.749	.757	.761	.762	.758	.760	.769	.775	.785	.801	.811	.831	.836
June 25	.828	.821	.835	.840	.849	.873	.880	.905	.942	.944	.946	.936	.942	.941	.930	.932	.927	.945	.930	.944	.937	.927	.922	.919
June 26	.912	.909	.915	.933	.920	.923	.923	.922	.922	.933	.924	.895	.881	.874	.866[k]	.847	.828	.815	.794	.782	.773	.772	.753	.753
June 27	.751	.739	.721	.711	.710	.714	.695	.690	.685	.676	.667	.641	.633	.615	.585	.565	.548	.526	.516	.514	.504	.502	.478	.479
June 28	.456	.436	.427	.413	.411	.403	.405	.407	.410	.425	.431	.441	.457	.438	.426	.431	.426	.415	.433	.446	.453	.456	.458	.458
June 29	.456	.463	.454	.452	.458	.468	.481	.482	.506	.509	.513	.521	.509	.517	.513	.513	.508	.501	.506	.511	.518	.515	.522	.530
June 30	.531	.520	.513	.512	.527	.522	.541	.522	.537	.535	.538	.535	.542	.545	.542	.540	.525	.519	.529	.536	.542	.551	.541	.545
Mean	0.5157	0.5115	0.5078	0.5070	0.5124	0.5158	0.5203	0.5261	0.5319	0.5362	0.5340	0.5332	0.5316	0.5300	0.5260	0.5221	0.5176	0.5176	0.5216	0.5231	0.5258	0.5247	0.5216	0.5165

[a] Recorded as 0.294.
[b] Recorded as 0.361.
[c] Recorded as 0.452.
[d] Recorded as 0.440.
[e] Recorded as 0.485.
[f] Recorded as 0.387.
[g] Recorded as 0.432.
[h] Recorded as 0.223.
[i] Recorded as 0.751.
[k] Recorded as 0.926.

Hourly observations, Mount Washington, New Hampshire (Station No. 2), 1873.

TEMPERATURE.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	7.57 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	4.57 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11.22 p. m.	Midnight.
June 1	36	35	36	36	36	37	37	38	41	43	45	47	47	48	50	50	48	47	46	44	43	42	42	39
June 2	37	34	32	30	30	31	32	32	32	35	39	40	42	43	45	44	42	40	36	34	34	33	32	33
June 3	32	32	32	33	33	34	35	34	38	38	40	43	45	45	47	47	46	44	42	39	39	42	41	41
June 4	40	41	40	38	39	40	40	40	38	42	44	46	46	48	50	51	50	50	50	50	50	50	49	48
June 5	47	45	43	42	41	39	40	42	43	43	45	46	49	50	48	46	44	44	43	42	41	41	40	40
June 6	41	41	42	41	42	42	44	45	45	46	47	39	47	50	48	49	50	48	44	44	43	42	40	40
June 7	40	40	39	39	38	38	38	38	39	39	38	49	48	38	49	48	38	38	48	38	37	36	37	37
June 8	38	38	37	36	36	35	35	36	38	40	42	44	46	47	47	48	50	48	47	42	42	42	40	40
June 9	40	40	40	39	39	42	43	44	46	46	49	52	54	54	54	58	56	56	52	48	46	45	44	44
June 10	44	44	45	44	45	46	48	50	53	54	55	58	61	60	58	63	62	61	57	52	50	50	50	50
June 11	51	50	48	49	50	50	50	51	50	51	51	51	50	49	48	47	47	47	46	44	43	42	40	39
June 12	38	37	37	36	34	34	34	36	38	38	40	42	41	40	41	38	37	36	36	35	36	36	36	37
June 13	37	36	36	36	38	40	40	42	47	48	50	52	53	51	54	52	50	49	47	43	42	41	40	39
June 14	38	37	36	38	38	41	41	44	46	48	50	54	53	53	52	50	48	45	47	44	42	44	45	45
June 15	44	46	43	43	43	44	44	48	48	50	52	56	56	58	54	52	50	51	50	49	49	49	49	49
June 16	50	50	50	50	50	50	50	52	54	57	58	60	62	58	58	58	56	55	52	50	49	48	43	42
June 17	42	42	42	41	42	42	42	39	38	38	41	41	42	44	46	46	46	43	40	37	35	34	33	32
June 18	37	32	31	32	32	34	35	38	39	42	46	48	50	52	52	54	52	50	48	48	48	48	48	48
June 19	47	46	46	44	46	47	47	48	49	50	54	56	55	55	54	56	58	58	57	57	57	57	56	57
June 20	56	56	55	54	46	48	47	47	48	50	50	52	54	53	53	54	49	50	45	43	42	39	36	34
June 21	33	33	32	32	31	32	32	34	36	37	36	37	34	35	35	35	34	34	34	34	33	33	33	32
June 22	32	32	31	31	32	33	34	35	36	36	37	39	39	42	42	39	39	38	38	37	36	36	35	35
June 23	34	34	35	34	34	42	44	45	48	51	50	52	52	55	56	52	54	49	48	46	45	43	43	42
June 24	42	42	40	40	44	48	48	50	51	52	55	54	54	56	55	55	55	55	54	50	48	50	48	47
June 25	47	48	47	45	46	48	52	54	56	56	59	59	64	62	62	63	62	62	60	54	53	52	51	50
June 26	49	50	49	48	50	54	56	57	58	60	61	64	65	66	67	65	64	64	60	55	53	52	51	50
June 27	49	49	49	48	49	52	53	54	58	60	62	63	63	65	65	66	65	62	58	56	55	54	54	53
June 28	54	54	53	53	54	54	54	54	54	54	53	54	55	56	57	55	56	55	53	52	51	50	48	48
June 29	50	50	49	50	50	52	54	56	57	60	62	64	67	65	67	68	66	62	58	57	56	56	56	57
June 30	57	56	55	55	55	57	56	55	56	58	55	56	55	56	57	57	56	57	57	56	55	54	53	53
	42.7	42.3	41.7	41.2	41.4	42.9	43.5	44.6	46.0	47.4	48.9	50.6	51.5	51.8	52.4	52.2	51.0	49.9	48.4	46.0	45.1	45.0	43.8	43.4

Hourly observations, Mount Washington, New Hampshire (summit), 1873.

PRESSURE.

[23 inches + the figures in the table.]

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	7.57 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	4.57 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11.22 p. m.	Midnight.
June 1	0.992	0.971	0.944	0.927	0.914	0.919	0.888	0.890	0.878	0.877	0.867[a]	0.861	0.864	0.855	0.843	0.816	0.805	0.808	0.818	0.826[b]	0.857	0.849	0.829	0.851
June 2	.848	.823	.803	.788	.797	.819	.841	.842	.832	.852	.879	.876	.845	.853	.854	.858	.858	.870	.870	.897	.913	.921	.943	.945
June 3	.964	.960	.950	.945	.961	.952	.964	.973	.971	.969	.975	.964	.967	.955	.947	.932	.921	.902	.902	.890	.895	.893	.894	.892
June 4	.800	.838	.808	.794	.775	.767	.744	.699	.670	.648	.626	.625	.603	.582	.561	.524	.506	.507	.495	.500	.488	.470	.469	.462
June 5	.442	.436	.408	.414	.406	.428	.449	.464	.492	.531	.538	.560	.557	.557	.551[c]	.542[d]	.530	.511[e]	.528[f]	.541	.556	.570	.584	.567
June 6	.567	.578	.580	.595	.608	.618	.628	.642	.644	.656	.658	.654	.651	.661	.682	.677	.676	.683	.685	.703	.687	.705	.695	.695
June 7	.670	.677	.661	.655	.659	.677	.701	.703	.708	.727	.692	.710	.701	.708	.714	.723	.736	.768	.781	.767	.790	.805	.803	.797
June 8	.797	.800	.807	.820	.850	.855	.891	.905	.939	.965	1.012	1.000	0.998	1.006	1.016	1.014	1.018	1.020[g]	1.020	1.022	1.022	1.018	1.006	1.012
June 9	1.005	1.000	1.002	0.995	1.001	0.998	0.993	0.982	0.982	1.000	0.983	0.965	0.979	0.970	0.955	0.933	0.923	0.916	0.909	0.897	0.901	0.893	0.875	0.867
June 10	.865	.863	.853	.857	.870	.866	.866	.847	.847	.855	.857	.862	.852	.852	.852	.847	.834	.838	.823	.831	.825	.808	.784	.778
June 11	.768	.749	.736[f]	.725	.687	.690	.691	.671	.670	.677	.697	.715	.725	.685	.684	.698	.692	.723[g]	.732	.752[h]	.773	.769	.788	.769
June 12	.764	.762	.748	.750[i]	.745	.766	.785	.780	.822	.825[k]	.835	.844	.878	.867	.870	.890	.888	.915	.931	.957	.952	.968	.997	.999
June 13	1.002	1.012	1.005	1.010	1.005	1.011	1.010	1.020	1.029	1.043	1.039	1.036	1.036	1.020	1.004	1.002	0.977	0.982	0.976	0.972	0.965	.965	.957	.946
June 14	.952	.940	.937	.930	.926	.925	.912[l]	.915	.910	.913	.922	.902	.897	.884	.881	.869	.863	.859	.855	.859	.856	.855	.825	.818
June 15	.810[m]	.805[n]	.800	.790	.807	.797	.805	.797	.786	.785	.782	.777	.775	.783	.767	.766	.765	.764	.738	.734	.752	.752	.747	.729
June 16	.755	.777	.775	.780	.782	.777	.783	.804	.811	.807	.822	.812	.810	.755	.738	.727	.710	.680	.664	.685	.693	.670	.614	.599
June 17	.548	.556	.550	.540	.551	.574	.594	.587	.614	.612	.633	.646	.655	.660	.655	.659	.658	.641	.647	.638[i]	.621	.606	.614	.633
June 18	.635	.639	.642	.659	.668	.683	.695	.701	.718	.715	.735	.748	.748	.721	.702	.703	.675	.670	.661	.678	.671	.650	.608	.601
June 19	.621	.599	.613	.583	.573	.560	.567	.591	.630	.673	.689	.685	.698	.717	.698	.673	.691	.698	.699	.678	.676	.628	.594	.574
June 20	.522	.516	.528	.468	.473	.482	.480	.486	.485	.464	.479	.500	.514	.511	.515	.509	.481	.517	.534	.544	.539	.491	.518	.489[o]
June 21	.493	.468	.468	.496	.519	.533	.546[p]	.574	.594	.603	.599[q]	.583	.575[r]	.569	.562	.610	.616	.609	.634	.641	.648	.661	.594	.706
June 22	.716	.720	.719	.734	.737	.757	.778	.783	.802	.810	.817	.823	.829	.842	.860	.861	.871	.894	.910	.927	.939	.955	.963	.964
June 23	.974	.965	.972	.970	.985	.997	1.009	1.029	1.037	1.067	1.072	1.055	1.059	1.057	1.061	1.057	1.050	1.050	1.047	1.042	1.042	1.053	1.057	1.052
June 24	1.040	1.031	1.022	1.012	1.018	1.026	1.042	1.046	1.047	1.061	1.072	1.077	1.074	1.076	1.085	1.082	1.095	1.102	1.114	1.111	1.139	1.135	1.160	1.155
June 25	1.159	1.157	1.166	1.180	1.187	1.208	1.219	1.236	1.253	1.255	1.263	1.270	1.270	1.258	1.258	1.268	1.254	1.260	1.256	1.247	1.249	1.243	1.234	1.234
June 26	1.238	1.236	1.238	1.235	1.237	1.230	1.236	1.235	1.244	1.244	1.244	1.234	1.212	1.207	1.186	1.173	1.143	1.135	1.095	1.075	1.071	1.065	1.056	1.046
June 27	1.046	1.048	1.042	1.038	1.040	1.018	1.010	1.002	1.007	.994	.985	.963	.943	.928	.918	.893	.858	.840	.822	.797	.805	.779	.772	.772
June 28	.770	.760	.740	.740	.730	.725	.732	.730	.725	.712	.720	.717	.742	.747	.747	.737	.708	.722	.735	.764	.786	.787	.794	.790
June 29	.791	.782	.774	.755	.780	.790	.795	.822	.836	.838	.851	.853	.855	.850	.850	.857	.852	.849	.853	.851	.863	.853	.875	.871
June 30	.866	.868	.865	.865	.869	.870	.873	.866	.867	.875	.873	.871	.876	.878	.857	.849	.844	.847	.861	.864	.870	.871	.877	.866
	0.8160	0.8112	0.8052	0.8017	0.8053	0.8106	0.8176	0.8207	0.8283	0.8351	0.8405	0.8407	0.8397	0.8338	0.8291	0.8250	0.8175	0.8193	0.8198	0.8230	0.8281	0.8229	0.8175	0.8160

[a] Recorded as 0.827.
[b] Recorded as 0.746.
[c] Recorded as .571.
[d] Recorded as .502.
[e] Recorded as .561.
[f] Recorded as .766.
[g] Recorded as .743.
[h] Recorded as .712.
[i] Recorded as .780.
[k] Recorded as .925.
[l] Recorded as 1.012.
[m] Recorded as .910.
[n] Recorded as .905.
[o] Recorded as .469.
[p] Recorded as .646.
[q] Recorded as .569.
[r] Recorded as .545.
[s] Recorded as .498.
[t] Recorded as .618.
[u] Recorded as 1.040.

Hourly observations, Mount Washington (summit), 1873.

TEMPERATURE.

Date.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	7.57 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	4.57 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11.22 p. m.	Midnight.
June 1	31	31	31	31	32	33	34	34	36	36	38	40	40	40	41	42	42	41	40	39	38	38	37	37
June 2	34	33	30	28	28	29	30	30	31	32	34	35	35	36	36	35	35	34	32	31	30	30	29	28
June 3	27	28	29	29	29	30	32	32	33	35	36	37	39	41	38	39	38	37	36	35	36	35	37	37
June 4	37	36	36	36	36	36	36	38	36	39	41	43	43	45	45	47	47	46	48	48	47	48	47	46
June 5	44	42	40	40	39	39	39	40	42	42	43	44	44	44	45	42	42	41	40	39	39	39	37	37
June 6	38	38	39	39	39	39	40	41	42	42	42	42	43	43	43	42	43	43	42	41	40	40	38	38
June 7	37	37	36	35	35	35	35	36	36	36	36	36	37	36	36	35	35	36	36	36	36	36	35	35
June 8	34	34	34	33	33	33	33	33	34	35	35	39	40	40	41	41	40	40	39	38	38	38	36	36
June 9	35	35	34	34	37	38	39	40	41	42	44	45	48	48	48	48	48	47	45	43	42	42	41	40
June 10	40	40	39	40	40	41	43	44	47	50	51	53	54	53	53	53	53	51	49	48	47	47	47	46
June 11	46	47	45	48	48	48	48	48	48	48	48	48	48	47	47	46	45	43	43	42	41	40	39	39
June 12	39	38	35	33	32	34	33	32	33	34	35	36	36	35	35	36	33	33	33	32	33	33	32	32
June 13	33	33	32	32	34	35	37	38	39	42	42	42	44	45	44	44	44	42	41	39	39	38	38	38
June 14	36	36	36	36	36	36	36	37	40	40	43	44	43	44	43	43	44	41	40	39	38	39	41	41
June 15	41	41	41	41	40	39	40	43	46	47	49	52	52	52	50	49	47	47	46	46	46	46	46	46
June 16	47	48	48	48	48	47	47	49	50	54	55	55	56	54	54	53	51	49	48	48	47	46	42	40
June 17	40	40	40	39	40	40	39	37	37	36	37	37	38	39	37	38	37	36	35	35	33	32	30	30
June 18	30	29	29	29	29	29	32	34	35	38	40	43	43	44	43	43	44	45	44	44	44	44	44	44
June 19	43	43	43	42	42	43	44	45	45	46	49	50	50	51	51	52	53	53	52	52	52	51	53	53
June 20	53	53	52	53	53	50	45	46	45	45	45	45	45	47	49	49	49	44	43	42	40	38	36	34
June 21	33	32	31	30	30	31	30	31	31	31	35	35	36	36	32	34	34	34	33	32	32	32	32	32
June 22	32	32	32	32	33	34	34	34	35	35	33	35	34	35	35	36	36	36	38	34	34	34	34	34
June 23	34	35	35	36	36	37	39	41	42	43	44	46	47	45	46	47	46	44	45	45	45	44	44	44
June 24	44	43	42	41	42	43	44	45	48	48	49	49	50	51	50	49	48	50	48	46	46	45	45	45
June 25	44	44	44	44	44	47	49	50	52	52	54	55	54	56	56	55	55	56	52	51	50	49	48	48
June 26	48	48	48	46	47	49	51	56	55	56	57	57	59	59	58	57	57	57	55	52	51	51	50	49
June 27	49	47	47	47	47	49	51	52	56	56	59	59	58	58	57	57	55	54	53	53	52	52	51	51
June 28	51	51	51	51	52	52	52	52	52	52	52	53	53	53	53	52	51	50	50	49	49	47	47	47
June 29	46	46	46	46	47	48	51	53	54	54	56	57	57	58	58	58	58	57	55	54	54	54	54	54
June 30	54	54	53	53	53	53	53	53	53	54	51	53	53	54	54	54	55	54	55	54	53	52	52	52
	40.0	39.8	39.3	39.1	39.4	39.9	40.5	41.5	42.5	43.3	44.4	45.5	46.0	46.3	45.9	45.9	45.5	44.7	43.9	42.9	42.4	42.1	41.4	41.1

Hourly observations at Colorado Springs, Colo.

PRESSURES.

[23 inches + the figures in the table.]

Date.	5.42 a. m.	7 a. m.	8 a. m.	9 a. m.	10.08 a. m.	11 a. m.	12 a. m.	1 p. m.	2 p. m.	2.42 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9.07 p. m.
1874.																
August 1	1.258	1.263	1.255	1.220	1.197	1.182	1.168	1.148	1.138	1.125	1.111	1.110	1.108	1.131	1.139	1.191
August 2	1.191	1.211	1.217	1.215	1.207	1.198	1.202	1.185	1.164	1.167	1.177	1.159	1.191	1.203	1.223	1.238
August 3	1.258	1.258	1.261	1.254	1.261	1.246	1.231	1.218	1.214	1.198	1.244	1.282	1.273	1.265	1.284	1.269
August 4	1.238	1.240	1.248	1.239	1.246	1.222	1.223	1.220	1.208	1.198	1.195	1.198	1.205	1.221	1.225	1.243
August 5	1.241	1.245	1.247	1.234	1.234	1.220	1.204	1.190	1.181	1.159	1.142	1.174	1.191	1.202	1.227	1.229
August 6	1.213	1.229	1.229	1.234	1.236	1.227	1.224	1.211	1.204	1.202	1.174	1.174	1.176	1.182	1.194	1.205
August 7	1.221	1.207	1.235	1.235	1.247	1.249	1.249	1.219	1.217	1.217	1.197	1.179	1.180	1.196	1.218	1.229
August 8	1.228	1.228	1.224	1.227	1.235	1.205	1.203	1.183	1.172	1.212	1.208	1.208	1.187	1.195	1.219	1.211
August 9	1.171	1.165	1.178	1.164	1.152	1.146	1.118	1.116	1.074	1.070	1.076	1.081	1.095	1.089	1.089	1.094
August 10	0.990	0.978	0.970	0.989	0.997	1.001	0.984	0.986	0.977	0.964	0.950	0.940	0.951	0.957	0.979	1.003
August 11	1.098	1.130	1.119	1.129	1.135	1.132	1.116	1.118	1.100	1.090	1.090	1.092	1.092	1.107	1.119	1.144
August 12	1.252	1.270	1.277	1.277	1.286	1.272	1.253	1.243	1.231	1.240	1.233	1.247	1.253	1.254	1.286	1.293
August 13	1.295	1.299	1.289	1.293	1.293	1.273	1.253	1.243	1.251	1.239	1.243	1.246	1.254	1.256	1.256	1.266
August 14	1.254	1.277	1.267	1.270	1.263	1.255	1.241	1.231	1.225	1.219	1.207	1.198	1.209	1.219	1.234	1.234
August 15	1.248	1.257	1.265	1.265	1.260	1.255	1.239	1.227	1.213	1.199	1.191	1.194	1.193	1.197	1.211	1.222
August 16	1.217	1.220	1.217	1.227	1.224	1.214	1.211	1.214	1.202	1.212	1.214	1.213	1.208	1.210	1.224	1.227
August 17	1.284	1.325	1.323	1.329	1.318	1.314	1.289	1.267	1.253	1.241	1.243	1.276	1.288	1.268	1.271	1.265
August 18	1.224	1.220	1.222	1.211	1.202	1.190	1.166	1.152	1.120	1.108	1.118	1.096	1.101	1.113	1.137	1.145
August 19	1.200	1.206	1.216	1.207	1.209	1.197	1.189	1.169	1.149	1.145	1.142*	1.124	1.142	1.180	1.190	1.192
August 20	1.203	1.198	1.198	1.187	1.187	1.165	1.148	1.140	1.111	1.108	1.112	1.134	1.152	1.167	1.177	1.164
August 21	1.197	1.220	1.201	1.204	1.201	1.206	1.196	1.186	1.166	1.169	1.188	1.184	1.172	1.189	1.191	1.211
August 22	1.311	1.314	1.326	1.325	1.321	1.315	1.297	1.287	1.263	1.255	1.258	1.254	1.262	1.271	1.274	1.280
August 23	1.282	1.290	1.297	1.293	1.295	1.277	1.257	1.238	1.245	1.238	1.228	1.230	1.252	1.237	1.262	1.272
August 24	1.267	1.270	1.271	1.279	1.255	1.249	1.228	1.216	1.210	1.194	1.168	1.162	1.152	1.157	1.169	1.174
August 25	1.144	1.156	1.156	1.162	1.158	1.145	1.130	1.118	1.089	1.078	1.074	1.067	1.069	1.073	1.083	1.091
August 26	1.064	1.070	1.073	1.071	1.075	1.061	1.055	1.047	1.036	1.047	1.061	1.051	1.054	1.070	1.070	1.078
August 27	1.035	1.033	1.046	1.044	1.046	1.039	1.031	1.011	0.991	0.971	0.981	0.985	0.991	1.005	1.009	1.029
August 28	1.114	1.111	1.126	1.124	1.128	1.131	1.133	1.123	1.109	1.111	1.111	1.121	1.114	1.147	1.179	1.201
August 29	1.294	1.287	1.296	1.304	1.307	1.297	1.280	1.270	1.260	1.240	1.230	1.230	1.220	1.224	1.259	1.269
August 30	1.269	1.268	1.258	1.258	1.234	1.220	1.198	1.176	1.228?	1.224?	1.207	1.179	1.183	1.182	1.190	1.192
August 31	1.179	1.175	1.166	1.176	1.166	1.166	1.148	1.138	1.116	1.106	1.104	1.108	1.123	1.131	1.161	1.167
	1.2077	1.2135	1.2153	1.2144	1.2121	1.2022	1.1892	1.1771	1.1651	1.1595	1.1573	1.1583	1.1620	1.1709	1.1855	1.1954

* Recorded as 1.172.

Hourly observations.—Colorado Springs.

TEMPERATURE.

Date.	5.42 a. m.	7 a. m.	8 a. m.	9 a. m.	10.07 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	2.42 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9.07 p. m.
1874—.																
August 1	64.5	68.0	72.0	70.5	76.3	77.0	79.5	81.5	74.5	77.0	74.5	74.8	73.0	71.5	66.5	66.5
August 2	58.8	65.5	70.0	72.5	75.5	77.0	72.0	76.0	78.5	75.5	75.3	74.5	71.0	67.0	65.5	64.0
August 3	56.7	66.0	72.0	75.0	78.0	80.5	78.8	80.5	84.0	76.5	67.5	60.0	58.0	59.0	61.0	66.0
August 4	58.0	64.5	64.0	69.7	71.5	75.5	75.5	79.5	85.5	80.5	78.0	75.5	72.5	72.0	70.5	68.2
August 5	59.8	67.0	71.5	78.2	81.0	81.0	84.0	86.5	87.2	87.0	79.0	75.0	72.5	69.5	67.0	67.0
August 6	60.0	65.0	70.0	75.2	78.0	85.0	84.5	86.5	82.3	80.5	85.5	84.0	79.0	75.5	71.5	70.0
August 7	65.5	71.5	77.0	79.0	80.5	85.0	87.2	88.0	87.5	88.2	89.0	90.0	86.5	78.5	75.0	73.5
August 8	59.0	69.0	76.2	82.0	87.0	89.5	91.0	92.0	87.0	75.5	77.0	78.2	76.0	71.0	68.0	64.2
August 9	61.5	71.5	73.0	76.5	80.5	83.2	85.0	88.5	87.0	90.0	79.5	74.2	67.0	66.0	66.2	64.0
August 10	62.5	74.0	74.5	75.0	78.5	80.5	83.0	85.5	86.0	86.0	86.0	91.0	88.0	77.5	74.0	70.0
August 11	54.0	68.0	74.0	74.2	76.0	78.0	81.0	82.0	80.5	81.5	80.5	82.0	79.5	74.0	69.0	68.0
August 12	59.0	62.0	64.5	69.5	75.0	78.0	84.0	84.5	85.5	84.8	83.0	86.0	80.0	74.0	70.0	68.0
August 13	58.0	67.5	69.5	74.0	79.5	81.5	87.0	81.5	78.0	78.2	78.0	73.5	72.5	72.0	72.5	73.0
August 14	61.0	75.0	74.0	78.5	81.5	81.5	82.5	84.2	85.5	85.0	86.0	84.5	85.5	86.5	74.0	69.0
August 15	62.0	70.0	76.2	82.0	85.5	89.0	90.0	89.0	90.0	89.0	90.0	92.0	86.0	80.5	77.5	76.5
August 16	61.5	73.0	76.5	83.0	80.0	85.0	84.0	84.0	85.5	81.5	78.0	80.5	80.0	77.0	74.0	72.0
August 17	63.5	64.0	64.0	66.5	75.0	78.5	83.8	83.5	84.0	84.8	75.0	68.0	63.0	62.0	61.0	61.5
August 18	57.5	57.5	61.0	63.0	68.5	72.5	79.0	82.5	84.0	86.0	84.0	85.0	82.5	75.5	73.0	69.0
August 19	66.0	71.5	75.5	79.0	83.0	84.5	86.5	86.5	87.0	86.8	81.0	82.2	80.5	76.0	71.0	67.5
August 20	60.0	65.5	72.0	76.0	79.2	85.0	87.0	85.0	87.8	86.0	79.0	74.0	67.0	67.0	66.0	65.0
August 21	59.0	61.5	70.0	76.0	77.0	81.0	81.0	79.0	82.5	78.0	73.5	72.5	74.0	68.0	64.0	62.0
August 22	58.5	64.0	68.5	72.0	75.0	76.2	79.0	81.0	81.0	79.2	74.5	71.5	71.5	67.0	65.0	63.5
August 23	56.0	60.0	68.0	70.0	73.5	76.0	79.0	84.5	81.0	80.0	81.0	81.0	79.0	69.5	66.0	62.0
August 24	54.0	64.0	70.5	75.0	73.5	80.5	82.2	82.0	81.0	82.0	80.0	76.0	70.5	72.0	69.2	70.0
August 25	60.0	62.5	64.0	67.5	70.0	70.2	75.5	75.0	79.0	81.5	77.0	77.0	79.5	71.5	70.0	69.0
August 26	59.5	61.0	66.0	70.5	76.0	76.0	78.0	77.0	78.2	70.5	65.0	64.0	65.2	64.5	63.2	63.0
August 27	59.5	73.2	74.5	76.5	78.0	79.0	80.0	82.0	81.2	83.5	81.5	81.0	79.0	73.0	71.0	70.5
August 28	60.5	66.0	69.5	72.0	74.0	75.5	76.2	79.0	80.5	81.5	81.0	80.5	80.5	71.0	68.0	66.0
August 29	53.0	62.0	68.0	73.0	76.0	77.0	78.5	79.0	81.0	81.0	81.0	81.0	81.0	72.0	69.0	70.0
August 30	58.0	60.5	67.0	68.5	73.0	76.0	82.0	83.5	60.5	63.5	67.0	69.0	68.0	64.0	62.0	61.0
August 31	57.0	66.0	71.5	74.0	77.0	80.0	82.5	84.0	84.0	84.0	82.0	81.2	78.2	71.0	67.0	65.0
	59.48	66.35	70.48	74.01	77.19	79.84	81.91	83.01	82.49	81.45	79.01	78.05	75.69	71.47	68.63	67.25

Hourly observations at Pike's Peak, Colorado.

PRESSURE.

[17 inches + the figures in the table.]

Date.	6.42 a. m.	7 a. m.	8 a. m.	9 a. m.	10.07 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	2.42 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9.07 p. m.
1874.																
August 1	1.048	1.046	1.057	1.061	1.063	1.066	1.061	1.055	1.056	1.046	1.044	1.047	1.036	1.045	1.037	1.041
August 2	1.050	1.061	1.065	1.076	1.082	1.085	1.075	1.080	1.081	1.083	1.076	1.076	1.071	1.076	1.091	1.107
August 3	1.117	1.120	1.132	1.138	1.142	1.139	1.135	1.135	1.120	1.107	1.091	1.086	1.075	1.092	1.098	1.105
August 4	1.046	1.049	1.059	1.065	1.090	1.106	1.117	1.125	1.117	1.109	1.091	1.097	1.111	1.113	1.115	1.122
August 5	1.081	1.073	1.093	1.099	1.121	1.124	1.123	1.118	1.119	1.115	1.096	1.085	1.081	1.091	1.079	1.087
August 6	1.079	1.084	1.095	1.096	1.100	1.102	1.098	1.097	1.099	1.087	1.088	1.073	1.067	1.080	1.082	1.080
August 7	1.088	1.100	1.113	1.130	1.145	1.142	1.155	1.150	1.152	1.143	1.134	1.126	1.126	1.121	1.133	1.148
August 8	1.138	1.121	1.143	1.144	1.172	1.179	1.161	1.153	1.141	1.118	1.123	1.115	1.101	1.107	1.107	1.098
August 9	1.077	1.075	1.076	1.083	1.073	1.072	1.059	1.056	1.047	1.041	1.010	1.017	1.001	0.987	0.937	0.945
August 10	0.865[a]	0.873	0.880	0.891	0.909	0.910	0.910	0.924	0.934	0.933	0.917	0.916	0.918	0.920	0.914	0.913
August 11	0.916	0.910	0.953	0.974	0.973	0.980	0.989	1.012	1.011	1.004	1.024	0.987	1.025	1.044	1.031	1.047
August 12	1.089	1.104	1.110	1.120	1.123	1.133	1.139	1.145	1.146	1.133	1.131	1.126	1.130	1.126	1.146	1.148
August 13	1.143	1.150	1.153	1.164	1.169	1.169	1.159	1.153	1.153	1.140	1.141	1.135	1.132	1.141	1.143	1.132
August 14	1.109	1.120	1.127	1.136	1.147	1.152	1.150	1.149	1.146	1.149	1.140	1.140	1.138	1.142	1.149	1.152
August 15	1.146	1.152	1.160	1.168	1.167	1.169	1.167	1.161	1.164	1.158	1.159	1.156	1.156	1.152	1.153	1.154
August 16	1.112	1.123	1.134	1.145	1.142	1.143	1.145	1.139	1.137	1.135	1.131	1.133	1.133	1.131	1.131	1.136
August 17	1.123	1.131	1.138	1.131	1.143	1.140	1.134	1.128	1.118	1.109	1.096	1.057	1.077	1.068	1.072	1.092
August 18	1.031	1.045	1.040	1.049	1.063	1.063	1.071	1.087	1.085	1.075	1.069	1.072	1.068	1.079	1.081	1.078
August 19	1.085	1.092	1.098	1.111	1.128	1.123	1.121	1.122	1.112	1.107	1.094	1.075	1.079	1.092	1.084	1.078
August 20	1.045	1.061	1.070	1.089	1.088	1.088	1.086	1.076	1.070	1.048	1.052	1.048	1.061	1.062	1.067	1.061
August 21	1.057	1.052	1.055	1.073	1.093	1.094	1.095	1.093	1.086	1.074	1.071	1.059	1.061	1.055	1.071	1.079
August 22	1.102	1.115	1.116	1.123	1.123	1.123	1.116	1.116	1.120	1.119	1.109	1.107	1.103	1.113	1.112	1.122
August 23	1.113	1.117	1.117	1.127	1.128	1.130	1.123	1.124	1.117	1.117	1.110	1.106	1.107	1.108	1.111	1.112
August 24	1.090	1.101	1.099	1.105	1.103	1.099	1.091	1.079	1.063	1.058	1.055	1.039	1.035	1.028	1.027	1.017
August 25	0.949	0.965	0.969	0.982	0.981	0.971	0.959	0.939	0.960	0.951	0.944	0.939	0.941	0.958	0.968	0.971
August 26	0.933	0.942	0.953	0.961	0.961	0.964	0.960	0.955	0.948	0.945	0.947	0.931	0.932	0.948	0.954	0.964
August 27	0.930	0.927	0.928	0.927	0.933	0.923	0.925	0.930	0.923	0.924	0.916	0.903	0.899	0.914	0.917	0.939
August 28	0.929	0.936	0.947	0.961	0.977	0.981	0.990	0.998	1.008	1.012	1.018	1.025	1.031	1.036	1.051	1.060
August 29	1.076	1.089	1.100	1.107	1.114	1.123	1.121	1.117	1.115	1.113	1.114	1.110	1.104	1.102	1.115	1.118
August 30	1.086	1.079	1.083	1.085	1.089	1.087	1.088	1.075	1.049	1.008	1.006	1.015	1.006	1.018	1.029	1.023
August 31	1.009	1.021	1.025	1.034	1.056	1.061	1.054	1.062	1.057	1.055	1.061	1.065	1.057	1.063	1.067	1.065
	1.0536	1.0592	1.0674	1.0760	1.0838	1.0852	1.0831	1.0824	1.0792	1.0715	1.0664	1.0602	1.0601	1.0649	1.0668	1.0708

[a] Recorded as 17.815.

Hourly observations, Pike's Peak, Colo.

TEMPERATURE.

Date.	5.42 a. m.	7 a. m.	8 a. m.	9 a. m.	10.07 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	2.42 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9.07 p. m.
1874.																
August 1	34.5	37.5	41.0	44.0	46.2	48.0	49.3	49.3	50.0	48.3	47.3	45.2	43.7	42.7	41.0	41.1
August 2	36.0	39.0	42.2	45.1	46.2	45.2	47.0	48.2	47.1	47.0	47.8	44.2	40.0	38.3	37.2	37.0
August 3	37.0	38.2	40.5	44.0	45.3	49.0	49.3	47.0	44.8	43.3	36.9	37.5	36.8	36.8	34.0	33.7
August 4	33.9	33.8	36.2	36.4	40.3	44.3	45.4	46.3	46.3	43.0	43.1	43.0	41.3	40.2	39.2	39.1
August 5	34.0	35.3	36.0	39.8	42.2	46.5	47.3	47.5	48.0	49.4	44.3	43.8	44.0	42.0	39.0	37.0
August 6	35.0	40.2	41.0	40.1	41.1	47.1	46.9	45.2	46.2	39.9	41.0	41.0	39.9	38.5	37.7	37.2
August 7	35.3	38.8	43.4	44.0	47.4	49.5	51.6	51.5	51.0	50.4	49.2	47.5	45.5	43.0	41.0	40.0
August 8	38.0	41.6	44.2	48.2	50.0	53.0	54.5	54.6	51.5	43.2	41.2	41.0	42.0	40.8	39.4	38.0
August 9	36.5	38.2	40.5	39.4	40.0	40.8	49.3	50.0	50.0	51.3	46.8	46.2	44.2	41.0	40.0	38.4
August 10	30.5	31.0	35.8	40.0	40.0	43.0	45.5	48.2	48.5	48.8	45.2	44.4	43.2	40.5	39.2	37.0
August 11	31.0	32.5	34.5	37.2	40.0	43.5	45.2	45.5	44.4	44.4	44.8	44.0	43.0	42.5	40.3	38.2
August 12	34.8	39.0	42.2	44.0	48.4	50.0	51.2	52.1	52.2	52.2	48.4	45.1	41.3	38.7	37.5	37.0
August 13	37.9	45.5	46.0	49.0	49.3	46.0	43.5	39.7	37.2	38.2	37.5	38.0	37.0	38.0	36.5	35.0
August 14	36.0	36.5	37.5	38.9	42.0	46.4	50.2	53.0	52.3	50.2	47.3	45.0	43.1	42.0	42.0	40.9
August 15	38.8	45.2	44.2	44.0	43.3	46.0	46.2	46.0	47.0	47.5	47.3	47.3	45.4	44.2	43.0	41.5
August 16	38.5	40.0	40.2	41.0	45.2	45.0	44.8	46.2	43.9	44.8	41.4	41.3	42.0	42.0	40.9	40.2
August 17	36.5	36.2	36.0	37.0	39.2	39.2	38.5	41.0	42.1	40.2	38.7	38.0	36.0	35.2	37.2	34.8
August 18	33.8	37.3	42.0	45.0	45.5	47.3	50.0	50.4	51.0	49.2	48.2	46.1	45.0	43.2	41.8	40.7
August 19	37.0	40.2	44.0	47.0	48.8	51.2	51.2	52.5	50.0	49.0	42.8	42.2	41.5	42.1	39.3	38.5
August 20	35.8	38.1	43.0	46.3	50.4	52.0	51.3	50.1	50.5	45.0	43.4	38.9	39.9	39.0	38.8	38.5
August 21	35.0	37.5	39.9	49.5	48.1	49.0	49.7	50.0	47.5	44.8	42.2	40.4	39.5	39.0	37.5	37.0
August 22	35.0	37.7	39.5	40.9	42.0	40.5	42.5	44.2	45.1	43.1	39.9	40.1	37.0	37.2	35.5	35.2
August 23	34.0	40.0	42.9	43.5	44.0	46.1	41.9	40.2	40.2	38.0	39.1	39.1	38.4	37.0	35.9	35.1
August 24	32.0	36.3	38.1	40.3	40.2	41.0	42.0	42.7	41.0	40.0	39.1	36.0	37.0	36.1	35.1	34.5
August 25	33.0	34.0	34.8	35.0	34.9	36.2	36.1	35.4	35.3	36.2	37.5	36.2	35.2	34.3	35.0	34.1
August 26	33.9	34.3	35.3	39.1	40.7	42.0	42.2	44.9	44.6	43.0	43.6	39.0	38.9	36.8	36.6	35.9
August 27	33.0	33.6	37.4	38.0	38.0	43.2	46.1	42.9	45.0	43.2	41.9	40.9	38.4	35.2	35.2	32.2
August 28	31.1	34.0	34.1	38.1	41.5	45.9	47.7	50.1	48.0	48.0	45.1	43.2	41.0	38.9	38.0	37.9
August 29	31.1	36.0	39.8	41.2	43.0	46.7	47.0	48.1	47.5	47.2	44.8	43.4	41.0	39.0	38.1	36.5
August 30	34.1	35.7	37.7	43.6	46.0	47.5	47.1	46.2	39.0	39.2	40.3	39.8	38.0	37.0	35.2	35.1
August 31	32.7	35.3	37.2	39.2	42.3	45.5	48.1	51.0	50.7	49.2	49.5	47.1	45.3	44.1	41.8	40.0
	34.70	37.37	39.58	41.90	43.60	45.70	46.73	47.10	46.38	45.07	43.41	42.09	40.79	39.53	38.35	37.33

Hourly observations at Colorado Springs, Colo.

PRESSURE.

[23 inches + the figures in the table.]

Date.	5.42 a. m.	7 a. m.	8 a. m.	9 a. m.	10.07 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	2.42 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9.07 p. m.
1874.																
September 1	1.181	1.175	1.174	1.186	1.185	1.172	1.162	1.144	1.134	1.112	1.130	1.207	1.211	1.213	1.253	1.253
September 2	1.356	1.357	1.363	1.360	1.348	1.355	1.353	1.357	1.347	1.347	1.335	1.337	1.338	1.343	1.398	1.404
September 3	1.420	1.423	1.416	1.418	1.408	1.398	1.372	1.364	1.346	1.338	1.331	1.331	1.331	1.334	1.327	1.333
September 4	1.242	1.228	1.228	1.213	1.204	1.190	1.174	1.170	1.162	1.158	1.160	1.170	1.180	1.186	1.205	1.212
September 5	1.210	1.202	1.198	1.208	1.195	1.193	1.179	1.155	1.153	1.141	1.133	1.143	1.135	1.152	1.164	1.172
September 6	1.175	1.171	1.177	1.172	1.172	1.164	1.149	1.137	1.114	1.114	1.108	1.105	1.103	1.109	1.120	1.140
September 7	1.150	1.148	1.164	1.164	1.168	1.166	1.158	1.152	1.138	1.118	1.112	1.114	1.111	1.131	1.166	1.170
September 8	1.137	1.129	1.121	1.114	1.094	1.070	1.057	1.059	1.041	1.039	1.027	1.041	1.055	1.062	1.054	1.032
September 9	0.950	0.939	0.940	0.926	0.926	0.906	0.884	0.866	0.854	0.839	0.852	0.852	0.868	0.892	0.914	0.936
September 10	1.137	1.145	1.169	1.147	1.141	1.105	1.084	1.040	1.020	1.007	0.989	0.983	0.975	0.975	0.997	0.983
September 11	0.951	0.945	0.966	0.974	0.956	0.956	0.968	0.946	0.928	0.930	0.985	1.023	1.056	1.082	1.146	1.164
September 12	1.240	1.253	1.244	1.254	1.258	1.243	1.217	1.208	1.180	1.170	1.168	1.170	1.180	1.191	1.209	1.211
September 13	1.125	1.135	1.126	1.126	1.107	1.103	1.079	1.081	1.101	1.129	1.124	1.124	1.126	1.136	1.197	1.215
September 14	1.338	1.354	1.337	1.350	1.348	1.336	1.317	1.294	1.281	1.261	1.251	1.263	1.275	1.287	1.300	1.294
September 15	1.240	1.217	1.212	1.197	1.186	1.168	1.147	1.133	1.088	1.076	1.066	1.052	1.046	1.055	1.057	1.053
September 16	0.994	1.001	1.004	1.000	0.983	0.963	0.927	0.942	0.939	0.944	0.957	0.949	0.983	1.041	1.057	1.071
September 17	1.069	1.048	1.031	1.027	0.999	0.967	0.948	0.900	0.851	0.829	0.823	0.825	0.835	0.858	0.900	0.944
September 18	1.027	1.061	1.075	1.112	1.114	1.114	1.124	1.138	1.144	1.154	1.162	1.182	1.212	1.217	1.222	1.230
September 19	1.225	1.213	1.201	1.199	1.186	1.177	1.165	1.155	1.125	1.115	1.115	1.115	1.117	1.144	1.146	1.150
September 20	1.122	1.139	1.141	1.147	1.141	1.131	1.117	1.098	1.096	1.094	1.104	1.130	1.152	1.185	1.203	1.217
September 21	1.246	1.244	1.246	1.227	1.215	1.218	1.182	1.165	1.152	1.162	1.163	1.170	1.173	1.187	1.214	1.229
September 22	1.201	1.208	1.208	1.206	1.212	1.218	1.207	1.218	1.220	1.198	1.178	1.196	1.200	1.202	1.203	1.209
September 23	1.215	1.223	1.231	1.231	1.239	1.235	1.222	1.225	1.213	1.192	1.203	1.197	1.209	1.213	1.225	1.227
September 24	1.184	1.180	1.177	1.176	1.172	1.166	1.144	1.131	1.111	1.110	1.096	1.099	1.103	1.105	1.109	1.117
September 25	1.059	1.048	1.051	1.070	1.034	1.031	1.018	1.014	1.001	1.003	1.013	1.011	1.024	1.046	1.094	1.114
September 26	1.327	1.343	1.350	1.360	1.361	1.357	1.344	1.310	1.296	1.282	1.282	1.293	1.299	1.309	1.319	1.337
September 27	1.360	1.360	1.358	1.372	1.363	1.353	1.337	1.323	1.303	1.309	1.291	1.293	1.308	1.316	1.318	1.316
September 28	1.284	1.282	1.275	1.278	1.264	1.252	1.242	1.222	1.218	1.208	1.195	1.198	1.202	1.206	1.226	1.228
September 29	1.261	1.275	1.287	1.281	1.274	1.270	1.270	1.251	1.251	1.241	1.243	1.246	1.250	1.256	1.278	1.283
September 30	1.277	1.288	1.295	1.287	1.280	1.278	1.262	1.229	1.221	1.221	1.215	1.204	1.202	1.194	1.206	1.215
Means	1.1901	1.1911	1.1922	1.1927	1.1844	1.1753	1.1596	1.1479	1.1343	1.1280	1.1270	1.1341	1.1420	1.1556	1.1742	1.1820

Hourly observations, Colorado Springs.

TEMPERATURE.

Date.	5.42 a. m.	7 a. m.	8 a. m.	9 a. m.	10.07 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	2.42 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.
1874.																
September 1	58.5	69.0	74.0	77.0	81.0	84.0	87.0	85.5	85.0	85.5	79.5	68.0	66.5	65.5	64.0	63.0
September 2	50.0	50.0	49.5	50.0	50.5	49.0	50.5	50.0	48.0	48.0	49.0	47.0	47.0	45.0	44.0	44.5
September 3	40.0	41.0	44.5	43.0	45.0	45.5	47.5	49.5	51.0	50.0	50.5	47.0	46.0	45.0	44.0	44.5
September 4	41.0	45.5	47.5	53.5	60.5	66.5	70.0	71.5	73.0	73.0	73.0	72.0	67.5	61.5	58.0	55.0
September 5	46.5	56.0	61.0	67.0	70.5	73.0	74.0	76.0	76.0	77.0	76.5	76.2	71.5	63.0	60.5	57.0
September 6	50.0	63.5	65.2	70.0	76.0	78.0	79.5	80.0	81.0	82.0	82.0	80.0	75.0	68.2	63.0	59.0
September 7	51.0	61.0	65.0	72.5	76.0	79.0	79.5	80.0	81.2	81.0	80.0	79.0	74.0	68.0	66.0	64.5
September 8	53.0	56.0	59.0	63.5	69.0	74.0	77.5	77.5	77.5	76.0	75.0	71.5	68.0	65.0	63.0	61.5
September 9	48.5	56.0	60.2	66.5	72.0	78.0	80.5	83.0	85.0	83.5	84.5	84.0	78.0	70.5	69.5	68.0
September 10	48.0	56.5	58.0	62.0	65.0	67.0	69.2	71.0	71.5	71.5	71.0	70.0	65.5	62.0	62.0	59.5
September 11	49.0	63.0	65.5	73.5	78.0	80.0	79.0	81.5	81.5	79.0	71.0	68.5	65.0	62.0	60.0	57.0
September 12	42.0	44.0	52.0	57.5	61.0	64.0	65.0	65.5	65.0	66.0	66.0	64.5	59.0	56.0	54.5	54.0
September 13	50.0	50.5	53.5	56.0	58.0	60.5	62.0	62.0	57.0	48.5	52.0	54.0	55.0	54.5	52.0	52.5
September 14	46.0	45.5	46.0	48.3	54.0	57.5	57.0	57.5	59.0	59.5	59.5	58.0	55.0	52.0	51.5	50.0
September 15	39.0	41.5	45.0	50.2	57.0	60.5	64.0	68.2	72.0	72.5	72.0	72.0	70.5	66.0	61.0	58.0
September 16	58.0	63.0	67.0	69.0	73.0	74.5	74.0	73.0[a]	71.0	71.5	67.0	67.5	64.5	59.0	55.0	53.5
September 17	47.0	52.5	52.0	55.0	56.0	58.0	64.0	68.0	71.2	73.0	75.0	74.5	70.5	64.5	62.0	57.0
September 18	43.5	43.0	48.0	44.5	45.0	46.5	48.0	48.0	47.5	47.5	46.5	46.5	44.0	42.0	40.0	39.0
September 19	29.0	32.5	42.0	42.0	50.0	56.0	59.5	61.0	61.5	61.5	62.5	61.5	56.5	52.0	49.0	45.0
September 20	41.0	48.5	53.0	58.0	60.5	64.0	66.5	68.5	69.5	70.0	68.5	65.0	63.0	59.5	55.0	53.0
September 21	42.0	45.0	47.0	54.0	56.5	61.0	65.0	66.5	66.5	65.5	66.5	65.0	60.5	57.0	56.0	56.5
September 22	52.5	51.5	52.0	52.0	48.0	47.5	47.0	44.0	44.0	48.0	49.0	49.5	47.5	48.0	46.0	46.0
September 23	49.0	50.5	53.5	53.5	57.0	58.5	60.0	60.0	62.0	63.0	60.0	60.0	57.0	52.0	50.5	49.5
September 24	42.0	44.0	48.2	51.5	57.0	60.0	62.0	63.0	65.0	65.0	64.0	62.0	58.0	55.0	52.5	49.5
September 25	42.0	44.5	51.0	55.5	71.0	72.0	73.0	74.0	75.0	75.5	74.0	73.2	65.0	64.0	60.0	59.0
September 26	47.5	50.0	52.0	54.0	55.5	57.0	58.0	62.0	64.0	63.5	62.2	61.0	57.0	53.0	51.0	48.0
September 27	39.0	44.5	51.5	59.0	63.5	67.0	69.0	69.5	70.5	71.0	70.2	68.0	61.0	57.0	54.0	52.5
September 28	43.0	45.0	55.0	61.0	66.0	69.5	73.0	74.5	77.0	77.5	77.0	75.0	66.0	63.0	57.0	54.5
September 29	48.2	50.0	60.0	67.0	72.0	73.5	75.0	76.0	76.5	76.0	76.0	73.7	65.2	60.5	56.0	51.5
September 30	43.0	48.0	55.0	64.0	67.0	69.5	74.0	75.0	75.0	73.0	72.5	69.0	65.0	60.0	54.2	52.5
Mean	45.97	50.38	54.44	58.36	62.38	65.03	67.01	68.06	68.66	68.48	67.75	66.10	62.14	58.36	55.71	53.83

[a] Recorded as 63°.

Hourly observations at Pike's Peak, Colorado.

PRESSURE.

[17 inches + the figures in the table.]

Date.	5.42 a. m.	7 a. m.	8 a. m.	9 a. m.	10.07 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	2.42 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9.07 p. m.
1874.																
September 1	1.045	1.044	1.061	1.077	1.095	1.095	1.089	1.087	1.087	1.081	1.083	1.076	1.070	1.059	1.072	1.067
September 2	1.019	1.011	1.001	1.003	1.000	0.991	0.994	0.998	0.976	0.969	0.963	0.965	0.955	0.957	0.969	0.966
September 3	0.939	0.938	0.945	0.934	0.938	0.929	0.917	0.929	0.922	0.916	0.905	0.910	0.911	0.913	0.915	0.920
September 4	0.922	0.930	0.953	0.968	0.975	0.975	0.971	0.976	0.972	0.980	0.985	0.984	0.987	0.992	1.002	0.993
September 5	0.975	0.981	0.984	0.995	1.009	1.011	1.012	1.012	1.009	1.003	1.001	1.004	0.998	1.003	1.012	1.013
September 6	1.007	1.016	1.020	1.030	1.031	1.031	1.032	1.031	1.029	1.027	1.021	1.017	1.011	1.011	1.028	1.026
September 7	1.037	1.039	1.038	1.045	1.045	1.048	1.041	1.037	1.029	1.029	1.015	1.015	1.011	1.007	1.021	1.015
September 8	0.941	0.943	0.949	0.950	0.943	0.946	0.943	0.941	0.934	0.926	0.920	0.913	0.911	0.904	0.905	0.904
September 9	0.795	0.801	0.800	0.809	0.831	0.810	0.789	0.793	0.811	0.824	0.838	0.839	0.848	0.857	0.847	0.857
September 10	0.879	0.893	0.900	0.901	0.897	0.893	0.877	0.872	0.855	0.852	0.841	0.827	0.814	0.827	0.838	0.830
September 11	0.767	0.755	0.796	0.818	0.851	0.858	0.863	0.872	0.865	0.866	0.861	0.857	0.863	0.870	0.890	0.892
September 12	0.876	0.890	0.889	0.909	0.910	0.911	0.900	0.903	0.907	0.904	0.898	0.896	0.895	0.897	0.914	0.916
September 13	0.827	0.828	0.829	0.835	0.832	0.830	0.824	0.832	0.821	0.823	0.820	0.822	0.847	0.853	0.870	0.862
September 14	0.934	0.942	0.952	0.951	0.954	0.956	0.959	0.956	0.953	0.957	0.953	0.956	0.964	0.966	0.970	0.962
September 15	0.937	0.957	0.965	0.963	0.973	0.962	0.956	0.946	0.951	0.953	0.929	0.927	0.913	0.927	0.918	0.911
September 16	0.833	0.802	0.771	0.771	0.790	0.784	0.768	0.740	0.719	0.735	0.727	0.762	0.795	0.798	0.866	0.811
September 17	0.728	0.732	0.728	0.720	0.713	0.718	0.713	0.711	0.713	0.702	0.716	0.723	0.725	0.728	0.735	0.716
September 18	0.676	0.697	0.696	0.709	0.706	0.717	0.736	0.737	0.746	0.755	0.760	0.777	0.779	0.788	0.795	0.795
September 19	0.804	0.818	0.826	0.832	0.843	0.844	0.847	0.850	0.847	0.842	0.841	0.826	0.836	0.843	0.846	0.847
September 20	0.816	0.849	0.869	0.877	0.881	0.876	0.879	0.875	0.871	0.873	0.888	0.894	0.897	0.898	0.905	0.898
September 21	0.878	0.886	0.899	0.907	0.927	0.933	0.921	0.924	0.925	0.920	0.935	0.928	0.931	0.931	0.939	0.933
September 22	0.888	0.889	0.886	0.882	0.878	0.870	0.865	0.870	0.862	0.858	0.854	0.854	0.857	0.860	0.855	0.854
September 23	0.863	0.875	0.877	0.882	0.890	0.890	0.901	0.894	0.899	0.896	0.893	0.900	0.898	0.899	0.909	0.914
September 24	0.888	0.906	0.895	0.907	0.917	0.912	0.918	0.899	0.899	0.898	0.883	0.885	0.877	0.882	0.888	0.889
September 25	0.847	0.840	0.843	0.855	0.861	0.867	0.866	0.877	0.879	0.889	0.892	0.905	0.908	0.923	0.928	0.944
September 26	0.963	0.968	0.990	1.001	1.008	1.017	1.021	1.019	1.029	1.024	1.017	1.023	1.025	1.041	1.039	1.055
September 27	1.065	1.075	1.086	1.091	1.095	1.083	1.090	1.085	1.087	1.082	1.079	1.079	1.068	1.076	1.084	1.091
September 28	1.044	1.053	1.067	1.069	1.064	1.054	1.066	1.053	1.063	1.064	1.063	1.052	1.044	1.062	1.069	1.057
September 29	1.054	1.061	1.072	1.084	1.084	1.089	1.078	1.073	1.072	1.073	1.071	1.072	1.065	1.068	1.075	1.067
September 30	1.047	1.055	1.061	1.059	1.069	1.069	1.080*	1.063	1.040	1.032	1.036	1.028	1.029	1.031	1.025	1.037
	0.9098	0.9158	0.9216	0.9278	0.9337	0.9323	0.9305	0.9281	0.9257	0.9251	0.9229	0.9239	0.9244	0.9290	0.9356	0.9357

* Recorded as 1.100.

Hourly observations, Pike's Peak.

TEMPERATURE.

Date.	5.42 a. m.	7 a. m.	8 a. m.	9 a. m.	10.07 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	2.42 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9.07 p. m.
1874.																
September 1	34.1	37.1	39.0	43.9	48.5	50.1	50.0	51.1	49.8	49.0	46.7	45.2	42.0	39.2	38.5	36.5
September 2	32.6	32.5	32.3	32.5	33.5	33.0	33.0	32.0	31.5	31.4	31.1	31.0	30.9	30.0	30.0	28.1
September 3	24.0	24.2	25.0	25.2	25.9	26.7	25.8	28.0	29.4	29.9	28.4	24.5	23.0	22.0	21.6	21.5
September 4	27.5	28.0	29.0	31.4	33.0	32.2	33.0	34.3	35.0	35.2	34.7	33.5	34.0	32.3	31.2	29.7
September 5	25.0	29.2	31.8	35.4	41.2	45.9	45.3	41.0	41.0	42.3	40.0	42.0	38.0	36.0	34.9	33.2
September 6	30.3	34.0	37.5	39.9	45.2	48.4	47.3	47.1	46.1	46.2	44.8	43.3	41.0	38.4	36.6	35.9
September 7	35.0	39.5	40.9	43.1	43.7	45.1	44.9	46.4	43.9	43.0	41.3	41.1	39.0	38.6	37.7	37.2
September 8	32.0	33.8	34.7	36.0	37.0	38.5	39.9	40.2	39.2	39.2	39.0	37.0	36.2	35.3	36.1	35.8
September 9	32.0	37.1	38.8	41.3	41.1	42.2	46.8	46.1	46.0	46.0	45.4	44.2	43.9	41.8	37.5	35.2
September 10	28.1	31.8	33.5	36.0	38.2	40.0	41.2	42.1	41.6	40.1	42.7	39.8	36.9	34.8	33.9	32.9
September 11	29.2	31.0	33.8	35.3	39.1	42.7	44.2	45.2	45.5	45.4	36.1	32.5	29.0	33.1	30.8	29.0
September 12	22.0	24.2	27.3	30.3	30.0	30.7	32.9	34.8	35.4	35.7	34.2	36.2	35.8	33.0	30.1	29.1
September 13	26.0	27.6	28.0	26.8	28.3	28.3	27.0	27.9	25.1	24.0	23.0	23.2	20.2	21.0	22.1	23.0
September 14	21.5	23.5	26.2	27.2	28.0	29.3	32.0	32.2	28.8	28.9	29.2	30.0	28.1	28.0	27.3	26.8
September 15	24.0	25.2	27.3	28.0	29.5	35.0	41.6	39.1	38.8	38.0	37.7	37.2	34.2	32.2	31.2	30.7
September 16	26.3	27.0	27.1	31.0	31.7	36.2	34.4	29.9	31.2	27.9	27.0	26.2	23.3	22.6	22.2	22.9
September 17	19.4	21.9	23.5	28.2	29.0	31.8	34.2	35.2	35.1	35.1	35.0	33.4	31.4	29.7	28.3	25.2
September 18	19.2	19.9	17.2	17.2	15.5	16.3	18.4	18.9	21.0	20.0	20.1	18.5	18.0	16.1	16.6	16.0
September 19	15.1	17.1	19.9	21.6	26.3	28.2	32.0	33.1	30.0	33.0	32.2	28.8	26.2	25.0	25.0	24.5
September 20	22.7	25.5	28.0	32.0	34.2	37.2	38.2	39.0	37.9	36.3	31.1	28.8	26.0	26.0	25.5	24.6
September 21	21.7	21.0	26.0	31.0	33.0	36.2	32.9	32.0	31.0	26.0	31.4	28.1	29.0	27.1	25.9	25.0
September 22	24.7	26.1	27.7	27.5	26.1	26.1	25.7	25.3	28.0	28.5	27.0	23.7	22.5	22.8	23.0	23.0
September 23	23.0	22.9	23.7	24.0	22.2	23.5	24.3	24.2	23.0	23.4	24.2	23.9	23.2	19.3	19.0	17.0
September 24	24.0	24.0	24.8	25.0	26.0	27.0	26.8	27.9	24.0	28.1	27.0	26.3	25.1	24.8	24.8	24.8
September 25	25.0	24.8	25.1	25.5	27.0	28.4	29.8	31.1	31.0	31.0	32.0	31.1	30.7	30.0	29.5	28.1
September 26	22.0	23.8	24.9	25.4	27.5	31.5	30.7	29.0	29.1	29.0	29.8	29.6	29.5	29.5	29.0	28.8
September 27	26.6	27.5	28.9	30.1	32.2	33.2	34.1	36.3	35.1	33.9	33.7	32.8	31.5	29.2	28.9	28.8
September 28	28.0	28.2	30.1	31.9	32.6	33.9	35.1	35.3	34.8	34.8	33.2	31.7	31.7	30.1	30.2	29.9
September 29	26.8	28.0	29.1	31.9	37.6	42.1	42.2	44.3	37.8	37.3	35.4	33.2	32.5	31.1	30.2	28.8
September 30	27.1	28.0	29.8	32.3	32.9	33.2	34.9	39.8	34.2	35.1	33.2	32.8	30.6	30.2	30.0	29.2
	25.83	27.58	29.03	30.90	32.53	34.43	35.35	35.63	34.81	34.46	33.55	32.32	30.78	29.64	28.92	28.04

APPENDIX No. 74.

WAR DEPARTMENT,
Washington, May 23, 1881.

SIR: I have the honor to inclose to you a communication from the Chief Signal Officer to myself, recommending that Sergeants Wright and Greene, described as "of the Signal Corps, United States Army," be appointed second lieutenants, Signal Corps, United States Army, and the opinion of the Judge-Advocate-General given upon the communication as to the status which would be held by such officers after appointment.

I have the honor to request of you a review of the opinion of the Judge-Advocate-General, and further to request your opinion upon the general question: whether officers engaged in the performance of duties under sections 221 to 223 of the Revised Statutes, other than the Chief Signal Officer and officers detailed from the Army, as organized by chapter 1, title 14, of the Revised Statutes, are a part of the Army of the United States; and whether the enlisted men engaged in the performance of the duties under sections 221 to 223 of the Revised Statutes not detailed for such duties from any branch of the Army named in section 1094 of the Revised Statutes, but having indorsed on their enlistment papers the words "enlisted for the Signal Corps, United States Army," are a part of the Army of the United States.

In this connection I invite your attention to the inclosed pamphlet, entitled Legislation and Orders relating to the Signal Service, United States Army, from 1860 to 1873, and to a comparison of section 22 of the act of Congress approved July 28, 1866 (14 Statutes at Large, 335), incorporated in substance in the Revised Statutes at sections 1094, 1195, 1196, and 1197, with the practice indicated by the orders of this Department since the passage of that act set out in the pamphlet.

I also invite your attention to the act of Congress, approved February 24, 1881, entitled "An act making appropriations for the support of the Army for the fiscal year ending June 30, 1882, and for other purposes," and inform you that at the time of the approval of that act the Signal Service duties were and still are performed by the Chief Signal Officer of the Army, having under him certain officers of the Army detailed from various branches of the Army for that duty (none being officers of the Engineer Corps); also four second lieutenants appointed under the act of Congress approved June 20, 1878 (20 Statutes at Large, 219), and nearly five hundred enlisted men not detailed from the engineer battalion, nor from any arm of the service mentioned in section 1094 of the Revised Statutes, but enlisted by one of the officers of the Army detailed for duty under the Chief Signal Officer by papers, a copy of one of which is inclosed herewith, the paper differing from the usual enlistment paper only in having written on its margin, "enlisted for the Signal Corps, United States Army." Of the four second lieutenants before mentioned two of them were, November 1, 1878, appointed by the President "second lieutenants in the Signal Corps, United States Army," and were, December 2, 1878, nominated to the Senate for appointment as "second lieutenants in the Signal Service in the Army of the United States." The Senate confirmed their appointment December 18, 1878, as "second lieutenants in the Signal Service of the Army of the United States," and they were on December 25, 1878, commissioned as "second lieutenants in the Signal Corps in the service of the United States." The other two were, November 12, 1879, appointed "second lieutenants in the Signal Corps of the Army in the service of the United States;" were nominated to the Senate December 1, 1879, as "second lieutenants in the Signal Corps in the service of the United States;" were confirmed by the Senate January 13, 1880, as "second lieutenants in the Signal Corps in the service of the United States," and were commissioned January 16, 1880, as "second lieutenants in the Signal Corps in the service of the United States."

Your attention is also respectfully invited to sections 3 and 4 of the act of Congress approved June 18, 1878, providing for the filling of vacancies in the grade of second lieutenant in the Army in certain cases by the appointment of non-commissioned officers of the Army, recommended by the "Chief of Engineers and of other staff corps," from their respective commands, with the suggestion that if Congress either did not consider the enlisted men under the Chief Signal Officer as a part of the Army, or did not consider the Chief Signal Officer and the men under him as one of the staff corps, and desired to put the non-commissioned officers of his specially enlisted force on an equality with the non-commissioned officers of the staff corps in respect to being made second lieutenants

in the Army, the act of June 20, 1878, was necessary as an amendment to the act of June 18, 1878.

I also invite your attention to the fact that in the above-mentioned act of February 24, 1881, special provision is made, in the proper clauses, for the pay and subsistence of the enlisted men of the Signal Corps, as distinguished from the enlisted men of the Army, but not for their transportation.

At the request of the Chief Signal Officer I herewith transmit a communication from him, bearing date the 21st instant, upon this subject, inclosing a memorandum with exhibits, to which your attention is invited.

I am, sir, very respectfully, your obedient servant,

ROBERT T. LINCOLN,
Secretary of War.

The honorable THE ATTORNEY-GENERAL.

WAR DEPARTMENT,
Washington, May 24, 1881.

SIR: In connection with the letter of this Department of yesterday's date, touching the legal status of the Signal Corps, I have the honor to enclose herewith additional memoranda on the subject, just received from the Chief Signal Officer.

Very respectfully, your obedient servant,

A. T. CROSBY, *Chief Clerk,*
For the Secretary of War, in his absence.

The honorable THE ATTORNEY-GENERAL.

WAR DEPARTMENT,
Washington, June 1, 1881.

SIR: I have the honor to inclose herewith a communication from the Chief Signal Officer of yesterday's date, covering addendum to memoranda regarding the legal status of the Signal Corps, transmitted to you in letters of this Department dated the 21st and 33d ultimo.

Very respectfully, your obedient servant,

A. T. CROSBY, *Chief Clerk,*
For the Secretary of War, in his absence.

The honorable THE ATTORNEY-GENERAL.

WAR DEPARTMENT, OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, D. C., May 20, 1881.

MEMORANDUM.

The Signal Service had its origin in 1860, when, by the act of Congress approved June 21, there was added to the staff of the Army a major and signal officer to have charge, under the Secretary of War, of the manufacture and purchase of apparatus provided for by the same act.

The act of February 22, 1862, gave to the officers acting as signal officers the pay of mounted officers, but made no provision for the men who were detailed from the line. But the act of March 3, 1863, organized "The Signal Corps of the Army," with a Chief Signal Officer (a colonel) and subordinate officers (lieutenant-colonels, majors, and captains), and enlisted men (sergeants and privates) who were during the war of the rebellion a part of the regular Army. (See opinion of the Judge-Advocate-General, October 9, 1863, Inclosure A.)

Following this decision the forms of discharge were assimilated to those of regular troops (letters from Adjutant-General's Office, July 28, 1864, Inclosure B, and July 30, 1864, Inclosure C, and circular No. 40, War Department, Adjutant-General's Office, 1865, Inclosure D) and while in service they were transferred like other soldiers from one arm of service to another (General Order 106, War Department, Adjutant-General's Office, April 28, 1863, paragraph 2, Inclosure E).

It will be noted that this law, though it organized the corps on the same basis with regular troops, expired by its own limitation when the rebellion ended, and the corps accordingly ceased to exist. The last discharges were made in the early part of 1866.

No useful purpose will be served by examining the long contest between the Secretary of War and General Myer, by which the chief offices in the corps were kept vacant to

all intents and purposes from July 4, 1864 (Inclosure F), when General Myer's appointment as colonel, under the act of March 3, 1863, expired by constitutional limitation, and no successor was appointed until on the reorganization of the Army by the act approved July 28, 1866, section 22, Colonel Myer received his appointment and confirmation as colonel and head of the corps. But had he received the appointment and confirmation as colonel under the law of 1863 he would at the close of the rebellion have fallen back to the rank of major, as provided by the law of 1860, the law of 1863 having expired with the rebellion.

The new law of July 28, 1866 (Inclosure G), reads: "There shall be one Chief Signal Officer (colonel of cavalry). * * * And the Secretary of War shall have power to detail six officers and not to exceed 100 non-commissioned officers and privates from the battalion of engineers." * * * This was virtually a reorganization of the corps, the old corps of the rebellion having actually ceased to exist.

The Secretary of War was by this law given power but not command to make these details, and he proceeded to carry this law into effect by a departure from its text but not from its spirit. For various reasons this law was, so far as the enlisted men were concerned, practically suspended in execution until August, 1868. On the 18th of that month General Myer, the Chief Signal Officer (since July 28, 1866), applied (Inclosure H) to the Secretary of War for the assignment of a sufficent number of selected men of the general service, not attached to any regiment or corps, to constitute a garrison for Fort Greble, which he also asked might be placed under his exclusive control, and to furnish a detachment for instruction. In his letter he states in suggestive terms why men so selected will be more acceptable to him than the detail of the 100 non-commissioned officers and men of the engineers, for which the law of 1866 provided. A reply to this letter, dated on the 20th of August, 1868 (Inclosure I), informed General Myer that his application was approved, and that an officer had been directed to report to him for the purpose of selecting, "under your instructions, men from the recruits at the general depot, New York Harbor, to form a signal party to be stationed at Fort Greble." The request for putting Fort Greble exclusively under the control of the Chief Signal Officer was approved and directions given to carry it into immediate effect. The same letter contains a power very important in the consideration of the question now under discussion, *i. e.*, "should the number of men designed for the signal party not be selected from the recruits at the general depot, good men may be enlisted here for the party when they are approved by you, provided that not more than 50 in all are assigned to it." The legal status of men of the general service assigned to duties which are properly devolved by law upon the War Department will be further discussed, but it should be noted in passing that the authority given above is that under which, to the present time, or until June 20, 1878, lawful enlistments have been made in the Signal Corps.

On the 31st of March, 1870 (Inclosure K), the Secretary of War authorized the Chief Signal Officer to appoint from the general service men constituting the Signal Service detachment as many non-commissioned officers as may be necessary for its proper discipline, not to exceed the number provided for a company, to be paid in the same manner as other non-commissioned officers of the general service, United States Army, to take effect April 1, 1870. (War Department, 25, 1870.)

On the 19th April, 1870, the strength of this detachment was increased to a company of 60 privates, 4 corporals, 4 duty sergeants, and 1 first sergeant. (War Department, 32, 1870, Inclosure L.)

In the following July the detachment was still further increased by the selection of 30 men from the detachment of "select recruits" (really general service selected recruits) at Governor's Island, which men were detailed for instruction as observers (as necessitated by the joint resolution of Congress approved February 9, 1870, and the orders of the Secretary of War thereon, General Orders No. 29, Adjutant-General's Office, 1870, Inclosure M). These men were sent to Fort Whipple, which since had been occupied instead of Fort Greble as the instruction depot of the Signal Service. At the same time instructions from the Secretary of War authorized the Chief Signal Officer "to enlist suitable men and to advertise for them for the same purpose, limiting the number so enlisted to one for each point of observation designated, with the approval of the Secretary of War." "These men will receive the appointment of sergeant, and will be mustered and reported as belonging to the general service. They will be embraced on the same muster-rolls and monthly returns as the detachment at Fort Whipple, to be made according to the regulations direct to the Adjutant-General of the Army." "The officer appointed to enlist men for this purpose will render the usual recruiting returns to the Adjutant-General." The legal relations of these men to the military service was in all respects the same as that of the men enlisted at different recruiting stations in the country and sent to the recruiting depot at Governor's Island, and from whom the first detachment for Fort Greble was picked by the officer sent by the Chief Signal Officer under the letter of 20th April, 1868.

The demands for a high order of intelligence in these observer sergeants soon necessitated the giving certain assurances in order to maintain the proper mental standard, and the Secretary of War, on a recommendation by the Chief Signal Officer, on the 5th August, 1870, authorized (Inclosure N) the promise to these men that "though subject to strict military discipline while on this duty, they will not be transferred to any other branch of the service; and that a discharge will be given them when their services are no longer required." (Letter War Department, 12, Meteorological Division, 1870.)

In the assumed power to transfer these enlisted men to other branches of the (military) service may be found another recognition of their status as enlisted men of the Army.

A little later, on the 10th August, 1870 (Inclosure O), on recommendation of the Chief Signal Officer, "the pay and allowances of the general service men, enlisted for the duties of the observation and report of storms for the benefit of commerce on the northern lakes and seaboard," was made "the same as those of general service men of similar grades employed as clerks at the department headquarters of the military departments in which their stations may be." (See letter War Department, Meteorological Division, 14, 1870, Inclosure P; section 7, act approved July 13, 1866, Inclosure Q; paragraphs 902 and 903, article 39, Revised Regulations, 1863, as amended by General Orders 79, Adjutant-General's Office, 1866, Inclosure R; letter Headquarters Military Division Pacific, September 25, 1868, Inclosure S; General Orders 92, Adjutant-General's Office, November 4, 1868, and accompanying circular letter, Inclosure T; telegram, Adjutant-General's Office, November 5, 1868, Inclosure U; and General Orders 30, Adjutant-General's Office, April 6, 1869; Inclosure V, for explanation of the action recommended and approved at this time.)

The circular letter accompanying General Orders 92, Adjutant-General's Office, 1868, above, will explain in further detail the status of general service men; that they are not only enlisted like other soldiers, but that where general service detachments exist they may be completed by transfers from the line, or depleted by transfers to the line.

On the 5th July, 1871, the Signal Service detachment was again increased by the Secretary of War by the selection of 60 men from the general depot for recruits at Governor's Island (428, Signal Division, 1871, Inclosure W).

On the 27th February, 1872, the Secretary increased the number of sergeants to 125 in all (121 Meteorological Division, 1872, Inclosure X), and in March (25), 1873, the number of sergeants was still further increased by the same authority to 150 (256 Office Chief Signal Officer, Signal Division, 1873, Inclosure Y). These men as general service men were counted in the total enlisted strength of the Army as authorized by law, and as the number of enlisted men assigned to the Signal Service increased with the developments of meteorological observation, the strength of the other branches of the military service was diminished. Congress hereupon, June 16, 1874 (Inclosure Z), passed the first of the laws, which have been re-enacted with slight modifications annually, by which, as the Judge-Advocate-General of the Army held (November, 1875), "the stated force of the enlisted men of this (the Signal) Corps was clearly intended to be maintained as in addition to, or rather independent of, the enlisted force of the Army at large," which force by the same statute was "fixed at 25,000 men." (Winthrop's Digest, page 454.)

The language of this act, approved June 16, 1874, is worthy of attentive consideration: "Nothing, however, in this act shall be construed to diminish the Signal Service, which shall be maintained as now organized under the authority of the Secretary of War." Until this date, then, the Signal Service was charged with specific duties by law, which under the direction of the Secretary of War it was called upon to execute. But it was part and parcel of the Army. The necessities of the military service might in the opinion of the Secretary compel him to dispense with the further service of nearly the entire body, for we have seen that under the special guarantee of his authorizing the men though a part of the enlisted force of the Army could not like other soldiers be transferred to active regiments of the line. But from the date of this statute the men, though none the less a part of the enlisted force of the Army, were given a more fixed and independent status, and the Secretary was relieved from the embarrassment of finding their increase work a corresponding decrease in the active armed strength of his enlisted force.

The words "shall be maintained as now organized" are somewhat explained in confirmation of the view that at the date of the passage of this act (June, 1874) the men were general service men assigned to signal duty, and regularly enlisted in the Army, by the language of the Chief Signal Officer in the preceding annual report (1873) p.p. 234, 235 (Inclosure A). He says: "Recruiting for the Signal Service has been conducted under the direction of the War Department, that the recruiting officers of the general recruiting service at designated stations should enlist and order to this office such men, they passing the required physical examination, as may be presented to them by the recruiting observer, sergeants of the Signal Service."

The report then refers to Circular No. 17, 1873 (Inclosure B), herewith, dated Office Chief Signal Officer, June, 7. 1873. The following words are of interest, viz: "Entrance into this service in all cases is by enlistment as a private soldier in the regular Army of the United States, the pay, quarters, allowances, and duties being in the first instance, and unless changed after instruction, detail, or promotion, those of a private soldier in the Signal Service, &c." "The Secretary of War has power to grant discharges." These last words are full of meaning, for this power is derived from the fourth Article of War only, and can refer only to the persons who under paragraph 1342 Revised Statutes are excepted from the protection of the fifth amendment to the Constitution of the United States, and as persons in the land or naval forces are amenable to the military code. For if amenable to the Articles of War as enlisted men in one part they are amenable in all parts.

The subsequent acts approved March 3, 1875 (Inclosure C), had the same force as the act approved June 16, 1874 (Inclosure D); but the act approved July 24, 1876 (Inclosure E), fixed the number of enlisted men at 400, independently of the strength of the Army. The act approved June, 1878 (Inclosure F), increased the number to 450, and the act approved June 20, 1878 (Inclosure G), fixed the number at "150 sergeants, 30 corporals, and 270 privates, who shall receive the pay as engineer soldiers of similar grades," and provided for the promotion of 2 sergeants in each year "to be second lieutenants." This law would be sufficient even if under former laws there were any doubt, which is not admitted, to establish the full legal status of all the enlisted men of the Signal Corps from that date onward.

The act approved June 23, 1879, fixes the number as now organized (*i. e.*, with the same grades as the former act), including the provision for promotion. This law is regarded by some as an establishment of the corps from the date of its approval on a firmer basis. It certainly authorizes the enlistment for the Signal Corps of men who are graded and are to be paid like engineer soldiers of similar grades. The words in use in the law are, "And the enlisted force of the Signal Corps shall consist," &c. "Enlisted" is a word of technical and special meaning, which has no application to any branch of the public service not military; a term which, unqualified by other words, as by an exemption from military jurisdiction, has but one fair and authorized meaning; and used in connection with a branch of the War Department service, and with the maintenance or continuance of such service, and unlimited by qualifying phrases, means the enlistment of a soldier. "Enlist is a species of enrolling applicable only to the military or persons intended for military purposes." "In modern times soldiers are mostly raised by means of enlisting." (Crabbe's Synonyms.)

All the men of the Signal Service have been enlisted with the same formalities observed in the enlistment of other soldiers for the Regular Army, and they continue to be so enlisted as vacancies occur. The practice of the War Department was for years, until the early part of 1878, to style the Signal Service men in its orders "men of the general service, United States Army, now with the signal detachment, United States Army, at —," &c. The legal status of "general service men" is well understood. The Army needs recruiting constantly to maintain the units of its organization in serviceable condition. It is for the most part at places remote from the centers of population where recruiting is impossible. Recruiting stations are therefore established in localities named by the Adjutant-General of the Army, who by regulations (paragraph 911, General Regulations, 1863) is charged with the supervision of the recruiting service, under the directions of the Secretary of War.

Recruits so collected are sent from time to time to recruiting depots where they are instructed sufficiently to enable them to be classified and assigned to different arms with most promise of advantage to the service. Comparatively few men so recruited have any real preference for regiments of one arm or another, and as requisitions are made from companies, &c., orders are given to assign and send recruits to fill these requisitions. Hence there are at all times a certain number of men (see paragraph 8 of the now obsolete law of July 28, 1866) recruited for the Army who have been through all the forms of enlistment and are amenable to the discipline prescribed by the Articles of War, who do not belong to any regiment or corps but are classified in a group as "general service men," or "general service recruits," or "unassigned men," as they are indifferently termed without distinction. Among this class of men are the permanent parties at the recruiting depots.

There are necessities in the Army which can best be provided for by leaving a certain number of these men unassigned for indefinite periods. Principal among these are the clerical duties for which no other provision is made at the War Department and the headquarters of the military divisions and departments and at the offices of the superintendent of recruiting service. For these places general service men are more useful because more permanent than men who, being assigned to companies, are liable to follow the movements of their companies. It will require no argument to show that the Secretary

of War has powers of control over men after their assignment to companies, and before, or he would have no power to assign them to companies and in consequence he can leave them unassigned for indefinite periods, putting them on such duty as best serves the interests of his Department. This has now become the practice.

If these opinions of the status of general service men be incorrect, then the men employed from the earliest date in the office of the Adjutant-General and other offices of the War Department, those employed at headquarters of military divisions and departments, and indeed those belonging to permanent parties at recruiting stations, must be classed together as illegal; the men so employed have always been civilians; the transfers made from the line to the general service, and necessarily those made from the general service to the line, are and have been illegal, for all these men have been regarded as general service men unassigned to regiments. It is believed, on the contrary, that these men, in common with those of the Signal Service, were all properly enlisted in the Army and have been assigned by competent authority to specific and proper duties under the War Department. This view may be compared with the recommendation of the joint Congressional committee appointed under the act approved 18th June, 1878 (page 2555, Senate, Forty-fifth Congress, third session), and paragraph 37 of the reorganization law, proposed by them.

The enlisted force of the Signal Corps had from its origin, the date when General Myer's application was approved (20th April, 1868), been composed of men of the general service assigned to signal duty, until the passage of the law approved June 20, 1878, when it became a separate force of Signal Corps men; and in confirmation of this view see the acts making appropriation for the support of the Army passed at the time this act was pending and for the two subsequent years. These acts specially named the Signal Corps as an existing part of the military establishment, and made appropriation for them in common with other branches of the military service.

The foregoing is offered to show that the Signal Service is a purely military part of the War Department, not civil, or quasi military, with all the consequences of these distinctions necessarily considered. It has been the effort to show that the men of the Signal Service are and have always been in the military service of the United States, and these conclusions are believed to be warranted.—

1. By the historical development of the service.
2. By the nature of the contracts of these men's enlistments.
3. By the strongest and plainest statutory provisions—especially that of June 20, 1878.

ADDENDA TO MEMORANDUM REGARDING LEGAL STATUS OF THE SIGNAL CORPS.

1. The fact that the Signal Corps does not appear in section 1094, Title XIV, Revised Statutes as a part of the Army is susceptible of explanation entirely consistent with the opinion set forth as above. The last revision of the statutes was completed to January 1, 1878, at which time the enlisted force of the Signal Corps was made up of general service men assigned to signal duty, and though an independent force, the law as before shown did not there give it the separate status as the "enlisted force of the Signal Corps," which it obtained on the subsequent passage of the act approved June 20, 1878, and if this view is correct it would be proper in a new revision of the statutes to insert in section 1094, Title XIV, after the words "a Chief Signal Officer," and before "a Bureau of Military Justice," the words "the enlisted men (force) of the Signal Corps," and in a separate place to set forth the words of the act approved June 20, 1878, which create this force. This plan is conformable to that adopted for the Ordnance Corps, which in section 1094, Title XIV, Revised Statutes, is named as "an Ordnance Department," and as "the enlisted men of the Ordnance Department," and for the Engineer Corps, which is named "a Corps of Engineers," and "a battalion of engineer soldiers," compare sections 1154 and 1155, same title, with the phraseology of section 1094.

2. A point has been raised, with what intent is not clear, that notwithstanding the act approved June 20, 1878, the appropriation act approved February 24, 1881, in some manner affects this question. A comparison of H. Ex. Doc. No. 5, Forty-fifth Congress, first session, with H. Ex. Doc. No. 5, Forty-fifth Congress, third session, throws light upon this question.

In the first document quoted, page 10, will be found the estimate of appropriations required for the pay of the Army, in which the men of general service detailed for signal duty are included in the estimates of sergeants, corporals, and privates of cavalry, they being mounted under section 1194, Title XIV, Revised Statutes, and the total number of men estimated for pay will be found in Appendix A, page 35, of that document. On page 10, same document, will be found the estimate for commutation of subsistence for the Army and the men of the "Signal Service" and the "observers" are specified.

By reference to the second document quoted, page 10, it will be seen that the law of June 20, 1878, now having taken effect, the estimates for pay provide for the men of the

Signal Service in the corresponding ranks of engineers and ordnance soldiers. On page 71 the estimates for commutation of rations are made upon the same plan as the preceding year. The estimates for "pay" and "subsistence" in both these documents now being compared with the following estimates for transportation it will appear that the first two (pay and subsistence) are uniformly made in detail for all parts of the Army, and because they can easily be made the subject of specific estimates. There are so many men to be provided at such rates with pay or subsistence for one year. But transportation estimates are, of necessity, not so susceptible of exact treatment. The estimates quoted, though a year apart (1878, 1880), will be found to be for the same total amount, $4,400,000, with no attempt at specification. The act appropriating these funds follows the general plan of the estimates. It is therefore difficult to see that the point can be of any value in determining the legal status of the corps, and it would be as proper to regard the omission of specific mention of the "enlisted force of the Signal Corps" from mention in the appropriation for quarters as from the one item of transportation. If a part of the Army, they are as clearly within the reach of the benefits of the act as any other branch of the Army.

3. The fact that within the history of the Signal Service no detail has been made from the engineer battalion under section 1196, Title XIV, Revised Statutes, is believed to be unimportant in any view of the case. This section gives the Secretary discretionary power by the use of the word "may," and ought not to be construed as mandatory.

OFFICE CHIEF SIGNAL OFFICER.

Washington, D. C., May 31, 1881.

2. COMMISSIONED OFFICERS OF SIGNAL CORPS.

With regard to the status of the second lieutenants of the Signal Corps, the question has been raised whether the act approved June 20, 1878, really created in the Signal Corps grades for two sergeants, who may in each year be appointed to be second lieutenants or merely provided for the appointment of two second lieutenants in the Army by the promotion of two sergeants. If direct language is to be plainly interpreted, it is hard to see how any other view than the first can be maintained. After prescribing the enlisted force for the Signal Corps, it declares how these enlisted men may rise to the grade of commissioned officers, and this is by "appointment to be second lieutenants." This section of the act relates only to the Signal Corps, bears an appropriate caption, and is followed by sections which relate to no other branch of the Army. The act approved June 18, 1878, had provided already in plain terms for the promotion of deserving non-commissioned officers of this corps, in common with other non-commissioned officers of the Army. If the second interpretation is to be given to the act approved June 20, 1878, then its passage was entirely unnecessary, and, moreover, it might become inoperative by the fact that no vacancies in the grade of second lieutenant in the Army would be available for the assignment of two sergeants to be promoted annually. If the second view is taken, moreover, it is difficult to reconcile the language used with the general and natural form which would have been given to the words of the later act (June 20, 1878). Thus had there been a doubt of the applicability of the law approved June 18, 1878, to non-commissioned officers of the Signal Corps, the law would have taken natural form somewhat as follows: "That the provisions of the law approved June 18, 1878, are extended to include non-commissioned officers of the Signal Corps, who shall, like the non-commissioned officers of other staff corps, be eligible to promotion under the fourth section of said act." On the contrary, the words of the act approved June 20, 1878, ignore the existence of the act approved June 18, 1878, and in the simplest and plainest possible language provides for advancing two non-commissioned officers per annum to be second lieutenants; not of the Army, nor of the infantry, nor the cavalry, nor the artillery, but of the Signal Service; because this section of the act relates only and distinctly to the Signal Service.

The language of the conjunctive clause is very plain, simple, and direct. It says, "And two sergeants may in each year be appointed to be second lieutenants." Now, what is herein meant by these "two sergeants?" Plainly sergeants of the Signal Corps, for all the preceding language of the section refers only to the Signal Corps. They cannot be sergeants of the line, of infantry, cavalry, or artillery. Proceeding by the same rules of examination of this clause, what is meant by "second lieutenants" who are to be appointed? Here there is a total absence of any qualifying term or phrase. There is not even an implication of an intent to refer to the line of the Army. If the sergeants referred to in the same clause are sergeants of the Signal Corps, they are by an equally fair construction of language to "be appointed to be second lieutenants" of the Signal Corps. It would be manifestly a forced construction of language which would qualify one and leave unqualified the other of these terms.

If it is said that there was no such grade known as second lieutenant in the Signal

Corps to which these sergeants could be appointed, the answer is that this law created this grade. If it be said that there is no limitation of the number of second lieutenants who may be so appointed, it is answered that this law places a limitation upon the number by declaring that "two" may be appointed each year.

This construction appears to be the one to which the President arrived when he made the nomination of the officers who are now in commission, and that of the Senate when they confirmed these nominations, and it is that held by this office. It is significant, too, in the fact that this law was passed on June 20, 1878, it has not been amended or revised to suit the second construction, and that two sets of promotions have been made and confirmed, while a third now awaits the action of the President and Senate.

HEADQUARTERS MILITARY DIVISION OF THE PACIFIC,
San Francisco, Cal., September 25, 1868.

SIR: You are aware that the Adjutant-General's Department has up to this time been denied the privilege granted to the Quartermaster's Department, Subsistence Department, Pay Department, and others, of employing citizen clerks for service at headquarters of military divisions and departments. Not only inconvenience but actual detriment to the service results from the want of this clerical force. As a substitute for it, I earnestly invite your attention to what seems to me legal, proper, and practicable.

Section 8 of the act approved July 28, 1866, now in force, is as follows: "* * * and recruits may at all times be collected at the general rendezvous in addition to the number required to fill to the minimum all the regiments of the Army: *Provided*, That such recruits shall not exceed in the aggregate 3,000 men." Under this act grant authority for clerks and messengers detailed at headquarters of military divisions and departments, to be transferred from their companies to the "general service," and for the chief clerks to be rated as first sergeants of infantry, the other clerks as sergeants of infantry, and the messengers as corporals of infantry, limiting the number to be so rated, if you deem that necessary. This would greatly promote the efficiency of the various offices. Under present circumstances it is difficult to obtain and exceedingly difficult to retain suitable enlisted men in these duties in this division. The expenses here are very great, and suitable enlisted men are generally non-commissioned officers in their companies, and if taken away the captains naturally desire to reduce them to the ranks and fill their places, and when so reduced they cannot afford to remain here, and we lose them either by having to return them to their companies or by their refusal to re-enlist.

If you approve of and can affect this arrangement, as I earnestly hope you may, I would request, for special reasons affecting my own office, that it be done at the earliest date practicable.

I am, sir, very respectfully, your obedient servant,

JAMES B. FRY,
Assistant Adjutant-General.

To the ADJUTANT-GENERAL,
Washington, D. C.

Brevet Major-General GEORGE CROOK,
Commanding Department of the Columbia, Portland, Oreg.:

Under this order it is intended that the several commanders shall use their own discretion, without reference to this office, in obtaining, discharging, or transferring clerks to and from the general service detachment. They are authorized by their own order to transfer suitable clerks from companies within their command to the detachment or to enlist men for it.

It is recommended that no absolute conditions shall be made with the men, except such as are contingent upon their good conduct, so that if a man whose conduct has been good is no longer required at any time he may have the option of being discharged or transferred to a company to serve out his enlistment. But for misconduct he may be transferred to a company without the right to demand his discharge. All changes made under this order should appear on the muster-rolls for the period during which they occur.

Please correct copy of the order heretofore sent, so that the number of corporals in the fourth line, second paragraph, shall be two instead of one.

E. D. TOWNSEND,
Assistant Adjutant-General.

[Inclosure A.—Extract from annual report of the Chief Signal Officer for 1873.]

* * * * * * *

Recruiting for assignment to the Signal Service has been conducted under the direction of the War Department, that the recruiting officers of the general recruiting service at designated stations should enlist and order to this office such men, they passing the required physical examination, as may be presented to them by the recruiting observer, sergeants of the Signal Service. While the popularity of the service has been remarkable, its requirements are not always understood by those who apply to be enlisted. So much trouble has been occasioned to the Secretary of War by recruits complaining of the military duties considered by this office essential that a series of circulars and instructions, shown in papers 5 and 6 and paragraph 144 of paper 7, hereto annexed, have been prepared and so brought to the notice of every applicant for enlistment, the recruiting sergeant, and the recruiting officer, that misapprehension seems to be impossible.

DEPARTMENT OF JUSTICE,
Washington, July 1, 1881.

SIR: Herewith I submit a reply to yours of the 23d of May, addressed to the Attorney-General, in regard to the status of certain officers and privates of the Signal Corps.

After referring to a recent communication addressed to you by the Chief Signal Officer recommending that Sergeants Wright and Greene, of the Signal Corps, be appointed second lieutenants, Signal Corps, United States Army, you ask for an opinion whether—

1. Officers engaged in the performance of duties under section 221 to 223 of the Revised Statutes other than the Chief Signal Officer and officers detailed from the Army, as organized by chapter 1, Title XIV of the Revised Statutes, are a part of the Army of the United States.

2. The enlisted men engaged in the performance of the duties under section 221 to 223 of the Revised Statutes not detailed for such duties from any branch of the Army named in section 1094 of the Revised Statutes, but having indorsed on their enlistment papers the words "enlisted for the Signal Corps, United States Army," are a part of the Army of the United States.

The conclusion which I have reached is that such officers and enlisted men form a part of the Army of the United States in the sense that they are liable to all Army duties and entitled to all Army privileges that can be performed or be enjoyed without severing them from the Signal Service. In other words, as regards all such persons there is no such circulation so to say betwixt this member of the Army and other members thereof as exists betwixt those other members *inter se*. This state of separation between persons who belong to the same army may be anomalous, but results nevertheless from the legislation upon the subject, legislation which, concerning as it does a novel department of public administration, may well be expected to present novel features of detail. At all events nothing occurs or has been suggested to indicate that such details are unsuitable to the general purposes of Congress as regards the Signal Service, or are beyond its legislative competency.

The question is one of statutory interpretation only, and seems not difficult. It will require a consideration only of certain brief statutes recently enacted, beginning with the act of 1866, as found in sections 1195 and 1196 of the Revised Statutes. These sections create a signal force, to consist of one Chief Signal Officer, having the rank of colonel of cavalry (now brigadier-general, act of 1880, chapter 235), and of six officers from the Corps of Engineers, and not exceeding 100 non-commissioned officers and privates from the battalion of engineers.

By a resolution adopted February 9, 1870 (17 Stats., 369), the Secretary of War was authorized and required to provide for taking certain meteorological observations, and for giving notice of the approach and force of storms. This (or it may be some other action of Congress which has not been brought to my attention) was in practice construed as giving the Secretary authority to enlarge the signal force as above expressly defined; and other departures perhaps were made under orders, so that at the time of the passage of the act of 1874 (below) the force other than commissioned officers consisted as I gather (although that point is not material here) of about 300 men—150 of them being sergeants, who had been recruited for that especial purpose, under promise by the Secretary that they should not be transferred to any other part of the Army (see papers inclosed with your communication).

In this state of things the act of 1874, chapter 285 (18 Stat., 72), after providing that no money therein appropriated should be paid for recruiting the Army beyond 25,000 enlisted men, added as follows: "Nothing, however, in this act shall be construed to diminish the Signal Service, which shall be maintained as now organized under the authority of the Secretary of War."

It seems probable that as regards enlisted men (the only object of the above restrictive legislation, including the exception thereto) this act substituted the method adopted by the Secretary for recruiting the Signal Service as above, in place of that specified in the act of 1866, *i. e.*, that it provided that thereafter there were to be no enlisted men detailed from the Army into that service, but that special enlistment therefor was to take the place of detail.

The policy of the act of 1874 in confining the number of enlisted men in the Army proper to 25,000, coupled with the exception as above in favor of the Signal Service, has been kept up in all later Army appropriation acts. (See 18 Stats., 452; 19 do., 9720; do. 146, and the acts of 1880, chapter 81, and of February 24, 1881.)

Of these exceptions it will be necessary to quote only that contained in the act of 1880, chapter 81, as modified by the act of 1880, chapter 235, and the act of 1878, chapter 359, 20 Stat., 219. After inserting such modifications into its text, the exception in the statute first cited is as follows: "Nothing in this act shall be construed to prevent enlistments for the Signal Service, which shall hereafter be maintained as now organized and provided by law, with a force of enlisted men not exceeding 500, viz: 150 sergeants, 30 corporals, and 320 privates; and two sergeants may in each year be appointed to be second lieutenants.

The act of February 24, 1881, is to precisely the same effect.

1. Upon a perusal of the above legislation it appears that under the act of 1866 the enlisted men of the Signal Service were merely soldiers of the United States Army, under a special detail that was liable to be revoked at any moment. Subject to whatever modification the promise by the Secretary that they should not be transferred to ordinary military duty could effect, this status continued until after the act of 1874. Since then it has been plain that by law they cannot be transferred. But that in other respects they continue to belong to the United States Army seems equally plain: *Exceptio probat regulam.* For, to omit many details that concur to the same end, they continue to be enlisted. Enlistment is rendered necessary by all the statutes. The phrase is, no doubt, "enlisted for the Signal Service." But this phrase is elliptical, and suggests the question: Enlisted into what? Although the statutes express the purpose of the enlistment, they leave to be implied a portion of the effect of that ceremony. (Revised Statutes, sections 1111, 1112, 1118, 1119; see also 1608, 1610, &c.) Therefore the effect ordinarily produced by enlistment is to be implied, the more so when the history of the legislation upon this subject is considered; so that the answer to the above question will be, enlisted into the United States Army.

The practice in enlisting men has been to the same effect. The same general form is used by the Government for ordering enlistments into the Army and for those into the Signal Service; the person enlisted being required in both cases to acknowledge in terms that thereby he becomes "a soldier in the Army of the United States of America."

Upon the whole it seems that this point needs no further elaboration.

2. But that these enlisted men became members of only a special service in the Army seems equally certain.

The adoption by Congress in 1874 of the Secretary's engagement not to transfer to ordinary military duty persons enlisting for Signal Service did not create a mere personal privilege which might, as *jus pro se introductum*, be waived by such persons with the consent of the Secretary. The statute gave the consent of the United States to the condition required by the enlisted man, viz: that he should not be transferred to ordinary military duty, and thereupon a special status was created which could not be gotten rid of by either party to the enlistment without the consent of the other; the Secretary, in the mean time, not being empowered either impliedly or otherwise to represent the United States in giving that consent.

I apprehend that in the present state of legislation the only way in which a person enlisted for the Signal Service can enter the ordinary military service is by being discharged from the former and thereupon re-enlisted in the latter as usual. That the ordinary military force cannot, without further legislation, be recruited by transferring or detailing thereinto the signal force is a proposition which, as it appears to be a proper deduction from the acts themselves, so also is strongly fortified by recalling the history of the half dozen statutes since 1874 which contain the provisions under consideration. It will be recollected by all that the number of the ordinary force of enlisted men in the Army, 25,000, was the result of prolonged and heated discussions in Congress turning upon objections made by one party to any larger number subject to the ordinary duties of soldiers. The contest upon this point did not involve men enlisted in the Signal Service. No party seemed to suppose that the force of soldiers, in the general sense of the word, was larger in *esse* or in *posse* because of the Signal Corps. Indeed, the particular jealousy of Congress in regard to the Army proper was so far from manifesting itself in regard to the Signal Service that while the numbers of the former were diminished or, by compromise, rigidly held at a certain figure, those of the latter since 1874 have been

once and again increased, *nem. con.* as it were. I gather from this that Congress was of opinion that the number in the Army proper could not by mere executive action and without their consent be increased beyond the 25,000 by transferring thereto the 500 or other number of the Signal Service. In other words, that it was the intention of Congress to create for that service a distinct order of soldiers, *i. e.*, of persons whom it is best for the public service to be subject to the military rules and government, but who nevertheless are organically separate from the general mass of enlisted soldiers.

It follows that the second lieutenants spoken of in the act of 1880 above do not belong to the Army proper. The enactment upon this point is in general terms, but Congress must be taken to have had in view the creation of a higher rank of the same sort as that from which the person appointed was to come. If I have rightly construed this legislation in other respects, it is an alteration not so much of rank as of military quality that is required to change a Signal Service sergeant into a second lieutenant in the Army proper. The general scope of the enactment in which this clause is found concerns the Signal Corps, and in the absence of express qualifications to the contrary that scope must define the extent of any otherwise indefinite term therein found *noscitur a sociis*.

Besides this observation it is noticeable that at the same time that this act was pending before Congress that body was maturing another (1880, chapter 263, sections 3 and 4, 20 stat., 150), applying in terms to non-commissioned officers and second lieutenants of the Army proper, and very much more restricted in operation. It is hardly supposable that the legislation intended in both cases to meet and remedy the same evil. This circumstance renders more certain the above conclusion, that the evil sought to be remedied in the eighty-first chapter of the act of 1880 by the creation of second lieutenants was one affecting the Signal Service alone, and therefore that the remedy therein devised is to be restrained in its effect to that.

Upon the whole I have to repeat, as an answer to the questions stated by you, the qualified language first above employed.

Very respectfully, your obedient servant,

S. F. PHILLIPS,
Solicitor-General.

Approved.

WAYNE MACVEAGH,
Attorney-General.

The SECRETARY OF WAR.

[Paper A.—Special orders and correspondence.]

JUDGE-ADVOCATE GENERAL'S OFFICE,
October 9, 1863.

Respectfully returned. The present Signal Corps of the Army was organized under the provisions of sections 17, 18, 19, and 20 of chapter 79, act of March 3, 1863. The act specifies the number and grades of the officers of the Corps, and that they shall be appointed by the President, by and with the advice and consent of the Senate. Provision is also made for enlisting sergeants and privates into the Corps, as such, with the pay of engineer soldiers of the Regular Army. All officers and enlisted men are required, before entering upon their duties in the Corps, to be examined and approved by a military board convened by the Secretary of War. Officers and men are required also to serve in any part of the Army to which they may be ordered. It is assumed, also, that officers of the present Regular Army may be appointed to this Corps, and it is provided that if, after the rebellion, they are returned to their regiments, they shall lose no rank or promotion on account of having served in the Signal Corps meanwhile. And lastly, the Corps, as thus organized, is distinguished from the former temporary organization of the same character called "the Acting Signal Corps of the Army," which was composed to a considerable extent of volunteer officers detailed for duty therein; and it is provided that, in selecting officers and men for the present Corps, preference shall be given to those who have served faithfully in the "acting" Corps. From these peculiarities of organization, it is concluded that the Signal Corps is a part of the Regular Army of the United States. Though created by the necessities of the war, it is a permanent branch of the service, liable, however, with the Army to which it is attached, to be reduced or remodeled at the close of the rebellion.

J. HOLT,
Judge-Advocate General.

[Inclosure B.]

ADJUTANT-GENERAL'S OFFICE,
Washington, D. C., July 28, 1864.

SIR: I have the honor to acknowledge the receipt of a communication of the 7th ult. from Capt. F. W. Marston, Signal Corps, Department of the Gulf, requesting to be informed whether the enlisted men of the Signal Corps are to be discharged on final statements, or be mustered out on muster-rolls referred by you to the Secretary of War.

In reply, I am directed to inform you that as these men are considered as belonging to the Regular Army, they will be discharged on final statements by their officers, as required by Army Regulations, extract inclosed.

I am, sir, very respectfully, your obedient servant,

SAM'L. BRECK,
Assistant Adjutant General.

Maj. W. J. L. NICODEMUS,
In charge of Signal Corps, U. S. A.

NOTE.—The inclosure to this communication was entitled "Instructions concerning the discharge of enlisted men," dated War Department, Adjutant General's Office, Washington, June 17, 1864.

[Inclosure C.]

ADJUTANT-GENERAL'S OFFICE,
Washington, D. C., July 30, 1864.

SIR: I have the honor to acknowledge the receipt of a communication of the 20th instant from First Lieut. Cyrus W. Roberts, Chief Acting Signal Officer, Department of Kansas, Fort Leavenworth, Kansas, referred by you to this office, requesting to be informed if Sergeant Homer G. Woodin can be discharged at that point at the expiration of his term of service.

In reply, I have the honor to inform you that enlisted men of the Signal Corps, United States Army, being recognized as a part of the Regular Army, are to be discharged in the usual manner, with final statements.

I am, sir, very respectfully, your obedient servant,

SAM'L BRECK,
Assistant Adjutant General.

Maj. W. J. L. NICODEMUS,
Signal Corps, United States Army, Washington, D. C.

[Inclosure D.]

CIRCULAR No. 40.

WAR DEPARTMENT, ADJUTANT GENERAL'S OFFICE,
Washington, August 11, 1865.

Under the provisions of Special Orders No. 417 (paragraph 5), current series, from this office, relative to musters-out of the Signal Corps, the following will govern:

I. Commissioned officers will be mustered out in special orders from department headquarters, the order to be framed as follows, viz:

[Special Orders No. —.]

HEADQUARTERS DEPARTMENT OF ———,
———, —, 186-.

Under the provisions of General Orders, No. 79, May 1, 1865, and Special Orders, No. 417 (paragraph 5), August 3, 1865, from the War Department, Adjutant General's Office, the following officers are, by direction of the President, hereby mustered out and honorably discharged the service of the United States, on account of their services being no longer required.

They will receive no final payments until they shall have satisfied the Pay Department that they are not indebted to the Government.

II. Enlisted men will be discharged by their commanding officers on the order of the Department Commander, and paid on final statements.

E. D. TOWNSEND,
Assistant Adjutant General.

[Inclosure E—GENERAL ORDERS No. 106.]

WAR DEPARTMENT, ADJUTANT GENERAL'S OFFICE,
Washington, April 28, 1863.

1. A board of five officers (the signal officer and a medical officer of the Army being members) will be assembled in this city for the examination of officers now on signal duty in the Army of the Potomac, the Middle Department, and the Departments of Washington and Virginia; and thereafter, such persons as may be authorized by the Secretary of War to report to the Board for examination as candidates for commissions in this Corps. The same Board will examine enlisted men of the signal parties on duty in the Department of Washington, and such other candidates for enlistment in, or transfer to, the Corps, as may be brought before it.

2. As soon as practicable, the colonel and the two majors authorized by the act of March 3, 1863, shall be appointed.

3. Immediately after the appointment of the majors of the Signal Corps, auxiliary examining boards, in each of which one of the majors and a medical officer of the Army shall be members, will be appointed, for the examination of the officers now on signal duty in the Army corps and departments of the South and West; and thereafter, such other persons as may be authorized by the Secretary of War to report for examination as candidates for commission.

4. The commander of each Army corps or department in which the employment of signal parties is now, or may be, authorized, will immediately appoint a board of their officers, two of whom shall be officers now on signal duty and the third a medical officer, for the examination of enlisted men now on signal duty, who are candidates for transfer to, or enlistment in, the Signal Corps; and, if necessary to complete the organization of the signal parties in their command, such other persons as they may authorize to report for examination as candidates for enlistment. If the army corps forms a part of an army, then orders will be subject to the approval of the commanding general of that army.

5. The Board instituted by the first section will hold its sessions in the city of Washington, will adjourn from time to time according to the business before it, and be reassembled by order of its president It will call before it the officers to be examined by requisitions upon the commanding generals of the armies or departments in which they are serving; but, in order that no inconvenience to the service shall result, these requisitions shall be subject to the discretion of the commanding general as to the time and order in which the officers called for shall report, care being taken that the officers to be withdrawn shall be replaced in advance, as far as practicable, by others who have passed satisfactory examinations.

6. The boards instituted by section 3 will report in succession at the headquarters of the army, army corps, or departments in the districts to which they may be assigned, and will be subject to the discretion of the commanding generals as to the time and place of meeting, and the order in which candidates are to be examined.

7. Examining boards will be governed by the following rules:

First. Candidates for commissions shall be examined upon reading, writing, composition, and arithmetic; elementary chemistry, and the elementary branches of natural philosophy, surveying, and topography; the use and management of field signals and field telegraphs, and those who have served in the acting corps upon the mode of conducting signal parties in the field, and in the presence of the enemy, and upon rendering the proper papers and reports.

Second. Candidates for warrants shall be examined upon reading, writing, geography, and arithmetic.

Third. No person shall be recommended for appointment or enlistment in the Signal Corps who is not of good moral character, and physically competent for the duties.

Fourth. The several examining boards will adopt such forms of proceeding in questions upon the different branches of education enumerated above, or employ such other methods of ascertaining the merits of the different candidates as may seem expedient, having due reference to their mental and physical qualifications.

8. The principal and auxiliary examining boards will make to the Secretary of War, through the Signal Officer, weekly reports of the examinations made by them, designating by name, regiment, age, nativity, &c., of the persons examined, the grade for which they are recommended, and their recent standing, as determined by the examination and by their record of service. In the case of the auxiliary boards directed by sections 3 and 4, these reports will be transmitted through the commanding generals of the army or department in which the examinations were made.

9. As soon as the examinations of the auxiliary boards have been completed, a revising board, constituted as directed in the first section, with the addition of the majors who were members of the boards directed by the third section, will assemble in this city

for the purpose of reviewing the action of the several examining boards; determining the relative standing of the officers of each grade; the rules to be observed in the appointments to the grade of first and second lieutenants; the classification of enlisted men; and making such other recommendations as may have been suggested by observation and experience as essential to a perfect organization of the corps.

10. Until the reports of the revising board have been approved by the Secretary of War, the appointments in the Signal Corps will be limited to the colonel and the two majors, one captain, two first lieutenants, and four second lieutenants for each army corps or department in which signal parties have been or may be authorized; and the enlistments or transfers, to one sergeant, two privates of the first class, and four privates of the second class. The appointments thus made to be temporary; and the permanent standing of the officers to be determined by the action of the President, upon the recommendations of the reviewing board.

11. In order to facilitate as much as possible the organization of the corps, the commanders of army corps and departments are authorized to transfer enlisted men, now employed on signal duty who have passed satisfactory examinations, to the Signal Corps, copies of the muster and descriptive rolls of the men so transferred being sent to the headquarters of the corps in this city; and the chief signal officers in each army corps or department are authorized to complete the signal parties under their charge by the enlistment of a sufficient number of approved candidates: *Provided*, That all officers and men now on signal duty who may fail to pass satisfactory examinations shall be returned to their regiments; and any officers and men retained in the service under the provisions of War Department General Orders No. 92, who, in like manner, fail to pass satisfactory examinations, shall at once be discharged from the service of the United States by the commander of the army or department in which they are serving.

12. The chief signal officer in an army corps or department is authorized to appoint, upon the recommendation of the examining board, and subject to the approval of the colonel of the corps, the sergeants authorized for the parties under his charge, and, upon a like recommendation and approval, to designate the privates of the first and second classes.

13. Recruiting for the Signal Corps will be conducted under the rules prescribed for the regimental recruiting service. Enlistments will be made for the period of three years, or during the war; but enlisted men now on duty in the Signal Corps may re-enlist for the period of one or two years, and will be entitled to the benefits provided by the 18th section of the act of Congress approved March 3, 1863.

By order of the Secretary of War.

E. D. TOWNSEND,
Assistant Adjutant General.

[Inclosure F.]

Extract from Official Army Register for January, 1890.

SIGNAL CORPS.

CHIEF SIGNAL OFFICER.

Colonel.

Myer, Albert J., July 28, '66 (born in N. Y.; appt'd from N. Y.).

* * * * * * *

Col., Chf. Sig. Off., Mar. 3, '63, acc. Apl. 29, '63; vac. com. of maj., Chf. Sig. Off., Apr. 29, '63; appt. of col., Chief Sig. Off., *exp. by con. lim.*, July 4, '64, and *revoked* July 21, '64, paid to July 31, '64; brig. gen. bvt. Mar. 13, '65.

* * * * * * *

Col. Chf. Sig. Off., July 28, '66, acc. Nov. 3, '66.

[Inclosure G.]

AN ACT to increase and fix the military peace establishment of the United States.

* * * * * * *

SEC. 22. *And be it further enacted*, That there shall be one Chief Signal Officer of the Army, who shall have the rank, pay, and emoluments of a colonel of cavalry; and the Secretary of War shall have power to detail six officers, and not to exceed one hundred

non-commissioned officers and privates from the battalion of engineers for the performance of signal duty; but no officer or enlisted man shall be so detailed until he shall have been examined and approved by a military board, to be convened by the Secretary of War for that purpose; and enlisted men, while so detailed, shall, when deemed necessary, be mounted upon horses provided by the Government. (Statutes at Large, vol. 14, page 335, ch. 299, 1866.)

Approved July 28, 1866.

[Inclosure H.]

OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, D. C., August 18, 1868.

SIR: I have the honor to suggest as follows:

1. That the officers designated by generals commanding departments to be acting signal officers west of the Mississippi River be ordered to report to the Chief Signal Officer as the designations are received. The necessity for instruction west of the Mississippi is greater, and it will require much more time than for the departments east of that river, while the distance to be traveled will cause these officers to report as it is desired they should at different periods of time.

2. That, as heretofore recommended, Fort Greble be placed under the control of the Chief Signal Officer of the Army.

3. That a detachment of selected men of the general service, sufficient in number to afford a proper guard and to do post duty at the fort, and at the same time to furnish a sufficient detail to be instructed, report, as heretofore recommended, to the Chief Signal Officer for duty.

The opportunity now afforded for selecting a sufficient detail from the general service of men unusually well taught and not attached to any regiment or corps ought to be availed of.

The law contemplates the detail for this service of one hundred non-commissioned officers and men of engineers. A detail to be made from the general service in the mode suggested would be acceptable to the Chief Signal Officer and would avoid annoyances.

I am, sir, very respectfully, your obedient servant,

ALBERT J. MYER,
Bvt. Brig. Genl. and Chief Signal Officer of the Army.

To the honorable THE SECRETARY OF WAR,
Washington, D. C.

[Inclosure I.]

WAR DEPARTMENT, ADJUTANT GENERAL'S OFFICE,
Washington, August 20, 1868.

SIR: Referring to your letter of the 18th instant, you are respectfully informed that orders have been issued directing Lieut. J. P. Story, 34th Infantry, who has been ordered to report to you, to select, under your instructions, men from the recruits at the general depot, New York Harbor, to form a signal party to be stationed at Fort Greble, and that your recommendation of the 11th instant, that the post at Fort Greble be placed under your control, has been approved by the Secretary of War and the fact communicated to General Canby, commanding Department of Washington, by letter of this date from this office, a copy of which, together with a copy of a letter to General Butterfield, relative to the selection and forwarding of the detachment to form the signal party, is respectfully inclosed for your information.

Should the number of men designated for the signal party not be selected from the recruits at the general depot, good men may be enlisted here for the party when they are approved by you, provided that not more than fifty men in all are assigned to it.

The details of officers to report to you for signal duty will be made as they are reported by department and district commanders.

Very respectfully, your obedient servant,

J. C. KELTON,
Assistant Adjutant General.

Brevet Brigadier General A. J. MYER,
Chief Signal Officer, Washington, D. C.

[Inclosure K.]

ADJUTANT GENERAL'S OFFICE.
Washington, March 31, 1870.

GENERAL: I have to inform you that your application for authority to appoint from the general service men constituting the Signal Service detachment as many non-commissioned officers as may be necessary for its proper discipline, not to exceed the number provided for a company, to be paid in the same manner as other non-commissioned officers of the general service, United States Army, having been submitted to the Secretary of War, is approved to take effect April 1, 1870.

I am, very respectfully, your obedient servant,

E. D. TOWNSEND,
Adjutant General.

Brevet Brigadier General A. J. MYER, U. S. A.,
Chief Signal Officer, Washington, D. C.

[Inclosure L.]

WAR DEPARTMENT, ADJUTANT GENERAL'S OFFICE,
Washington, April 19, 1870.

SIR: I have the honor to inform you that the recommendation contained in your communication of the 12th inst., "that the Signal Service detachment at Fort Whipple, Virginia, be maintained at the strength of a company," has been approved by the Secretary of War, and the General of the Army directs me to inform you that you can appoint your own non-commissioned officers and assign enough recruits from time to time, to the extent of sixty (60) privates, four (4) corporals, four (4) duty sergeants, and one (1) first sergeant.

Very respectfully, your obedient servant,

E. D. TOWNSEND,
Adjutant General.

Brevet Brigadier General A. J. MYER,
Chief Signal Officer, Washington, D. C.

[Inclosure M—GENERAL ORDERS No. 29.]

HEADQUARTERS OF THE ARMY, ADJUTANT GENERAL'S OFFICE,
Washington, March 15, 1870.

By direction of the Secretary of War the following public resolution and orders are published for the information of all concerned:

[Public resolution—No. 9.]

JOINT RESOLUTION to authorize the Secretary of War to provide for taking meteorological observations at the military stations and other points in the interior of the continent, and for giving notice on the northern lakes and seaboard of the approach and force of storms.

Be it resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of War be, and he hereby is, authorized and required to provide for taking meteorological observations at the military stations in the interior of the continent and at other points in the States and Territories of the United States, and for giving notice on the northern lakes and on the sea-coast, by magnetic telegraph and marine signals, of the approach and force of storms.

Approved February 9, 1870.

The Chief Signal Officer of the Army is charged, subject to the direction of the Secretary of War, with the special duties of the observation and giving notice, by telegraph and signal, of the approach and force of storms, under the provisions of this resolution.

The undertaking thus imposed upon the Secretary of War is for the benefit of the commerce of the United States. It is therefore expected that all commanding officers will afford every facility for its successful discharge; and all scientific establishments, commercial associations, and others are requested to aid, by their co-operation, in its accomplishment.

By command of General Sherman:

E. D. TOWNSEND,
Adjutant General.

[Inclosure N.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE,
Washington, D. C., August 5, 1870.

SIR: I respectfully recommend that the Chief Signal Officer be authorized to inform candidates for enlistment as sergeants for the "observation and report of storms, by telegraph and signal, for the benefit of the commerce of the northern lakes and seaboard," that although they will be subject to strict military discipline while on this duty, they will not be transferred to any other branch of the service, and that a discharge will be given them when their services are no longer required.

I am, sir, very respectfully, your obedient servant,

ALBERT J. MYER,
Brevet Brig. Gen'l and Chief Signal Officer of the Army.

To the honorable THE SECRETARY OF WAR,
Washington, D. C.

Approved:

WM. W. BELKNAP,
Secretary of War.

AUGUST 5, 1870.

[Inclosure O and P.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE,
Washington, D. C., August 9, 1870.

SIR: I respectfully recommend that the pay and allowances of general service men, enlisted for the duties of the observation and report of storms for the benefit of commerce on the northern lakes and seaboard, be the same as those of general service men of similar grades employed as clerks at the department headquarters of the military department in which their stations may be.

I am, sir, very respectfully, your obedient servant,

ALBERT J. MYER,
Brevet Brig. Gen'l and Chief Signal Officer of the Army.

To the honorable THE SECRETARY OF WAR,
Washington, D. C.

Approved August 10, 1870.
W. D., Met. Div. 14, 1870.

[Inclosure Q—GENERAL ORDERS No. 48.]

WAR DEPARTMENT, ADJUTANT GENERAL'S OFFICE,
Washington, July 19, 1866.

The following joint resolution and acts of Congress are published for the information and government of all concerned:

* * * * * * *

[Public—No. 103.]

AN ACT making appropriations for the support of the Army for the year ending 30th of June, 1867, and for other purposes.

* * * * * * *

SEC. 7. *And be it further enacted*, That when it is necessary to employ soldiers as artificers or laborers in the construction of permanent military works, public roads, or other constant labor of not less than ten days' duration in any case, they shall receive, in addition to their regular pay, the following additional compensation therefor: Enlisted men working as artificers, and non-commissioned officers employed as overseers of such work, not exceeding one overseer for every twenty men, thirty-five cents per day; and enlisted men employed as laborers, twenty cents per day; but such working parties shall only be authorized on the written order of a commanding officer. This allowance of extra pay is not to apply to the troops of the Engineer and Ordinance Departments.

* * * * * * *

Approved July 13, 1866.
By order of the Secretary of War:

E. D. TOWNSEND,
Assistant Adjutant General.

[Inclosure R—GENERAL ORDERS No. 79.]

WAR DEPARTMENT, ADJUTANT GENERAL'S OFFICE.
Washington, September 22, 1866.

In accordance with section 7, act approved July 13, 1866, the following are substituted for paragraphs 902 and 903, article 39, of Revised Regulations of 1863:

902. When it is necessary to employ soldiers as artificers or laborers in the construction of permanent military works, public roads, or other constant labor of not less than ten days' duration in any case, they shall receive, in addition to their regular pay, the following additional compensation therefor: Enlisted men working as artificers, and non-commissioned officers employed as overseers of such work, not exceeding one overseer for every twenty men, thirty-five cents per day; and enlisted men employed as laborers twenty cents per day. The non-commissioned officers and soldiers so employed are to be mustered as extra-duty men. The allowance of thirty-five cents a day is to those employed as mechanics, overseers, and clerks in the Bureaus of the War Department, at the Headquarters of the Army, and at military division or department headquarters. But no man shall be rated and paid as a clerk, overseer, or mechanic who is not actually employed as such. Commanding officers will particularly see to this; nor shall any soldier be rated at higher pay than twenty cents per day, except by their order.

903. Enlisted men of the Ordnance and Engineer Departments, artificers of artillery, hospital stewards and ordnance sergeants, are not entitled to this allowance.

By order of the Secretary of War:

E. D. TOWNSEND,
Assistant Adjutant General.

[Inclosure S.]

HEADQUARTERS MILITARY DIVISION OF THE PACIFIC,
San Francisco, Cal., September 15, 1868.

SIR: You are aware that the Adjutant-General's Department has up to this time been denied the privilege granted to the Quartermaster's Department, Subsistence Department, Pay Department, and others of employing citizen clerks for service at headquarters of military divisions and departments. Not only inconvenience but actual detriment to the service results from the want of this clerical force. As a substitute for it, I earnestly invite your attention to what seems to me legal, proper, and practicable.

Section 8 of the act approved July 28, 1866, now in force, is as follows: " * * * and recruits may at all times be collected" at the general rendezvous in addition to the number required to "fill to the minimum all the regiments of the Army;" provided, "such recruits shall not exceed in the aggregate 3,000 men." Under this act grant authority for clerks and messengers detailed at headquarters of military divisions and departments to be transferred from their companies to the "general service" and for the chief clerks to be rated as first sergeants of infantry, the other clerks as sergeants of infantry, and the messengers as corporals of infantry; limiting the number to be so rated, if you deem that necessary. This would greatly promote the efficiency of the various offices. Under present circumstances it is difficult to obtain, and exceedingly difficult to retain, suitable enlisted men in these duties in this division. The expenses here are very great, and suitable enlisted men are generally non-commissioned officers in their companies and if taken away the captains naturally desire to reduce them to the ranks and fill their places, and when so reduced they cannot afford to remain here, and we lose them either by having to return them to their companies or by their refusal to re-enlist.

If you approve of and can effect the arrangement, as I earnestly hope you may, I would request, for special reasons affecting my own office, that it be done at the earliest date practicable.

I am sir, very respectfully, your obedient servant,

JAMES B. FRY,
Assistant Adjutant General.

To the ADJUTANT GENERAL,
Washington D. C.

[Inclosure T.—GENERAL ORDERS No. 92.]

HEADQUARTERS OF THE ARMY, ADJUTANT GENERAL'S OFFICE,
Washington, November 4, 1868.

The following order has been received from the War Department and is published for the government of all concerned. No other allowances of the class designated than those herein prescribed will be sanctioned after January 1, 1869:

The records of divisions, departments, and districts show a very large number of

soldiers employed on extra duty as clerks, messengers, and orderlies at their headquarters This is probably in some degree due to the difficulty of obtaining and keeping the necessary number of efficient and reliable men under the present uncertain system of details.

Accordingly the commanding generals of military divisions and departments, and of the military districts, are hereby authorized to enlist a detachment of "general service" men, in no case exceeding one sergeant, two corporals, and ten privates, and as much less as the actual necessities of the service will permit, to be employed as clerks at their headquarters; and they are authorized to discharge them from time to time when they are not required as clerks. It is expected that the efficiency of clerks thus obtained will greatly diminish the necessity for a large number.

If it be necessary to employ any men in excess of the number above authorized, the commanding generals must detail them from regiments serving within their commands; and in this case the men will not be dropped from the rolls of their companies.

Extra pay and commutation of rations, fuel, and quarters will be allowed under this order for the number of men and at the rates laid down in the following table. For any detailed men in excess of such number, only the cost price of the regulation allowance of rations, fuel, and quarters, and no extra pay will, under any circumstances, be authorized:

Grade.	Number allowed.	Extra pay per diem.	Commutation.		
			R'tions p'r diem.	Fuel per month.	Quarters per m'nth.
Clerks (general service)	13	$0 35	$0 75	$8 00	$10 00
Messengers (detailed from companies)	5	20	50	8 00	10 00

Muster and muster and pay rolls of the detachments will be made as prescribed in the Army Regulations for companies. The general service men and detailed men will be all mustered on the same rolls, with remarks showing to what commands or companies they properly belong. The detailed men who receive extra-duty pay and allowances will be distinguished from those detailed in excess of the authorized number.

This order will begin to go into effect immediately on its receipt, and the reductions to be made under its provisions must be fully completed by January 1, 1869.

By command of General Grant:

E. D. TOWNSEND,
Assistant Adjutant General.

Inclosure U.

WASHINGTON, D. C., *November* 5, 1868.

Brevet Major-General JAMES B. FRY,
Assistant Adjutant General:

You are authorized to enlist not more than one sergeant, two corporals, ten privates, general service, as clerks, and detail from companies not more than five privates for messengers, per division and each department headquarters; clerks, 35 cents extra pay, 75 cents rations, $8 fuel, $10 quarters; messengers, 25 cents extra pay, 50 cents rations, fuel and quarters same as clerks.

E. D. TOWNSEND,
Assistant Adjutant General.

[Inclosure V.—GENERAL ORDERS No. 30.]

HEADQUARTERS OF THE ARMY, ADJUTANT GENERAL'S OFFICE,
Washington, April 6, 1869.

The following regulations have been received from the War Department and are published for the government of all concerned:

I. The number of clerks and messengers allowed to the headquarters of military divisions and departments out of the general service recruits, as prescribed in General Orders No. 92, of November 4, 1868, will be reduced so that from the 1st of July next they will not exceed ten in the aggregate, all of whom will be rated as clerks and allowed the extra pay and commutations prescribed for "clerks."

II. The aggregate number of hired citizens employed by the Quartermaster's Department, whether rated as clerks, teamsters, mechanics, or laborers, will be reduced as rapidly as possible, so that by the 1st of July, 1869, and thereafter, they will not exceed four thousand in the aggregate. The Quartermaster General will distribute this number

to the several departments according to the number of troops therein or according to the work to be done; and when any necessity arises for a special number of hired men in excess of the above number he will submit the case for the orders of the President.

III. The commanding generals of military divisions and departments will cause thorough inspections to be made as to the number of officers drawing commutation for fuel and quarters, and will reduce the number as much as possible. All officers and troops should be quartered in the regular forts and barracks belonging to the United States whenever it be possible, and when the barracks are inadequate for all military purposes they may submit plans and estimates for new or enlarged barracks, with a view to accommodate in public buildings the Army on its present standard.

IV. In like manner the commanding generals of divisions and departments will cause a thorough inquiry into all the means of transportation, whether of animals, wagons, barges, boats, &c., with a view to a reduction to the actual wants of the service, and will report thereon specially to the Headquarters of the Army.

By command of General Sherman:

E. D. TOWNSEND,
Assistant Adjutant General.

Brevet Major General GEO. CROOK,
Commanding Department of the Columbia, Portland, Oregon:

Under this order it is intended that the several commanders shall exercise their own discretion, without reference to this office, in obtaining, discharging, and transferring clerks to and from the general service detachment. They are authorized by their own order to transfer suitable clerks from companies within their command to the detachment, or to enlist men for it.

It is recommended that no absolute conditions shall be made with the men except such as are contingent upon their good conduct; so that if a man, whose conduct has been good is no longer required at any time he may have the option of being discharged or transferred to a company to serve out his enlistment. But for misconduct he may be transferred to a company without the right to demand his discharge. All changes made under this order should appear on the muster-rolls for the period during which they occur. Please correct copy of the order heretofore sent, so that the number of corporals in the fourth line, second paragraph, shall be two instead of one.

E. D. TOWNSEND,
Assistant Adjutant General.

[Inclosure W.]

WAR DEPARTMENT, ADJUTANT GENERAL'S OFFICE,
Washington, July, 5, 1871.

SIR: The Secretary of War has authorized the selection of sixty recruits from those which are or may from time to time become disposable at the depot, who on examination may be found suitable for employment in the Signal Service detachment and school of instruction at Fort Whipple, Virginia, the selection to be made by a commissioned officer designated by the Chief Signal Officer of the Army.

You will please give General Myer every assistance in your power in procuring the best men possible, without, however, breaking in upon the "permanent company."

Very respectfully, your obedient servant,

THOMAS M. VINCENT,
Assistant Adjutant General.

To the SUPERINTENDENT GENERAL RECRUITING SERVICE,
(*Eastern Division*) *New York City.*

[Inclosure X.]

ADJUTANT GENERAL'S OFFICE,
Washington, D. C., February 27, 1872.

GENERAL: Referring to your letter of January 12, 1872, relative to the number of sergeants in the Army, I am instructed to inform you that the number of sergeants in the Signal Corps may be increased as high as 125 in all.

I am, sir, very respectfully, your obedient servant,

E. D. TOWNSEND,
Adjutant General.

Brevet Brigadier General A. J. MYER,
Chief Signal Officer, U. S. A., Washington, D. C.

[Inclosure Y.]

WAR DEPARTMENT, ADJUTANT GENERAL'S OFFICE,
Washington, March 25, 1873.

GENERAL: In reply to your communication of March 20, 1873, I have respectfully to inform you that the Secretary of War has approved of your recommendation that the number of sergeants in the Signal Corps be increased to 150 in all.

Very respectfully, your obedient servant,

E. D. TOWNSEND,
Adjutant General.

Brigadier General A. J. MYER,
Chief Signal Officer, U. S. A., Washington, D. C.

[Inclosure Z.]

AN ACT making appropriations for the support of the Army for the fiscal year ending June thirtieth, eighteen hundred and seventy-five, and for other purposes.

* * * * * * *

For expenses of recruiting and transportation of recruits, $105,000. And no money appropriated by this act shall be paid for recruiting the Army beyond the number of 25,000 enlisted including Indian scouts. Nothing, however, in this act shall be construed to diminish the Signal Service, which shall be maintained, as now organized, under the authority of the Secretary of War.

* * * * * * *

Approved June 16, 1874.

[Inclosure A.—Extract from annual report of the Chief Signal Officer for 1873.]

* * * Recruiting for assignment to the Signal Service has been conducted under the direction of the War Department, that the recruiting officers of the general recruiting service at designated stations should enlist and order to this office such men, they passing the required physical examination, as may be presented to them by the recruiting observer sergeants of the Signal Service. While the popularity of the service has been remarkable, its requirements are not always understood by those who apply to be enlisted. So much trouble has been occasioned to the Secretary of War by recruits complaining of the military duties considered by this office essential that a series of circulars and instructions shown in papers 5 and 6 and paragraph 144 of paper 7, hereto annexed, have been prepared and so brought to the notice of every applicant for enlistment, the recruiting sergeant, and recruiting officer that misapprehension seems to be impossible.

WAR DEPARTMENT, OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, D. C., June 7, 1873.

[Circular No. 17.]

This circular is published for the information of those desiring to enter the Signal Service, United States Army, with reference to its field duties, including field signals and electric telegraph, as distinguished from the full duties of that service, which include the observation and report of storms and display of cautionary signals, &c.

1. Entrance into this service in all cases is by enlistment as a private soldier in the Regular Army of the United States, the pay, quarters, allowances, and duties being, in the first instance, and unless changed after instruction, detail, or promotion, those of a private soldier in the Signal Service, United States Army. All men enlisted are drilled in the use of arms and disciplined in the duties of soldiers. The term of service is five years, unless sooner discharged. The Secretary of War has power to grant discharges, which this office is authorized to promise when applied for on proper grounds, and at times when no special injury to the service would result therefrom; but as a rule no application for discharge will be favorably entertained until after two years of faithful service, and not then, except as above specified. With the single exception that men enlisting for the Signal Service will not be transferred to any other branch of the Army, no promise will be given which can alter or affect the usual terms of enlistment. The service, while strictly military, is also probationary, with opportunities for advancement, depending mainly on the good conduct and capacity of each individual.

Married men and those under twenty-one or over forty years of age are not enlisted. The standard height is five feet four inches and upward.

2. Applicants can present themselves in person to the officer in charge at Fort Whipple, Virginia, near Washington, D. C., or to the observer sergeants of the Signal Service at the following points, viz: New York, Philadelphia, Baltimore, Cincinnati, Saint Louis, Boston, Buffalo, Chicago, Cleveland, Detroit, Indianapolis, and Louisville, which sergeants are ordered to present proper applicants to the recruiting officers of the United States Army in those cities. No promise or statement different from this circular, made by any one, is authorized, or will be allowed to affect the terms of enlistment of any recruit. Recruits enlisted at Fort Whipple, or at the above-mentioned cities, are placed on duty in the first instance at Fort Whipple or at such other stations where their services may be made available. They will not be precluded from eventual advancement to the full duties of the Signal Service, and promotion, in case they prove fit and worthy, but will not be considered as included, upon their enlistment, in the regulations made for those recruits who may have been enlisted with special reference to the full duties above referred to. They may, however, be subject to detail on any of the duties of the Signal Service in the discretion of higher authority.

3. The pay and allowances of either a sergeant or private vary according to the character and place of the duties and the length of the service of each individual. The following table exhibits the average amount per month for five years, according to the present law:

	When at Fort Whipple, Va., or at a military post.	When on station.	When at this office.
Sergeants	$31 87	$74 68	$92 49
Privates	17 18	57 99	86 45

Of the above amounts one dollar per month in the third year, two dollars per month in the fourth year, and three dollars per month in the fifth year, are retained, and will not be paid until final discharge after faithful service. An allowance for clothing, averaging $3.02 per month for sergeants and $2.98 for privates, is also included in the above, which, if clothing is not drawn in kind, is also retained until discharge. When at Fort Whipple both sergeants and privates receive quarters and rations, and at all places are, when ill, provided with medical attendance and medicines.

4. Applications being frequently made for enlistment in this service, conditioned upon the applicant being placed upon some specified duty or stationed at a particular place, it is to be clearly understood that no such qualification of the contract of enlistment will be allowed or considered, the wants of the service, which cannot be known in advance, regulating all details of duty.

By order of the Chief Signal Officer of the Army:

GARRICK MALLERY,

Captain and Brevet Lieut. Col., U. S. A., Acting Signal Officer and Assistant.

[Inclosure b.]

——— ———, the undersigned, having read and understanding the above circular, do, in accordance with its terms, offer ——— ——— for enlistment as a private soldier in the Signal Service, United States Army.

Place.	Date.	Signature.	Witness to signature.

[Inclosure c.]

AN ACT making appropriations for the support of the Army for the fiscal year ending June thirtieth, eighteen hundred and seventy-six, and for other purposes.

* * * For expenses of recruiting and transportation of recruits, $105,000. And no money appropriated by this act shall be paid for recruiting the Army beyond the number of 25,000 enlisted men, including Indian scouts and hospital stewards. Nothing, however, in this act shall be construed to prevent enlistments for the Signal Service, which shall hereafter be maintained as now organized, and with the force of enlisted men now provided by law. (Statutes at Large, vol. 18, page 452, ch. 133, 1875.)

Approved March 3, 1875.

[Inclosure d.]

AN ACT making appropriations for the support of the Army for the fiscal year ending June thirtieth, eighteen hundred and seventy-five, and for other purposes.

* * * For expenses of recruiting and transportation of recruits, $105,000. And no money appropriated by this act shall be paid for recruiting the Army beyond the number of 25,000 enlisted men, including Indian scouts. Nothing, however, in this act shall be construed to diminish the Signal Service, which shall be maintained, as now organized, under the authority of the Secretary of War. (Statutes at Large, vol. 18, page 72, ch. 285, 1874.)

Approved June 16, 1874.

[Inclosure e.]

AN ACT making appropriations for the support of the Army for the fiscal year ending June thirtieth, eighteen hundred and seventy-seven, and for other purposes.

* * * For expenses of recruiting and transportation of recruits, $90,000. And no money appropriated by this act shall be paid for recruiting the Army beyond the number of 25,000 enlisted men, including Indian scouts and hospital stewards. Nothing, however, in this act shall be construed to prevent enlistments for the Signal Service, which shall hereafter be maintained as now organized, and as provided by law, with a force of enlisted men not exceeding 400 after present terms of enlistment have expired. (Statutes at Large, vol. 19, page 97, ch. 226, 1876.)

Approved July 24, 1876.

[Inclosure f.]

AN ACT making appropriations for the support of the Army for the fiscal year ending June thirtieth, eighteen hundred and seventy-nine, and for other purposes.

* * * For expenses of recruiting and transportation of recruits, $75,000. And no money appropriated by this act shall be paid for recruiting the Army beyond the number of 25,000 enlisted men, including Indian scouts and hospital stewards. Nothing, however, in this act shall be construed to prevent enlistments for the Signal Service, which shall hereafter be maintained as now organized and as provided by law, with a force of enlisted men not exceeding 450, after present terms of enlistment have expired. (Statutes at Large, vol. 20, page 146, ch. 263, 1878.)

Approved June 18, 1878.

[Inclosure g.]

AN ACT making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and seventy-nine, and for other purposes.

* * * * * * * *

UNDER THE WAR DEPARTMENT.

Signal Service.

Observations and report of storms: For the expenses of the observation and report of storms by telegraph and signal for the benefit of commerce and agriculture throughout

the United States; for manufacture, purchase, and repair of meteorological and other necessary instruments; for telegraphing reports; for expenses of storm signals announcing the probable approach and force of storms; for continuing the establishment and connection of stations at life-saving stations and light-houses; for instrument shelters; for hire, furniture, and expenses of offices maintained for public use in cities or ports receiving reports; for river reports; for maps and bulletins to be displayed in chambers of commerce and boards of trade rooms, and for distribution; for books, periodicals, newspapers, and stationery; and for incidental expenses not otherwise provided for, $350,000. And the enlisted force of the Signal Corps shall consist of 150 sergeants, 30 corporals, and 270 privates, who shall receive the pay of engineer soldiers of similar grades; and two sergeants may, in each year, be appointed to be second lieutenants: *Provided*, Signal Service men shall not receive extra duty pay unless specially directed by the Secretary of War.

* * * * * * *

Approved June 20, 1878.

APPENDIX No. 75

MEMOIR ON THE USE OF HOMING PIGEONS FOR MILITARY PURPOSES.

The result of the investigation into the practicability of using pigeons to carry messages in time of war is not so encouraging as was hoped. Although there are instances when they have been used to great advantage, and when they were, indeed, the only means of communication, there seem to be obstacles to their certain and systematic use in time of actual hostilities. It is a fact that, despite the greatest care in training, the pigeon sometimes fails at the critical moment. When it succeeds, however, the stake is generally very great. To attain one success it may be worth while to undergo many failures. For this reason, perhaps, those nations that devote most time and money to the perfecting of their military systems, still systematically train large numbers of pigeons for use in war.

It is proposed in this paper to give a brief historical sketch of the homing pigeon, the uses to which it has been put, and also some general ideas concerning its usefulness, from a military point of view, that may not be without interest.

The name "homing pigeon" is now given to birds that are trained to carry messages. The reason for this seems twofold: First, it is very expressive—the prominent and useful trait being implied in the name—*i. e.*, that the bird seeks its home; this is the trait that renders it valuable. Second, the name "carrier" is applied to a particular breed of pigeons, a class having particular characteristics; hence, to use the term "carrier-pigeon" to designate pigeons that are used for the purpose of carrying messages would lead to confusion. Although the name "carrier" is not entirely abandoned, it is not often used, and the name "homer" has about supplanted it.

The pigeon has been used for carrying from very early times, although the date of its first employment cannot be given. It is related that the victors in the Olympic games dispatched pigeons to convey to friends at home tidings of their triumph.

Pliny says that when Decimus Junius Brutus was besieged in Mutina (Modena) by Mark Antony, and the consuls Hirtius and Pansa, with Octavius, came to raise the siege—43 B. C.—Brutus communicated with the consuls by pigeons that flew over the heads of the besiegers. Commenting on this, Pliny says: "What service did Antony derive from his trenches and his vigilant blockade, and even from his nets stretched across the river, while the winged messenger was traversing the air?" And the fact that one great object of a blockade may be thereby defeated continues to make the use of pigeons popular, notwithstanding that each success may be attended by many disappointments.

It is well established that Nour-ed-deen Mahmoud, Mohammedan ruler of Syria and Egypt—1145 to 1174—had a regular pigeon postal service. From his residence, routes over which the birds flew radiated to the farthest points of his dominions. Along these routes at convenient distances towers were built for watchmen, whose business it was to look out for the pigeons and care for them. No other ruler has carried the use of the pigeon to such a systematic and high state of perfection as Nour-ed-deen.

It is said that when King Louis IX invaded Egypt in 1249 his arrival at Damietta was made known to the Sultan at Cairo by a pigeon, so that Nour-ed-deen's successors were not unmindful of the lessons he had taught.

In 1573, at the siege of Haarlem, William of Orange sent a homing pigeon toward the city; it fell into the hands of the Spaniards, who, after that, tried to kill every bird flying over their camp.

It is said that during the years of the success of Napoleon I, Nathan Rothschild, of London, established pigeon-posts in France and some of the adjacent countries. By means of these pigeon-posts, the maintenance of which required many agents, he obtained information of the results of Napoleon's measures and campaigns earlier than any one else, and thus speculated intelligently and successfully. Afterward the idea was adopted by others, and regular pigeon-posts were established between Paris and Brussels and other cities. Bankers were thus informed of the fluctuations of the money market.

In the revolution of 1848 accounts of what happened at Paris were carried by the pigeons, and the messages they bore were published almost as quickly in the Belgian as in the Paris papers.

It will thus be seen that at this time the pigeon was beginning to play the part—imperfectly, however—of the telegraph of to-day.

In 1849 a telegraph line was built between Berlin and Aix-la-Chapelle, but none from the latter place to Brussels; to fill this gap, Reuter had a pigeon-post established between Aix-la-Chapelle and Brussels, thus expediting communication by a saving of eight hours. Each telegram was forwarded by three pigeons, to make reasonably certain the delivery of the message. This pigeon-post did much to establish the fame of Reuter's telegraphic bureau. The telegraph soon after this supplanted the pigeon-posts, as the railroads have supplanted the stage-coaches.

When Paris was about to be besieged in 1870 the pigeon-fanciers in that city suggested to the military authorities that the pigeons within the city limits be sent out, and that others from the provinces be sent into the city. The latter proposition was acted upon, but the former was not, until balloons were used, when there was an opportunity to send out pigeons in the balloons, it being intended that the birds should return with messages.

Pigeons had been declared contraband of war early in the Franco-Prussian war of 1870. There were taken out of Paris, in balloons, three hundred and sixty-three pigeons. Of this number, fifty-seven only returned. These bore letters, photographed in finest characters upon scraps of paper so minute that two hundred of them weighed only one-eighth of a grain. Newspapers, reduced by photography to microscopical characters, were carried by these pigeons. The magic-lantern was made use of to enlarge the letters, which, thrown upon a prepared surface, were read by the public. These fifty-seven birds were not the only ones sent into Paris during the siege. A pigeon-post service was established at Tours, for the purpose of conveying messages into the capital. The regular rates for this service made it possible for one bird to carry $500 worth of dispatches, but, during the latter days of the siege, the Germans introduced trained hawks that were used to kill the pigeons.

These instances show sufficiently that while the pigeon has been used for carrying messages, many causes—some understood and others not understood—unite to make them an uncertain and untrustworthy means of communication.

The reason why the pigeon seeks its home, the fact that makes possible its use as a carrier, has never been satisfactorily given, and its discussion involves the most interesting inquiry concerning the bird. Some have believed the action of the bird due to instinct, others to training, while one of the most experienced and practical French fanciers has recently advanced the theory that the pigeon is guided in its flight by currents of electricity in the air, or by other atmospheric influences; others, again, differing from all these, believe that instinct, intelligence, and careful training, combined, account for the action of the birds.

What is instinct? To this there may be many answers, but when considered in connection with the flight of birds; instinct is illustrated by the stork, which, traveling only at night, flies north in the spring and returns in the fall. Swallows and wild geese, and many other birds, move north and south at the same seasons. They do not, however, confine their movements to the night-time. All these move by what we term instinct. Whatever that may be, it is all-powerful in its influence on the birds. But it is not so with the homing pigeon. Experience shows that the flight of that bird is not certain unless it has been trained, and unless atmospheric conditions are favorable to its flight. Notwithstanding this, however, there are sometimes circumstances that give color to the theory that the bird flies by instinct alone.

One instance is cited, on good authority, when pigeons brought from Antwerp to London returned to their homes, 180 miles distant, without previous training. Birds have very often been carried 75 or 100 miles from their homes, and, when released, have returned. It is very common, in training good birds, to make them fly from one station to another fifty or more miles apart. Now, how is it that the birds can find their way home under these conditions? They are carried in baskets, inside a car, so that it is impossible for them to see anything of the country through which they travel. No effort is made to enable them to see it. The explanation, it will be seen, is beset by difficulties. It cannot be instinct alone, for if there be a fog, or if snow covers the ground, or if it be night, the bird can do nothing. If an unerring instinct directs it, these natural circumstances would make no difference; the pigeon would return to its home. Nor can it be perceived how training alone can enable the pigeon to return. To assert this, is to say the bird sees its way home. This is actually asserted by some, but, it is believed, upon insufficient grounds. For instance, the fact that the pigeon when released usually circles round and round as he ascends, then darts off in the direction of home, is by some considered proof that he discerns some landmark by which to guide his flight. It cannot be pretended that the bird ascends until he can see 180 miles. To do this it would be necessary (owing to the sphericity of the earth) that he should rise to the height of about 7,600 yards. Now, pigeons cannot ascend so high. The powers of those car-

ried up to that altitude in balloons have been completely paralyzed, and when pitched into space the pigeons have fallen like stones through the air. It is also stated that pigeons released at a height of 325 yards from the earth, or even at a height of 850 or 1,100 yards, have not flown directly off, but, circling around lower and lower, have descended into apparently more congenial atmosphere before beginning their homeward journey. These facts seem to show that great altitudes are not suited for the voyages of pigeons, although they seem to ascend to them when first released, and before beginning their flight. To see 62 miles, the bird must ascend 925 yards; yet, when carried to that elevation and released, the pigeon immediately descends from it.

Mr. W. B. Tegetmeyer, the most experienced fancier in England, gives it as his opinion, that the homing faculty in pigeons depends solely upon observation and intelligence, as opposed to instinct. In his opinion pigeons fly by sight. If this be so, it may be asked why do not birds taken north from Paris return to that city in the same manner as they do from the south? Of several thousands sent north from that city by the military authorities, for homing practice, only a dozen or so returned. For this reason it is stated (with what truth is not known) that the training of pigeons at Paris for military purposes toward the north has been abandoned. In the failure here cited, M. Paul de la Rue, a celebrated French fancier, finds one of the strongest confirmations of his theory, that the homing pigeon is guided by electrical currents, or by something analogous thereto.

After carefully weighing all the arguments advanced by the various writers on this subject, it seems reasonable to suppose that the homing faculty of the pigeon is a combination of instinctive love of home, of sight, intelligence, and memory. The mainspring of its action is the love of home. This feeling exists in cows, horses, cats, and dogs, but it seems to be pre-eminent in the homing pigeon. It is by no means uncommon for the mental processes of those animals that are commonly supposed not to reason, to so nearly resemble reasoning that it is difficult to distinguish between them and the operations of the minds of confessedly reasoning beings. For example, a horse carrying his rider over the prairie comes to cross-roads; the rider is puzzled, does not know which road to take, and finally he permits the horse to choose; if they are returning home the horse will almost always take the right road. This is a very common experience on the great plains of the West, and the writer of this article can testify to the trustworthiness of the horse under such circumstances. It is believed that the faculties employed by the homing pigeon are similar to those exercised on these occasions by the horse—that is, a love of home and desire to reach it, the sense of sight, intelligence, and memory.

If this be so, it would seem proper that attention should be given to developing these faculties or senses in the homing pigeon. The higher they are developed, the more valuable will be the pigeon.

Recognizing the fact that the birds are improved by proper selection for breeding, and by subsequent training, no pains are spared by those whose business it is to raise homing pigeons for carrying purposes to secure the best breeds, and to give the most careful training. The subject of the breeding of pigeons is foreign to the purposes of this paper, but the following remarks upon their training may be found interesting:

It is proper to remark that pigeons will fly only toward their homes. The popular idea that they will fly in any direction at command is fallacious and without foundation in fact. In Belgium, the land of homing pigeons, where the flying of birds is the great national sport, they are flown first, at the age of five or six months, 5 miles. This distance is regularly increased to 180 miles, which is thought all they can well do the first year.

In England, pigeons, at the age of two or three months, fly 1 mile, then 2, then 4, &c., the distance being regularly increased.

Mr. Louis Offermans, of New York City, a veteran trainer, both in Belgium and in this country, advises as follows for young birds: At three months of age loose them at a distance of 3 miles from home, at the cardinal points of the compass. He advises that, having done this, the bird be started in the direction in which it is to be flown. The bird should be flown every other day, and the distance increased from 3 to 6, from 6 to 10, and from 10 to 14 miles; then flights of 24, 36, and 48 miles should be successively undertaken, with three days between flights, and after that flights of 70, 100, and 150 miles, with an interval of one week; after three weeks' rest the season should be closed with a 200 miles' flight.

For the second season, and for old birds, he advises as follows: Loose them 3 miles from home, at each of the cardinal points of the compass; then 6 miles; train in the direction whence it is desired the bird shall fly, first at 12, then at 24 miles, with one day's interval; rest them two days and send 90 miles; nine days later 200 miles; fourteen days later, 275 miles; fourteen days later, 375 miles; three weeks later, 500 miles, then closing the season.

It will be noticed that this plan of training confines the pigeon to the particular point of the compass whence it is desired that he should fly. This is for the purpose of acquainting the bird with the path he is to travel. This idea is followed in training pigeons for military purposes at the garrisons in Europe. In Germany the pigeons are considered trustworthy for distances of from 50 to 100 miles, if the breed of birds is good, if the birds are reared at the locality to which they are to fly, and if they are acquainted with the country over which they are to travel.

A flight of 30 miles an hour, sustained for any length of time, is extraordinary, though for short distances pigeons have flown faster than a mile a minute.

The following table gives a summary of races, selected at random, in 1874 and 1875, in France and Belgium:

1874.	Yards per minute.	Miles per hour.	1875.	Yards per minute.	Miles per hour.
June 7	860	29½	May 30	699	23¾
June 14	831	28½	June 6	1,531	52½
June 14	1,383	47½	June 13	1,531	52½
June 21	853	29	June 20	1,476	50¼
June 28	1,208	41¼	June 27	1,208	41¼

To still better illustrate the average flight of birds, twenty-one flights were taken. The time of the flights over the same distance varied from three to eight hours, the distance per minute varying from 858 to 1,780 yards, the latter rate having been sustained for four and three-fourths hours.

In England 200 miles at a race is seldom exceeded. In Belgium, the distance flown in the racing season by old birds ranges from 200 to 500 miles. At the grand race of 1868, of 500 miles, 1,507 birds were entered. The prize bird flew the distance in 25 hours, an average speed of 20 miles an hour. This bird did not fly the 25 hours continuously, but, as is the custom of the pigeon, came down a little before dark and started again soon after daybreak, meanwhile securing food.

Atmospheric conditions exert a strong influence on the flight of pigeons. Birds of the best breed, full-grown and well trained, will fly 500 miles in twelve hours in favorable weather, but in bad weather the same birds will take two or three days to make the same distance, and often they cannot fly at all.

In the United States the first attempt to fly pigeons 500 miles was in 1878, from Columbus, Ohio, to New York City. The birds were never heard of after they were started. Next year (1879) the attempt was repeated with six birds; they were released July 27 and two of them arrived in New York the next day.

On June 12, 1881, some New York City birds were loosened at Cresson, Pa., the distance being 243 miles. The day was clear, the wind contrary, and the time of flight of the winner was 433 minutes, or an average of 988 yards a minute. On June 14th, with a favorable wind and foggy, cloudy weather, with occasional sudden and severe thunderstorms, the winner passed over this same course at the rate of 1,296 yards a minute. The birds are generally practiced over this course by easy stages and, therefore, they are very familiar with the country.

On June 28, 1878, the New York pigeons were flown from Steubenville, Ohio, 341 miles. The winner made the distance home in eight hours and eighteen minutes, or at the rate of 1,205 yards a minute.

In 1868 the experiment of flying birds from Rome, Italy, into Belgium, was tried. The distance is 900 miles. Five hundred miles of this country was unknown to the birds. Of the two hundred loosened but twenty returned, the shortest time made being 13½ days. As the Alps stood in the line of flight, and as the birds must have flown around the mountains, it is a wonder that any of them returned. It is doubtful if this experiment did any good. It proved, indeed, that the homing pigeon is endowed to a wonderful degree with the faculty, whatever it is, which directs its flight toward home, but that only one pigeon of ten returned to its loft is certainly not encouraging.

In Europe the homing pigeon is carefully bred and trained, with a view of perfecting its good qualities. There are many socities in Belgium and France for training pigeons for the annual races, which are a national pastime in each country. As may be supposed, this training is attended with trouble and expense. One plan is this: A man is sent with the baskets containing the birds; he feeds them, looks out for their welfare, and releases them at the proper time, and in the proper manner. Another plan is to send the pigeons, properly labeled, in care of the express and station agents, who attend to the wants and flight of the birds. The first plan is the more expensive, but it has so many advantages that it is generally resorted to in important cases, and generally when the owners of the pigeons can afford the expense.

There are many societies in the United States devoted to the raising and training of the homing pigeon. They constitute the "Federation of Homing Pigeon Societies of the United States." Among these are "The Red Star Pigeon Club," of Philadelphia, Pa.; "The Albany County Homing Club," of New York; "The New York Homing Pigeon Club," and "The Old Dominion Homing Pigeon Club," of Alexandria, Va.

In addition to the work done by civil societies, many European governments train pigeons for military purposes. The Russian minister of war has ordered the expenditure of $10,000 for pigeon training in Warsaw and Kieff alone. Large numbers of "homers" are kept systematically trained at both places. Several officers have become very expert in the management of the birds, and two have lately been especially honored for their energy, and for arranging rules for the employment of pigeons during war. In Germany and France, also, the training of pigeons for military purposes is carried on. Pigeons are also used in Turkey. In fact, all nations of Europe seem to recognize that homing pigeons can be used advantageously in war, and all, in greater or less degree, devote time and money to keeping their pigeons in training and to improving their stock.

In the United States, so far as the writer is aware, there has been but one experiment with pigeons made under the patronage of Government officials. In 1878 the Signal Office purchased some pigeons of Mr. Thomas Gist, Philadelphia, Pa., and sent them to Col. Nelson Miles, Fifth Infantry, in Dakota. Colonel Miles tried to train and use the birds, but without success. This was doubtless due to many causes. The birds might not have been of the best and most trustworthy breeds; the trainer may not have been conversant with his duties; the systematic exercise of the pigeons may have been either neglected or improperly carried on. Either of these causes would prove fatal to success. In addition to these possible drawbacks, Colonel Miles speaks of a species of hawk, common to that region, which most persistently hunted down the pigeons, in many cases killing them before they could regain their lofts.

It may be considered as an established fact that the military authorities in the United States will not devote either time or money to extensive experiments with homing pigeons until it can be made more apparent that the birds can be advantageously employed. The most inviting field for action would be the Indian country of the West; yet it is extremely doubtful if the best breed of the birds would be so useful as to compensate for the trouble of training and caring for them. That they may be of practical use it is necessary that the birds be of the finest strain; that they be carefully and systematically trained, and that they become acquainted with the ground over which they fly. Take the best bird into the Indian country, establish a loft at one of our military posts, then, without previously training him, carry the pigeon a hundred miles into the mountains or bad-lands, and turn him loose; the chances are very great that he will never be heard of again. It will readily be understood that it will be impossible to give the pigeons the careful and elaborate training that fanciers assert is necessary. It may be assumed that no occasion will arise when soldiers in a hostile country will not have enough to do without carrying pigeons distances of from five to fifty miles for training purposes. The plan now recommended by fanciers who have given the subject study is that each bird be trained in the direction in which he is to fly; then he will know the country. It is impossible to rely upon such a system in our Indian country. How can a scouting party, starting out toward the north, know but that the next day they will be a hundred miles south of their post? If they had taken their pigeons trained only for flight from the north, of what service could they be? In one word, so far as the writer of this paper can judge, there is no benefit to be derived from training pigeons in the Indian country at all commensurate with the trouble, the labor, and the expense involved. Along the seaboard and in the interior, excluding the Indian country, it is different. In most of the cities of the seaboard there are many birds that could be procured for training for military purposes, and the railroads and steamboats afford facilities for training.

No branch of the army is so well equipped for this kind of work as the Signal Service. Its agents are scattered at reasonably short intervals all over the interior and along the seaboard. They are intelligent men, and would serve admirably in the necessary office of custodians for the pigeons, and would see that they were properly taken care of and properly flown.

After the views expressed above as to the questionable utility of pigeons for carrying purposes in time of war, it seems unnecessary to present a detailed plan for a military pigeon service. If one be desired, however, the demand can be complied with.

All of which is respectfully submitted.

WM. E. BIRKHIMER,
First Lieutenant, Third Artillery, Acting Signal Officer.

May 13, 1882.

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CHART NO. 24.

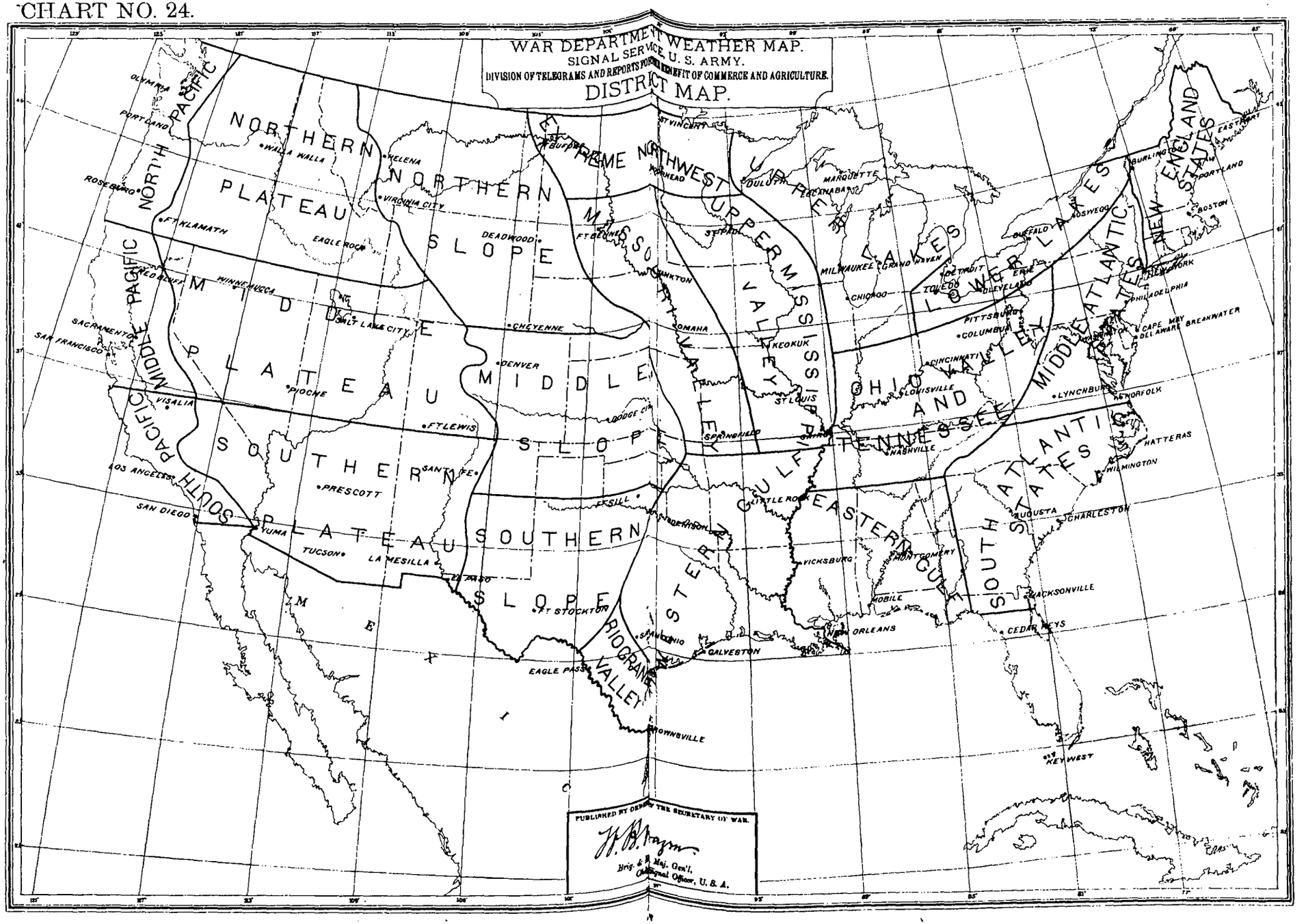
WAR DEPARTMENT WEATHER MAP.
SIGNAL SERVICE, U. S. ARMY.
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.
DISTRICT MAP.
NORTH PACIFIC
NORTHERN PLATEAU
NORTHERN SLOPE
EXTREME NORTHWEST
MISSOURI VALLEY
UPPER MISSISSIPPI VALLEY
UPPER LAKES
LOWER LAKES
NEW ENGLAND STATES
MIDDLE PACIFIC
MIDDLE PLATEAU
MIDDLE SLOPE
OHIO VALLEY AND TENNESSEE
MIDDLE ATLANTIC STATES
SOUTH PACIFIC
SOUTHERN PLATEAU
SOUTHERN SLOPE
WESTERN GULF
EASTERN GULF
SOUTH ATLANTIC STATES
RIO GRANDE VALLEY
MEXICO
OLYMPIA
PORTLAND
ROSEBURG
WALLA WALLA
HELENA
VIRGINIA CITY
FT KLAMATH
EAGLE ROCK
DEADWOOD
FT BENNET
ST VINCENT
WORKHEAD
DULUTH
MARQUETTE
ESCANABA
ST PAUL
MILWAUKEE
GRAND HAVEN
CHICAGO
DETROIT
TOLEDO
ERIE
CLEVELAND
BUFFALO
OSWEGO
BURLINGTON
EASTPORT
PORTLAND
BOSTON
NEW YORK
PHILADELPHIA
CAPE MAY
DELAWARE BREAKWATER
WASHINGTON
PITTSBURG
COLUMBUS
CINCINNATI
LOUISVILLE
NASHVILLE
LYNCHBURG
NORFOLK
HATTERAS
WILMINGTON
AUGUSTA
CHARLESTON
JACKSONVILLE
CEDAR KEYS
KEY WEST
MONTGOMERY
MOBILE
NEW ORLEANS
VICKSBURG
LITTLE ROCK
ST LOUIS
KEOKUK
SPRINGFIELD
OMAHA
YANKTON
CHEYENNE
DENVER
DODGE CITY
FT LEWIS
SANTA FE
PRESCOTT
FT SILL
DENISON
FT STOCKTON
SAN ANTONIO
GALVESTON
EAGLE PASS
BROWNSVILLE
RED BLUFF
WINNEMUCCA
SALT LAKE CITY
SACRAMENTO
SAN FRANCISCO
VISALIA
PIOCHE
LOS ANGELES
SAN DIEGO
YUMA
TUCSON
LA MESILLA
EL PASO
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
Brig. & Maj. Gen'l,
Chief Signal Officer, U. S. A.

CHART No. 25. OSCILLATIONS OF THE UPPER MISSISSIPPI RIVER.

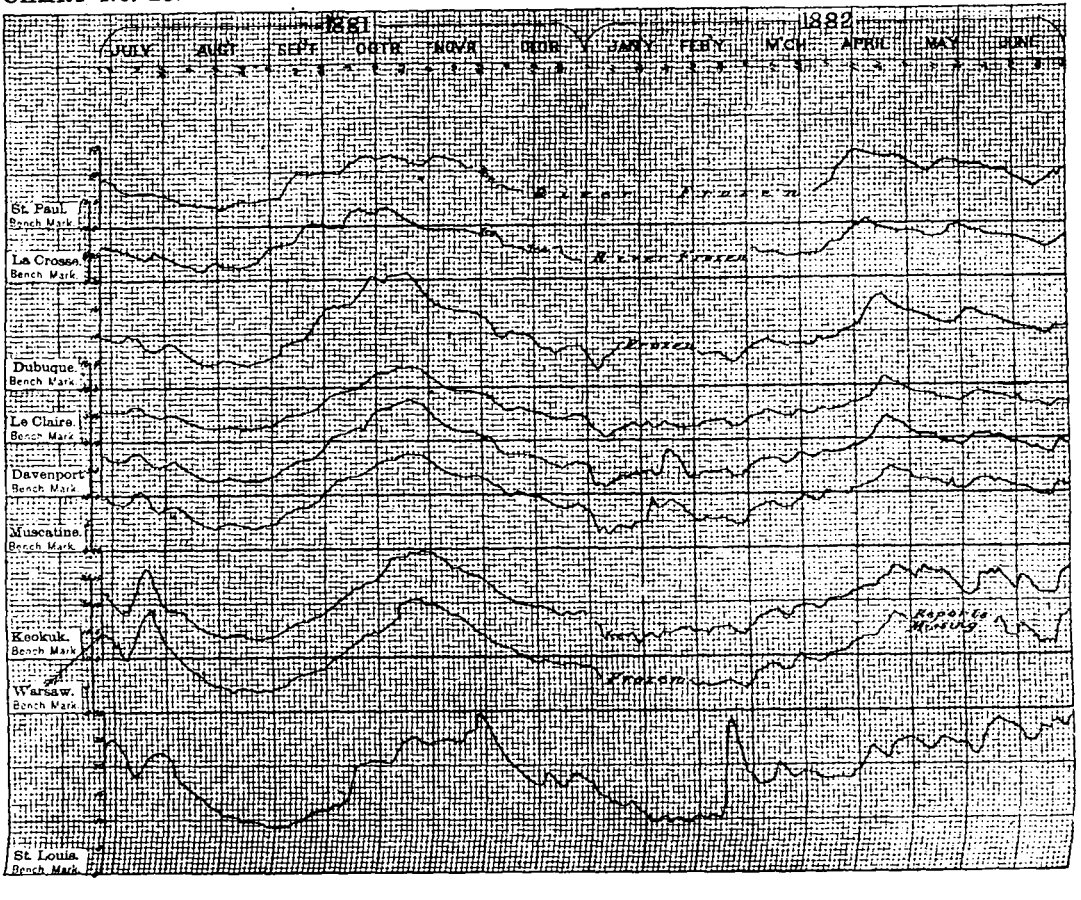

CHART No. 26. OSCILLATIONS OF THE LOWER MISSISSIPPI RIVER.

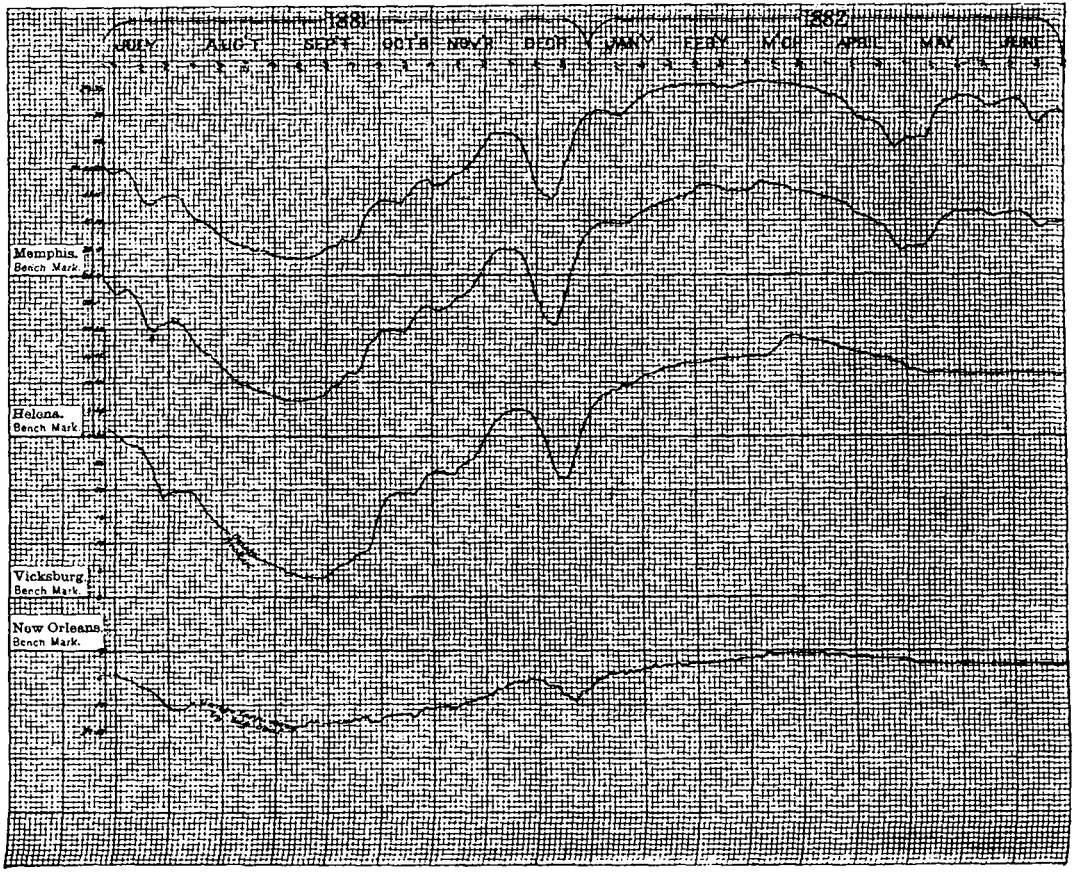

CHART No. 27. OSCILLATIONS OF THE MISSOURI RIVER.

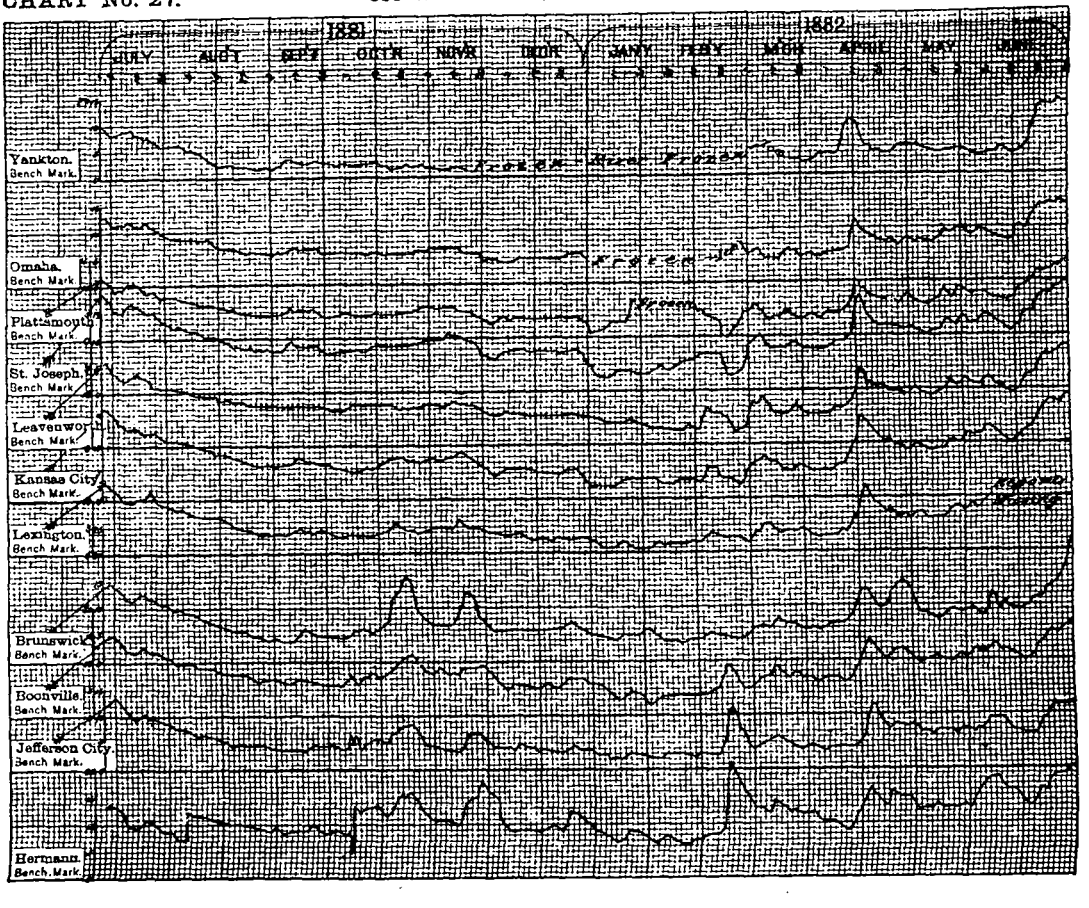

CHART No. 28. OSCILLATIONS OF THE OHIO RIVER.

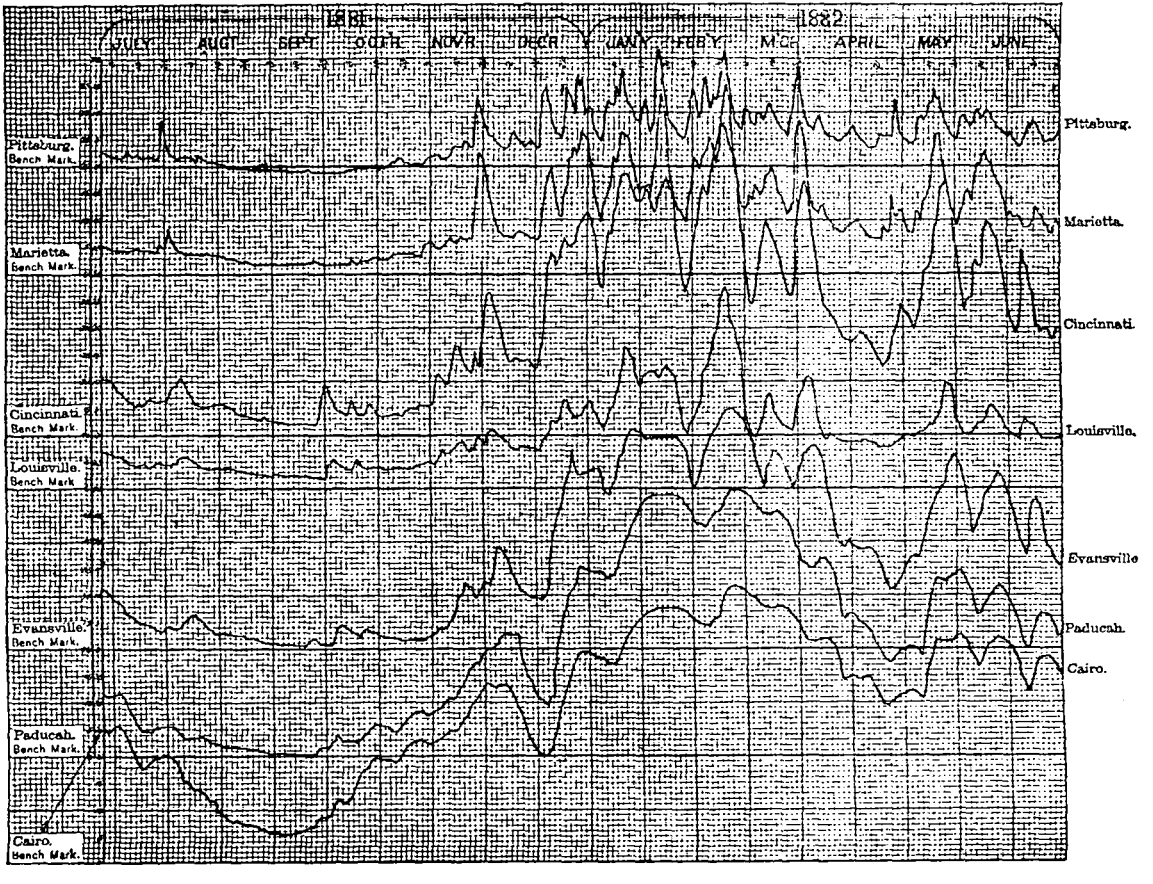

CHART No. 29. OSCILLATIONS OF THE MONONGAHELA RIVER.

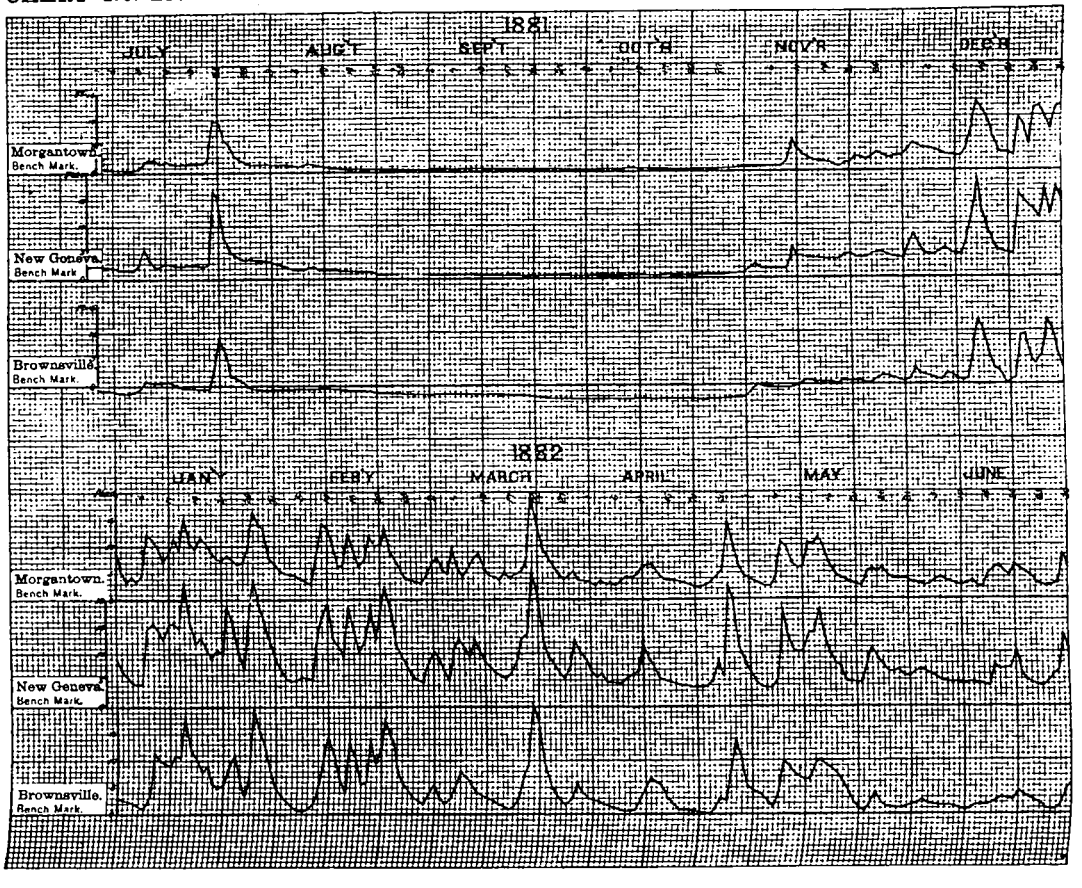

CHART No. 30. OSCILLATIONS OF THE YOUGHIOGHENY RIVER.

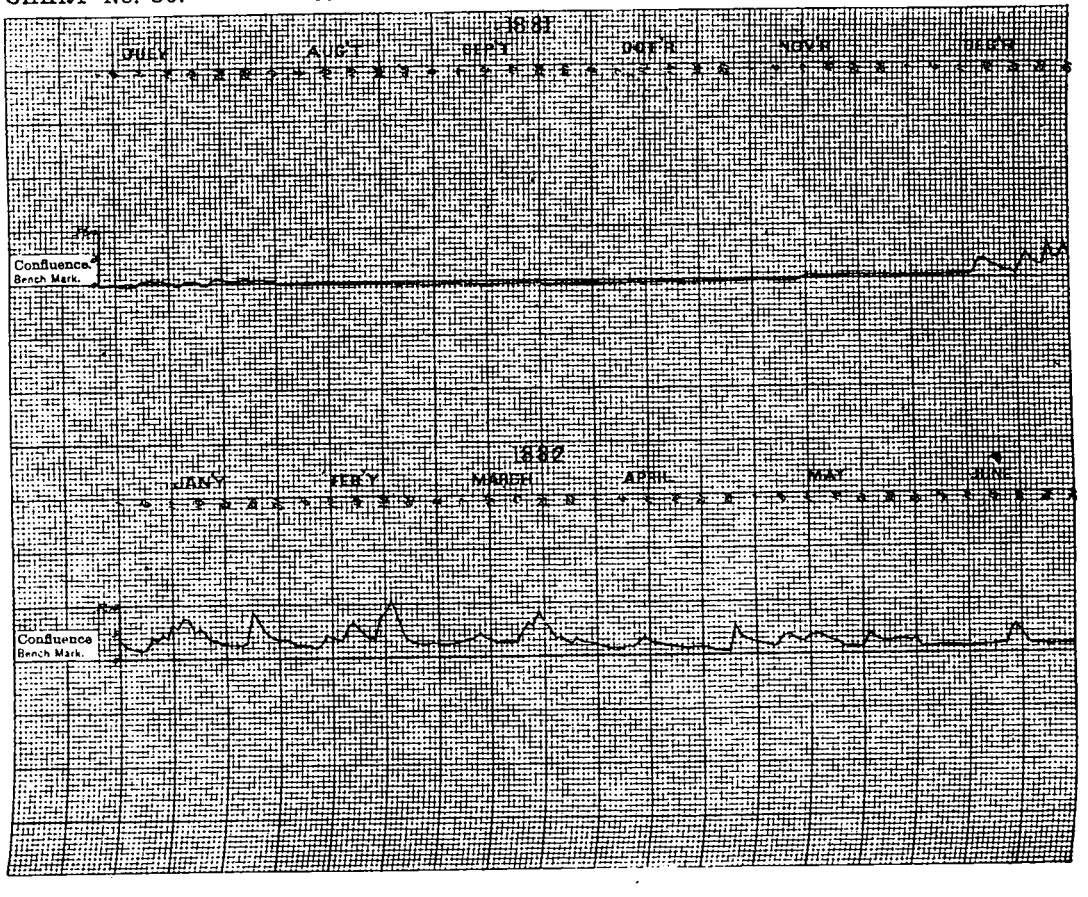

CHART No. 31. OSCILLATIONS OF THE ALLEGHANY RIVER.

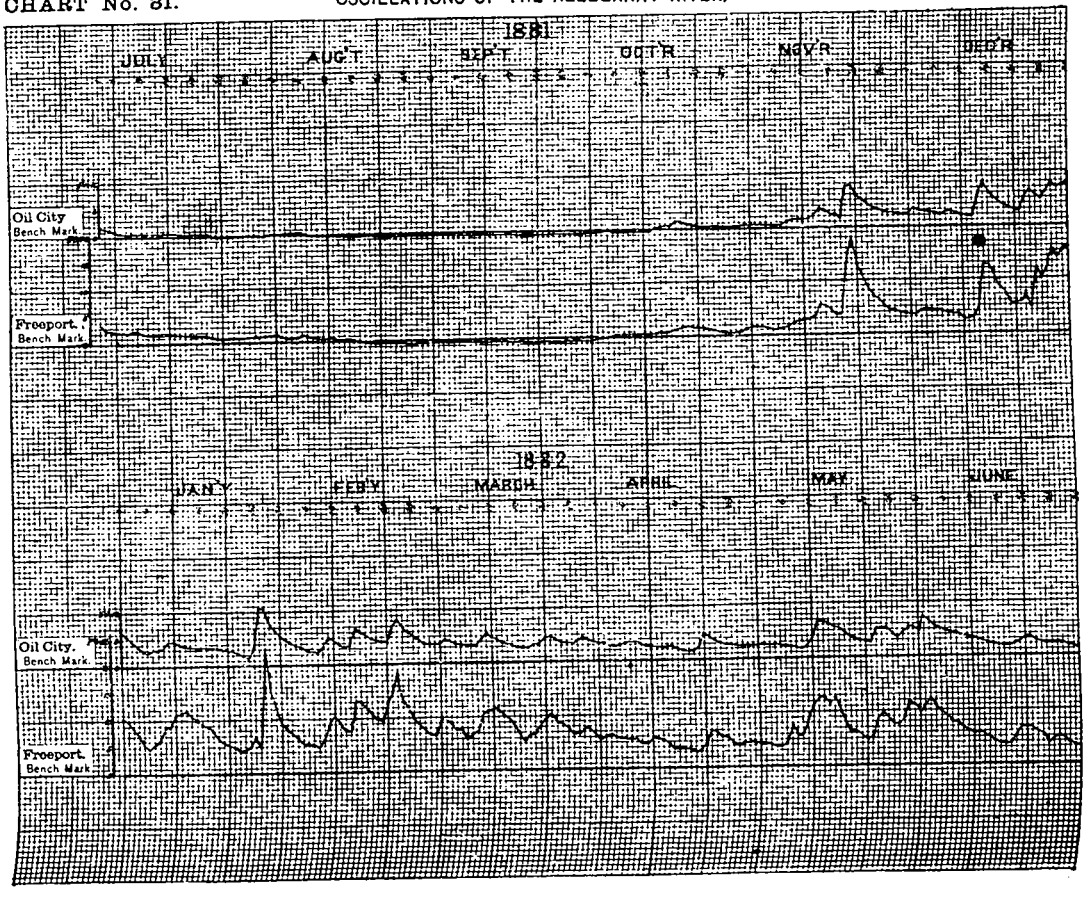

CHART No. 32. OSCILLATIONS OF THE ARKANSAS RIVER.

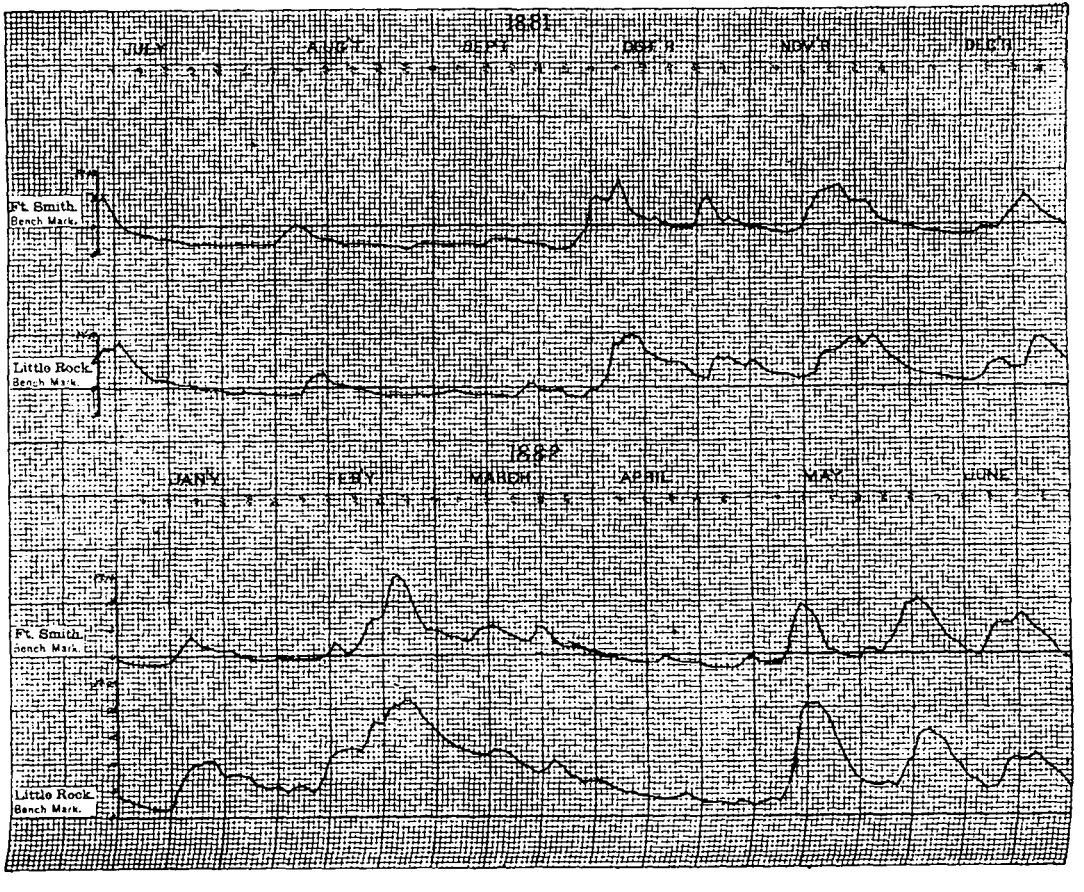

CHART No. 33. OSCILLATIONS OF THE RED RIVER.

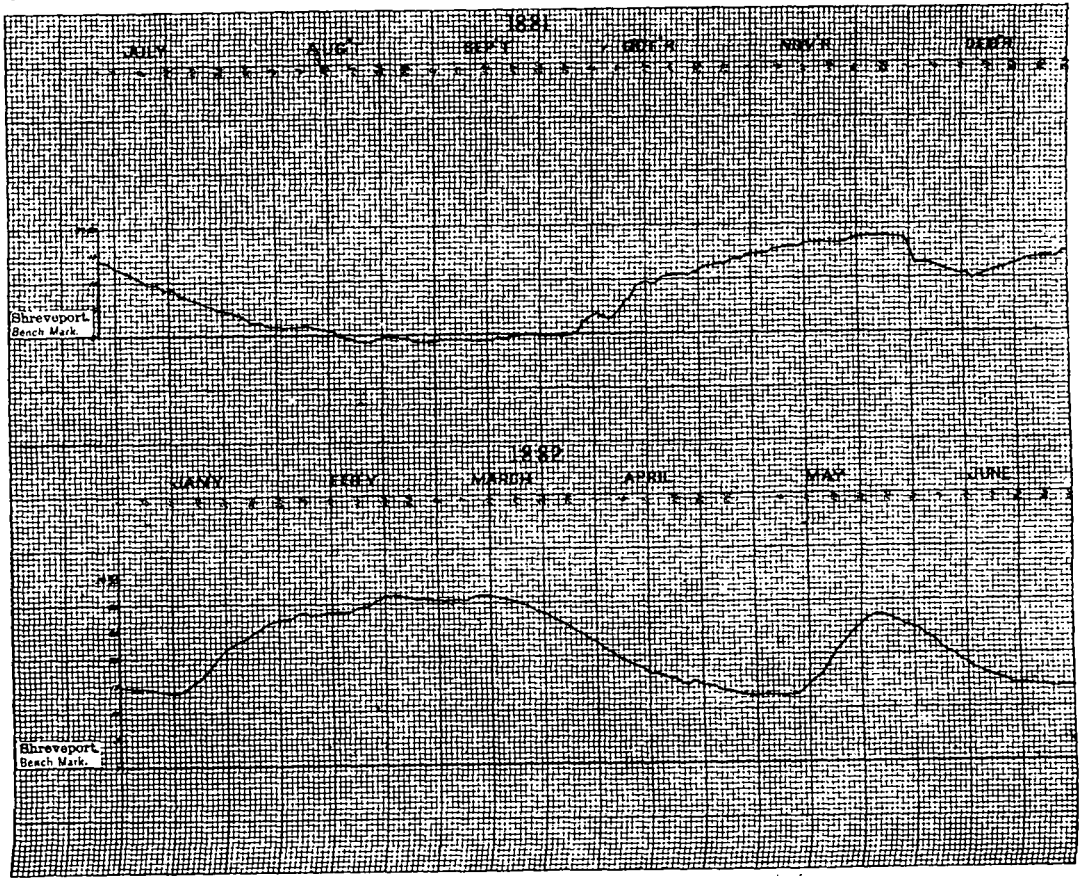

CHART No. 34. *OSCILLATIONS OF THE TENNESSEE RIVER.*

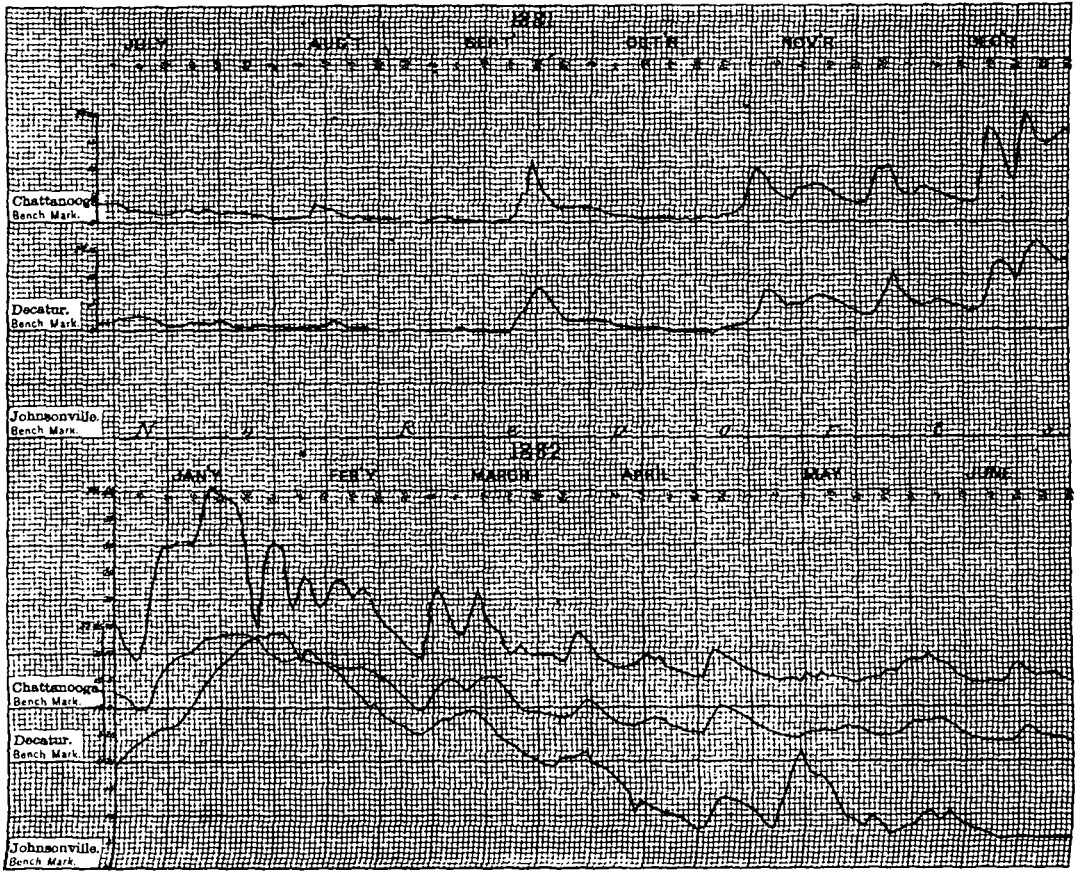

CHART No. 35. OSCILLATIONS OF THE CUMBERLAND RIVER.

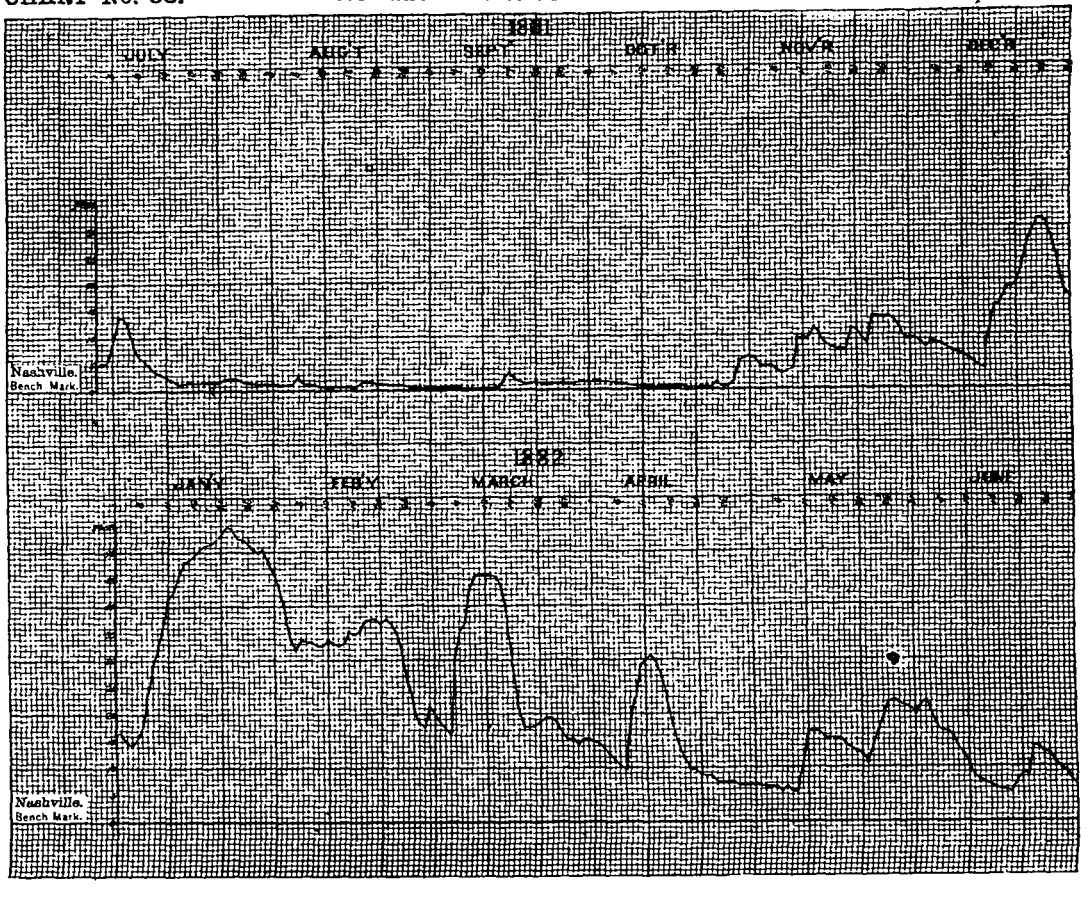

CHART No. 36. OSCILLATIONS OF THE COLUMBIA RIVER.

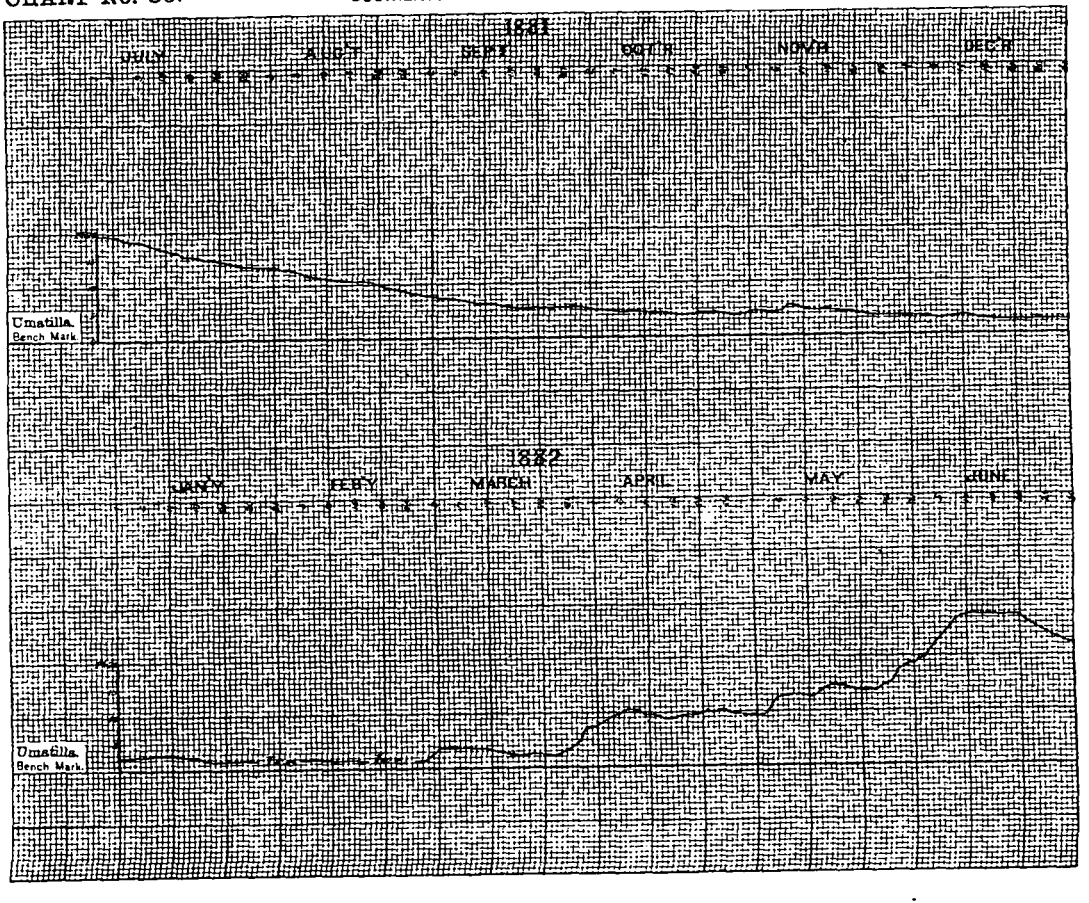

CHART No. 37. OSCILLATIONS OF THE WILLAMETTE RIVER.

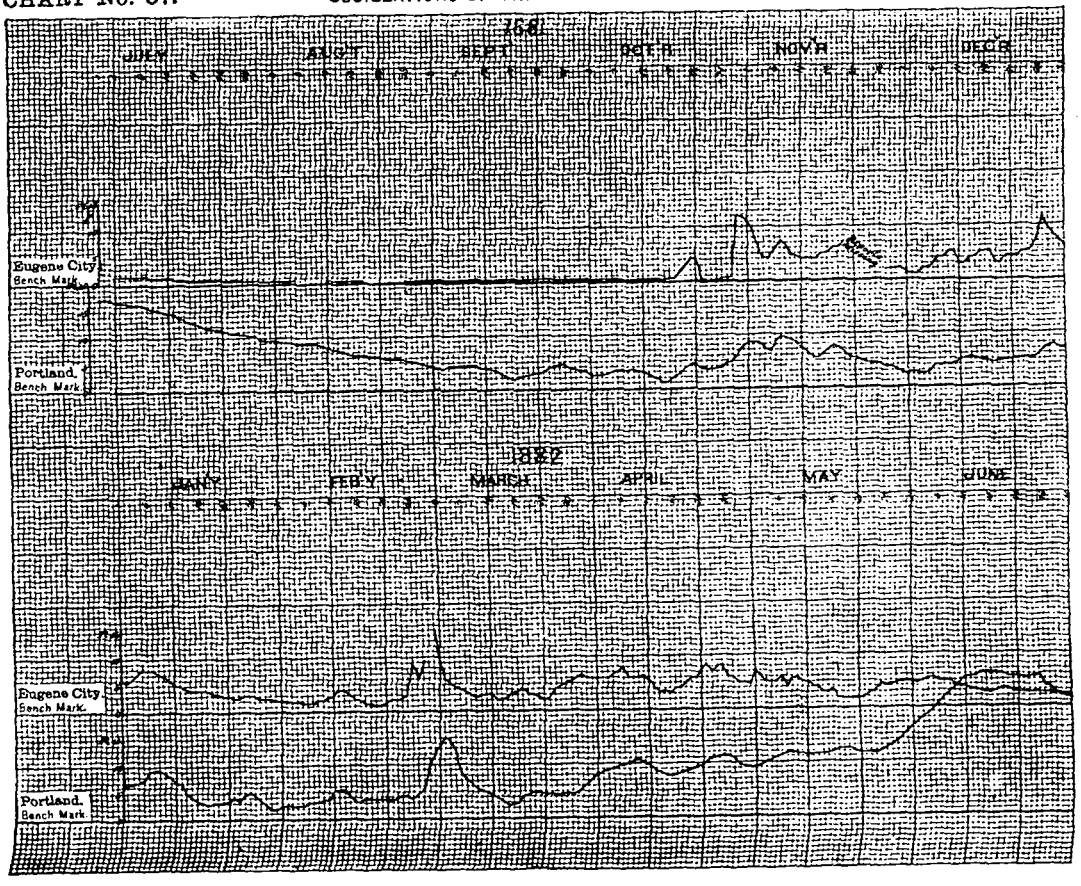

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CHART NO. 51.

INTERNATIONAL POLAR STATIONS AND STATIONS FROM WHICH REPORTS ARE RECEIVED FOR THE INTERNATIONAL BULLETIN.

WESTERN HEMISPHERE.

UNITED STATES SERIES.

1 Albany.
2 Alpena.
3 Astoria.
4 Atka, Alaska.
5 Atlanta.
6 Augusta.
7 Baltimore.
8 Billings.
9 Bismarck.
10 Block Island.
11 Bois City.
12 Boston.
13 Brownsville.
14 Buffalo.
15 Burlington.
16 Cairo.
17 Cape Mendocino.
18 Cedar Keys.
19 Champaign.
20 Charleston.
21 Charlotte.
22 Chattanooga.
23 Cheyenne.
24 Chicago
25 Chilicoot, Alaska.
26 Chincoteague.
27 Cincinnati.
28 Cleveland.
29 Coleman City.
30 Columbus.
31 Concho.
32 Cordova Bay, Alaska.
33 Davenport.
34 Deadwood.
35 Denison.
36 Denver.
37 Des Moines.
38 Detroit.
39 Dodge City.
40 Dubuque.
41 Duluth.
42 Eagle Pass.
43 Eagle Rock.
44 Eastport.
45 Erie.
46 Escanaba.
47 Fort Alexander, Alaska.
48 Fort Apache.
49 Fort Assiniboine.
50 Fort Bennett.
51 Fort Buford.
52 Fort Custer.
53 Fort Elliott.
54 Fort Keogh.
55 Fort Macon.
56 Fort Missoula.
57 Fort Saint Michael's, Alaska.
58 Fort Shaw.
59 Fort Sill.
60 Fort Smith.
61 Fort Washakie.
62 Fort Wrangel, Alaska.
63 Yukon, Alaska.
64 Fredericksburg.
65 Galveston.
66 Grand Haven.
67 Harrisburg, Alaska.
68 Hatteras.
69 Helena.
70 Huron.
71 Indianapolis.
72 Indianola.
73 Jacksboro.
74 Jacksonville.
75 Kenai, Alaska.
76 Keokuk.
77 Key West.
78 Knoxville.
79 Koskokvim, Alaska.
80 La Crosse.
81 La Mesilla.
82 Laredo.
83 Leavenworth.
84 Lewiston.
85 Little Rock.
86 Los Angeles.
87 Louisville.
88 Lynchburg.
89 Mackinac City.
90 Marquette.
91 Memphis.
92 Milwaukee.
93 Mobile.
94 Montgomery.
95 Moorhead.
96 Morgantown.
97 Morzovia, Alaska.
98 Nashville.
99 New Haven.
100 New London.
101 New Orleans.
102 New York.
103 Norfolk.
104 North Platte.
105 Nulato, Alaska.
106 Olympia.
107 Omaha.
108 Oswego.
109 Palestine.
110 Pensacola.
111 Philadelphia.
112 Pioche.
113 Pittsburg.
114 Point Barrow, Alaska.
115 Poplar River.
116 Port Eads.
117 Port Etches, Alaska.
118 Port Huron.
119 Portland, Maine.
120 Portland, Oregon.
121 Prescott.
122 Provincetown.
123 Punta Rassa.
124 Red Bluff.
125 Rochester.
126 Roseburg.
127 Sacramento.
128 Saint Louis.
129 Saint Paul.
130 Saint Paul Island, Behring Sea.
131 Saint Vincent.
132 Salt Lake City.
133 San Antonio.
134 San Diego.
135 Sanford.
136 San Francisco.
137 Santa Fé.
138 Savannah.
139 Shreveport.
140 Silver City.
141 Sitka.
142 Spokane Falls.
143 Springfield, Illinois.
144 Springfield, Missouri.
145 Starkville.
146 Stockton.
147 Toledo.
148 Tucson.
149 Umatilla.
150 Unalashka, Alaska.
151 Vicksburg.
152 Visalia.
153 Washington.
154 West Las Animas.
155 Williamsport.
156 Wilmington.
157 Winnemucca.
158 Yankton.
159 Yukutat Bay, Alaska.
160 Yuma.

MISCELLANEOUS.

161 Bridgetown, Barbadoes.
162 Lady Franklin Bay, Grinnell Land.
163 Fort Chimo, Labrador.
164 Fort Rae, B. A.
165 Fort Resolution, B. A.
166 Havana, Cuba.
167 Kingston, Jamaica.
168 Libertad, San Salvador.
169 Navassa, W. I.
170 Paramaribo, S. A.
171 Rio Magua, W. I.
172 Rivas, Nicaragua.
173 San José, Guatemala.
174 Santiago de Cuba, W. I.
175 Saint Thomas, W. I.
176 York Factory, B. A.
177 Jacobshavn, Greenland.
178 Godthaab, Greenland.
179 Upernavik, Greenland.
180 YoungForeland,JanMayen Island.
181 Hogarth Inlet,Cumberland Sound.
182 Axar Fiord, Iceland (E. H.)

CANADIAN SERIES.

183 Battleford.
184 Charlottetown.
185 Chatham.
186 Churchill.
187 Cornwall.
188 Dalhousie.
189 Edmonton.
190 Father Point.
191 Fort Garry.
192 Fredericton.
193 Halifax.
194 Humboldt.
195 Kingston.
196 Livingston.
197 Montreal.
198 Moose Factory.
199 Parry Sound.
200 Peterboro.
201 Port Stanley.
202 Prince Arthur's Landing.
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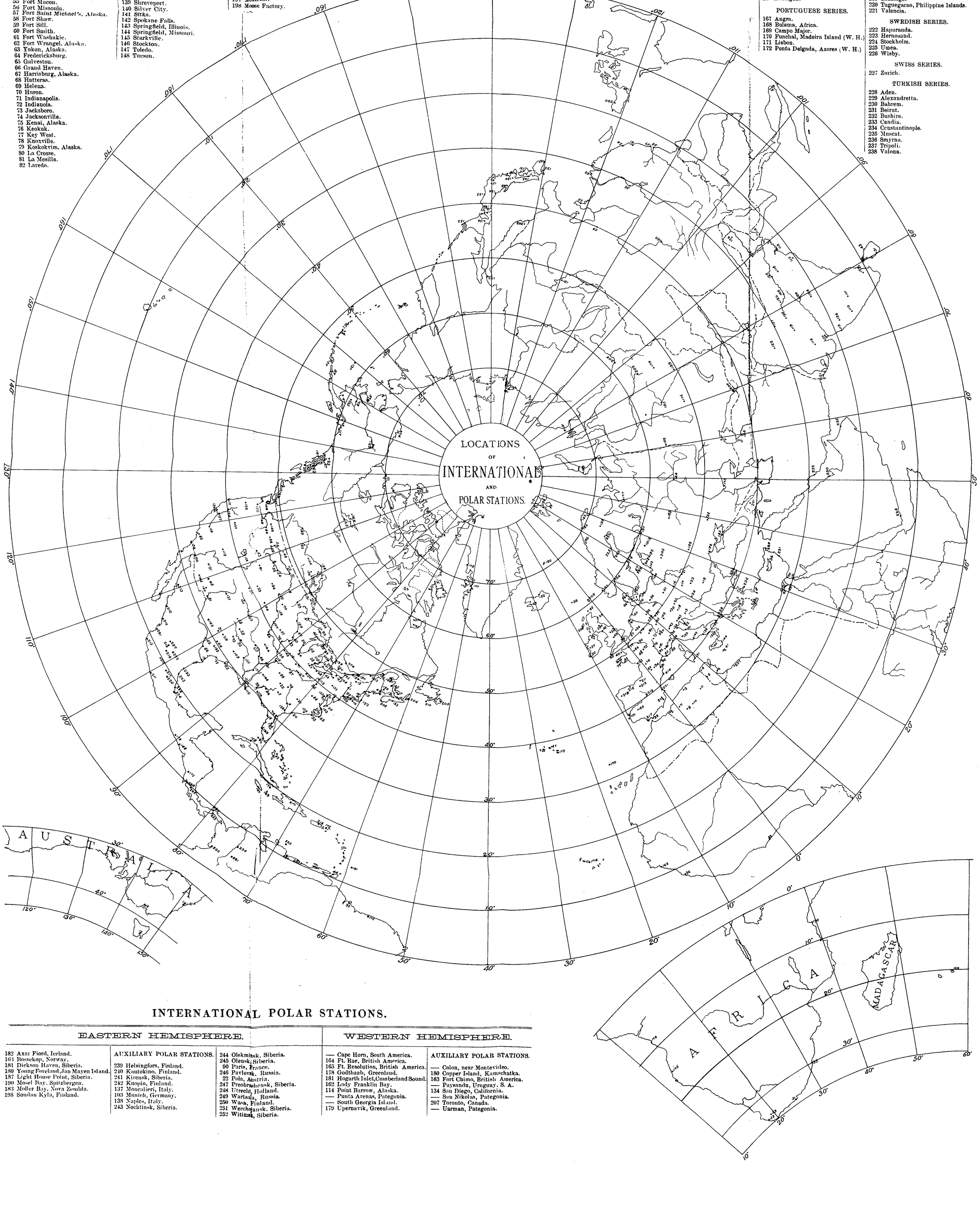

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CHART NO. 52.

MAP

Showing railroads co-operating with the Signal Service in the distribution of Norther warnings.

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