ANNUAL REPORT

OF THE

CHIEF SIGNAL OFFICER

MADE TO

THE SECRETARY OF WAR

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REPORT

OF

THE CHIEF SIGNAL OFFICER.

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, D. C., October 20, 1870.

SIR: The plans previously inaugurated for the instruction of the Army in military signaling, and for supplying it with the necessary signal apparatus, have been pursued during the past year. The design of giving to all officers, as rapidly as an opportunity permitted, sufficient knowledge of the signal service to enable them to avail themselves of it, for the benefit of their commands or the service in general, whenever occasion should present itself, has seemed to be appreciated by officers of every grade; and the work of instruction has been rendered proportionately easy.

The instruction, under the direction of this office, has been actively carried on in five of the ten military departments, and in three others (Departments of the East, of the Lakes, and of Texas) some progress, it is believed, has been made toward the same end, although the department commanders have not had the opportunity of availing themselves of the plans of tuition arranged by this office. In the remaining two departments (Arizona and Columbia) instruction is still unprovided for.

The plan of this office has been to supply each department with one acting signal officer, (a selected line officer, carefully and thoroughly taught the duties of the signal service at the school of instruction at Fort Whipple, Virginia,) who should, through the assistance of district instructors, carry the instruction to at least one officer and two enlisted men at each post in the department, these to be in turn instructors at the posts, and also to supply each post with two complete sets of signal equipments. The operation of this plan, or modifications of it, has resulted in the proper tuition of one hundred and ninety (190) officers and three hundred and twenty-one (321) men at seventy-six (76) posts, and the partial instruction of one hundred and fifty-five (155) officers and three hundred and fifty-one (351) enlisted men at twenty-four (24) additional posts. One hundred and fifty-five (155) of the two hundred and twenty (220) posts have been supplied with signal equipments. During the ensuing year the necessary instruction may be carried to the remaining one hundred and twenty (120) posts, and the sixty-five (65) posts still needing equipments be supplied therewith. (Paper 1.)

Methods of perpetuating and of extending the knowledge of the signal service, already imparted, have been recommended by this office to the department commanders, and generally adopted. In furtherance of this object, a printed "Manual of Signal Service Drills" has been issued to the posts. The knowledge of the service already acquired has been put to practical use in the establishment of signal lines of communication between the forts in the harbors of New York, of Boston, and of San Francisco. This office is informed by reports that stations for observation and communication have also been established in the

Indian country to warn posts, emigrant parties, and others of the approach of hostile Indians.

The usual course of instruction and practice in the duties of the signal service has been had at the United States Military Academy during the year; Captain Peter S. Michie, United States Engineers, being the instructor, and Lieutenant J. P. Story, acting signal officer, his assistant. The yearly exhibition drills of the cadets in the uses of the flag and torch, and of the field electric telegraph, took place before the Board of Visitors and the Secretary of War; and field telegraphic lines were erected and properly worked as part of the regular drills during the annual encampment. The course has been conducted with commendable thoroughness.

Attention is respectfully invited to the propriety of a regulation which shall place the course under the charge of an instructor as a specialty, and which shall give proficiency in this branch a value affecting the merit and general standing of the cadet, precisely as is given in other studies of the academic course. The changes in a service so constantly developing as the signal service has been, have made it difficult hitherto to define exactly the lessons for classes. This difficulty is disappearing, and the course may now be arranged with as much of precision, perhaps, as for any other study. The Academy continues to be supplied with such improved signal apparatus and equipments for the field telegraphic trains as have been adopted for use by this office.

In view of the plan of giving all officers of the Army some practical knowledge of the signal service, it seems proper to refer to the following recommendation in reference to the artillery school of practice at Fortress Monroe, and the school of practice for engineers at Willett's Point, New York Harbor, as submitted in the last annual report of this office:

> The schools of practice afford an opportunity for reaching officers there gathered for instruction, and to be afterward scattered throughout the service. It is respectfully recommended that the temporary services of a suitably-instructed officer from those who have passed the full course of instruction and practice of acting signal officers, or of one designated from the school to be instructed, be authorized for each of the schools of practice, and that they be supplied with the apparatus and equipments necessary for such parts of the course as can properly be taught at either.

The post of Fort Whipple, Virginia, has been maintained during the past year as a school of instruction and practice in the duties of the signal service, at which such officers of the Army and Navy as might be designated for instructors in this branch of military duty, in their respective services, may themselves first receive a thorough knowledge of it. It has been an object also to maintain a nucleus for the service capable of being expanded upon any emergency. The equipments of the school for field practice have consisted of one section of a field telegraph train, complete in its appointments, eight telegraphic instruments and batteries, and the necessary testing apparatus for the instruction-rooms, and the requisite sets of signal equipments for day and night signaling. The theoretical instruction comprehends the study of the Army Manual of Signals, the Cipher Manual, and text-books of practical telegraphy, and discourses, together with oral instructions by the instructor. An inspection of the school on the 19th of March, 1870, by the Honorable Secretary of War, resulted in his expressed satisfaction with its management, and the authorization to increase the strength of the signal service detachment there stationed to the minimum of a company, to appoint the necessary non-commissioned officers for the detachment, and to erect such temporary structures as were necessary to increase the efficiency of the school and promote the comfort of the command. Dur-

ing the year thirty-eight (38) officers have been under instruction at the school, (Paper A,) thirty-one (31) of whom belonged to the Navy, four (4) to the Army, and three (3) to the Marine Corps. Of these, thirty (30) completed the full course of instruction, and were declared competent as acting signal officers and instructors. Of the officers of the Navy instructed, twenty-three (23) have been assigned to vessels of the Navy now in service, to diffuse, as instructors in their turn, a knowledge of the signal service throughout the Navy, and to so provide for the thorough coöperation of the land and naval forces whenever occasion may require. The officers of marines instructed have been in charge of similar instruction given in the Corps of Marines. Of the Army officers who passed the course, two (2) have been assigned to duty as instructors, one (1) as assistant in this office, and the other temporarily as officer in charge of the signal service detachment. In addition to the officers instructed in the school, forty-one (41) observer sergeants, intended for assignment in the division of telegrams and reports for the benefit of commerce, have received, within the year, the theoretical and practical instruction necessary to fit them for their duties. In the pressure of other duties, the experimental practice usually had at this school, for the improvement of the signal and military telegraphic apparatus, had been, to a great extent, suspended. The established drills have, however, been continued and improved. It is hoped that facilities may be given to provide, during the ensuing year, a field telegraph train, as a model, as perfect in all its parts as ingenuity and experiment can make it.

As in preceding years, this office has received several applications from foreign powers evidencing their interest in the service under its charge, and has responded as authorized by the honorable Secretary of War. The attention of the North German and Austrian governments seems to have been especially attracted to this division of our service, and communications have been had with officers representing them in reference to it.

In the revision of the labors of the past year, the Chief Signal Officer refers with some satisfaction to the list of officers of the Army and Navy instructed under the supervision of this office. The progress of the service has been, perhaps, as rapid as could be expected, with the many obstructions arising from the unusual vicissitudes of the Army and the uncertainties and delays incident to the constant changes it has undergone. A general knowledge of the duties of the signal service has been extended, as was planned, throughout the military and naval services of the United States. There are few officers of either now so ignorant of its uses as to be unable to avail themselves of it, either by their own skill or the skill of others, in occasions to arise hereafter. The school of practice established at Fort Whipple, Virginia, secures the knowledge already had by experience, and enables it to be improved for the future. The signal services of the Army and Navy are in complete accord, and provision seems to have been had by the War and Navy Departments to secure a coöperation of the respective arms, so far as ready intercommunication is concerned, more perfect than has hitherto existed. No material changes suggest themselves as at this time to be recommended. The duties of the office have been greatly increased since the date of the last annual report by the addition of those pertaining to the division of telegrams and reports for the benefit of commerce. The engrossing character of these duties, the brief time in which it has seeemed desirable they should be pressed to results, and the fact that they have been accomplished so far without material addition to the force, and with no change in the organization of the office, are to be considered in any estimate of its labors.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE.

On February 9, 1870, a joint resolution as follows—

PUBLIC RESOLUTION No. 9.

JOINT RESOLUTION to authorize the Secretary of War to provide for taking meteorological observations at the military stations and at other points in the interior of the continent, and for giving notice on the northern lakes and seaboard of the approach and force of storms.

Be it resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of War be, and he hereby is, authorized and required to provide for taking meteorological observations at the military stations in the interior of the continent, and at other points in the States and Territories of the United States, and for giving notice on the northern lakes and on the seacoast, by magnetic telegraph and marine signals, of the approach and force of storms—

which had been passed, without dissent, by both Houses of Congress, became, by the approval of the President, a law. The Chief Signal Officer of the Army was charged, by letter of the Honorable Secretary of War, dated February 28, 1870, and in General Orders No. 29, dated Headquarters of the Army, Adjutant General's Office, March 15, 1870, (copy herewith, Paper A^2,) with the immediate supervision of the service. The duty thus imposed upon the Department was one for which the popular mind had been in some degree prepared by the recorded labors and the theories of meteorologists, and by detached efforts, made at different times to accomplish the ends in view, but without fixed organizations and with necessarily contracted plans. The undertaking, upon a scale of such magnitude as that provided by the law, had not been generally contemplated even in this country.

The precedents which some experience had established in other countries were hardly in any way applicable in our own, and the problem presented this office was to provide in the United States for a novel duty to be performed by a new organization and under rules which, to a great extent, must be at once invented for and proven by actual practice. The general interest evidenced, and the acts of scientific men exhibited, an expectation of results, which none better knew than the experienced physicists consulted, must be sparingly promised. The service was capable of an indefinite extension. The benefits to be had, if fair success could be obtained, were vast and lasting. It was not a subject for trivial contemplation, a duty which should stretch its branches from the northern coast of Maine along the coast on the Atlantic and the Gulf coasts, thence over the thousands of miles of the States and Territories to the Pacific, and along its coasts together with the added other thousands of miles of coast line of the northern lakes and navigable rivers. It was a work to be entered upon with a sense of grave responsibility.

The course pursued by this office has been so constantly in each of its steps before the Secretary of War, that a minute recital is not needed here. The plans of execution first suggested by the Act are set forth in the accompanying memorandum. (Paper B.) In establishing these plans the subjects to be considered have been, 1st, the character of the meteorological observations to be made; 2d, by whom they should be made; 3d, at what places; 4th, in what form they should be reported; 5th, how frequently; 6th, to what places reports should be sent, and what reports be sent to each; 7th, the necessary arrangements for telegraphing the reports; 8th, the mode of publication; 9th, the extent to be given the duty to meet the intent of the law.

A careful examination of European forms and consultation with experienced physicists in the United States, readily determined the substance of the meteorological observations and reports to be at the out-

set at least of the character of Form 4, herewith. These observations and reports will of themselves form a valuable record. They may vary with experience, and additional facts may be made the subject of observation as scientific inquiry suggests them.

The daily reports made from the different stations are intended solely for telegraphic transmission. It became at once a subject of inquiry how they could be made briefly and placed in a style most compact. Forms Nos. 1 and 5 exhibit the method adopted, and explain the meanings conveyed by the cipher.

It is estimated that the intelligence conveyed in a "twenty-word report" could not be written in full with the use of less than sixty words. The translation of a ten-word report requires thirty words.

These cipher forms are so devised that, if hundreds of them are thrown heaped together, any of them, selected at random, will give each the name of the station from which it is sent, the date and time, in addition to the weather report it contains. Improvements in this cipher are about to be adopted.

The regular telegraphic reports are to be made on the forms, thrice daily, at the times given in the memorandum. A system to be satisfactory to this office would permit no interval longer than eight hours to elapse between reports. It would be rare that a storm of magnitude would progress more than three hundred miles in that period of time. Considerations of economy, and the fact that the telegraphic wires are so thronged as not to permit their use, at hours other than those given, has influenced the selection of times. The reports being habitual and regular, it is hoped that, with a proper arrangement of stations of observation, no great atmospheric disturbance existing, either as premonitory to, or as part of, a storm will be so rapidly progressed in the intervals between reports as to prevent the tracing of its course, or to permit it to be in advance of the report which should give warning of it.

It is aimed to cover the Lakes, the Atlantic coasts, and those of the Gulf, by stations of observation outlying many hundreds of miles toward the course of ordinary storms, and from which the telegrams will outstrip the storm by some hours of time. Arrangements are made that the observations shall be simultaneously had at the same moment of time throughout the whole system of stations, and the movement of the reports upon the telegraphic wires will be as nearly synchronous as it can be made. The result will be to give thrice daily a synoptic view of the atmospheric condition over a greater portion of the States and Territories of the United States. It will, it is hoped, enable the atmospheric condition reported at any one station to be followed in its progress, if it does progress, from place to place, by report following report, until it is changed or ceases to be observed. It is not of record that any system of synchronous reports has been hitherto established upon a scale of similar magnitude.

Table A gives, in a tabulated form, the names of cities and ports to which, in the contemplated plans for the year, regular weather reports are to be sent, together with the points reporting to each. The distribution of reports has been thus planned with a view of giving each port intelligence, from those stations which lie, in reference to that port, in the track of coming storms. The table is given as rather sketching out the plans at this stage of the duty, that they may be understood, and exhibiting the manner in which they are commenced, than with any idea of offering them as completed.

The places or stations at which the observations are to be primarily made, and whence reports are to be had, and which have been of course

to be fixed by the study of the geographical relations of the points to each other and to what was known of the general course of storms, and by their situation in reference to the facilities for the necessary telegraphic communication have been, after consultation with some of the best meteorologists in the United States, fixed as given in this table. The stations of observation may be changed in location or number, as knowledge of the needs of the service and facilities for its discharge are increased. The stations will be of two classes: 1st, stations of observation and report, or those at which observations are made and thence reported, and to which also reports of observations elsewhere made are forwarded; 2d, stations of report alone, or those at which observations elsewhere made are reported.

It has been assumed that the places now designated are sufficient in number and suited in location to fully comply for this year with the intention of Congress. When thorough trial and benefits proven shall have shown the value of the service, the plans are already fixed for its extension, and new stations and their communications can be multiplied. The points already chosen give the work that general character the law has called for. They are enough to permit the placing of posts of observation in the course of most storms, nor can any section justly complain that there has been failure on the part of the Department to provide for its interest as fully as the limited appropriation in its control has permitted.

A number of stations are now occupied. In view of the dangers of fall navigation it was determined to provide for the lake section of stations at the earliest moment practicable, and, on October 10th, orders were issued to twenty-five (25) observer sergeants to take post, one at each of the following-named stations: Washington, New York City, Boston, Chicago, St. Louis, Cincinnati, New Orleans, Nashville, Mobile, Montgomery, Augusta, (Georgia,) Buffalo, Rochester, Oswego, Cleveland, Toledo, Detroit, Milwaukee, St. Paul, Du Luth, Omaha, Cheyenne, Pittsburg, Key West, and Lake City. (Paper 2.)

The observers had reported at their posts by the 16th of October. This office has been advised by the telegraph companies that they will be able to commence the regular transmission of reports on November 1, 1870. Cf. U.S. Post Chief 1871

To provide the observers at the different stations has been a subject of anxious consideration. The observations to be made and the reports to be rendered were of an official character, and needed the stamp of official exactness. The observers must be responsible for instruments; for reports; for the regularity and promptness in making reports. They must be under strict control. The labors of amateur meteorologists, however fascinating and however much of value for statistical information, would be useless where rapidity and discipline were required. The labors of irregular employés, wholly irresponsible, who would be willing to supplement a scanty pay for other employment more engrossing to them, by such an allowance as could be offered for a partial attention to a duty like this, would be still more unsatisfactory. The duties most often be at military posts. They are exact and unceasing. The display of signals, when that shall be reached, would need to be by authority. Nor was there any portion of the work which could be safely cared for without rigid inspection and control. The law in its scope seemed to require that competent men should make such careful observations and report them under such rules that they might stand safely as standard. In some instances of foreign experience the excellence of meteorological reports, made by non-commissioned officers of the British army, had

attracted attention. To those who know the material had for warrant officers in the service of the United States during the rebellion, and have seen the graduates of our highest universities carrying the musket, it would easily suggest itself that perhaps better men could be had for the military service to do the duties proposed, in the United States, than in any other country in the world. The attempt was made to secure such men, and was successful. By the exercise of the powers confided to the Secretary of War, the privilege of enlisting was made a subject for competition. The duties of the service are in charge to-day of enlisted men who count among their number engineers, divines, students, scholars, almost all of whom aspire to fit themselves by study for elevated professions, and who know, if they cannot carry the baton of a marshal in their knapsacks, that the road is open to the presidency. Each observer is required to pass two examinations. They are enrolled for the General Service; twenty-five (25) of them have been assigned to and are at stations of observation, equipped and at work. They are held to their duty by their military oath; they are subject to military penalties for any neglect of it; they obey military orders. A corps has been provided, to pay which adds not one dollar to the estimated expenditures for the Army. Legislation, to fix the position of these men, was recommended at the last session of Congress.

The telegraphic transmission of the regular reports has presented a problem difficult of solution. The list of stations of observation and report exhibits a large number of stations so located that, if reports are to be both received from and sent to them two or three times a day without an organization of working especially designed for the purpose, the delays would be great and the repetitions, each of which involves a chance of error, numerous. A careful study of this question has resulted in the organization of a plan best exhibited by the map filed in this office, and the working forms of circuits herewith submitted as illustrations. Seventeen working forms of circuits have been prepared. The extensive lines of the Western Union Telegraph Company, and the coöperating companies, the International Ocean Cable Company and Northwestern Telegraph Company, have been divided into circuits. These circuits reach in their courses every station of observation and report; each circuit thus provides for a certain group of stations. This being arranged, the working forms of circuits (Papers C to R) set forth minutely the telegraphic labor needed for the movement of the messages of each group; for the exchange of message reports between different groups; between different places in different groups; and, finally, for the assembling of all the dispatches in Washington. I am not aware that a style similar to this has been before adopted. If it is successfully carried out, it does away at once with the greatest difficulty which has been presented in the attempt to have the reports of observation not only taken synchronously, but so delivered at their widely separated destinations as to be announced almost simultaneously.

Aside from the transmission and proper grouping of the reports, it will be noticed that, by the fact that the observers are thrice each day present in the telegraph offices at the stations at which they are posted on each circuit, their presence is thus thrice reported daily at this office, and any order or instruction can reach the different points of observation throughout the United States in a manner not before arranged.

The benefits to accrue from an organization so minute do not require to be enlarged upon. If the plan endures the test of practical working, it will make it possible to receive, at any time, a synchronous report

of the atmospheric condition over the whole territory of the United States, and from the coasts of the Atlantic and Pacific Oceans, within two hours from the moment at which the transmission over the circuits is commenced.

The plan of circuits, and the working forms of circuits, are purposely made capable of an indefinite extension. Thus when telegraphic lines may surround or cross the Caribbean Sea, a circuit added would bring whatever stations might be established on islands therein as another group only into coöperation with the general plan. A Canadian circuit would extend our meteorological reports through Canada. A South American group would give the atmospheric condition of that continent. The time may come when European, Asiatic, and American groups will interchange reports by means of the deep-sea cables. The idea of a world-wide system of telegraphic weather reports is not as chimerical to-day as was thirty years ago the workings of the electric telegraph itself. In connection with the subject of the telegraphic transmission of reports, it is proper to mention that, by an arrangement with the telegraphic companies, an effort is making to arrive at a fair fixed rate per word, at which rate all weather reports shall be transmitted within the United States without regard had to distance. It is perhaps in this way only that rates at once just to the telegraphic companies and fair for the United States will be determined. A rate so determined will permit the duty to be extended or diminished without special contracts in each case. In all negotiations with the telegraph companies of the United States, this office has met a spirit of liberality and fairness, and has recognized a wish on the part of the companies to do their share in a work they have regarded as for the common good. The replies of the Western Union Telegraph Company, of the International Ocean Telegraph Company, and of the Northwestern Telegraph Company to the proposition of the United States herewith, evidence the views with which these companies have acted. (Papers S^1, T^1, U^1, S^2, T^2, U^2.)

Each station of observation now reports by telegraph forty words per day in three reports. The first duty of securing the reports accomplished, the question of the reduction of the length of the reports became at once one for attention. There is not perhaps a better illustration of the duties of this office than in the fact that by the elaboration of a cipher completed since this report was commenced, the number of words deemed necessary under the present plan for each report has been reduced one-half, and in the further fact of the reduction of the annual estimates which the office has, by the result of this work, been enabled to recommend to the honorable Secretary of War, in a communication of date October 24, 1870. The sums to be annually saved to the United States by the establishment of this cipher alone are not inconsiderable.

The publication of so many of these reports as are concentrated at each station for its information is provided for by bulletins, by maps, and by furnishing them gratuitously to the press. Arrangements will be made for the coöperation of the different scientific institutions throughout the country, to any of which copies of the reports will be furnished, and the coöperation of boards of trade and commercial associations, some of which have modes of publication of their own, is sought for. (Paper 3.) As the duty is systematized, and time is had for the arrangement, plans of signals will be displayed at points selected. The service has been too much in its infancy to permit more to be undertaken in regard to this and other modes of publication than is here set forth. The reports once correctly made and received, it will be a matter of minor difficulty to

make them as widely known as is desirable. Form 3 shows the proposed form of bulletin.

The publication of official deductions or forecasts to be had from the mass of reports received at different centers, involves so much of responsibility, that, while it has been considered, the office has not been willing to enter upon it until it shall have practically tested the promptness with which the reports will be received, and the facts as to the approach and force of storms which synchronous reports, following each other in such close succession, will announce without any effort of anticipation. The fact that an extensive storm is moving in a certain direction, and its movement and its force reported at intervals of a few hours as it reaches the different stations in its course, will, of themselves, be a warning to points further in the track of its probable progress, and a little experience with the study of the "generalizations," which meteorological research has seemed to establish, and which, it is proposed, shall accompany the bulletin reports, together with the synoptic charts exhibited by the meteorological maps displayed, will enable conclusions reasonably correct to be arrived at in the threatened localities. It has been considered wise by this office not to attempt more than this at the outset.

The observations heretofore referred to, and for which the stations now established are equipped, are such only as can be made with instruments which have been quickly attainable, and reference has been had hitherto in this report to the operation of such preliminary plans only as have been hurried into execution to meet, if possible, the storms of the coming fall and winter, providing, also, so far as was practicable, for future and permanent service.

The subject of the provision of instruments and their proper use has been, and must be, one of principal importance. Each station has been equipped with a barometer, a thermometer, a hygrometer, an anemometer, an anemoscope, (a vane,) and pluviameter. The instruments are made upon similar plans, and compared—those of them of which comparison is necessary—with standards at Washington. The character of the observation reports, their transmission, and publication, have been, perhaps, sufficiently described. The rules for observations require that readings of the instruments should be made at each station in certain fixed succession, or order of precedence; that the readings commence at the same moment of time; that before they are reported the reductions shall be made for temperature and elevation, and the corrections had for the instrumental errors which have been shown by comparison with the standard. The observer at each station will be advised of the magnetic variation at his station, and of the barometric and thermometric monthly means. Precaution is thus had to secure correctness. The study of the instruments, their improvement, and the diffusion of improved plans throughout the United States, which the law has made possible, and the consequent value of the reports, will be, in the view of this office, one of the great advantages accruing to the country. The observations now had at the stations depend, of course, upon the ocular readings and the individual skill of the observers. In such observations, meteorologists have found causes of error. The attention of this office was early directed to the inauguration of a system of meteorological readings to be had from self-registering apparatus. The interesting tracings of those adopted by Daniel Draper, esq., of the New York Central Park Observatory, induced the order for a set to be prepared by him for this office. They are nearly completed, and will soon be in operation. A careful examination was also given instruments made upon the elaborate plans of Professor H. Wild, of Berlin,

now of St. Petersburg. A letter from this distinguished meteorologist, in response to one from this office, stating that these instruments had been used under his supervision, and with satisfactory results, for now two years, and that they were about to be introduced in various observatories of Russia, seemed to vouch for as careful tests as could be desired. Two complete sets were ordered for this office, and are now making.

Professor George W. Hough, of Albany, New York, whose skill as a meteorologist and whose practical ingenuity are widely known, has been requested to furnish a set of self-registering instruments devised by himself upon plans which he has tested.

By the courtesy of its superintendent, Balfour Stewart, LL. D., F. R. S., the observatory at Kew, England, is furnishing a set of instruments, as standards, not to be surpassed in accuracy. It is contemplated to compare at Washington, with every circumstance of care, the uses of different forms of self-registering instruments in sets, and to select as a model that from which satisfactory results are had. A suitable model once determined, a wide distribution of such instruments offers to the country, with the facility for their use now had by the legislation in pursuance of which this report is made, results whose value can hardly be estimated. It is sufficient to say here that, if reliable instruments can be obtained, their use will furnish a record of every atmospheric change (those which are generally considered) self-recorded upon the instruments for every minute of the day and night, and continuously for the year. The record sheets taken from the instrument and bound, form the record for future reference, instead of the wearying columns of figures which crowd the myriad pages of meteorological registers. The distribution of self-registering instruments, if only in the proportion of one set to each capital city, would give to the United States, in five years' time, a record of climatology more valuable perhaps for this especial service than any now possessed by any other country after the accumulated labors of the past. Sheets of the self-registered records are filed in this office, from which an idea may be formed of the character of the registration.

The opinions of meteorologists consulted are concurrent that, in the systematized improvement of instruments, both of the styles in common use and of those for self-registration, is opened one of the most useful fields of study.

In regard to the development of this duty, the views of this office, as expressed at its inception, remain unchanged. Its progress must be slow, but every day of the necessary practice will add valuable experience. If the duty is to be done at all, it should fail in no circumstance to enable it to be well done. A responsibility which may involve life as well as property is too great to be undertaken without proper provision. The efforts of this office have been given to so organize the service in the few days since it was established, that the Department might be able to report a definite plan and to exhibit the modes by which it proposes to carry it out. It has been another care to so arrange that plan as to consist in effect of units of working, and to be capable thus of expansion or contraction, in the future, without the labor of planning anew, or of toiling again through another organization.

There has thus been laid before the honorable Secretary of War the narration of the hurried labors of the past summer. Three months have elapsed since the appropriation by Congress became available for the purpose of this duty, to the date at which this report is submitted. The organization of a service wholly without precedent on the scale on which this was to be organized, to provide for that service in every part, both as to the personnel and to the equipment, without a precedent example

in this country, to establish a system of stations with a practiced observer at each, to negotiate with telegraph companies for a work on their part of which their records show not even a semblance before attempted, to diffuse some general knowledge of the plans and aims to be accomplished, and to secure the coöperation of scientific establishments and of those commercial interests for the good of which the work was especially planned, have been some of the labors devolving upon this office. With these labors, at this date yet untried as to their results, this report, except in so far as it may show the work up to this time accomplished, must be a report of intentions rather than of facts. More could not, perhaps, be asked at this time, than that these intentions should be, as they are in part, ready to be put upon the trial of execution.

In this connection it is a pleasant duty to refer to the universal good will and ready coöperation with which the different scientific establishments have responded to the requests of this office. From the Smithsonian Institution, the Coast Survey Office, the Naval Observatory, the Agricultural Bureau, and the office of the Surgeon General of the Army in Washington, and from the observatories at Cincinnati, Albany, and at different points throughout the country, useful assistance has been had and tenders are made of any co-working it may be in their power to give. The chambers of commerce, boards of trade, and commercial associations generally, at the different cities at which has been the inception of the service, have exhibited an interest in its success, and in many cases have formally tendered their practical assistance. To this general encouragement and the steady support the Secretary of War has found it his duty to give, in view of the powers conferred upon him by the action of Congress, has been largely due whatever of progress has been accomplished.

I am, sir, very respectfully, your obedient servant,

ALBERT J. MYER,

Bvt. Brig. Gen. and Chief Signal Officer of the Army.

The Hon. WM. W. BELKNAP,

Secretary of War, Washington, D. C.

Oct 20 1870

No. 1.

Instruction and supply of the Army.	Departments—												
	Of Arizona, (when part of the Department of California.)	Of the Lakes.	Of the Columbia.	Of California.	Of Dakota.	Of the East.	Of the Missouri.	Of the Platte.	Of the South.	Of Texas.	United States Military Academy.	Totals for the past year.	Aggregate up to date.
Number of officers instructed	5	....	....	....	19	....	14	14	46	....	....	108	190
Number of officers partially instructed	1	....	....	....	35	8	56	26	37	....	....	163	.....
Number of posts now having instructed officers.	3	....	....	8	14	....	7	5	10	....	....	47	76
Number of enlisted men instructed	19	....	....	....	42	....	50	22	53	....	....	186	321
Number of enlisted men partially instructed.	.....	.....	.....	.....	98	....	80	49	124	....	....	351	351
Number of sets of signal equipments sent to the department.	20	....	....	39	18	24	55	2	41	32	10	241	520
Number of posts supplied with signal equipments.	14	....	....	8	4	12	26	1	19	12	....	95	155

A.

TABLE I.—*Officers under instruction at beginning of current year.*

Names.	Rank and corps.	Reported for instruction.	Relieved from instruction.	Remarks.
J. E. Noell	Lieut. U. S. Navy	Aug. 17, 1869	Oct. 26, 1869	Completed full course of instruction.
G. C. Goodloe	2d Lieut. U. S. M. C.	Oct. 12, 1869	Mar. 2, 1870	Do.
William B. Remey	1st Lieut. U. S. M. C.	Oct. 13, 1869	Jan. 12, 1870	Do.
James M. T. Young	do	Oct. 13, 1869	Jan. 12, 1870	Do.
E. Dennison	Ensign U. S. Navy	Oct. 13, 1869	Nov. 4, 1869	Relieved at request of Navy Department; course not completed.

TABLE II.—*Officers instructed during the current year.*

Names.	Rank and corps.	Reported for instruction.	Relieved from instruction.	Remarks.
Alfred Elliott	Ensign U. S. Navy	Oct. 26, 1869	Jan. 22, 1870	Completed full course of instruction.
George A. Norris	Master U. S. Navy	Nov. 5, 1869	Feb. 15, 1870	Do.
F. J. Naile	Lt. Com'dr U. S. Navy.	Nov. 11, 1869	Feb. 9, 1870	Do.
R. M. Cutts	Master U. S. Navy	Dec. 6, 1869	Mar. 2, 1870	Do.
C. M. Jarboe	Ensign U. S. Navy	Dec. 8, 1860	Mar. 16, 1870	Do.
W. W. Machy	Lt. Com'dr U. S. Navy.	Dec. 9, 1869	Jan. 31, 1870	Relieved for disobedience of orders; course not completed.
J. B. Smith	Ensign U. S. Navy	Dec. 9, 1869	Mar. 2, 1870	Completed full course of instruction.
J. D. J. Kelley	do	Dec. 10, 1869	Mar. 9, 1870	Do.
W. W. Mead	Lieut. U. S. Navy	Dec. 13, 1869	Mar. 17, 1870	Do.
F. J. Drake	Ensign U. S. Navy	Dec. 13, 1869	Mar. 5, 1870	Do.
J. C. Irvine	do	Dec. 13, 1869	Mar. 12, 1870	Do.
E. K. Moore	do	Dec. 14, 1869	Mar. 16, 1870	Do.
J. W. Carlin	do	Feb. 9, 1870	June 7, 1870	Do.
H. M. Tallman	do	Feb. 9, 1870	Mar. 7, 1870	Relieved at his own request on account of sickness; course not completed.
George S. Grimes	1st Lieut U. S. Army	Mar. 3, 1870	June 15, 1870	Completed full course of instruction.
R. P. Leary	Lieut. U. S. Navy	Mar. 17, 1870	July 18, 1870	Do.
F. H. Delano	Master U. S. Navy	Mar. 17, 1870	June 15, 1870	Relieved for disobedience of orders; course not completed.
Albert Ross	do	Mar. 17, 1870	July 5, 1870	Relieved at his own request on account of sickness; course not completed.
Allyn Capron	2d Lieut. 1st U. S. Art.	Mar. 24, 1870	July 1, 1870	Completed full course of instruction.
Richardson Clover	Master U. S. Navy	Mar. 26, 1870	June 28, 1870	Do.
Charles M. Pyne	Capt. U. S. Army	Apr. 20, 1870	July 11, 1870	Do.
D. F. Heald	Master U. S. Navy	Apr. 25, 1870	June 9, 1870	Relieved for disobedience of orders; course not completed.
G. J. Mitchell	do	May 12, 1870	July 16, 1870	Completed full course of instruction.
C. H. West	do	May 16, 1870	July 21, 1870	Do.
A. R. Couden	do	May 16, 1870	July 22, 1870	Do.
G. W. Tyler	Ensign U. S. Navy	June 16, 1870	Aug. 16, 1870	Do.
J. W. Miller	Master U. S. Navy	June 17, 1870	Aug. 20, 1870	Do.
W. H. Beehler	Ensign U. S. Navy	June 17, 1870	July 9, 1870	Relieved at request of Navy Department; course not completed.
W. J. Barnette	do	June 17, 1870	June 29, 1870	Relieved at his own request on account of sickness; course not completed.
W. O. Sharrer	do	June 17, 1870	Aug. 15, 1870	Completed full course of instruction.
J. F. Meigs	Master U. S. Navy	June 20, 1870	Aug. 16, 1870	Do.
G. Mallory	Capt. U. S. Army	Aug. 18, 1870		

TABLE III.—*Amount of field practice had by each officer.*

Names.	Rank and corps.	No. of days flag practice was had.	No. of nights torch practice was had.	Remarks.
Alfred Elliott	Ensign U. S. N	19	6	
George A. Norris	Master U. S. N	20	3	
F. J. Naile	Lieut. Commander U. S. N	25	3	
R. M. Cutts	Master U. S. N	20	4	
C. W. Jarboe	Ensign U. S. N	25	5	
W. W. Maclay	Lieut. Commander U. S. N	11	2	Relieved before completing course.
J. B. Smith	Ensign U. S. N	20	4	
J. D. J. Kelley	do	22	4	
W. W. Mead	Lieut. U. S. N	21	6	
F. J. Drake	Ensign U. S. N	19	4	
J. C. Irvine	do	26	4	
E. K. Moore	do	22	4	
J. W. Carlin	do	26	8	
George S. Grimes	1st Lieut. U. S. A	28	9	
R. P. Leary	Lieut. Commander U. S. N	26	6	
F. H. Delano	Master U. S. N	27	5	Relieved before completing course.
Albert Ross	do	26	5	Do. do.
Allyn Capron	2d Lieut. 1st U. S. Art	19	5	
R. Clover	Master U. S. N	26	6	
Charles M. Pyne	Captain U. S. A	22	5	
D. F. Heald	Master U. S. N	15	2	Relieved before completing course.
G. J. Mitchell	do	20	7	
J. P. Merrell	do	16	6	
C. H. West	do	20	7	
A. R. Couden	do	20	6	
G. W. Tyler	Ensign U. S. N	16	4	
J. W. Miller	Master U. S. N	20	6	
W. O. Sharrer	Ensign U. S. N	20	5	
J. F. Meigs	Master U. S. N	20	6	
G. Mallery	Captain U. S. A	12	4	

TABLE IV.—*Number of observer sergeants instructed.*

Name.	Instruction commenced—	Date of examination.	Remarks.
Theodore Smith	Aug. 9, 1870	Sept. 22, 1870	
George H. Witmer	Aug. 9, 1870	Sept. 23, 1870	
George C. Schaeffer, jr.	Aug. 9, 1870	Sept. 29, 1870	
Theodore Mosher	Aug. 9, 1870	Sept. 23, 1870	
M. G. Chew	Aug. 9, 1870	Sept. 23, 1770	
J. E. Evans	Aug. 11, 1870	Sept. 29, 1870	Examined Sept. 23, and sent back for further instruction.
John R. Allen	Aug. 16, 1870	Sept. 24, 1870	
James West	Aug. 18, 1870	Sept. 28, 1870	
William F. Slater	Aug. 23, 1870	Sept. 27, 1870	
W. B. Webster	Aug. 23, 1870	.....	Still under instruction.
A. R. Eastlake	Aug. 23, 1870	.....	Do.
F. B. Lloyd	Aug. 23, 1870	Sept. 28, 1870	
A. W. Cox	Aug. 25, 1870	Sept. 27, 1870	
William J. Faherty	Aug. 29, 1870	Sept. 24. 1870	
B. F. Hough	Aug. 30, 1870	Oct. 1, 1870	Examined Sept. 26, and sent back for further instruction.
D. S. Pullen	Aug. 29, 1870	Sept. 24, 1870	
E. T. Upperman	Aug. 29, 1870	.....	Still under instruction.
F. H. Fletcher	Aug 29, 1870	Sept. 24, 1870	
A. C. Barclay	Aug. 31, 1870	Oct. 1, 1870	Examined Sept. 26, and sent back for further instruction.
James R. Allen	Aug. 31, 1870	Oct. 1, 1870	
C. R. Estabrook	Aug. 31, 1870	Sept. 28, 1870	
W. W. Craig	Sept. 1, 1870	Oct. 4, 1870	Examined Sept. 27, and sent back for further instruction.
J. Mackintosh	Aug. 31, 1870	Oct. 1, 1870	
F. M. M. Boall	Sept. 2, 1870	Sept. 27, 1870	
W. L. Elliott	Sept. 2, 1870	.....	Discharged.
M. Duval	Sept. 7, 1870	.....	Examined Sept. 28, and failed to pass; was recommended for discharge on account of incapacity.
J. McNabb	Sept. 7, 1870	.....	Still under instruction.
I. V. Munger	Sept. 7, 1870	Oct. 5, 1870	
C. E. Brinsmade	Sept. 8, 1870	.....	Do.
Henry Fenton	Sept. 7, 1870	Oct. 4, 1870	
A. B. Williams	Sept. 8, 1870	.....	Examined Oct. 7, and returned for further instruction.
A. C. Dobbins	Sept. 10, 1870	Oct. 7, 1870	
D. A. Daboll	Sept. 10, 1870	Oct. 14, 1870	
D. J. Gibbon	Sept. 12, 1870	Oct. 4, 1870	
C. A. Shaw	Sept. 14, 1870	.....	
A. Brimer	Sept. 15, 1870	Oct. 5, 1870	
A. Buell	Sept. 16, 1870	Oct. 4, 1870	
F. Meyer	Sept. 26, 1870	Oct. 14, 1870	
A. R. Thornett	Sept. 21, 1870		
J. E. Cowan	Sept. 23, 1870		
G. B. Crane	Sept. 29, 1870		
C. R. Daw	Oct. 9, 1870		
W. T. Blythe	Oct. 5, 1870	.....	Still under instruction.

A[2].

[General Orders No. 29.]

HEADQUARTERS OF THE ARMY, ADJUTANT GENERAL'S OFFICE,
Washington, March 15, 1870.

By direction of the Secretary of War, the following public resolution and orders are published for the information of all concerned:

[PUBLIC RESOLUTION No. 9.]

JOINT RESOLUTION to authorize the Secretary of War to provide for taking meteorological observations at the military stations and other points in the interior of the continent, and for giving notice on the northern lakes and seaboard of the approach and force of storms.

Be it resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of War be, and he hereby is, authorized and required to provide for taking meteorological observations at the military stations in the interior of the continent, and at other points in the States and Territories of the United States, and for giving notice on the northern lakes and on the seacoast, by magnetic telegraph and marine signals, of the approach and force of storms.

Approved February 9, 1870.

The Chief Signal Officer of the Army is charged, subject to the directions of the Sec-

retary of War, with the special duties of the observation and giving notice, by telegraph and signal, of the approach and force of storms, under the provisions of this resolution.

The undertaking thus imposed upon the Secretary of War is for the benefit of the commerce of the United States. It is therefore expected that all commanding officers will afford every facility for its successful discharge; and all scientific establishments, commercial associations, and others are requested to aid, by their coöperation, in its accomplishment.

By command of General Sherman:

E. D. TOWNSEND,
Adjutant General.

B.

MEMORANDUM.

Preliminary plans for observation and report of storms by telegraph and signal for the benefit of commerce.

1. OBSERVATION AND REPORT OF ATMOSPHERIC PHENOMENA.

a. A series of meteorological observations and reports will be made by careful observers under military control, and supplied with the best attainable instruments. All instruments will be compared with a standard at Washington.

b. The observers will be stationed at points throughout the United States, selected by competent authority, as those from which reports of observation will be most useful, as indicating the general condition of the atmosphere, or the approach and force of storms.

It has been in view to so locate these stations that the existence of a storm at one or more of them being determined, information of the facts may be had by the regular reports communicated by telegraph in advance of its probable movement.

c. Synchronous observations will be taken, and reports made from the stations three times a day, one about 8 a. m., one about 6 p. m., and one at midnight. These observations and reports will be timed by Washington time. The office is in a measure led to this selection of hours by the press of business at other times upon the telegraphic lines. Other observations will be made for record.

2. TRANSMISSION OF REPORTS.

a. The reports of observations are to be transmitted by telegraph, under a special arrangement with the telegraph companies whose lines connect the different points where stations will be established.

b. By a combination of telegraphic circuits, the reports of observations made at different points synchronously will be rapidly transmitted to the different cities at which they are to be published. They will also be concentrated at Washington. The whole time required to transmit, collate, and deliver the reports from the extreme points of observation to the points of publication will, it is hoped, not exceed one hour.

3. PUBLICATION OF REPORTS.

a. It is intended to give the widest publicity to these reports, in order to make them useful to the greatest number. Copies of all reports will be furnished to the different papers for publication, and each report will be bulletined in the board of trade rooms, merchants' exchanges, or other conspicuous places, immediately upon its receipt.

b. So soon as the necessary arrangements can be had, a meteorological map, on which the changes can be noted as each report is received, will be displayed at the board of trade rooms, or other business centers in each city receiving reports. Similar maps will be furnished the different scientific establishments coöperating with the Department.

c. The reports will be limited at the outset to the simple statement of meteorological facts existing at the stations of observations. These facts, together with such general laws as seem to have been determined by meteorological observations hitherto made and as may permit probable deductions to be made from the reports, will be published.

d. It is not deemed advisable to attempt at the outset further than in this way predictions which must often be erroneous.

e. Whenever experience has certainly determined what may be regarded for any section of country as premonitions of approaching storms, signal stations will be established as quickly as the necessary arrangements can be made, and signals will be displayed announcing the probable approach, with other information which may be possible.

f. The observer, when one is stationed in any city, will be constantly on duty during business hours, and every facility will be given to obtain copies of the bulletins, or other full and the latest information.

4. STATIONS.

The following have been designated as stations of observation and report, or of report alone, and will be occupied as rapidly as arrangements can be effected:

Plaister Cove, N. S.; St. John's, N. B.; Portland, Me.; Boston, Mass.; New Haven, Conn.; New York City, N. Y.; Philadelphia, Pa.; Baltimore, Md.; Washington, D. C.; Wilmington, N. C.; Charleston, S. C.; Augusta, Ga.; Savannah, Ga.; Lake City, Fla.; Key West, Fla.; Montgomery, Ala.; Mobile, Ala.; New Orleans, La.; Jackson, Miss.; Memphis, Tenn.; Nashville, Tenn.; Louisville, Ky.; Cincinnati, Ohio; Knoxville, Tenn.; Albany, N. Y.; Oswego, N. Y.; Rochester, N. Y.; Buffalo, N. Y.; Cleveland, Ohio; Toledo, Ohio; Detroit, Mich.; Chicago, Ill.; Indianapolis, Ind.; St. Louis, Mo.; Milwaukee, Wis.; St. Paul, Minn.; Du Luth, Minn.; Omaha, Neb.; Cheyenne, W. T.; Corinne, Utah; Santa Fé, N. M.; Fort Benton, Montana; San Francisco, Cal.; Pittsburg, Pa.

FORM 4.

WAR DEPARTMENT.—SIGNAL SERVICE UNITED STATES ARMY.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE.

Meteorological record for the ——— ending ———————.

Date of observation.	Time of observation.	Height of barometer.	Height of attached thermometer.	Reduced barometer.	Thermometer, (open air.)		Direction of wind.	Velocity of wind in miles per hour.	Pressure of wind. (Lbs. per sq. foot.)	Amount of cloud.	Direction in which upper clouds move.	Rain or snow commenced, (time.)	Rain or snow end'd. (time.)	Am't of rain or melted snow.	Remarks.
					Dry bulb.	Wet bulb.									

FORM 1.

SIGNAL SERVICE UNITED STATES ARMY.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE.

Report of observations taken at Smithville, Va., July 19, at 9 p. m.

1	Nine	Eight	Seven	Two	One	98721
2	Seven	Six	Naught	Seven	Three	76073
3	One	Three	Naught	One	Two	13012
4	Four	Naught	Naught	Three	Five	40035

JAMES THOMPSON, *Observer.*

NOTE.—Operators will send the numeral *words* and not the figures, which are written as a *check* on the words.

The numbers must always consist of five figures each.

They will send only the matter inside the heavy lines, without address or signature.

EXPLANATION OF THE ABOVE FORM.

1. This line gives height of barometer, (omitting the first figure of the height in inches,) and also the name of the station by number. As given, the barometer stands at Station 21 at 29.87. The two terminal figures indicate the station.

2. Gives height of dry bulb thermometer, with difference between it and the wet bulb, and also direction of wind indicated by numbers from one to eight, beginning at the *north*. A *calm* is indicated by *zero* or *naught*. The numbers given show the thermometer to stand at 76°, the wet bulb at 69°, and the direction of the wind to be due *east*.

3. Gives velocity of wind per hour in miles, with date of report, and amount of cloud indicated by a scale of numbers from *one* to *four*. The reading given shows a velocity of 13 miles per hour, and that the date is the *first* of the month, and that the sky was half covered with clouds.

4. First figure indicates state of weather, as follows: Clear, 1; fair, 2; rain, (light,) 3; rain, (heavy,) 4; snow, 5. Last three figures indicate rain-fall since last report, in inches and hundredths. The figures show that a heavy *rain* was falling and that 0.35 of an inch had fallen since last report.

FORM 5.

SIGNAL SERVICE UNITED STATES ARMY.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE.

Report of observations taken at Smithville, Va., August 19, at 8 p. m.

1	Nine	Eight	Seven	Two	One	D	98721
2	Three	Seven	Two	Six	Four	S	37264

JOHN THOMAS, *Observer.*

NOTE.—Operators will send the numeral *words* and not the figures, which are written as a *check* on the words.

The numbers must always consist of five figures each.

They will send only the matter inside the heavy lines, without address or signature.

EXPLANATION OF THE ABOVE FORM.

1. This line gives height of barometer, (omitting the first figure of the height in inches,) and also the number of the station. In the reading given the barometer stands at 29.87 at Station 21.

2. The first figure gives direction of wind, indicated by numbers from one to eight, beginning at the north and moving to the eastward. The second figure gives the *force* of the wind by the Beaufort scale. The third indicates state of the weather by a series of numbers from one to five. *One* being *clear; two*, cloudy and clear sky; *three*, light rain; *four*, heavy rain; and *five*, snow. The last two figures give the height of the thermometer. The reading given shows the wind to be east, blowing strongly, with a

fair sky, and a temperature of 64°. The letter "D" or "N" at the end of the *first* line will show whether the report is a day or a night report. The letter at the end of the *second* line corresponding by the number of its place in the alphabet to the date, thus **a** for the first, **b** for the second and so on, gives the date—the 27th, 28th, 29th, 30th, and 31st are shown by **ab**, **ac**, **ad**, **ae**, and **af**, respectively.

TABLE A.

No. of stations.	Stations.	No. of reports.	Reporting stations.
1	Albany	39	San Francisco, Fort Benton, Santa Fé, Corinne, Omaha, Chicago, St Paul, Milwaukee, St. Louis, Cairo, Cincinnati, Louisville, Indianapolis, Nashville, Memphis, Jackson, New Orleans, Detroit, Toledo, Cleveland, Buffalo, Rochester, Syracuse, Oswego, Plaister Cove, St. John's, Portland, Boston, New Haven, New York, Philadelphia, Washington, Wilmington, Knoxville, Charleston, Augusta, Savannah, Key West, Baltimore.
2	Syracuse	39	Same as above.
3	Oswego	39	Same as above.
4	Rochester	39	Same as above.
5	Buffalo	39	Same as above.
6	Cleveland	39	Same as above.
7	Toledo	39	Same as above.
8	Detroit	39	Same as above.
9	Chicago	39	Same as above.
10	Plaister Cove	16	New York, Washington, Wilmington, Charleston, Key West, St. Paul, Chicago, Detroit, Buffalo, Cincinnati, Knoxville, New Orleans, Portland, St. John's, Boston, New Haven.
11	St. Johns	16	New York, Washington, Wilmington, Charleston, Key West, St. Paul. Chicago, Detroit, Buffalo, Cincinnati, Knoxville, New Orleans, Plaister Cove, Portland, Boston, New Haven.
12	Portland	16	Plaister Cove, St. John's, Boston, New Haven, New York, Washington, Wilmington, Charleston, Key West, St. Paul, Chicago, Detroit, Buffalo, Cincinnati, Knoxville, New Orleans.
13	Boston	16	Plaister Cove, St. John's, Portland, New Haven, New York, Washington, Wilmington, Charleston, Key West, St. Paul, Chicago, Detroit, Buffalo, Cincinnati, Knoxville, New Orleans.
14	New Haven	16	Plaister Cove, St. John's, Portland, New Haven, New York, Washington, Wilmington, Charleston, Key West, St. Paul, Chicago, Detroit, Buffalo, Cincinnati, Knoxville, New Orleans.
15	New York	45	Plaister Cove, St. John's, Portland, Boston, New Haven, Philadelphia, Baltimore, Washington, Wilmington, Knoxville, Charleston, Augusta, Savannah, Key West, San Francisco, Fort Benton, Santa Fé, Corinne, Omaha, Chicago, St. Paul, Milwaukee, St. Louis, Cincinnati, Louisville, Indianapolis, Nashville, Memphis, Jackson, New Orleans, Detroit, Toledo, Cleveland, Buffalo, Rochester, Syracuse, Oswego, Albany, Richmond, Cheyenne, Du Luth, Mobile, Montgomery, Lake City.
16	Philadelphia	45	Plaister Cove, St. John's, Portland, Boston, New Haven, New York, Baltimore, Washington, Wilmington, Knoxville, Charleston, Augusta, Savannah, Key West, San Francisco, Fort Benton, Santa Fé, Corinne, Omaha, Chicago, St. Paul, Milwaukee, St. Louis, Cincinnati, Louisville, Indianapolis, Nashville, Memphis, Jackson, New Orleans, Detroit, Toledo, Cleveland, Buffalo, Rochester, Syracuse, Oswego, Albany, Richmond, Cheyenne, Du Luth, Mobile, Montgomery, Lake City.
17	Baltimore	45	Plaister Cove, St. Johns, Portland, Boston, New Haven, Philadelphia, Washington, Wilmington, Knoxville, Charleston, Augusta, Savannah, Key West, San Francisco, Fort Benton, Santa Fé, Corinne, Omaha, Chicago, St. Paul, Milwaukee, St. Louis, Cincinnati, Louisville, Indianapolis, Nashville, Memphis, Jackson, New Orleans, Detroit, Toledo, Cleveland, Buffalo, Rochester, Syracuse, Oswego, Albany, Richmond, Cheyenne, Du Luth, Mobile, Montgomery, Lake City, New York City.
18	Washington	45	Same as above.
19	Wilmington	13	Key West, Lake City, New Orleans, Mobile, Montgomery, Savannah, Augusta, Charleston, Plaister Cove, New York, Chicago, Cincinnati, Washington.
20	Charleston	13	Same as above.
21	Augusta	13	Same as above.
22	Savannah	13	Same as above.
23	Lake City.	13	Same as above.
24	Key West	13	Same as above.
25	Montgomery	13	Same as above.
26	Mobile	13	Same as above.
27	New Orleans	13	Same as above.
28	Jackson	6	New Orleans, Memphis, Nashville, Louisville, Cincinnati, Indianapolis.
29	Memphis	6	Same as above.
30	Nashville	6	Same as above.
31	Louisville	6	Same as above.
32	Cincinnati	6	Same as above.
33	Indianapolis	6	Same as above.

TABLE A—Continued.

No. of stations.	Stations.	No. of reports.	Reporting stations.
34	Knoxville	.....	
35	St. Louis	5	Omaha, St. Paul, Chicago, New Orleans, Memphis.
36	Milwaukee	1	St. Paul.
37	St. Paul	4	Chicago, Omaha, St. Louis, New Orleans.
38	Du Luth	4	Same as above.
39	Omaha	4	San Francisco, Fort Benton, Santa Fé, Corinne.
40	Cheyenne	.....	
41	Corinne	3	San Francisco, Fort Benton, Santa Fé.
42	Santa Fé	.....	
43	Fort Benton	.....	
44	San Francisco	.....	

PAPER 2. Issued Oct 10, 1870 to 25 observers sergeants 4/75

WAR DEPARTMENT, OFFICE OF THE CHIEF SIGNAL OFFICER,
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE,
Washington, D. C., October 1, 1870.

SERGEANT:

I. You will proceed with as little delay as practicable to ———, as observer at that station, reporting upon your arrival there, by letter, to this office.

II. Upon arriving at your station, you will immediately proceed to secure a room suitable for office purposes and the storage of instruments and other United States property in your charge. This room must be in the immediate vicinity of the telegraph office charged with the transmission and receipt of the weather reports, and should be in the upper story of a building, and contain at least one window facing the north. In all cases you will endeavor to get permission to occupy the roof of the (or a) building for the necessary exposure of your instruments, and the erection of an instrument room in accordance with the plans furnished by this office. When this cannot be done, an instrument shelter will be constructed similar to the one described on page 2 of the Smithsonian Directions for taking Meteorological Observations, a copy of which is furnished for your guidance. The building selected should be detached from other buildings, and where this cannot be found, should be higher than those surrounding it. Too much attention cannot be given to the proper setting up of the instruments and their protection from local influences.

III. As soon as practicable after arriving at your station, you will put yourself in communication with the board of trade, chamber of commerce, board of underwriters, or other committee, if any may be in coöperation with this office, and also with all colleges, scientific associations, and other institutions of learning in your vicinity which may desire coöperation. You will bear constantly in mind that it is expected you will use every effort in your power to render your office of the greatest public utility.

IV. The office furniture will be of the plainest kind, and will consist of such articles only as are absolutely necessary for the transaction of business, viz., one desk, one table, and two chairs, and a stove or other heating apparatus when required.

V. You will be notified by telegraph on what day the regular reports will commence, and from and after that date you will make three observations daily for transmission by telegraph, and three observations at different hours for transmission by mail.

VI. The observations for telegraphic transmission will be entered on Forms 1 and 5, supplied by this office, and made in time to be delivered in person to the operator charged with their transmission, in the order and at the times named below, viz: Report No. 1, (on Form No. 1, 20 words,) at ——— a. m.; report No. 2, (on Form 5, 10 words,) at ——— p. m.; report No. 3, (on Form 5, 10 words,) at ——— p. m. You will be at the telegraph office with the reports carefully and plainly written out, ten minutes before the hours named, in order that the operator may be notified in time to prepare for their transmission. You will also furnish the chief operator with a plainly written list of the stations (with their proper numbers) from which reports are to be received, and also of those to be sent from his office, with the names of the place or places to which they are to be sent over the wires. If reports are to be transferred or selected for transfer at your station, you must personally attend to such transfer or selection unless prevented by sickness or other extraordinary causes. To provide against such an event, you will so arrange with, and instruct, the chief operator that the regular transmission of reports will not be interrupted by your absence. You will follow the local time in carrying out these instructions.

VII. In addition to the above observations, three others will be taken daily at 7 a. m., 2 p. m., and 9 p. m., respectively, and entered upon forms provided by this office for that purpose. A copy of these records will be forwarded by mail weekly to the Chief Signal Officer of the Army at Washington, District of Columbia.

VIII. After delivering the reports from your station to the operator, you will remain in the telegraph office until they are sent, and until the reports from other points, intended for use at your station, are received, or until assured that their receipt has been prevented by some cause beyond the control of the operator. You will keep the operator supplied with Form 2, on which he is to receive the reports, and in all cases see that he fills in the time of delivery to you. You will also fill up in like manner Forms 1 and 5 before delivery.

IX. Immediately upon the receipt of the reports intended for use at your station, you will return to your office and translate them into their true reading, in accordance with the instructions furnished. You will then write out plainly a copy for each daily newspaper published in the city or town where you are stationed, and supply them promptly and regularly to such newspapers. You will also fill up, from the reports received, the bulletin, (Form No. 3,) and post this regularly in the rooms of the board of trade, and such other conspicuous places as may hereafter be designated. The local observations will always be entered upon the bulletin and in the press reports. In carrying out this portion of your duty, you will be required to act promptly and intelligently, bearing constantly in mind that the usefulness of these reports depends wholly upon the promptness with which they are laid before the public.

X. The following forms and books of record will be supplied by this office, viz: Journal, Daily Record of observations, Record of telegrams sent and received, Record of bulletins, Record of letters sent, Record of letters received; Forms from 1 to 6 inclusive; map of the United States.

Form No. 1 will be used for the morning report of 20 words, and will be filled up as follows: In the first line will be entered the height of the barometer, read to hundredths of an inch, (omitting the first figure of the height in inches,) and the number of the station, which will be shown by the two terminal figures.

In the second line the first two figures will show the height of the exposed thermometer, the next two the difference between the dry and wet-bulb thermometers, and the terminal figure the direction of the wind, indicated by a series of numbers from 1 to 8, beginning at the north and moving to the east. A *calm* will be indicated by zero or naught.

In the third line the first two figures will show the velocity of the wind per hour, in miles; the next two the date of the report; and the last figure the amount of cloudiness, indicated by a series of numbers from 1 to 4. Clear sky will be indicated by zero or naught.

In the fourth line the first figure will show the state of the weather as follows: 1 clear, 2 fair, 3 light rain, 4 heavy rain, 5 snow. The second space not being needed at present, will be filled by zero or naught, and the three terminal figures will show in inches and hundredths of an inch the amount of rain-fall since the last report. The form will always be dated, and time of observation given, and must be signed by the observer before delivery to the operator. The time of delivery to the operator must also be noted. The directions given in the printed note on each form must be strictly followed, and you must assure yourself that they are clearly understood by the telegraph operator.

Form 2 will be used by the operator in receiving the reports from other stations, and will be filled up in regular order, commencing at the upper left-hand space, and filling each space to the right in succession on the first line and then commencing at the left-hand space of the second line, and so on until each space is filled. You will see that he signs and dates the record before receiving it from him, and the time of receipt will also be carefully noted.

Form No. 3 is the bulletin for public information, and will be filled out promptly on the receipt of reports, in the following manner, viz:

In the first column will be given the names of places from which observations have been received. In column No. 2, the height of the barometer, and in the third column, the change since last report. If the barometer has *risen* since the previous report, the figures alone will be given, without additional sign; but if it has *fallen*, they will be preceded by the minus sign. The fourth column will show the height of the thermometer, (exposed,) and the fifth will show the change in the last twenty-four hours, and *not* since last report. When the current reading is *lower* than the preceding one, the minus sign will be used; if *higher*, the figures alone. In the sixth column, the direction of the wind will be given in initial letters. In the seventh column, the velocity of the wind will be given in miles per hour. In the eighth column, the pressure in pounds per square foot will be given; and in the ninth column, the force of the wind, deduced from the velocity and pressure, will be given in the Beaufort scale, expressing the kind of wind in words, and not by the figures. In column ten will be entered the amount of cloud; in column eleven the amount of rain-fall since last report in inches and hundredths of an inch, and in the twelfth column the state of the weather will be

shown. The bulletin will be dated and the hour of report given in the proper place at the head of the form, but will *not* be signed.

Form No. 4 will be filled out weekly, and transmitted to the Chief Signal Officer at Washington. It is divided into seven parts, in each one of which will be entered the three daily observations under the proper heading. It will be properly filled out as to date, and signed by the person making the report.

Form No. 5 will be used for the afternoon and midnight 10-word reports. The first line will show height of barometer and number of station, as in Form No. 1; the letter "D" or "N" at the end of the line will show whether the report is a day or night report. The first figure of the second line gives direction of the wind, indicated by numbers from 1 to 8, beginning at the north and moving to the eastward. The second figure gives the *force* of the wind by the Beaufort scale, as given in Loomis's Treatise on Meteorology, page 70, paragraph 123. The third figure indicates the state of the weather, by a series of numbers from 1 to 5, as in Form No. 1. The last two figures give the height of the exposed thermometer. A *letter* at the end of this line corresponding by the number of its place in the alphabet to the date—thus, **a** for the first, **b** for the second, and so on—gives the date; the 27th, 28th, 29th, 30th, and 31st are shown by **ab**, **ac**, **ad**, **ae**, and **af**, respectively. The instructions given for dating, timing, and signing Form No. 1 will be followed in filling out this form.

In transmitting the readings of the thermometer below zero the word *minus* will be sent in the place occupied by the first figure of the readings when above ten. If the number of degrees should exceed ten, it can be written in one place, thus, "fourteen," "nineteen," &c.

In all readings above 100° the hundred figure should be omitted in sending, so as to keep the matter within two places. The receiver can readily supply it in the same manner that the first figure of the barometer reading is supplied.

Form No. 6 is a memorandum receipt for property, and will be filled up with the number of articles received, signed, dated, and transmitted to the property officer of the Signal Office in Washington, District of Columbia.

In the journal will be entered daily all matters of interest not provided for in the forms, such as meteoric and auroral displays and unusual atmospheric disturbances, giving, in all cases, time of commencement and duration of each. Note will also be made of any damage to the instruments, and the cause, and all such items as have a bearing upon the discharge of your duties. A monthly abstract of this journal will be made out and forwarded monthly to the Chief Signal Officer for his information. The book of daily record of observations will be an exact copy of Form No. 4, and will be kept for reference. This book will always be carried to the telegraph office, and the operator receiving the report be required to sign his name in the margin as an acknowledgment of its proper receipt.

The record of bulletins will also be an exact copy of all bulletins posted. In the record of letters sent and received will be entered all letters sent and received relating to the official business of the station.

The map of the United States will be hung up in the principal room of the Board of Trade or Chamber of Commerce, or both, and the condition of the weather throughout the United States, as collated from the telegraphic weather reports, will be shown upon it as soon after the receipt of the morning report as is practicable, and in the following manner: The height of the barometer and thermometer and force of the wind at each station will be plainly written in figures upon a rectangular piece of pasteboard, and placed upon the metallic pin at that station; over this will be placed one of the pasteboard disks indicating the state of the weather, and upon this the metallic arrow will be placed, pointed in the direction toward which the wind is blowing; and the whole will be secured in position by the milled screw.

XI. INSTRUMENTS.

Each station will be supplied with the following instruments, viz.: 1 barometer, 1 thermometer, 1 hygrometer, 1 anemometer, 1 rain gauge, 1 clock.

1. *Barometer.*—In putting up and using the barometer, the instructions given in the Smithsonian pamphlet, pages 54–62, will be closely followed. The readings will be corrected for temperature by reducing them to the freezing point by the table given in Loomis's Treatise on Meteorology, pages 258, 259. They must also be reduced to the level of the sea by table VII, on page 257 of the same work. These reductions will, in all cases, be made before the observations are transmitted by telegraph or entered on the fifth column of Form 4.

In transporting a barometer, even across a room, it should be screwed up and carried with its cistern uppermost. For traveling, it is provided with a wooden case. On steamboats or railroads it should be hung up by a hook in the state-room or car. In wheeled vehicles it should be carried by hand, supported by a strap over the shoulder, or held upright between the legs; but it should *not* be allowed to rest on the floor of the carriage, for a sudden jolt might break the tube. If carried on horseback it should

be strapped over the shoulders of the rider, where it is not likely to be injured, unless the animal is subject to a sudden change of gait. When about to be used it should be taken from its case and, while screwed up, gently inverted and hung up, when it can be unscrewed. While it has its cistern uppermost the tube is full, is one solid mass of metal and glass, and not easily injured; but when hung up, a sudden jolt might send a bubble of air into the vacuum at the upper end of the tube, and the instrument would be useless until repaired.

If the cistern should become dirty it can be cleaned with safety, and without changing, in the slightest degree, the zero of the instrument. Everything used in the operation must be clean and dry. Avoid blowing upon any of the parts, as the moisture from the breath is injurious.

The instrument being placed upright, the cistern uppermost, unscrew and take off the brass casing which incloses the wooden and leather part of the cistern. This wooden part (which has the grain crosswise, and therefore is not air-tight) is made in two pieces, fastened together by four screws and four brass pieces, each in the form of the half of a circular ring. It will be necessary to take out two of these screws, and loosen the other two, when the brass pieces can be taken off. The upper wooden piece, to which the bag is attached, can then be lifted off, and the mercury will be exposed. By then inclining the instrument a little, a portion of the mercury in the cistern may be poured out into a clean vessel at hand to receive it, when the end of the tube will be uncovered. This is to be closed by the *gloved hand*, when the instrument can be inverted, the cistern emptied, and the tube brought again to its upright position. Great care must be taken not to permit any mercury to pass out of the tube. The long screws which fasten the glass portion of the cistern to the other parts can then be taken off, the various parts wiped with a clean cloth or handkerchief, and restored to their former positions. The mercury which had been taken out of the cistern must now be cleaned, or it must be replaced by other that is clean and pure. If the old mercury is merely dusty, or dimmed by a film of oxide, the cleaning may be effected by straining it through chamois leather, or through a funnel with a capillary hole at the end, of a size to admit of the passage of but a small thread of the metal. Such a funnel is conveniently made of letter paper. The dust will adhere to the skin or paper, and the filtered mercury will present a clean and bright appearance. If chemically impure, it should be rejected, and fresh, clean mercury used. With such clean mercury the cistern should be filled as nearly full as possible; the wooden portions put together and securely fastened by the screws and clamps; the brass casing screwed on, and the screw at its end screwed up. The instrument can then be hung up and readjusted. The tube and its contents having been undisturbed, the instrument should read the same as before. If a little mercury has been lost during the operation, and there is none at hand to replace it, no serious harm has been done; but if much is lost, the open end of the tube may become exposed in inverting the instrument, in which case air may enter.

2. *Thermometer.*—The Smithsonian instructions, pages 3, 4, will be followed in putting up and reading the exposed thermometer. Great care must be taken in making and recording the observations below zero, and the minus sign must *always* be prefixed to such readings.

3. *Hygrometer.*—In using this instrument follow so much of the Smithsonian instructions as applies to the form adopted by the signal service, in which the wet bulb is kept constantly moistened, so that the reading can be taken instantaneously.

4. *Anemometer.*—The Lind anemometer for determining the direction and pressure of the wind will be put up in an exposed position, where the wind can act freely upon it, and will be filled to the zero mark with water, except during the winter months, when, to prevent freezing, alcohol will be used. The tubes will be kept filled to the zero mark by daily additions to compensate the loss by evaporation. It must be firmly secured to a base on which is marked the *true meridian* of the locality as determined with a good compass, corrected for magnetic variation. In reading the scale the amount of depression in one limb must be added to the elevation in the other, the sum of the two giving the pressure. The following table will be used:

Table showing the force of wind per square foot for different heights of the column of water in Lind's wind gauge.

Inches.	Force in pounds.	Common designation of wind.	Inches.	Force in pounds.	Common designation of wind.
6	31.75	Hurricane.	1	5.21	High wind.
5	26.04	Violent storm.	.5	2.60	Brisk wind.
4	20.83	Great storm.	.1	.52	Fresh breeze.
3	15.62	Storm.	.05	.26	Gentle breeze.
2	10.42	Strong wind.	0.	0.	Calm.

To determine the velocity of the wind from the pressure thus obtained, table 8, on page 277 of Loomis's Treatise on Meteorology, will be used.

5. *Rain gauge.*—Whenever practicable this gauge will be placed with the top of the funnel, twelve inches above the surface of the ground, firmly fixed in a vertical position, and protected from interference of unauthorized persons. It will be examined at the hours named for reports, and the amount of water contained carefully measured with the graduated rod sent with it, and then emptied and returned to its position. When a position at the level of the ground cannot be found with a sufficiently clear exposure it will be exposed on the top of the instrument room or roof of building occupied by the observer, but in this case the height above the ground must be measured and reported to this office at once. The measuring rod is graduated in inches and tenths, so that ten inches upon the rod correspond with one inch of rain-fall, an inch on the rod to one-tenth of an inch of rain, and one-tenth on the rod to a hundredth of an inch of rain.

Clock.—The clock will be hung upon the interior wall of the room occupied, and will be corrected daily by time received from Washington, District of Columbia.

XII. Immediately after locating your instruments you will make to this office a full report in writing, showing the kind, size, and position of room selected, how each instrument is located, stating height of each from the ground, height of wind vane, and Lind anemometer above the roof and ground, and whether each instrument is freely and properly exposed. You will also state such other facts in relation to your station as will enable this office to judge of the manner in which you have performed your duty in this respect.

XIII. You will give close attention to the observation and record of all the local premonitory signs of storms or changes of weather, and report them promptly to this office. Note particularly the direction and force of the wind, the appearance and kind of clouds, the action of the barometer and thermometer before, during, and after the storm or change, and such purely local causes as appear to influence the results.

XIV. As soon after arriving at your station as is practicable, you will make arrangements with some person to perform your duties in case of sickness or disability. The person so selected must be carefully instructed in the use and care of the instruments, in the manner of making out and forwarding the weather reports, and the proper disposition of those received. His employment will be temporary only, and he will be paid from this office at the expiration of the month in which the services have been rendered. His name and the date at which he commenced performing the duty will be reported to this office by mail, and the date of his relief from duty, with number of days employed, will also be promptly reported. The rate of compensation will be fixed by this office.

In case of sickness or other disability, rendering you unable to perform your duties in person, you will report the fact at once to this office by telegraph.

* * * * * * * * *

XIX. You will bear in mind that you are expected to improve yourself in the duties of your position, and that at any time after one year's service you are liable to be called before a board of examiners for your second regular examination.

By order of the Chief Signal Officer of the Army.

_____ _____,

First Lieut. and Brt. Maj. U. S. A., Acting Signal Officer and Assistant.

To _____ _____.

C.—WORKING FORMS OF CIRCUIT.

(*Circuit No.* 1.)

PLAISTER COVE TO NEW YORK CITY.

PLAISTER COVE TO NEW YORK CITY.							NEW YORK CITY TO PLAISTER COVE.				
At 7.45 a. m., Plaister Cove will send report through—	At 7.47 a. m., St. John's will send through—	At 7.45 a. m., Portland will send through—	At 7.51 a. m., Boston will send through—	At 7.55 a. m., New Haven will send through—	No. of words from each.	Time in minutes.	At — a. m., New York will send Plaister Cove reports from—	No. of words.	No. of minutes.	Total No. of words.	Total No. of minutes.
St. John's					20	1	New York	20	1		
Portland	Portland				20	1	Washington	20	1		
Boston	Boston	Boston			20	1	Wilmington	20	1		
New Haven	New Haven	New Haven	New Haven		20	1	Charleston	20	1		
to	to	to	to	to			Key West	20	1		
New York	New York	New York	New York	New York	20	1	St. Paul	20	1		
							Chicago	20	1		
							Detroit	20	1		
							Buffalo	20	1		
							Cincinnati	20	1		
							Knoxville	20	1		
							New Orleans	20	1		
Aggregate					100	5	Aggregate	240	12	340	17

NOTE.—Each station will take down the reports sent by the others in regular succession, so that when New Haven finishes all of them will have the full reports from the others.

NOTE.—Each intermediate station will take down the above reports as they pass over the line. Copies of these reports will be bulletined in the rooms of the different Boards of Trade and furnished to the local papers for publication.

D.—WORKING FORM OF CIRCUITS.

(*Circuit No.* 2.)

AUGUSTA TO NEW YORK CITY.

AUGUSTA TO NEW YORK CITY.										NEW YORK CITY TO AUGUSTA.				
At 7.45 a. m., Augusta will send through—	At — a. m., Charleston will send through—	At — a. m., Wilmington will send through—	At — a. m., Richmond will send through—	At — a. m., Washington will send through—	At — a. m., Baltimore will send through—	At 7.53 a. m., Philadelphia will send through—	Number of words.	Time in minutes.		At — a. m., New York will send to Augusta reports from—	Number of words.	Time in minutes.	Total number of words.	Whole time circuit will be needed.
*Charls'n							60	3		New York	20	1		
Wilm'gtn	Wilm'gtn						20	1		Pl'ster Cove	20	1		
Richm'd	Richm'd	Richm'd					20	1		Chicago	20	1		
Wash'gtn	Wash'gtn	Wash'gtn	Wash'gtn				20	1		Cincinnati	20	1		
Baltimore	Baltimore	Baltimore	Baltimore	Baltimore			20	1		New Orl'ns	20	1		
Philad'a	Philad'a	Philad'a	Philad'a	Philad'a	Philad'a		20	1						
to	to	to	to	to	to									
NewYork	NewYork	NewYork	NewYork	NewYork	NewYork	NewYork	20	1						
Agg'ate							180	9		Aggregate	100	5	280	14

* Including Savannah and Key West.

NOTE.—Same as No. 1 circuit.

E.—WORKING FORM OF CIRCUITS.

(*Circuit No.* 3.)

LAKE CITY TO AUGUSTA.

LAKE CITY TO AUGUSTA.				AUGUSTA TO LAKE CITY.				
At 7.41 a. m. Lake City will send through—	At — a. m. Savannah will send to—	Number of words.	Time in minutes.	At 8 a. m. Augusta will send to Lake City reports from—	Number of words.	Time in minutes.	Whole number of words sent over circuit.	Whole time circuit will be needed— minutes.
Savannah, (including Key West,) to Augusta.	Augusta	40 20	2 1	New York Chicago Cincinnati New Orleans Charleston Washington	20 20 20 20 20 20	1 1 1 1 1 1		
Aggregate		60	3	Aggregate	120	6	180	9

NOTE.—Same as No. 1 circuit.

F.—WORKING FORM OF CIRCUITS.

(*Circuit No.* 4.)

KEY WEST TO LAKE CITY.

KEY WEST TO LAKE CITY.			LAKE CITY TO KEY WEST.				
At 8 a. m. Key West will send to—	Number of words.	Time in minutes.	At — a. m. Lake City will send to Key West reports from—	Number of words.	Time in minutes.	Total number of words.	Total amount of time.
Lake City	20	1	New York Washington New Orleans Charleston Cincinnati Chicago	20 20 20 20 20 20	1 1 1 1 1 1		
Aggregate	20	1	Aggregate	120	6	140	7

NOTE.—Same as No. 1 circuit.

G.—WORKING FORM OF CIRCUIT.

(*Circuit No. 5.*)

CHICAGO TO NEW YORK.

CHICAGO TO NEW YORK.													NEW YORK TO CHICAGO.				
At—a. m. Chicago will send New York reports from—	Sending through—	At—a. m. Detroit will send through—	At—a. m. Toledo will send through—	At—a. m. Cleveland will send through—	At—a. m. Buffalo will send through—	At—a. m. Rochester will send through—	At—a. m. Syracuse will send through—	At—a. m. Oswego will send through—	At—a. m. Albany will send through—	No. of words.	No. of minutes.		At—a. m. New York will send Chicago reports from—	No. of words.	No. of minutes.	Total No. of words.	Total No. of minutes.
San Francisco													Plaister Cove	20	1		
Fort Benton													St. John's	20	1		
Santa Fe													Portland	20	1		
Corinne													Boston	20	1		
Omaha													New Haven	20	1		
Chicago													New York	20	1		
St. Paul													Philadelphia	20	1		
Milwaukee													Baltimore	20	1		
St Louis													Washington	20	1		
Cairo													Wilmington	20	1		
Louisville													Knoxville	20	1		
Indianapolis													Charleston	20	1		
Nashville													Augusta	20	1		
Memphis													Savannah	20	1		
Jackson													Key West	20	1		
New Orleans																	
Cincinnati											340	17					
	Detroit										20	1					
	Toledo	Toledo									20	1					
	Cleveland	Cleveland	Cleveland								20	1					
	Buffalo	Buffalo	Buffalo	Buffalo							20	1					
	Rochester	Rochester	Rochester	Rochester	Rochester						20	1					
	Syracuse	Syracuse	Syracuse	Syracuse	Syracuse	Syracuse					20	1					
	Oswego	Oswego	Oswego	Oswego	Oswego	Oswego	Oswego				20	1					
	Albany	Albany to New York	Albany to New York	Albany to New York	Albany to New York	Albany to New York	Albany to New York	Albany to New York			20	1					
										New York	20	1					
Aggregate											520	26	Aggregate	300	15	820	41

NOTE.—Same as No. 1 circuit.

H. WORKING FORM OF CIRCUITS.

(*Circuit No. 6.*)

NEW ORLEANS TO CHICAGO.

NEW ORLEANS TO CHICAGO.									CHICAGO TO NEW ORLEANS.				
At — a. m. New Orleans will report through—	At — a. m. Jackson will send through—	At — a. m. Memphis will send through—	At — a. m. Nashville will send through—	At — a. m. Louisville will send through—	At — a. m. Cincinnati will send through—	At — a. m. Indianapolis will send to—	Number of words.	Number of minutes.	At — a. m. Chicago will send to New Orleans reports from—	Number of words.	Number of minutes.	Total number of words.	Total number of minutes.
Jackson							20	1					
Memphis	Memphis						20	1					
Nashville	Nashville	Nashville					20	1					
Louisville	Louisville	Louisville	Louisville				20	1					
Cincinnati	Cincinnati	Cincinnati	Cincinnati	Cincinnati			20	1					
Indianapolis to Chicago	Indianapolis to Chicago	Indianapolis to Chicago	Indianapolis to Chicago	Indianapolis to Chicago	Indianapolis to Chicago	Chicago	20	1					
Aggregate							140	7	Aggregate			140	7

NOTE.—Same as No. 1 circuit.

I.—WORKING FORM OF CIRCUITS.

(*Circuit No. 7.*)

AUGUSTA TO NEW ORLEANS.

AUGUSTA TO NEW ORLEANS.						NEW ORLEANS TO AUGUSTA.				
At — a. m. Augusta will send reports from—	Sending through—	At — a. m. Montgomery will send through—	At — a. m. Mobile will send to—	Number of words.	Number of minutes.	At — a. m. New Orleans will send to Augusta reports from—	Number of words.	Number of minutes.	Total number of words.	Total number of minutes.
Key West				20	1					
Savannah				20	1					
	Montgomery			20	1					
	Mobile	Mobile		20	1					
	to New Orleans	to New Orleans	New Orleans	20	1					
Aggregate				100	5	Aggregate			100	5

NOTE.—Same as No. 1 circuit.

J.—WORKING FORM OF CIRCUITS.

(*Circuit No. 8.*)

ST. PAUL TO CHICAGO.

ST. PAUL TO CHICAGO.				CHICAGO TO ST. PAUL.				
At — a. m. St. Paul will send through—	At — a. m. Milwaukee will send to—	Number of words.	Number of minutes.	At — a. m. Chicago will send to St. Paul reports from—	Number of words.	Number of minutes.	Total number of words.	Total number of minutes.
Milwaukee to Chicago.	Chicago.	20 20	1 1	Chicago Omaha St. Louis New Orleans	20 20 20 20	1 1 1 1		
Aggregate		40	2	Aggregate	80	4	120	6

NOTE.—Same as No. 1 circuit.

K.—WORKING FORM OF CIRCUITS.

(*Circuit No. 9.*)

ST. LOUIS TO CHICAGO.

ST. LOUIS TO CHICAGO.			CHICAGO TO ST. LOUIS.				
At — a. m. St. Louis will report to—	Number of words.	Number of minutes.	At — a. m. Chicago will send to St. Louis reports from—	Number of words.	Number of minutes.	Total number of words.	Total number of minutes.
Chicago	20	1	Omaha St. Paul Chicago New Orleans Memphis	20 20 20 20 20	1 1 1 1 1		
Aggregate	20	1	Aggregate	100	5	120	6

NOTE.—Same as No. 1 circuit.

L.—WORKING FORM OF CIRCUITS.

(*Circuit No.* 10.)

NEW YORK TO WASHINGTON.

NEW YORK TO WASHINGTON.				WASHINGTON TO NEW YORK.				
At —— a. m. New York will send to Washington reports from—		No. of words.	No. of minutes.	At —— a. m. Washington will send to New York reports from—	No. of words.	No. of minutes.	Total number of words.	Total number of minutes.
Plaister Cove		20	1	Washington	20	1		
St. John's		20	1					
Portland		20	1					
Boston		20	1					
New Haven		20	1					
New York		20	1					
Albany		20	1					
Oswego		20	1					
Syracuse		20	1					
Rochester		20	1					
Buffalo		20	1					
Cleveland		20	1					
Toledo		20	1					
Detroit		20	1					
Chicago		20	1					
St Paul		20	1					
Milwaukee		20	1					
St. Louis		20	1					
Cairo		20	1					
Cincinnati		20	1					
Louisville		20	1					
Indianapolis		20	1					
Nashville		20	1					
Memphis		20	1					
Jackson		20	1					
New Orleans		20	1					
Knoxville		20	1					
Omaha		20	1					
Corinne		20	1					
Fort Benton		20	1					
Santa Fé		20	1					
San Francisco		20	1					
		640	32				660	33

NOTE—Same as No. 1 circuit.

M.—WORKING FORM OF CIRCUITS.

(*Circuit No.* 11.)

KNOXVILLE TO NEW YORK.

KNOXVILLE TO NEW YORK.				NEW YORK TO KNOXVILLE.				
At —— a. m. Knoxville will send report to—		No. of words.	No. of minutes.	At —— a. m. New York will send to Knoxville reports from—	No. of words.	No. of minutes.	Total number of words.	Total number of minutes.
New York		20	1					
Aggregate		20	1	Aggregate			20	1

NOTE—Same as No. 1 circuit.

N.—WORKING FORM OF CIRCUITS.

(*Circuit No.* 12.)

OMAHA TO CHICAGO.

OMAHA TO CHICAGO.				CHICAGO TO OMAHA.				
At — a. m., Omaha will send Chicago reports from—	Sending through.	Number of words.	Number of minutes.				Total number of words.	Total number of minutes.
Omaha		20	1					
San Francisco		20	1					
Fort Benton		20	1					
Santa Fé		20	1					
Corinne		20	1					
Aggregate		100	5	Aggregate			100	5

NOTE.—Same as No. 1 circuit.

O.—WORKING FORM OF CIRCUITS.

(*Circuit No.* 13.)

CORINNE TO OMAHA.

CORINNE TO OMAHA.				OMAHA TO CORINNE.				
At — a. m., Corinne will send Omaha reports from—	Sending through.	Number of words.	Number of minutes.				Total number of words.	Total number of minutes.
San Francisco		20	1					
Fort Benton		20	1					
Santa Fé		20	1					
Corinne		20	1					
Aggregate		80	4	Aggregate			80	4

NOTE.—Same as No. 1 circuit.

P.—WORKING FORM OF CIRCUITS.

(Circuit No. 14.)

FORT BENTON TO CORINNE.

FORT BENTON TO CORINNE.				CORINNE TO FORT BENTON.				
At — a. m., Fort Benton will send to—		Number of words.	Number of minutes.				Total number of words.	Total number of minutes.
Corinne		20	1					
Aggregate		20	1	Aggregate			20	1

NOTE.—Same as No. 1 circuit.

Q.—WORKING FORM OF CIRCUITS.

(Circuit No. 15.)

SANTA FÉ TO CORINNE.

SANTA FÉ TO CORINNE.				CORINNE TO SANTA FÉ.				
At — a. m., Santa Fé will send to—		Number of words.	Number of minutes.				Total number of words.	Total number of minutes.
Corinne		20	1					
Aggregate		20	1	Aggregate			20	1

NOTE.—Same as No. 1 circuit.

R.—WORKING FORM OF CIRCUITS.

(*Circuit No.* 16.)

SAN FRANCISCO TO CORINNE.

SAN FRANCISCO TO CORINNE.				CORINNE TO SAN FRANCISCO.			
At — a. m., San Francisco will send to—		Number of words.	Number of minutes.			Total number of words.	Total number of minutes.
Corinne		20	5				
Aggregate		20	5	Aggregate		20	5

NOTE.—Same as No. 1 circuit.

S.

WAR DEPARTMENT, OFFICE OF THE CHIEF SIGNAL OFFICER,
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE,
Washington, D. C., September 1, 1870.

SIR: I have the honor to present for the consideration of the company you represent, the accompanying working forms of telegraphic circuits, (papers A to P,) organizing the transmissions by telegraph of the weather reports, meteorological observations for the purpose of the observation and report of storms for the benefit of commerce, on the northern lakes and seaboard, as authorized by a recent act of Congress, together with the accompanying map of circuits (paper 2) and proposed forms of reports, and to request to be informed upon what terms or under what arrangement three reports daily—one of 20 words, at 8 a. m.; one of 10 words, at 6 p. m.; and one of 10 words, at midnight, 12 m., (New York time,) can be transmitted over the wires of the Western Union Telegraph Company. The reports to be of the character of those herewith, (papers R and S.) The working forms of circuits to be as nearly as practicable as exhibited upon the forms and on the map herewith. The reports to be furnished by the United States at the offices of the company, and their transmission over the wires and receipt in rough, on the part of the company's operators, being all that is to be required; the working forms of circuits to be so arranged that the transmission of reports shall be as nearly synchronous throughout the United States as is practicable; the midnight report to be from principal cities only, where night operators are employed, or as it may be especially arranged with the company.

In addition to the regular reports, it is contemplated that it may become necessary to communicate briefly to the different stations at different times from the War Department, at Washington. These communications will be brief, and will take the course of ordinary messages, unless when sent at the regular hours for reports. The privilege to be reserved to the United States of reducing the amount of matter sent, and of altering the hours of reports if experience shall so suggest—such alterations to be concerted with the officers of the company.

It may not be in the power of the United States to bring fully into action immediately all the circuits herewith described; but it is in the view of the War Department to do so as rapidly as possible. It is assumed that a brief experimental service will enable the officers of the company to establish some fixed rate per word for the telegraphic transmission of these reports, without regard to distance. It is in every way desirable

that such a mode of computation be arrived at, permitting, as it will, the further increase or diminution of the service, or its variation within reasonable limits at any time, without an especial contract in each instance. In submitting this communication, I invite attention to the fact that the estimate of work is very greatly reduced from that proposed on the 7th of July, to enable some basis of valuation to be arrived at.

While I am aware of the difficulties of computation still to be met by the officers of the company in providing for a duty heretofore never attempted in the United States, I entertain the hope that some of them are removed by the concise form in which the subject has been placed, and I am confident of the liberal spirit in which it will be considered by the company,

Very respectfully, your obedient servant,

ALBERT J. MYER,
Brevet Brigadier General, Chief Signal Officer U. S. A.

Hon. W. ORTON,
President Western Union Telegraph Company, New York.

T1.

WAR DEPARTMENT, OFFICE OF THE CHIEF SIGNAL OFFICER,
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE,
Washington, D. C., September 6, 1870.

SIR: I have the honor to present for the consideration of the company you represent the accompanying working form of telegraphic circuits, (paper A,) organizing the transmission by telegraph of the weather reports, meteorological observations for the purpose of the observation and report of storms for the benefit of commerce on the northern lakes and seaboard, as authorized by a recent act of Congress, together with the accompanying map of circuits, (paper B,) and proposed forms of reports, and to request to be informed upon what terms or under what arrangement three reports daily, one of 20 words, at 8 a. m., one of 10 words, at 6 p. m., and one of 10 words at midnight, 12 m., (New York time,) can be transmitted over the wires of the International Ocean Telegraph Company, the reports to be of the character of those herewith, (papers R and S,) the working forms of circuits to be as nearly as practicable as exhibited upon the forms and on the map herewith, the reports to be furnished by the United States at the offices of the company, and their transmission over the wires and receipt in rough, on the part of the company's operators, being all that is required; the working forms of circuits to be so arranged that the transmission of reports shall be as nearly synchronous throughout the United States as is practicable; the midnight reports to be from principal points only where night operators are employed, or as it may be especially arranged with the company.

In addition to the regular reports, it is contemplated that it may become necessary to communicate briefly to the different stations at different times from the War Department at Washington. These communications will be brief, and will take the course of ordinary messages, unless when sent at the regular hours for reports. The privilege to be reserved to the United States of reducing the amount of matter sent, and of altering the hours of reports, if experience shall so suggest, such alteration to be concerted with the officers of the company.

It may not be in the power of the United States to bring fully into action immediately the circuits herewith described, but it is in the view of the War Department to do so as rapidly as possible. It is assumed that a brief experimental service will enable the officers of the company to establish some fixed rate per word for the telegraphic transmission of these reports, without regard to distance. It is in every way desirable that such a mode of computation be arrived at, permitting, as it will, the further increase or diminution of the service, or its variation within reasonable limits at any time, without an especial contract in each instance.

While I am aware of the difficulties of computation to be met by the company in providing for a duty heretofore never attempted in the United States, I entertain the hope that some of them are removed by the concise form in which the subject has been placed, and I am confident of the liberal spirit in which it will be considered by the company.

Very respectfully, your obedient servant,

ALBERT J. MYER,
Brevet Brigadier General, and Chief Signal Officer of the Army.

General WILLIAM F. SMITH,
President International Ocean Telegraph Company,
No. 88 *Liberty street, New York City.*

U₁.

WAR DEPARTMENT, OFFICE OF THE CHIEF SIGNAL OFFICER,
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE,
Washington, D. C., October 10, 1870.

SIR: I have the honor to present for the consideration of the company you represent, the accompanying working form of telegraphic circuits (paper A) organizing the transmission by telegraph of the weather reports—meteorological observations for the purpose of the observations and report of storms for the benefit of commerce on the northern lakes and seaboard, as authorized by a recent act of Congress, together with the accompanying map of circuits (paper B) and proposed forms of reports, and to request to be informed upon what terms or under what arrangement three reports daily, one of 20 words at 8 a. m., one of 10 words at 6 p. m., and one of 10 words at midnight, 12 m., (New York time,) can be transmitted over the wires of the Northwestern Telegraph Company. The reports to be of the character of those herewith, (papers R and S.) The working forms of circuits to be as nearly as practicable as exhibited upon the forms and on the map herewith. The reports to be furnished by the United States at the offices of the company, and their transmission over the wires and receipt in rough on the part of the company's operators, being all that is to be required. The working forms of circuits to be so arranged that the transmission of reports shall be as nearly synchronous throughout the United States as is practicable. The midnight reports to be from principal points only, where night operators are employed, or as it may be especially arranged with the company.

In addition to the regular reports, it is contemplated that it may become necessary to communicate briefly to the different stations at different times from the War Department at Washington. These communications will be brief, and will take the course of ordinary messages, unless when sent at the regular hours for reports. The privilege to be reserved to the United States of reducing the amount of matter sent, and of altering the hours of reports, if experience should so suggest, such alteration to be concerted with the officers of the company. It may not be in the power of the United States to bring fully into action immediately the circuits herewith described, but it is the view of the War Department to do so as rapidly as possible.

It is assumed that a brief experimental service will enable the officers of the company to establish some fixed rate per word for the telegraphic transmission of these reports without regard to distance. It is in every way desirable that such a mode of computation be arrived at, permitting, as it will, the further increase or diminution of the service or its variations within reasonable limits at any time, without an especial contract in each instance.

While I am aware of the difficulties of computation to be met by the company in providing for a duty heretofore never attempted in the United States, I entertain the hope that some of them are removed by the concise form in which the subject has been placed, and I am confident of the liberal spirit in which it will be received by the company.

I am, sir, very respectfully, your obedient servant,

ALBERT J. MYER,
Brevet Brigadier General and Chief Signal Officer of the Army.

Hon. Z. G. SIMMONS,
President Northwestern Telegraph Company, Kenosha, Wisconsin.

S₂.

EXECUTIVE OFFICE, WESTERN UNION TELEGRAPH COMPANY,
145 *Broadway, New York, September* 3, 1870.

GENERAL: I have had the honor to receive your communication under date 1st instant, and in reply thereto, have to say:

After full consideration of the subject, and of the various estimates and plans submitted by you on behalf of the War Department, the company is not yet able to fix definitely the rates at which it will be in its power to transmit the weather reports required by the United States.

The Western Union Telegraph Company has, however, made it a practice to be always first in extending a liberal use of its lines and facilities for every attempted advance in the cause of science, or of hoped-for utility to the people of the United States, and I am instructed to say that its facilities will be placed at the service of the United States, and the weather reports proposed to be furnished for the benefit of commerce will be transmitted over its wires upon the circuits, and at the times set forth, in so far as is practicable, with every exertion upon the part of the company and its officers, together with such brief telegrams as may be needed to and from the central office at Washington, for a period of four months from the date at which the service may com-

mence. An accurate account of work actually done, and of the expenditures and commercial value to the company, will be kept during this time, with a view to its consideration as a basis for future negotiation. No remuneration will be asked for this service from the United States, except such as the Secretary of War may, at the termination of this experimental test, approve, and which shall be such part of the appropriation for this branch as may then be decided by him as properly applicable to the payment for the telegraphic transmission of the reports, without rendering impracticable that discharge of the duty for the ensuing year which Congress has authorized and required.

I have further to inform you that, subject to the same conditions as above, the company will be pleased to modify the service as experience may approve, and as may be agreed upon by its officers and those representing the War Department. Its efforts will further be given to establish a fair fixed rate per word at which messages of this description may be charged. The sole object of the company I represent in adopting this plan, is to determine by the fullest coöperation with the officers of the United States the most economical, prompt, and satisfactory manner in which the needed reports may be transmitted over its lines. The company has ordered this course from enlarged views of what it has deemed its part in forwarding a public duty to be of benefit to the whole commercial interests of the United States.

I am confident, in conveying its proposition to you and the Department you represent, the fairness of these views and of the action based upon them will be appreciated.

I am, very respectfully, &c.,

WM. ORTON, *President.*

Brevet Brigadier General A. J. MYER,
Chief Signal Officer United States Army, Washington, D. C.

T_2.

OFFICE OF THE INTERNATIONAL OCEAN TELEGRAPH COMPANY,
No. 88 Liberty street, New York, September 7, 1870.
(P. O. boxNo. 62.)

GENERAL: I have to acknowledge the receipt of your letter of the 6th instant, and beg to state that the subject has been brought before the board of directors, and after full consideration, I am requested to inform you that this company, existing by a grant conferred by Congress, has always been most anxious in every way to do far more for the Government than is called for by the conditions of its franchise. In addition to that, the company is anxious to aid to the extent of its ability in carrying out a plan which bids fair to be of such great benefit to commerce.

The work to be done being so different from any other presented at our stations, it is very difficult to arrive at an estimate of what would be a fair compensation to the company. We would suggest that the work be done as indicated in your letter, for a period of, say four months, and we shall then be able to ascertain the precise cost, and arrange with you upon terms acceptable to both the Government and ourselves. For the four months we shall rely upon the War Department for such remuneration as may be proper and possible in view of all circumstances. Any variations in the manner of doing the work, or in amount of work done, may be made during the four months, by giving us timely notice. The service dispatches between Washington and the stations on our line will be forwarded upon the same understanding. With reference to the midnight dispatches, our offices are closed at 10 o'clock p. m., and it will be necessary for you to make some special arrangements with our operators, which can readily be done. No charge will be made by this company for such midnight dispatches.

Upon these terms, and subject to these conditions, the company I represent is ready to undertake the work in the manner and upon the plans proposed by you.

Trusting that you will be able successfully to carry out your great work, and assuring you at all times of the hearty coöperation of this company, I remain, as ever, yours sincerely,

WM. F. SMITH, *President.*

Brevet Brigadier General A. J. MYER,
Chief Signal Officer United States Army, Washington, D. C.

U_2.

NEW YORK, *October* 10, 1870.

SIR: Referring to your communication of October 10, 1870, I have the honor to state that, in view of the heretofore untried character of this service in the United States, the Northwestern Telegraph Company cannot definitely fix at this time the terms at which it will be able to transmit the telegrams required.

The company, however, desires to contribute its share in an undertaking promising

to be for the public benefit, and will transmit for the period of four months from the date of commencement, at the times and in the manner stated in your letter, the weather reports therein referred to. For this service no charge will be made the United States other than such sum as may then be held by the Secretary of War to be such portion of the appropriation in his hands for the purpose as he may deem proper to set aside, as in his view proportional to the service rendered, as compared with the sum allowed the Western Union Telegraph Company for their more extensive service.

The efforts of the company will be given to establish a fair fixed rate per word, at which hereafter reports of this description may be transmitted over its wires without regard to distance.

Very respectfully, &c.,

Z. G. SIMMONS,
President Northwestern Telegraph Company.

Brevet Brigadier General A. J. MYER,
Chief Signal Officer United States Army, Washington, D. C.

FORM 3.—DAILY BULLETIN.

WAR DEPARTMENT, SIGNAL SERVICE UNITED STATES ARMY.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE.

Meteorological record, ————, 187 , ——*m.*

Place of observation.	Height of barometer.	Change since last report.	Thermometer.	Change in last 24 hours.	Direction of wind.	Velocity of wind. *Miles per hour.*	Pressure of wind. *Pounds per square foot.*	Force of wind reduced to Beaufort scale. (Approximately.)	Amount of cloud.	Rain fall since last report. *Inches and hundredths.*	State of weather.

OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, D. C., October 1, 1870.

GENTLEMEN: Under a joint resolution of Congress, of which a copy is herewith inclosed, the undertaking has been imposed upon the Secretary of War of causing meteorological observations to be taken, and of giving notice by telegraph and signal of the approach and force of storms upon the northern lakes and seaboard. By order of the Secretary of War, the Chief Signal Officer of the Army is placed in immediate supervision of these duties. The care with which this office is thus charged is, in the intention of Congress, proposed almost wholly for the benefit of commerce and of the other interests represented by the association of which you are members. The success which will be most satisfactory to the Department is to be had in so conducting the service as to best advance these interests. A memorandum of the plans contemplated, and as it has been possible to organize them in the short time since the passage of the act, is herewith. The preliminary arrangements have been made, and the service is about to

commence. The development of a work of this description must necessarily be slow. In the view of this office, its duty is executive only, and is to announce meteorological facts by an organized system of reports, and to apply for practical use, without any theories of its own, the results already had by meteorological investigations, and those to be gained hereafter. The opinions of the wisest physicists are concurrent that the undertaking inaugurated by Congress can be entered upon in another country with circumstances more favorable than those which are found in the extent and location of the territory and in the net-work of telegraphs existing in our own. Attempts to accomplish similar ends have been sufficiently beneficial to be maintained by the principal governments of Europe.

In all of the steps tending to an equal success here, or to any discharge of the duty, the cordial coöperation of the Boards of Trade, commercial associations, and others throughout the United States, as requested by the Secretary of War in the order herewith, can be of important usefulness.

The city of ——— has been designated as a station of observation and report, and I respectfully suggest that practical form be given the coöperation invited by the appointment, on the part of your board, of a permanent committee to confer, from time to time, with the Chief Signal Officer of the Army, and to take, in conjunction with him, such steps, or to recommend for the consideration of the board such action, as may be deemed desirable.

The Secretary of War has advanced this service by every legal method in his power, in his desire to give full effect to the intention of Congress, and there is every wish on the part of this office to render its results beneficial to the commerce for which it is especially provided, and of utility to the country.

I am, gentlemen, very respectfully, your obedient servant,

Brevet Brigadier General and Chief Signal Officer of the Army.

To the BOARD OF TRADE.