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**REPORT OF THE CHIEF OF THE WEATHER
BUREAU, 1933 - 1938**

UNITED STATES DEPARTMENT OF AGRICULTURE,
WEATHER BUREAU,
Washington, D.C., September 21, 1933.

SIR: I submit herewith a report of the work of the Weather Bureau during the fiscal year ended June 30, 1933.

Respectfully,

C. F. MARVIN, *Chief.*

HON. HENRY A. WALLACE,
Secretary of Agriculture.

Drastic economies, retrenchments, and suspension of public service have characterized the program of Weather Bureau work from the beginning of the fiscal year 1932 to the present time.

During this period not only have large reductions been made in the annual appropriations but also the appropriations made have been expended with great economy, resulting in large unobligated balances which augmented the reductions and increased the savings. In the early portion of the period changes were made that would entail the least harm to the general public service, but the program for the fiscal year ending June 1934 has necessitated the saving of over \$800,000 from the appropriation as passed by Congress. This has resulted in the closing of more than a score of primary first-order stations and large numbers of substations of all classes, and has involved the dismissal of nearly 500 employees.

It is believed that a rigid investigation of the administration of activities of the Weather Bureau will show conclusively that its affairs have been carried on with marked economy and efficiency over many years of operation.

The normal functions of the Weather Bureau cover a wide range and are not duplicated to any appreciable extent by any other Government agency. Accordingly, further economies than have already been accomplished in the cost of the Weather Bureau service to the Nation as a whole can be effected only by reductions and curtailments in long-established service to the general detriment of agriculture, commerce, and navigation.

The newest activity of the Weather Bureau, namely, its service in aid of air navigation, has come so much to the attention of certain of the public engaged in this particular field that the impression prevails that the service rendered this new industry has now become the major activity of the Weather Bureau. This is grossly erroneous and must continue to be so indefinitely if the Bureau effectively performs all of the duties assigned to it by organic law.

WEATHER BUREAU ACTIVITIES

Following is a list of the principal activities of the Bureau, which indicates the relative part of the whole comprised in the meteorological aids to air navigation:

1. *Primary network of stations.*—The Bureau has charge of the establishment, equipment, and maintenance by trained personnel of a primary network of about 200 first-order stations overspreading the continental United States and its possessions, except the Philippines. Twice-daily telegraphic reports and other observations, reports, and automatic records from these stations, including numerous radio reports from ships at sea, also the twice-daily exchange of numerous observations between nearly all the great nations of the Northern

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Hemisphere constitute the foundation of all classes of the public service of the Bureau, including aids to air navigation.

2. *Twice-daily public forecasts of all kinds.*—General weather forecasts are issued twice daily, Sundays and holidays included, throughout the year for all States, parts of States, and the larger cities. These include radio broadcasts from more than 300 radio stations of numerous weather bulletins for the benefit of all classes of the public, press notices, bulletins, etc., and also Navy broadcasts from Arlington and San Francisco of the coded and other weather reports for use by the shipping interests, the military branches of the Government, students, and specialists.

3. *River gaging and flood warnings.*—The daily gaging and reporting of stages of all the principal rivers of the continent are made by the Bureau. This service includes the indispensable flood-warning service at all times of heavy rains and the flood seasons of the year.

4. *Hurricane warnings and storms on the Great Lakes.*—This is a special service from June to November, comprising invaluable hurricane warnings for the benefit of all shipping plying the adjacent oceans, the Gulf of Mexico, and Caribbean Sea. This includes, of course, the property savings and other benefits to the commerce and industries of all the coastal States visited by hurricanes, especially the protection of the lives of many residents and citizens.

5. *Secondary network of stations.*—The Bureau maintains over 1,200 secondary stations (not including any airway stations), which furnish simple reports of rainfall, river, weather, and crop conditions, and receive a small compensation ranging from \$10 to \$25 per month.

6. *Network of climatic stations.*—The Bureau also has a vast network of cooperative observers. These are public-spirited citizens residing mostly in rural districts, who, because of their personal interest in the weather, make daily records of the maximum and minimum temperature, the rainfall, and state of weather, including notes on special meteorological phenomena. The instruments and forms for reports are supplied by the Government, but the service is performed without any monetary compensation whatsoever. There are now about 5,000 such observers. The Nation owes a great debt of gratitude to these faithful observers. Their observations for more than half a century give an invaluable index of every important feature of the climate of almost every county in the whole Government domain, except the Philippines, in which the meteorological work is in the hands of the local government.

7. *Weekly bulletins of crop-weather conditions.*—Incidental to the daily and weekly reports from the 200 first-order and the 300 secondary stations, the Bureau issues a weekly bulletin of weather and crop conditions. In the winter season this includes details of snow and ice conditions. During the growing season of the year these weekly bulletins furnish authoritative facts on drought and current weather conditions and suppress or refute wild rumors and misinformation which would otherwise arise and which would seriously affect the orderly farm management, harvesting, and marketing of all the great agricultural crops.

8. *Frost warnings for horticulture.*—The Bureau maintains a thoroughly organized frost and cold-wave service for the benefit of citrus growers and orchardists located in Florida, Mississippi, Texas, California, Oregon, and Washington.

9. *Shippers' forecasts, cattle and stock-raising service.*—Warnings of temperature and cold waves are issued for the shipment of perishable products and livestock, and for the care and protection of livestock on the range in winter and at shearing time in the spring.

10. *Solar-radiation investigations.*—The Bureau investigates and measures the intensity of solar radiation at the surface of the earth. It is well known that solar radiation is the ultimate source of all terrestrial weather and life.

All the foregoing items of activity cover the services of the Weather Bureau to the general public, to agriculture, commerce, and navigation other than air navigation. The whole program is the growth and development of 62 years of experience.

11. *Aid to air navigation.*—The Air Commerce Act of 1926 specifically directs the Weather Bureau:

To furnish such weather reports, forecasts, warnings, and advices as may be required to promote the safety and efficiency of air navigation in the United States and above the high seas, particularly upon civil airways designated by the Secretary of Commerce under authority of law as routes suitable for air commerce, and for such purposes to observe, measure, and investigate atmospheric phenomena, and establish meteorological offices and stations.

Table 1 shows the actual amounts of appropriations and savings that have been effected practically since January 1, 1932, to the present time.

TABLE 1.—*Appropriations for the Weather Bureau and savings effected, 1932-34*

Fiscal year	Appropriation	Legislative and all voluntary savings				
		Cut in appropriations	Cuts in all public service	Pay and wage cuts	Vacancies unfilled	Total savings
1932.....	\$4,497,720		¹ \$332,966		\$32,743	\$365,709
1933.....	4,164,038	\$333,682	246,847	\$277,318	115,284	639,449
1934.....	3,731,235	² 2,909,884	382,760	³ 444,481	193,352	825,351

¹ Fully two thirds of this saving was effected in 1932 by the suspension or partial inauguration only of extensions in aids to navigation of the air for which appropriations had just been made. In other words, the work was not inaugurated and has been in a state of partial development since that time.

² Cash withdrawal authorized June 22. The set-up under this limitation of expenditure could not be made effective until about Aug. 1, 1933. Of course all the items of savings for 1934 are merely close estimates and may probably be exceeded by the amount of a small unexpended balance at the close of the year.

³ Gross savings on an annual basis resulting from the 15-percent cut in pay and wages of all Weather Bureau employees, including also about \$50,000 which must be absorbed by administrative furloughs of all commissioned employees. The amount of the gross saving will be reduced by any change in the 15-percent cut made prior to June 30, 1934.

Under the law the responsibilities imposed upon the Weather Bureau are unique and exacting. No other agency of the Government is in any way specifically directed to engage in and conduct meteorological work, except possibly the nucleus of meteorological activities organized in the military branches for purely military needs. Through the nearly 200 fully-equipped stations of the Bureau, the contact of the personnel with the industries and the public is very close, and all those making up the personnel are keenly alert to their respective responsibilities, especially during times of extreme weather conditions such as severe cold waves, floods, hurricanes, and the like. For example, it is difficult for the public to realize the intense activity at a Weather Bureau station during the prevalence of a hurricane. The ordinary legal hours of duty and considerations of Sundays and holidays have no meaning. No more loyal and faithful body of Federal employees can be found than at Weather Bureau stations. On many occasions the men remain on duty during long hours, often throughout the entire night, snatching such moments for food, rest, and sleep as may be possible. The number of personnel has always been limited and the average compensation relatively low in the Federal service.

If the gross appropriation for 1932 is compared with the cash-withdrawal authorization available for 1934, it is seen that the total saving in conducting the work of the Weather Bureau amounts to \$1,587,836. Comparisons of the items also indicate that the savings resulting from unfilled vacancies, compulsory and involuntary retirements, and cuts in pay and wages of all classes of personnel have in the aggregate exceeded the actual savings effected by cuts in all classes of public service. In a few words, by dismissals, pay cuts, furloughs, and increased work due to reduced force and unfilled vacancies, the personnel of the Weather Bureau is now bearing the brunt of more than half the economies effected in the maintenance of the service as planned for the fiscal year 1934.

REDUCTIONS IN PUBLIC SERVICE

To effect the economies outlined it was first necessary to close a number of so-called "first-order" stations of the Weather Bureau or to reduce the duties and responsibilities in a material way. The following is a list of these stations, the new status being indicated in parentheses:

- Apalachicola, Fla. (second order).
- Concord, N.H. (second order).
- Dayton, Ohio (river and cooperative).
- Fort Worth, Tex. (reduced in personnel and service).
- Grand Haven, Mich. (cooperative and storm warning).
- Greenville, S.C. (cotton region and cooperative).
- Hannibal, Mo. (river and cooperative).
- Hartford, Conn. (reduced in personnel and service).
- Houghton, Mich. (storm warning and cooperative).

Lewiston, Idaho (river and cooperative).
 Lexington, Ky. (second order).
 Ludington, Mich. (second order).
 Lynchburg, Va. (second order).
 Pierre, S.Dak. (river and cooperative).
 Port Angeles, Wash. (storm warning and cooperative).
 Port Huron, Mich. (storm warning and cooperative).
 St. Paul, Minn. (river).
 San Jose, Calif. (cooperative).
 Tacoma, Wash. (storm warning).
 Taylor, Tex. (cotton region and cooperative).
 Thomasville, Ga. (second order).
 Wausau, Wis. (river and cooperative).
 Yankton, S.Dak. (river and cooperative).

In addition, a program of curtailment of service along airways is now being worked out. The stations are all secondary ones devoted exclusively to airway work, and a list cannot be given at this time.

In addition to closing some stations and reducing the status and activities of others, savings have been effected by closing 30 storm-warning, 11 second-order, 5 tobacco, 46 cattle-region, 97 crop-weather, 84 river and rainfall, and 7 snow-fall stations, and reducing the pay status in many others. The number of places to which daily forecasts are telegraphed has been reduced by more than 125, and a heavy reduction has been made in the distribution of forenoon and afternoon coded telegraphic reports. In other cases the issuing of weather maps has been suspended or changed to card bulletins. Telegraph expenses have been drastically curtailed. Corresponding economies will be applied to flood and storm warnings, fruit-frost, fruit-spray, and all other projects.

The closing days of the fiscal year were occupied in hastily projecting the extensive program of reduced service for the fiscal year 1934 which, as already stated, became substantially effective as of July 31, 1933. While very substantial savings were effected in the expenditures for 1933, nevertheless the general program of work was not harmfully affected. Practically all lines of activity were carried forward in nearly normal fashion except that important researches in solar radiation and climatology were abruptly suspended by the retirement of the leaders of these projects.

Notwithstanding the economies mentioned in the foregoing it became possible to inaugurate, at small cost, an important plan for increasing the number of ships' reports during the prevalence of tropical hurricanes. This is briefly described below:

Beginning June 1, 1933, the Weather Bureau put into operation a supplemental plan for securing weather observations by radio from ships at sea in connection with hurricanes. Arrangements were made with certain radio companies whereby direct requests are made for weather reports at designated hours from ships known to be in areas in which a tropical disturbance is in progress.

All warnings of hurricanes are issued from Washington. When conditions warrant, the forecaster on duty indicates the ocean areas in which a tropical disturbance is known or suspected to be in progress and from which observations are desired. This information is at once telegraphed to officials in charge of designated Weather Bureau offices who have contact with the operators of the radio stations involved. The operators are advised of the hours at which the observations are needed and the ocean zones from which they are desired. All ships, regardless of nationality, in these zones are requested by special message to take weather observations at the designated hours and transmit them by radio in a coded message to "Observer, Washington."

This arrangement was designed with a view to assuring the receipt of weather reports when they are urgently needed from ships with which it is impracticable to make arrangements in advance. Hurricane activities in the Caribbean Sea and Gulf of Mexico began unusually early in the 1933 season. The new method has already demonstrated its practicability and success as a supplement to that in operation in previous years.

In the operation of its hurricane-warning service, the Weather Bureau has, for a number of years, secured daily weather observations from continental and island stations and from ships at sea. When a tropical storm is in progress over the water at a distance from island and coastal stations, dependence must be placed almost wholly on ships' weather reports by radio. For this purpose the cooperative services of the masters of about 300 merchant ships have been enlisted to transmit, during the hurricane season, twice daily, radiograms containing standard weather information. The ships are selected so as to afford as nearly as possible a representative daily collection from all areas in which West Indian hurricanes are likely to occur.

A representative collection is not realized every day during the hurricane season, because the number of ships in hurricane areas varies greatly from day to day and some areas are rarely traveled. Another difficulty is that when a storm is in progress, the fact is known to mariners through the daily weather bulletins and advices broadcast by the Bureau and shipmasters naturally avoid the storm area as far as possible. Therefore, it frequently happens that few or none of the ships with which arrangements for daily observations have been made are close enough to the storm center to enable the forecaster to form an accurate judgment as to its future behavior. By the new plan if there are any ships in the storm zone, reports therefrom are likely to be obtained.

For several years it has been the practice of the Weather Bureau to broadcast appeals by radio to shipmasters for weather reports when tropical storms are in progress. While this has yielded valuable results, it is inadequate because the appeals may not reach ships on which the complete weather broadcasts are not copied. Moreover, many ships do not have regular schedules and are routed into hurricane areas at intervals of several months. Yet such ships form a very considerable proportion of the traffic in the hurricane belt, and no regular reporting program for them can be arranged in advance.

A marked advantage of the new plan is that it utilizes radio operators' knowledge of the location of ships at sea so as to secure direct contact with the masters of all ships that are located within the storm area, from many of whom no reports otherwise would be obtained. The response to direct calls sent to ships of all national registers has been gratifying, but this was fully expected because of the very hearty cooperation the Weather Bureau has always received from shipmasters.

OCEAN METEOROLOGY

During the year, the 3-year project of recomputation of all meteorological data for the Central American Waters Pilot Chart was brought to completion. A discussion of the relation between sea surface and air temperatures in that area was prepared and published.

Investigation into the sources of temperature variations in the Gulf Stream at one of its principal origins (the Florida Straits) was substantially advanced, and conclusions are about ready for publication.

Atmospheric variation is found by these studies to play a primary role in the causation of the seasonal and irregular fluctuations in the average temperature of waters at the origins of the Gulf Stream.

The daily synoptic weather maps of the Northern Hemisphere have been improved in respect to the entry of observations from the oceans. A campaign of improvement has been pursued in two directions: (1) Special efforts have been successful in securing additional reports from ships sailing into sea areas which were poorly represented in the reports previously available; and (2) the cooperation of ships' officers and operators has been diligently sought with the object of improving the quality of ships' meteorological instruments and the accuracy of observation. Material results are being obtained; many inferior barometers and thermometers have been replaced with instruments of satisfactory quality by the ships' operators without expense to the Bureau.

The Marine Division is assisting in the international polar-year program, by transcription of over 100,000 regular ships' weather-observation records for use of the Polar Year Commission.

Improvement in shipboard meteorological equipment has been obtained without issue of Bureau-owned instruments, through successful enlistment of the cooperation of ships' officers and operators.

Some economies have been effected by a change in the style of record book used at vessel-reporting stations.

RIVER AND FLOOD SERVICE

Observations have been made of river stages, rainfall, and mountain snowfall. River stages are being published in volume XXX of Daily River Stages, now at the Government Printing Office. Rainfall and mountain-snowfall observations have been published in the monthly statements of climatic data, issued by the several climatic section centers of the country. The data appearing in these publications are used to a great extent in the flood-control work of the Federal Government, the States, and of the numerous drainage districts that have been organized in various parts of the country. They are also employed

and are considered indispensable by water users of all kinds throughout the United States.

The daily river forecasts made for the principal rivers have been used, as in the past, by navigation interests, hydraulic engineers, and the vast number of people interested in an advance knowledge of river stages.

Flood warnings have been successfully made and issued for all of the major streams in which floods have occurred in the last year. The floods of the greatest importance were in the Ohio River, the Yazoo River of Mississippi, and the Columbia River. Timely warnings of all of these floods were issued, and the public appreciation of their value is attested by the numerous commendatory letters and newspaper articles that have been received in the central office.

There have been demands for an expansion of the flood-warning service, but it has been impossible to meet them, on account of the lack of funds available for the river work. In fact, in June 1933, it became necessary to reduce the expenditures for this work by \$12,562, which represents a reduction of almost 20 percent under the amount authorized for 1933, and the Bureau enters the fiscal year 1934 with a greatly changed organization for river work. In effecting the necessary reductions, an effort has been made to trim the work where the least harm to the public interests will follow.

SERVICE IN AID OF AIR NAVIGATION

The Bureau now maintains quite adequate service over about 25,000 miles of civil airways, including the maintenance of 500 cooperative and paid secondary stations on the airways. On 13,000 miles the service is continuous night and day as required by various schedules of flying during the 24 hours. The service over the remaining 12,000 miles is part time and is adjusted most effectively to the flying schedules mostly those in the daytime.

From the very nature of this service, more than half of which is continuous throughout the 24 hours, thereby involving at least three shifts of trained meteorologists, the cost is necessarily relatively more expensive to maintain than are the varied and comprehensive services to the public, agriculture, and industries. It is perfectly certain that safe navigation of the air is more or less impossible without a well-organized meteorological service. On the other hand, it is erroneous to belittle the benefits which the general public, agriculture, and the national industries realize from the old organized work of the Bureau and to subordinate the importance of a full continuance of this service under the mistaken impression that the new and somewhat spectacular service in aid of aviation dominates all other services in importance.

AIRPLANES DISPLACE KITES IN UPPER-AIR INVESTIGATIONS

The use of kites as a means of upper-air exploration was first begun as a regular program by meteorological services during the last decade of the nineteenth century. In this work the Weather Bureau was one of the early pioneers. As the value of the data thus secured became more and more apparent, the work was extended and for some years the Bureau had six stations in operation. This method, although it yielded results of genuine importance, nevertheless had decided defects since it was dependent on the wind conditions. That is to say, kite flights were not possible if the wind was very light or very strong. While using the kites, therefore, the Weather Bureau, in common with meteorological services of other countries, was constantly seeking some more satisfactory method.

The advent of the airplane provided this and in addition was a compelling cause for the abandonment of kite flying, owing to the hazards that the latter offered to aerial navigation. Accordingly, 2 years ago the Weather Bureau changed from kites to airplanes, although one of the kite stations was retained for a while, in order to be certain that, before that method was finally given up, the newer method would prove a success. This was amply demonstrated during the 2 years just completed, and, accordingly, the last kite station has now been discontinued and this phase of meteorological observation and investigation passes into history.

The record of the last 2 years with airplanes has shown that daily observations, almost without interruption, even during seasons of the worst weather, can be made up to a height of 15,000 feet. The data thus secured are of great value, both in the forecasting work of the Bureau and also for studies of the characteristics of the upper atmosphere. Studies of this type already made

have provided aids in forecasting, and it is certain that very much more of value along this line will be realized by further studies of the data, particularly if a more complete network of stations can be established.

The chief lines along which economies have been effected are:

1. Discontinuing substations at points along the airways.
2. Cutting down the number of observations at certain places.
3. The old program of 3-hourly observations was changed to a 4-hourly basis, thus making possible a considerable saving both in personnel and in the cost of telegraphing.
4. At certain selected stations, a program has been put into effect, whereby observations that are regularly taken are not telegraphed when weather conditions are favorable. The determining factors as to whether or not the weather is favorable are not left to the judgment of the observer but are rigidly set forth in instructions that have been issued to all stations.
5. Finally, by cooperation with the Department of Commerce, the personnel of that Department has been utilized at certain points where practicable in making surface weather observations, thereby dispensing with an airways observer otherwise paid by the Weather Bureau.

INSTRUMENTAL EXPOSURES

One of the serious problems confronting the Weather Bureau has long been the matter of securing good exposures for its instrumental equipment, particularly at stations in large cities. In such cases the offices must be located in the heart of the business activities in close touch with telegraph and newspaper offices, as well as the leaders of the major industries, boards of trade, commodity exchanges, etc. Finally, the extension of the public-building programs involves the saving of rent by the occupation of quarters in Federal buildings wherever possible. These often afford inferior or unsatisfactory conditions of exposure. In some of these cases instruments have been exposed on rented roof spaces on adjoining commercial buildings. This procedure has been gone into rather reluctantly because it is recognized that the observer should be in close attendance upon his instruments and should have ready access to them at all times. However, the widespread Federal building program together with the great need for economy has left no alternative but to work out the best possible arrangements for occupancy of these Federal buildings.

Notwithstanding these difficulties observations at city stations are carefully checked against certain observations at cooperative stations maintained under rural conditions, and it is believed that in the main the records from city stations are as accurate as practicable.

Wind velocities alone are probably the most seriously effected. In fact, the velocity of wind is such a complicated function of the irregularities of the local topography and the height of the instruments above the ground or the roofs of buildings in the vicinity that the observation itself must be interpreted with reference to the actual environment.

INTERNATIONAL POLAR YEAR

One of the notable features of the year beginning August 1, 1932, and ended August 31, 1933, is the international program for making certain meteorological and other scientific observations by all the meteorological services of the world comprising observations from the entire globe but particularly from stations in the Northern Hemisphere and as near the polar regions as possible. A brief report of this project follows:

An undertaking of genuine significance in the history of meteorology was the organization of an international program of observations, covering the period August 1882 to August 1883, inclusive. The data secured from a wide network of stations, including some within the Arctic Circle, formed the basis of many valuable researches.

As a fitting tribute to the memory of those who organized this first international polar year, it was decided at an international meeting of meteorologists some 4 or 5 years ago, to organize a so-called "Jubilee International Polar Year", this second program to be carried out exactly 50 years after the first, or in other words, during the period August 1932 to August 1933, inclusive. Through international conferences and correspondence, the proposed program was very carefully and completely planned and in spite of the unfavorable world-wide economic conditions has been carried out with only a small amount of modification.

This second polar year is naturally much more complete than the first one and has been organized on somewhat different lines. The primary purpose of the first effort was to secure statistical data. Although this is one of the purposes of the second program now completed, the chief goal in this one has been securing observations which would make possible the preparation of detailed weather maps on a world-wide scale from the study of which it is hoped valuable aids to forecasting may be developed. Naturally, the vastly improved methods in communication, including particularly the radio, have greatly assisted in this feature of the project and have also greatly simplified the organization of the work itself, since it has thus been possible to keep in close touch with all observing parties.

The Weather Bureau has taken an active part in this program. A special observing station was established at Point Barrow, Alaska, which is the point farthest north under the control of the United States. At this station a very complete set of surface records has been secured, and upper air soundings have been made with pilot balloons two or more times daily throughout the year. In addition, numerous photographs have been made of the aurora and a complete record kept of the occurrence of this phenomenon, including in some cases measurements of its altitude. Moreover, additional observations, as requested by the International Polar Year Commission, have been made at selected stations throughout the United States and its possessions. The observations included not only data of surface conditions but also of clouds and aurora and other phenomena. The upper-air part of the program consists of pilot balloon observations two to four times daily at about 70 stations; airplane observations, reaching a height of about 5 kilometers, as a rule, daily at 5 stations in the United States proper, from August 1932 to June 1933, inclusive, and at 4 stations during July and August 1933; airplane observations on selected days of each month only, at Fairbanks, Alaska; and sounding balloon observations, reaching heights of 8 to 15 miles in general, on specified days of each month, at 3 stations in the United States. In addition, a few high soundings by means of a special radio device have been made at Fairbanks.

Plans are being worked out for the compilation and analysis of the data that have thus been secured throughout the world. Already much of the work of compilation has been completed, but there remains the more important work of publishing the material in such form as to be readily available for study by qualified investigators. It is not yet certain whether publication will be by an international bureau or by the individual countries, in a form that may be prescribed by the International Polar Year Commission. In either case, the Weather Bureau expects to assume its full share in this part of the program as in that already completed, namely, the actual securing of the data.

RESEARCH WORK

The Weather Bureau is not organized for research activities in the same sense that research constitutes the major features of activities of many other branches of the Department of Agriculture. By far the greater part of the appropriations for the maintenance of the Weather Bureau are expended to provide a Nation-wide service to the public, agriculture, and the industries. Demands for the expansion of this service in almost every community are difficult to resist and absorb practically all the appropriations available. Nevertheless, members of the staff of the Weather Bureau include in their various activities certain particular investigations of the relations of weather to crop development, the inception and generation of storms, investigations of solar radiation, climatology, and the conditions and characteristics of the upper air as revealed by the observations in the free air procured by modern methods that have become available. As already mentioned, some of this research has been interrupted and suspended because of the retirement of the leading officials, and under the provisions of the Economy Act these vacancies have not been filled. Nevertheless, every effort has been made to preserve the nucleus of the research activities of the Bureau, the pursuit of which will be resumed and intensified at the earliest practicable opportunity.