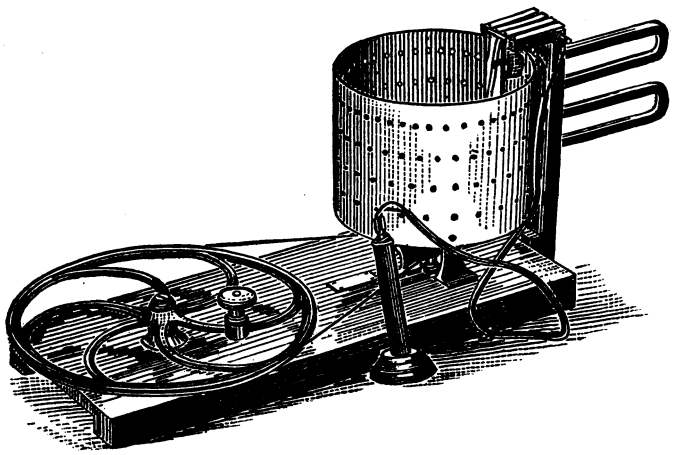
though somewhat faint, musical sound. About the same result was given by a disk consisting of the same sheet of tinfoil pasted on cardboard.

Any periodic variation from uniformity in the disk appears to produce corresponding variations in the magnetic field when the disk is rotated. Depressions made with a punch, at regular intervals, in a zinc disk, rendered it a sound-generator when rotated in this apparatus.

Since the pitch of the note obtained depends only on the number of holes passing the pole of the magnet in a second, it is easy to construct a piece of apparatus to illustrate musical intervals. A cylinder of galvanized iron, with four rows of holes in the ratio of 4 : 5 : 6 : 8, was



mounted on a whirling table, and provided with two U-magnets and two electro-magnets for induction. The latter were placed inside the cylinder, and the former outside. By means of four keys, any one of the bobbins, or all of them, can be put in circuit with the telephone. By depressing the keys, the four notes of the common, or major, chord are brought out with great distinctness and clearness. In fact, the intensity of the sounds obtained by the magnetophone is sometimes so great as to be painful to the ear when the telephone is held closely against it.

The above experiment was simplified by employing a disk perforated in four concentric circles with 24, 30, 36, and 48 holes respectively. A telephone with the mouthpiece and diaphragm removed, was presented to the four rows of holes in succession, with the production of the four notes of the major chord as before, clearly defined, but not so loud as with the other apparatus. Further experiments are in progress.

H. S. CARHART.

Evanston, Ill.

THE WEATHER IN JULY, 1883.

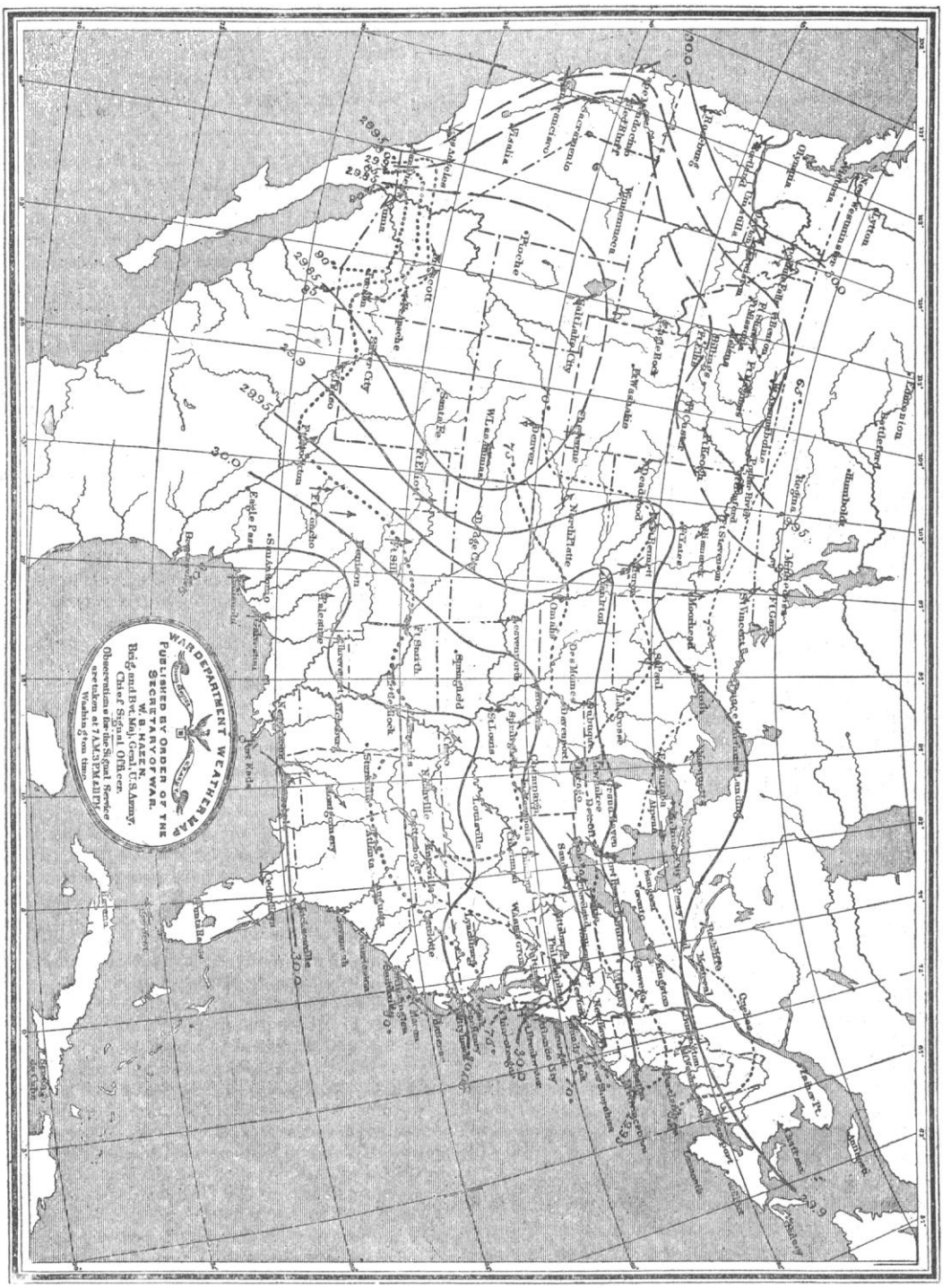
THE monthly weather review of the U.S. signal service shows that the most noteworthy characteristics of July were the large deficiencies in rainfall in the southern states and in the north-west, the low mean temperature in nearly the whole country, and the severe local storms, which were frequently accompanied by lightning and hail.

The pressure was nearly normal, the departures in few instances exceeding .05 inch. The progress of eight depressions has been charted. Only one of these passed south of New England, and none visited the southern states. None were traced from the Pacific coast, and four apparently developed in the Rocky-mountain region. One only of these depressions is deserving of the name of a severe storm. This developed in Colorado on the 4th, and reached Nova Scotia on the 7th, accompanied by heavy rains in the lake region, and violent local winds at Hatteras and Sandy Hook. The storm proceeded across the Atlantic, and on the 11th was central off the north-western coast of Ireland, causing heavy squalls and high seas during its passage.

The chart of ocean-ice shows, that, since the preceding month, the eastern limit has moved about 2° westward, and the southern limit about 2° northward. There is a marked diminution in the number of icebergs observed, compared with July, 1882.

The temperature has been below the average, except in the Pacific districts, the northern plateau region, the south Atlantic and east gulf states; but the departures have been small. In New England, the middle Atlantic and west gulf states, the temperature was less than 1° below the normal, while the greatest difference was 3° below in the extreme north-west. A maximum of 112° was recorded at Phœnix, Arizona; and frosts occurred in northern New York, Michigan, Wisconsin, Iowa, New Hampshire, and Pennsylvania.

The special feature in the precipitation record



MONTHLY MEAN ISOBARS, ISOTHERMS, AND WIND-DIRECTIONS, AUGUST, 1883. REPRINTED IN REDUCED FORM BY PERMISSION OF CHIEF SIGNAL-OFFICER.

is the large excess in the upper lake region, New England, and the upper Mississippi valley; and the large deficiency in the southern states, which materially affected the crops in that section. The following table contains the rainfall record: —

Average precipitation for July, 1883.

Districts.	Average for July. Signal-service observations.		Comparison of July, 1883, with the average for several years.
	For several years.	For 1883.	
	Inches.	Inches.	Inches.
New England	3.92	5.76	1.84 excess.
Middle Atlantic states	4.04	3.28	0.76 deficiency.
South Atlantic states	5.65	4.92	0.73 deficiency.
Florida peninsula	5.77	4.49	1.28 deficiency.
East gulf	5.04	2.50	2.54 deficiency.
West gulf	4.16	2.44	1.72 deficiency.
Tennessee	4.06	3.07	0.99 deficiency.
Ohio valley	4.55	5.35	0.80 excess.
Lower lakes	3.84	4.51	0.67 excess.
Upper lakes	3.36	5.42	2.06 excess.
Extreme north-west	2.83	2.44	0.39 deficiency.
Upper Mississippi valley	4.02	5.58	1.56 excess.
Missouri valley	4.44	3 37	1.07 deficiency.
Northern slope	1.94	0.82	1.12 deficiency.
Middle slope	2.77	2.57	0.20 deficiency.
Southern slope	2.50	3.19	0.69 excess.
Northern plateau	1.01	0.00	1.01 deficiency.
Southern plateau	2.35	2.50	0.15 excess.
North Pacific coast	0.58	0.00	0.58 deficiency.
Middle Pacific coast	0.01	0.00	0.01 deficiency.
South Pacific coast	0.08	0.15	0.07 excess.

In some portions of the southern states, the deficiencies were even greater than those recorded in the above table: at New Orleans the rainfall was 5 inches less, and at Vicksburg 6.82 inches less, than in July, 1882. Eastport, Me., reports a fall of 5.24 inches in 10 hours, on the 14th inst.

The local storms reported are very numerous, and much damage resulted from rain, lightning, and hail. The greatest damage from rain was at London, Ont., on the 10th, due to the overflowing of the river Thames. Much damage to crops, especially in the west, was caused by hail. A vessel in lake Michigan reports a hail-stone weighing two pounds. The rivers were not high, except at the very beginning of the month; and navigation was suspended in the Savannah and Cumberland rivers on account of low water.

Among miscellaneous phenomena may be noted the brilliant aurora on the nights of the 29th and 30th, which was observed from Dakota eastward to New England, and southward to southern Virginia. Slight earthquake shocks were experienced in Nevada, Illinois, California, and Kentucky; though insignificant in comparison with that on the island of Ischia, of which a condensed account is given. Sun-spots were numerous; and an instance is noted in Oregon, of their observation with the naked eye, taking advantage of the smoky state of the atmosphere caused by forest-fires.

The accompanying chart represents the distribution of the mean pressure, temperature, and wind direction for the month.

THE EARTHQUAKE OF JULY 28, 1883, IN THE ISLAND OF ISCHIA.[1]

HAVING visited the island of Ischia by order of the inspector-in-chief of the Royal corps of mining engineers, a few days after the earthquake of the 28th July, I present some observations made during my short tour; and begin with a brief account of the topographical and geological conditions of the island, which last are, without doubt, the chief cause of the terrible disaster.

The formation of the island of Ischia is wholly volcanic, with the exception here and there of some argillaceous elevations, of marine formation, but derived from the disintegration of pre-existing volcanic matter. In connection with the islands of Vivara and Procida, it belongs to the volcanic group of the Campi Flegrei, and forms its western limit.

The aspect of the island as seen from the north is pleasant and delightful, although with deep hollows crowned by the towering and indented crest of Epomeo, rising to an elevation of 792 metres.

The town of Casamicciola, now destroyed by the terrible scourge, was built on the side of Epomeo sloping towards the north, upon two small hills, beside which flow two of the principal streams of the island, one near the mountain, fed chiefly by the waters of thermal springs, the other emptying into the sea near Lacco Ameno, a little farther to the west; these run from south to north; and another more important stream, called the Scarrupato, runs from north to south, flowing through a deep and precipitous valley on the southern slope of the island, having on its banks the villages of Fontana, Serrara, Moropane, and Barano. These last two streams are, in my opinion, very important; being, as we shall see, situated directly in one of the principal gorges of the island.

Forio is on the west coast, upon a plain gently rising towards Epomeo, bordered upon the north by Mount Zale. Eastward of Casamicciola are seen the volcanoes of Monte Rotaro and Montagnone (respectively 215 and 236 metres in height.)

According to Fuchs, the most ancient terrane of the island is composed of the tufa of Epomeo, of a clear green color, containing numerous sanidin, and sometimes pumice and lapilli. On this rest, here and there, strata of pumice and trachytic tufa, and depositions of trachytic lava, with beautiful sanidin from the mountains Rotaro, Montagnone, Tabor, Garofali, etc., which may also be seen on the road from Lacco Ameno to Forio, forming the promontory of Zale.

On the tufa of Epomeo rests a great extension of

[1] Translated from the Italian of L. Baldacci of the Royal corps of mining engineers (*Boll. R. com. geol.* 1883, nos. 7, 8).