

anyone spoke to him he begged almost fretfully to be allowed to rest. The day passed on, and as the missing ones did not return, Rex became increasingly anxious. Late in the afternoon he took the renovated dinghey and sculled himself to the shore. Drawing it up on the beach, he began to explore the paths at the entrance to the forest. After penetrating to some distance, he found the path he had followed growing broader, and taking a distinctly upward direction. Immediately on perceiving this, he determined to follow it further, for it was evident that it led to the mountains, and in the mountains was Les Chaumettes. He had no weapons with him except a clasp-knife, but he cut a stout stick from the bushes and went on. In the shadow of the trees it was almost dark, and he stumbled blindly upwards over the rough path for some way. Stopping after a time to try and get a glimpse of the setting sun, from which he might take his bearings, he heard footsteps in front, and presently a small figure became dimly visible, plodding wearily, but resolutely, downwards. Catching sight of Rex, the boy uttered a cry and tried to run away, but caught his foot and fell, sobbing out incoherent prayers for mercy.

"Why, Tommy!" said the captain, stooping over him, and giving him a good shake, "what's the matter? Where's Miss Cheveley?"

"Up at that there place, and they're goin' to kill her," sobbed Tommy.

The captain's hand tightened on his shoulder.

"Tell me what you mean this instant, Tommy. Get up, and don't be a baby. If Miss Cheveley is in danger, she must be rescued."

Thus adjured, Tommy choked back his sobs and told his story.

"When me and Miss Cheveley got on shore this mornin', there was that there old nigger a-waitin' for us—and a rum old cove 'e is, too. And ain't 'is 'air done up queer, just! all in knots, like the 'orses' tails on May-day. Miss Cheveley she says it's becoz 'e's one of their parsons. 'E brought a moke—leastways, I means a donkey—for Miss Cheveley to ride on, and 'e takes us up 'ere hever so far, till we come to a 'ouse and a old nigger 'ooman, the 'orriddest-lookin' old gal I hever see. Miss Cheveley she talked to 'er, and the old gal she answers very pleasant, and Miss Cheveley she says to me as the medicine 'ud take some time to make, and she was goin' to take a sketch while it was bein'

cooked up. So then the old 'ooman put on a big pot with all sorts of things—hawful-lookin' things, some on 'em—in it, and Miss Cheveley she set down on the roots of a tree and began to draw, and I looked about the place a bit. I came on a sort of place in the trees near as I thought might be one of their temples, and I looked about to see if there was any hidols, like the vicar told us about in Sunday-school. But there was only a lot of bits from picture papers and a box, but I couldn't see what were in it, 'coz that there old nigger came and 'unted me out. So then I jest set down 'side of Miss Cheveley and went to sleep. Presently I woke up, feelin' Miss Cheveley's hand on me, and she looked very white, and says, 'Tom,' says she, 'I'm afraid we're in great danger. These people mean to sacrifice us to their hidols. I 'eard them whisperin' about it when I went to fetch some more water jest now. They was talkin' about the goat without 'orns, and I know what that means.' I says, 'Let's cut and run for it, miss. I'm game.' But she says, 'I can't. They can see me from where they are settin', but they can't see you. Slip away, and run down to the ship and get 'elp.' 'But ain't you better try, miss?' says I. So she got up, but the old 'ooman come out and 'ollered at 'er, very hangry like, and I see the old man be'ind 'er with a gun in 'is 'and, and Miss Cheveley she says to me, 'It's no go, Tom. They say they've 'ad no end of trouble makin' the medicine, and they won't let me go 'ome till it's done, so you bunk and fetch 'elp.' So then I sloped, as cunnin' as one of Buffler Bill's Injins, and come as fast as I could till I found you, sir."

"And you must go on to the ship," said Rex. "I will hurry up to the village, and try to get Miss Cheveley away before they can bring any more people together. Tell Mr. James from me—stay, I had better write the message, if I have any paper."

Feeling in his pocket, he found a letter, one that had been forwarded to him under cover at Port Royal, and scribbled on the back of the envelope with a stumpy pencil, "Bring ten men well-armed, and let Tommy show you the way. Lose no time. It is a matter of life and death." In the dim light he could scarcely see what he had written, but he gave the paper to Tommy and bade him run for his life, then resumed his upward path with feverish haste.

END OF CHAPTER THE FOURTH.

IN THE UNITED STATES WEATHER OFFICE.



AMONG the numerous "sights" which Washington offers to visitors, one of the most interesting, though, perhaps, one of the least visited, is afforded by the Weather Bureau during the few hours each day when the forecasting of the weather is being done and the weather map prepared.

The work of the Weather Bureau as a whole embraces, contrary to the popular impression, a great deal more than the mere forecasting of the weather from day to day. A brief consideration shows that the general meteorological work, the study of climatology in all its bearings upon vegetation and plant growth, as well as on animal and human health, is a

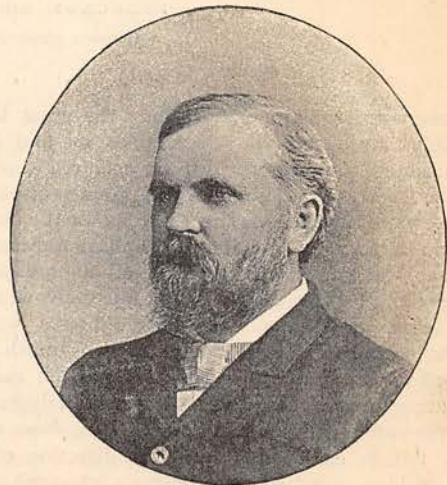


ACCOUNTS DIVISION—WEATHER BUREAU.
(From a photograph by Mr. Alexander McAdie.)

very broad subject, and I think it may be stated without exaggeration, that nowhere is it carried on on so broad a scale as in the United States, where over three thousand volunteer observers keep a daily weather record; where over 156 stations, in charge of salaried officers of the Bureau, are scattered throughout the country, maintaining daily telegraphic communication with each other, and with the central office in Washington; where, besides, many of the States cooperate with the Bureau by maintaining a State weather service, a system which, since the transfer of the Weather Bureau from the War Department to the control of the Department of Agriculture,* is likely to be greatly extended by enlisting in the meteorological work of the country the numerous agricultural experiment stations, nearly seventy in number, which, in connection with the State agricultural schools, draw a large annual allowance from the National Treasury. The fact, however, that the work of forecasting is, so to speak, the spectacular feature of the Weather Bureau work, and that the weather prognostications are published throughout the country, heralded by the signal flags from the thousands of "display stations," as they are called, which receive daily telegraphic communication from the central office in case of sudden weather changes; and that at over sixty

* The Weather Bureau was developed while under the control of the Chief Signal Officer of the War Department, but on July 1, 1891, the Weather Bureau was separated from the Signal Service, the latter remaining, of course, connected with the Army, while the former was transferred to the Department of Agriculture, and a chief officer appointed who is known as Chief of the Weather Bureau, and who is directly responsible to the Secretary of Agriculture.

stations, including the central office, weather maps are published daily showing the condition of the weather throughout the country during the previous twenty-four hours, and containing prognostications for a period of from twenty-four to thirty-six hours, inclines the popular mind to believe that the work of the Weather Bureau consists largely in foretelling the weather, which is certainly not the case. It will, however, no doubt interest your readers if they will endeavour to accompany me for an hour or so to the Washington Weather Bureau, at say about 8.30 to 9 p.m., when the forecasting is being done.

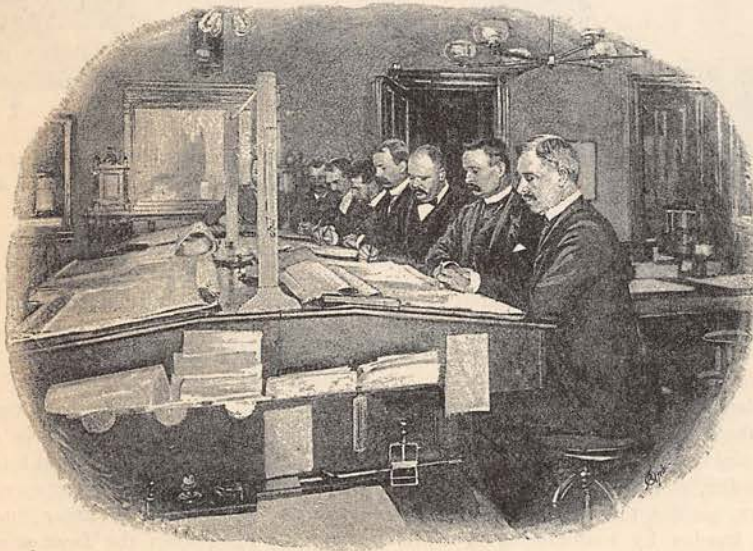


PROFESSOR MARK W. HARRINGTON.
(From a photograph by Mr. C. M. Bell, Washington, U.S.)

Being stopped at the door by the coloured messenger we will send our cards up to the Chief, Professor Mark W. Harrington, formerly of the University of Ann Arbor, Michigan, and at one time in charge of the Observatory at Pekin, China, a genial looking, pleasant-faced gentleman in the early forties, who, if we are fortunate enough to find him, will give us a cordial welcome to his domain, and after a few words of general conversation in regard to the work of the Bureau, will then conduct us through the library, one of the best meteorological libraries, we believe, in the world, to the forecast room. Here we shall find a high double desk, with three persons on a side; just beyond them a recess, furnished with printers' cases, at which two men are stationed; while extending to the left as we enter is a good-sized room, lined with large weather maps, including one immediately opposite the entrance made of stiff board and full of little holes,

telegram is in cypher, and as we look over the shoulder of the reader—we might call him the translator—we read the following apparently meaningless words, "Memphis, target, German, buffoon, tense, frost, cigar, normal," which, however, he proceeds to read aloud, with little or no reference to the cypher-key which lies by his hand, as follows: "Memphis, Tennessee. Barometer 29.92; temperature 44°; wind south-east; weather cloudy; precipitation .52 inch; wind velocity 10 miles per hour; minimum temperature 38°; river observation 10 feet above zero of gauge and falling; light frost due point, 42°; time 8 a.m.; upper clouds hidden; amount of clouds 10/10, kind, stratus; direction, south."

The principle of this cypher is the particular arrangement of certain of the letters in each word by which they are given a different value, and the use of a common word in such an arrangement has been found



FORECAST ROOM—WEATHER BUREAU.

(From a photograph by Mr. Alexander McAdie.)

each one representing a station along the great lakes and the Atlantic coast, in which holes we find little pegs inserted, the tops of which are coloured to represent the flags indicating the storm signals displayed at these various points during that day for the benefit of the mariners. Close by, and almost underneath this map, we find, on what printers call a proof-press, a copper sheet of the exact size of the daily weather map, having the shape of the United States, with a portion of the British Dominions to the north, and studded with curious little square holes, each one representing one of the stations in daily telegraphic communication with the main office. Just as we enter a boy follows us, coming from the direction of the click, clicking sound which indicates a telegraph office close by, and hands to a gentleman sitting on one side of the high desk referred to, a telegram. The

desirable to secure accuracy on the part of the operator, who is less liable to make a mistake when the letters fill out a word with which he is familiar. In this form the cypher has been found to conduce to correctness rather than the reverse, fewer mistakes having been found to occur in telegraphing since the cypher system was adopted than were detected when the telegram was expressed in plain terms. Of course the main advantage of the cypher, as can be seen by a comparison of the above telegram with its translated meaning, is in the immense saving of the expense, which amounts in the aggregate, even with all the economy thus effected, to a very large sum.

As soon as the translator begins to read every man goes to work, those at the same desk with the reader each recording on the map before him that phase of the weather which his particular map represents. For

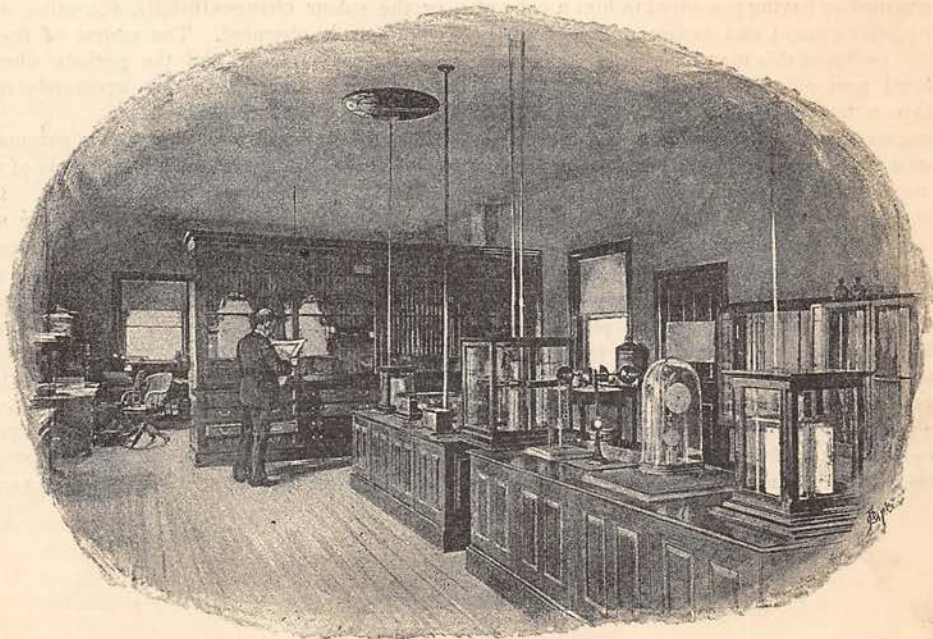
instance, one notes the temperature, another the barometric pressure, another the cloudiness or sunshine, as the case may be, while the operator standing by the copper map dotted with square holes, to which reference has been made, notes by the insertion of logotypes the direction of the wind, as well as the condition of the atmosphere. Each logotype represents an arrow traversing a circle. The arrow marks of course the direction of the wind, while the circle, if of solid black, represents cloudy; if black and white, partially cloudy, and if white, clear weather.

While all these particulars are thus being simultaneously noted on the several maps, the two compositors at the cases above mentioned, proceed to set up, using logotypes mostly, the particulars of the weather for the points named. The names of the stations are, of course, already set up, and all that is necessary is to insert, with a rapidity which only practice can give, the data relating to the weather, opposite the station called. About a quarter to nine the telegrams begin to come in from the various stations at which observations are taken simultaneously at 8 o'clock p.m., Washington time, and by about half-past nine all of the reports are in and noted, and at that hour one of the three forecasters who are assigned to this duty monthly, in turn, makes his appearance, and takes his place opposite one of the maps, which we then observe contains most of the data announced by the cypher reader, the other maps being apparently used largely as checks. A number of red and blue pencils are lying on the desk opposite this map, and the forecaster, taking a blue pencil, proceeds to draw the isotherm lines, as they are called, connecting all those stations showing the same temperature.

These are represented on the printed map by dotted lines. Then taking a red pencil he proceeds to mark the isobar lines, connecting all points showing the same barometric pressure—the barometric pressure, by the way, being reduced at all stations to sea-level before reporting. Then with the map before him made up twelve hours previously, namely, 8 a.m., Washington time, he compares it with the one he has just traced, any variation which strikes him as unusual being verified by reference to one of the other maps. The condition of the clouds and the direction of the wind are noted, a storm-line perhaps is also traced, the rainfall is studied, and he sees before him, as it were, the entire country, with all its varying meteorological conditions, from the Pacific to the Atlantic, from away up in the British possessions, for between the weather stations under the Canadian Government and those in the United States there is complete accord and co-operation, to the Gulf of Mexico. After a few moments' study of the subject's physiognomy, as one might say, he proceeds to dictate his forecast to the clerk seated by him, who writes on small sheets of paper between which carbon paper is inserted so as to make three copies simultaneously. Only a few words are written on each sheet, and the triplicate copies are immediately distributed, one to one of the compositors in the room, one to the telegraph office adjoining for transmission to other forecasting stations, while the third is retained by the forecaster. In forecasting, the forecaster divides the entire country into regions, thus:

For New England and Eastern New York, generally fair, preceded by light showers in northern portions; south-west winds.

For district of Columbia, Eastern Pennsylvania, New



INSTRUMENT ROOM—WEATHER BUREAU.
(From a photograph by Professor Chas. F. Marvin.)

Jersey, Delaware, Maryland, Virginia, and North Carolina, fair till Friday night; south-westerly winds.

For South Carolina and Georgia, fair; slightly warmer; southerly winds.

And so forth and so on, until he has covered the entire country, to which forecasts are added, as occasion requires, in regard to the probable fall or otherwise of the several rivers of the country.

As soon as the forecasting is done, which is usually about 10 o'clock or very soon after, a representative from the lithographic establishment attached to the Bureau, makes his appearance to carry off the maps upon which the isobars and isotherms and the rainfall are marked, for transfer to the stone. For this process all the lines and figures are first duplicated upon a map of the size of the regular daily weather map, made of specially prepared paper, and with a particular kind of ink. As soon as this is completed it is brought to the proof-press containing the copper sheet in which the logotypes have been inserted, representing the condition of the atmosphere and the direction of the wind. These are duly inked, the paper map adjusted over them, and these data thus transferred to it. The map now contains all the information shown on the map proper, and by this time proofs of the prognostications are ready, as well as of the weather record, which had been set up as the data were being announced by the reader. These proofs are attached to the map in the left-hand and right-hand corners respectively, the space representing a portion of the Pacific Ocean being utilised for the one, and that space representing a portion of the Atlantic Ocean for the other. As soon as this is done the process of transferring to the stone begins. This is but the work of a moment, and usually before a quarter to eleven the visitor is gratified by having presented to him a copy of the following day's map; and before midnight nearly one hundred copies of this map have found their way to the general post office for transmission to various points within a few hours' reach of Washington. A similar process takes place simultaneously at over sixty forecast stations in the United States, though at none of them is the forecasting made to cover the entire country as in Washington.

The work of forecasting is, I understand from foreigners who have visited our Washington Weather Bureau, more thoroughly and completely done here than in any other country. In the first place, American ingenuity has brought the principle of simultaneity, if I may use the term, in every detail of the work to the greatest perfection; but, what is far more important in the matter of forecasts, no other country presents so vast a territory from ocean to ocean at which simultaneous observations can be taken at so many

stations all under the control of one chief officer. Of course, numerous complaints are heard throughout the country of the unreliability of the weather forecasts, and yet a careful record shows that during the past ten months, the weather has been accurately forecasted on an average of eighty-eight times out of one hundred. Naturally, however, the twelve times when the weather has varied from the forecasts have attracted a great deal more attention than the eighty-eight times when the forecast has been fulfilled to the letter.

In the Annual Report of the Secretary of Agriculture for 1891, the record of the weather at principal points throughout the United States is given for every day in the year, by means of a diagram. Such a record for a series of years will, taken in conjunction with the condition of the various important crops, and of the plant diseases or insect pests by which they have been affected, undoubtedly form a most interesting study, as they indicate more and more surely to agriculturists the co-relation between meteorological conditions and the several vicissitudes by which our various agricultural products are affected.

In closing this brief sketch of one of the most interesting features of the meteorological work in the United States, it may be interesting to describe briefly one or two of the methods adopted for keeping an accurate record of meteorological conditions. One of these is the recording of sunshine automatically. An instrument has been devised which follows the course of the sun in such a manner as to reflect its rays upon a chemically-prepared surface which gradually changes colour wherever the sunlight strikes. Naturally, if the sun be completely overcast there is no change of colour, while if partially cloudy, the surface is blurred, or the colour changes fitfully, according as the sun shines or is obscured. The course of the sun from sunrise to sundown, and the periods when the sun shines or is cloudy, are thus accurately represented upon the surface of the machine.

Another ingenious device records automatically the force of the rainfall at different periods of the day, in addition to giving the total precipitation. The principle by which this is accomplished is very simple, the rain-gauge containing a pan which tips over whenever it is full, depositing the contents in the rain-gauge proper. The tilting of the pan is automatically recorded, and the quantity of what it contains being known, and the length of time taken for it to fill being shown, the rate of the precipitation at any time of the day or night can be calculated very closely.

The total cost of running the weather service of the United States is a little under \$900,000, or about £220,000 sterling.

ANGLO-AMERICAN.

