

SCIENCE.

FRIDAY, SEPTEMBER 14, 1883.

THE U. S. SIGNAL-SERVICE.

I.

THE annual report of the chief signal-officer for 1881, recently issued, is a volume which ought to be of great interest to all concerned in the progress of meteorological science in this country; and it would be, were it not for certain characteristics too apt to be found in government publications. Of these, the most notable at first sight is its ponderous bulk. After one has received the polite notice, 'a package too large for the carrier,' etc., and has achieved its safe delivery in one way or another, he is likely to wonder what end it may be best made to serve. If he be interested in meteorology, he will find it well worth his while to give at least one volume of the series a careful examination, in order that he may know what not to read in the next.

In its thirteen hundred broad pages, together with its maps, charts, etc., he will find much that is valuable; much that, to him, is perfectly useless; and, if his tastes be not too circumscribed, much that is amusing. A government report is not a likely place in which to seek entertainment; but, considered as a scientific publication, the report will furnish its share. In this respect it is, doubtless, clear ahead of all other scientific documents issued by the government.

As a scientific document it must be considered; for, since the organization of the weather bureau of the signal-service, by far the larger part of the operations of that service have had to do with meteorology; in fact, the work in the way of practical meteorology constitutes the only *raison d'être* of the service as at present organized and equipped.

A fair examination of this work can only be made by a comparison of this report with those of the several preceding years: indeed, justice could not be done the present administration

without such a comparison, as it indicates changes of considerable moment, which seem likely to greatly increase the efficiency and value of the service.

The first part of the volume consists of the report proper of the chief signal-officer. This seems, in each case, to be made up almost entirely by copying from the report of the previous year. It must have been written, of course, at some time, and by somebody; but when and by whom will soon be lost to the history of meteorological science. A few additions are made, fewer subtractions, and now and then a linguistic blunder has been eradicated, after it has done faithful service for several years. The impression is everywhere conveyed, that the preparation of this, which one might expect to find the freshest and most readable portion of the volume, is annually committed to the skill of a copying-clerk. It is not to be denied, that certain statements in regard to the service will bear, and deserve, repetition; and, indeed, the chief signal-officer himself inserted a sort of an apology for this repetition a few years ago, which has been faithfully reprinted along with the rest ever since. But whole pages are repeated year after year, when it would appear that they had served their purpose in a single publication; and this seems all the more uncalled-for in the case of much which might better have never been published at all.

We are annually informed, that "meagre reports only have been received of the instruction for the field duties of the signal-service elsewhere than at Fort Myer;" and we wonder why whoever is responsible for this neglect is not urged to remedy it, through some other avenue than the annual report. The need of a fire-engine at the post was a standing item for several years; but, as it does not appear in the last report, it may be assumed that the want has been supplied, possibly through the generosity of some distressed reader.

The space occupied by the fire-engine is now filled, however, by the extraordinary and interesting announcement, that "the post-garden is in good condition, and has, for some time, been a source of supply to the company mess." The importance of this statement entirely overshadows that of many others which might be quoted, — such as that the enlisted men have succeeded in managing the coal-oil lamps which have been supplied them, that the buildings of the post will require painting the coming season, etc.

In some instances the annual reprint has not received that attention which might be expected even from clerical supervision. One of the statements which has regularly made its appearance for several years is this: "It is needless, with such facts in view, and after — years of continuous service, to reiterate the advantages secured to the signal service by its military organization." In spite of this declaration, the reiteration has been religiously kept up; and it was evidently intended that the above blank should be properly filled as the years rolled by. In the report for 1879, it is filled with the word 'nineteen,' and this is exactly copied in that for 1880. In the report for 1881, the word 'twenty' is substituted; so that, unless an effort is made to 'catch up' in the next report, the corps will be deprived of one 'year of continuous service,' and the argument will be proportionately weakened.

Illustrations of useless and careless reprinting might be continued to almost any extent; but it will be of greater interest to pass to Appendix I., which contains the courses of instruction furnished at Fort Myer for the training of officers and men belonging to the service.

If this is to be considered as a school for the education of meteorological observers, its curriculum is certainly marvellous. Although certain portions of the course of study are given in the report in great detail, — even to the paragraph and page at which each lesson begins and ends, other portions are not so well defined; and some assumptions must be

made as to the time occupied in certain parts of the work. It is thought that no injustice is done in the following estimate of the distribution of study and practice: —

Officers who are assigned to the school for instruction in the duties of the service remain there about one year. The instruction is theoretical and practical. In the theoretical course, about 37 per cent of the whole time is spent in the study of meteorology and meteorological observations. In the practical course, 8 per cent is a high estimate for the time devoted to that subject. Indeed, out of the year's work, it is prescribed that *eight days* shall be spent in the meteorological observatory; in which time the officer is expected to learn "the use of all instruments used at observation offices of the signal-service, care of and repair of same, and making out of meteorological forms." The remainder of the year is devoted to the study and practice of military signalling, wand-practice, military surveying, electric telegraph, international signals, etc. It is fair to add, however, that for officers who are assigned to the headquarters of the chief signal-officer, and are candidates for service in the 'indication-room,' a very liberal course of advanced study and reading in meteorology is prescribed to be carried on at the office of the weather-bureau accompanied by practice in the preparation of charts and in 'forecasting.'

The enlisted men, however, upon whom falls the burden of collecting the great mass of meteorological material, which is daily digested in the central office, do not fare so well. The period of their stay at Fort Myer is limited to about six months, during the first two of which they cannot be placed under class instruction, but are required to recite in cavalry tactics, to attend wand and telegraph practice, to stand guard, and attend to other military duties. When, at last, they are permitted to begin the study of meteorology, the percentage of their time given to it is not noticeably greater than that of the officers. During their six months at the fort, ten days are spent in the meteorological observatory; and in that time

they are expected to learn, and probably do learn, all that the officers acquire in the eight days which is allowed them for practice in meteorology. When it is remembered that the sole occupation of the great majority of these men, during the entire period of their enlistment after leaving Fort Myer, is to make and record meteorological observations, it seems little short of folly to subject them to such a course of training in preparation. That only ten days, out of the one hundred and eighty spent in the school, should be occupied in practical training in observation, and the use of instruments, is certainly an inversion of the true order of things. It is difficult to see the value, to such men, of the long training in 'cavalry tactics,' the 'manual of the carbine,' the 'manual of the kit,'—whatever that may be,—and many other things found in the course. It is true, that, to observers stationed on the seacoast, a knowledge of naval signals is necessary; and, to all, a degree of familiarity with the practical working of the electric telegraph would be desirable: but the business of the great majority of the observers is purely scientific, and, it is to be hoped, peaceful in its character. It is clear that the skill and knowledge necessary to the successful performance of these duties must be largely acquired after active service has begun.

The chief signal-officer very properly remarks, that the criticism to which the service has been subjected is evidence of its success. No well-informed person can fail to feel great pride in the results achieved by the signal-service since the organization of the weather-bureau. The general increase in the accuracy of its forecasts, the efforts made to communicate important meteorological information to localities likely to be seriously affected by probable changes in the weather, and its valuable services in the display of cautionary and danger signals, have given it a hold upon the confidence of the people not easily weakened.

The percentages of verification of predictions since the organization of the weather-service, as given in the various reports, are as follows:

Year.	Per cent of verification.	Year.	Per cent of verification.
1871	69	1877	86
1872	77	1878	84
1873	77	1879	86
1874	84	1880	86
1875	87	1881	85
1876	-		

In the display of cautionary and danger signals, the success has been about equally great. In forecasting, in which the character of the weather only is considered, the percentage of verification is generally as high as ninety.

While these figures do not indicate any marked progress during the past five years, it must be remembered that a point has been reached from which farther advance must necessarily be difficult and slow.

'*REX MAGNUS*.'

At the suggestion of the editors of SCIENCE, I have carefully examined the 'viandine' brand of the new preservative '*Rex magnus*,' and find it contains boracic acid, sodium, potassium, and water as ingredients; and I believe its composition can be roughly formulated as follows:—

Boracic acid {	
Borax {	67 per cent.
Potassic chloride	15 "
Water	18 "

The mixture also contains very small amounts of sulphur and magnesium. Both, however, are probably accidental impurities.

To determine the preservative properties of the viandine brand, a number of experiments were undertaken, the general result of which can best be shown by copying some of the notes taken during the course of the experiments, and supplementing them with a formulated table.

July 5, I dissolved one-half pound of viandine in one gallon of water contained in a stone jar, and placed one pound of beef-steak, one pound of veal-steak, and one pound of fresh mackerel in the solution.

July 6, the beef, veal, and fish, which had remained in the solution twenty-six hours, were removed, and, after allowing them to drain for two or three minutes, were placed on plates in the laboratory.

July 7, I boiled the solution which had been used with the meats and fish, and removed the scum that rose to the surface. When cold, I added about two ounces of viandine, and poured the solution into a stone jar containing one pound of mutton-chops and one pound of liver.