reached the year previous. The atmospheric precipitation in both basins, particularly the snowfall, was below the average.

Passing now to the high water of 1904, it may be remarked that the atmospheric conditions of the winter of 1903-4 and during the spring of 1904 were such as would conspire to produce high water on the Great Lakes.

The winter of 1903-4 was characterized by severe and continuous cold weather and heavy snow. The latter blanketed practically the whole of the several watersheds and increased in depth as the winter progressed, since there was practically no loss except by evaporation. The snowfall was very heavy in the Lake Huron basin, especially on the higher lands of Ontario, immediately east of Lake Huron. This district was covered in December by a snow covering that probably averaged four feet in depth. In January and February, owing to the absence of thaws, the thickness of the snow covering increased. At the end of February, 1904, the entire Lake region, save the extreme southern portion, was covered by snow, the depth ranging from 5 to 60 inches. In March, although the weather in the southern portion of the Lake region moderated somewhat, cold, stormy weather, with considerable snow, continued in Canadian districts and in northern Wisconsin and northern Michigan. At the close of that month there were from 24 to 30 inches of snow on the ground in Muskoka and Nipissing districts. In southern Ontario, while the remains of drifts were still to be seen, the snow had practically disappeared. On the United States side, except in northern Michigan and northern Wisconsin, there was no snow on the ground.

In April the weather on the Canadian side was exceedingly cold and wet; the temperatures went well above the freezing point in the daytime, but the night temperatures were low enough to cause frost or freezing, especially in northern districts. The ice in the streams of southern and central Ontario broke up about the first of the month; in the Lake Superior watershed and north of Georgian Bay there was very little thawing until near the close of the month.

The stage of water on all of the lakes during the season of navigation just closed was higher than has been experienced for a number of years, the single exception being Lake Superior, which was not quite so high as in 1899, 1900, or 1903. The greatest rise, as compared with 1903 stages, occurred on Lakes Michigan, Huron, and Ontario. The last named for July, 1904, was three and one-half feet above the stage for the corresponding month of 1895, and both Lakes Huron and Michigan were considerably more than a foot above the July stages of that year.

More water came into the lakes, except possibly Superior, this year than for a number of years previous. The rise in Michigan from March to April was a little less than six inches; on Huron a little more than six inches; on Erie about thirteen inches, while on Ontario it was a little over fifteen inches. These figures, however, because of the varying size of the lakes, give no idea of the actual amount of water that flowed into the respective lakes. Remembering that a sheet of water an inch in thickness weighs 72,516 tons (of 2000 pounds each) per square mile, we can easily reduce the inflow of the several lakes to a convenient unit of comparison. Selecting a cubic mile of water as such unit and reducing the increase in level from March to April to terms of that unit, we find that the increase in the level of Lake Huron, roughly speaking, amounted to 2.2 cubic miles of water; Lake Michigan, 1.9; Lake Huron, 2.1; Lake Ontario, 1.9. For the period of replenishment the inflow into Lake Superior was approximately 6.6 cubic miles; Michigan, 5.4; Huron, 6.7; Erie, 2.7, and Ontario, 3.5.

In the opinion of the writer, based on the meteorological conditions that have prevailed during the winter just closed, the outlook for the coming season of navigation is not favorable to a continuation of the high water of 1904, although the season will probably rank as one of relatively high water, especially on the upper lakes. The difference between the levels of 1904 and 1905, due to atmospheric conditions, will naturally be most pronounced on Lakes Erie and Ontario where they may amount to half a foot or more.

RECENT PAPERS BEARING ON METEOROLOGY.

Mr. H. H. KIMBALL, Librarian and Climatologist.

The subjoined titles have been selected from the contents of the periodicals and serials recently received in the Library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau. Unsigned articles are indicated by a ——.

American Journal of Science. New Haven. 4 series. Vol. 19.
—— Possible variation in solar radiation. [Extract from report of S. P. Langley.] Pp. 246–248.

Astrophysical Journal. Chicago. Vol. 21.
Maunder, E. Walter The solar origin of terrestrial magnetic disturbances. Pp. 101–115.
Hale, George E. A study of the conditions for solar research at Mount Wilson, California. Pp. 124–150.
Hale, George E. The solar observatory of the Carnegie Institution of Washington. Pp. 151–172.

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Crostwait, H. L. A journey to Lake San Martin, Patagonia. Pp. 286–291.
Herbertson, A. J. The major natural regions: an essay in systematic geography. [Climate.] Pp. 304–306.

Journal of the Franklin Institute. Philadelphia. Vol. 59.
—— Magnetic storms and sun spots. [Note on work of E. W. Maunder.] P. 216.

Knowledge. London. New Series. Vol. 2.
Shackleton, W. The coming total eclipse. Pp. 45–47.
—— Radium, the cause of the earth's heat. [Note on article of E. Rutherford.] P. 61.

Proceedings of the Royal Society. London. Vol. 74.
Cave-Browne-Cave, F. E. On the influence of the time factor on the correlation between the barometric heights at stations more than 1000 miles apart. Pp. 403–413.

Quarterly Journal of the Royal Meteorological Society. London. Vol. 31.
Boyds, Charles W. R. Meteorological observing in the Antarctic regions. Pp. 1–14.
Brodie, Frederick J. Decrease of fog in London during recent years. Pp. 15–28.
—— Discussion of meteorological observations in relation to solar phenomena. P. 28.
Holmes, R. L. Hurricane in Fiji, January 21–22, 1904. Pp. 29–38.
Thomas, J. Lynn. Two cases of lightning-stroke, July 17, 1903. Pp. 55–60.
—— A legal decision as to damage by lightning and wind. Pp. 60–62.
—— Speculation in rain. P. 62.
Assmann, —. A kite struck by lightning at Hamburg. [Translation of note of Assmann.] P. 75.

School Science and Mathematics. Chicago. Vol. 5.
Cox, Henry J. Recent advances in meteorology. Pp. 159–167.

Scientific American. New York. Vol. 92.
Putnam, B. L. Grandfather's barometer. P. 179.

Scientific American Supplement. New York. Vol. 59.
Eliot, John. Meteorology in the British Empire. Pp. 24373–24374.
Eliot, John. Meteorology in the British Empire. P. 24386.
Clerke, Agnes M. Our solar system. Pp. 24386–24387.

Science. New York. Vol. 21.
Rotch, A. Lawrence. The temperature and drift of the air at great heights above the American Continent, obtained by means of registration balloons. [Preliminary report.] P. 335.
Ward, R. DeC. The teaching of meteorology. [Note on address of Cleveland Abbe.] Pp. 336–337.
Ward, R. DeC. Meteorological results of the Blue Hill kite work. [Review of work of H. H. Clayton.] Pp. 433–435.

Symons's Meteorological Magazine. London. Vol. 40.
—— The high barometer of January, 1905. Pp. 2–6.
Bonacina, L. C. W. The great problem of meteorology. Pp. 7–10.
Shaw, W. N. Autumn rainfall and yield of wheat. Pp. 10–12.
—— Our rainfall averages. Pp. 14–15.

Science Abstracts. London. Vol. 29.
Eb[ert, H.] Luftelektrische Messungen bei zwei Ballonfahrten. [Abstract of work of H. Gordien.] Pp. 208–209.

La Nature. Paris. 33me année.
R., L. R. Un nouvel observatoire d'astronomie physique. Pp. 161-162.
Viret, L. La bise du 1er au 3 janvier 1905. Pp. 175-176.
Rudaux, Lucien. La grande tache solaire. P. 208.
Rudaux, Lucien. Le vent et les arbres. Pp. 212-213.

Ciel et Terre. Bruxelles. 25me année.
Arctowski, Henryk. La météorologie des régions antarctiques et la coopération internationale dans les explorations polaires. Pp. 581-585.

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Violle, J. Sur l'action des canons paragrêles. Pp. 342-343.
Féry, Ch. Thermomètre intégrateur. Pp. 367-368.
Guillaume, J. Observations du soleil faites à l'Observatoire de Lyon (équatorial Brunner de 0^m, 16) pendant le quatrième trimestre de 1904. Pp. 420-422.
Nordmann, Charles. Enregistreur à écoulement liquide de l'ionisation atmosphérique. Pp. 422-425.

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Rutherford, E. Les probèmes actuels de la radioactivité. Pp. 125-150.
Gockel, A. Sur l'émanation radioactive de l'atmosphère. Pp. 151-158.

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Bebber, W. J. van. Bemerkenswerte Stürme. Pp. 49-55.
Möller, Johannes. Beobachtungen von Dämmerungserscheinungen, angestellt auf See. Pp. 55-58.
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Dadourian, H. M. Die Radioaktivität der Bodenluft. Pp. 98-101
Rebenstorf, H. Ueber das Verhalten der Schwefelsäure bei der Bildung von Nebeln. Pp. 101-107.

Gaea. Leipziz. 140 Jahrgang.
—— Luftelektriziät, Eigenladung der Erde und Aktivität der freien Luft. Pp. 132-136.
—— Drachenaufstiege auf dem Bodensee. Pp. 136-140.
—— Die Dämmerungserscheinungen der Jahre 1903 und 1904. [Review of work of W. Laska.] Pp. 179-180.

Illustrirte Aeronautische Mitteilungen. Strassburg. 9 Jahrgang.
—— Die Luftschiffahrt auf der Weltausstellung in St. Louis 1904. II. Pp. 33-39.
E. Die Tätigkeit des aeronautischen Observatoriums des Kgl. meteorologischen Instituts im Jahre 1904. Pp. 40-41.

Geographische Zeitschrift. Leipzig. 11 Jahrgang.
Schlüter, Otto. Das österreichisch-ungarische Okkupationsgebiet und sein Küstenland. Eine geographische Skizze. III. Das Klima. Pp. 99-103.

Himmel und Erde. Berlin. 17 Jahrgang.
Lendenfeld, Robert von. Ueber die Ursachen der Wüstenbildung.
Axmann, —. Physiologie des Wetters. Pp. 219-234.

Das Wetter. Berlin. 22 Jahrgang.
Kassner, E. Der Globus in der Meteorologie. Pp. 25-32.
Sieberg, August. Erdbeben und Witterung. Eine Studie über tellurische Dynamik. Pp. 32-34.
Hennig, R. Sturmfluten der Ostsee. Pp. 34-36.
Lancaster, A. Der grosse Hitze und Trockenheit im Juli 1904. Pp. 38-41.
Schwenck, Otto. Das Verhalten der Gewitterböen beim Passieren von Flussläufen in der kalten Tages und Jahreszeit. Pp. 42-43.
—— Meteorologische Station zu Lüdenscheid. Pp. 43-45.

Meteorologische Zeitschrift. Wien. Band 21.
Gallenkamp, W. Ueber den Verlauf des Regens. Pp. 1-10.
Szalay, L. v. Ueber die Empfindlichkeit der Gewitterapparate. Pp. 10-22.
Quervain, A. de. Bericht über die IV. Konferenz der internationalen Kommission für wissenschaftliche Luftschiffahrt in St. Petersburg. Pp. 22-26.
Wundt, W. Ueber die Superposition von Zyklonen. Pp. 26-27.
Johansson, Oscar V. Zur Definition des Rauhfrostes und Glatteises. Pp. 27-29.
Hann, J. Genäherte Berechnung des jährlichen Ganges der Temperatur aus den Mitteln der Jahreszeiten. Pp. 29-30.
Hann, J. Regenfall zu Greenwich 1815-1903. Pp. 30-32.
—— Resultate der meteorologischen Beobachtungen auf dem Ben Nevis und zu Fort William im Jahre 1903. Pp. 32-33.
—— Ergebnisse der meteorologischen Beobachtungen im Jahre 1903 in Manila. P. 33.
—— Meteorologische Beobachtungen zu Tanger, Marokko, 1899-190, und auf Neu-Kaledonien 1891-1901. P. 33.
—— Magnetische Elemente für Potsdam. P. 34.
—— Niederschlagsmengen in Transvaal. P. 34.
—— Regenmessungen auf den Fidschi-Inseln. P. 34-35.
—— Ergebnisse der meteorologischen Beobachtungen zu Ancud, 1900 bis 1902. P. 35.
Hann, J. Zum Kilma von Niederländisch-Ostindien. Pp. 35-36.
—— Meteorologische Beobachtungen zu Pasuruan in Ostjava. Pp. 37-39.
—— Jährliche Periode der Erdbeben im indischen Archipel. P. 39.
—— Resultate der meteorologischen Beobachtungen an der Küste des französischen Kongostaates, 1899-1901. Pp. 39-40.
Hann, J. Regenfall in Montpellier in der Periode 1873-1903. Pp. 40-41.
Hann, J. Bodentemperatur zu Harestock und Southport. Pp. 41-42.
—— Polis über den tägl. Gang der Temperatur zu Aachen an heiteren und trüben Tagen und die stündliche Anderung der Temperatur. Pp. 42-43.
—— Gewitter in Dänemark. P. 43.
Wolfer, A. Provisorische Sonnenflecken-Relativzahlen. P. 43.
—— Klima von Jerusalem. P. 43.

Hemel en Dampkring. Amsterdam. 2 Jahrgang.
Nell, Chr. A. C. De weervoorspelling met behulp van locale waarnemingen. Pp. 147-151.
Mars, S. De algemeene circulatie van den Dampkring. Pp. 151-157.

Boletim da Sociedade de Geographia de Lisboa. Lisboa. 22 Série 1904.
Berthoud, Paul. Météorologie de Lourenco Marques. Pp. 390-391; 438-439.

Memorie della Societa degli Spettroscopisti Italiani. Catania. Vol 33.
Duner, N. C. Sulla rotazione del sole. P. 13.
Birkeland, Kr. Recherches sur les taches du soleil et leur origine. Pp. 14-18.

RECENT ADDITIONS TO THE WEATHER BUREAU LIBRARY.

By Mr. H. H. KIMBALL, Librarian.

The following titles have been selected from among the books recently received, as representing those most likely to be useful to Weather Bureau officials in their meteorological work and studies. Most of them can be loaned for a limited time to officials and employees who make application for them.

Angström, Knut. Intensité de la radiation solaire a diffèrentes altitudes. Recherches faites a Ténériffe 1895 et 1896. (Nova acta soc. sc., Upsala. Ser. 3, Vol. 20, Fasc. 1, 1901.) 46 pp.

Baden. Zentralbureau für Meteorologie und Hydrographie. Niederschlagsbeobachtungen der meteorologischen Stationen im Grossherzogtum Baden, Jahrgang 1904. 2. Halbjahr. 25 pp.

Bates, Henry Walter. The naturalist on the river Amazon. lxxxix, 389 pp.

Buti, Giuseppe. Scritti di fisica e meteorologia. 290 pp.

Christoni, Ciro. Contributo del Leslie e del Belli agli studj attinometrici. (Estratto dagli Atti della Società dei Naturalisti e Matematici di Modena. Serie IV. Vol. III. Anno XXXIV. Modena, 1899.) Pp. 83-94.

Le formole di Bouger per il calcola degli spessori atmosferici e della trasparenza dell'atmosfera. (Estratto dagli Atti della Società dei Naturalisti de Modena. Serie III. Vol. XVI. Anno XXXI. Modena, 1899.) Pp. 165-187.

La fotometria e la pirometria del Lambert rispetto agli studi attinometrici. (Estratto dagli Atti della Società dei Naturalisti e Matematici di Modena. Serie IV. Vol. I. Anno XXXII. Modena, 1899.) Pp. 66-88.

Herschel (John) ed il metodo dinamico nelle misure attinometriche. (Estratto dalle Memorie della Società degli Spettroscopisti Italiani. Vol. 30, 1901.) 9 pp.

Osservazioni meteorologiche fatte negli anni 1899 e 1900 all'Osservatorio Geofisico della R. Università di Modena calcolate dall'Ing. Angelo Manzini. 109 pp.

Parafulmini del R. Osservatorio meteorologico di Sestola. (Pubblicazioni del R. Osservatorio Geofisico di Modena. No. 16.) 12 pp.

Ricerche sperimentali sul coefficiente di induzione dei magneti. 21 pp.

De Saussure e l'attinometria. (Estratto dagli Atti della Società dei Naturalisti e Matematici di Modena. Serie IV. Vol. III. Anno XXXIV. Modena, 1901.) 12 pp.

Sulla legge del raffreddamento di Newton e sulla determinazione della temperatura del sole attribuita al Newton. (Estratto dalle Memorie della Società degli Spettroscopisti Italiani.) Vol. 29, 1901.) 5. pp.

Dobrowolski, A. Expédition Antarcticque Belge. Résultats du voyage du S. Y. Belgica en 1897-1898-1899 sous le commandement de S. de Gerlache de Gomery. Rapports scientifiques publiés aux frais du gouvernment Belge, sous la direction de la Commission de la Belgica. Météorologie. La neige et le givre. 78 pp.

Dubinski, V. Magnetic storm on October 31-November 1. 1903, according to the investigations of the Constantine Observatory in Palovsk. (Reprint from Proceedings of the Imperial Academy of Sciences. Tome XX, No. 2. February, 1904.) Pp. 67-76.

Gautier, R. Résumé météorologique de l'année 1902 pour Genève et le Grand Saint-Bernard. (Tiré des archives des sciences de la bibliothéque universelle. Novembre et décembre 1903.) 108 pp.

Hann, Julius. Lehrbuch der Meteorologie. Lieferung I. Zweite, umgearbeitete Auflage. 96 pp.

Harvard College Astronomical Observatory. Annals of the