

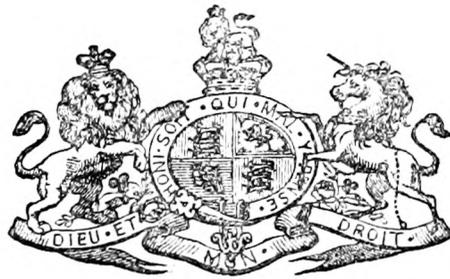
REPORT

OF THE

METEOROLOGICAL COMMITTEE OF THE ROYAL SOCIETY,

For the Year ending 31st December 1874.

Presented to both Houses of Parliament by Command of Her Majesty.



LONDON :

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P R E F A C E .

THE Meteorological Committee consists of Fellows of the Royal Society who have been nominated by its President and Council, at the request of the Board of Trade, for the purpose of superintending the Meteorological duties formerly undertaken by a Government Department, under the charge of Admiral FitzRoy.

The Committee are credited with a sum of £10,000, voted annually in the Estimates, for the administration of which they are wholly responsible.

The services of the Committee are *entirely gratuitous*.

The Meetings of the Committee are held regularly once a fortnight, or oftener when necessary, when every subject on which action has to be taken by their executive officers receives their careful consideration.

MEMBERS OF THE COMMITTEE :—

GENERAL SIR E. SABINE, R.A., K.C.B., *Chairman*.

Mr. DE LA RUE.

Captain F. J. O. EVANS, C.B., Hydrographer to the Admiralty.

Mr. FRANCIS GALTON.

Mr. GASSIOT.

Rear-Admiral G. H. RICHARDS, C.B.

The EARL of ROSSE.

Major-General W. J. SMYTHE, R.A.

Major-General R. STRACHEY, R.E., C.S.I.

Sir CHARLES WHEATSTONE.

May, 1875.

R E P O R T

For the year ending December 31st, 1874.

THE administration of the Office in this, the eighth year of its Introductory. management by the Committee, has been unchanged from that existing at the date of the last Report, the executive officers being Mr. Robert H. Scott, as Director, and Captain Henry Toynbee, as Marine Superintendent.

Among the principal points of interest in the proceedings of the year has been the assemblage at the Office, in the month of September, of a private International Conference on Maritime Meteorology, to discuss the questions deemed advisable for the further prosecution of that inquiry. The report of that Conference has now been published, and a summary of the resolutions adopted will be found in Part II.

An agreement has been entered into with the Meteorological Society (of London), by which that body, in consideration of a certain annual allowance, furnishes the Office with copies of the observations taken at some of their stations. The particulars of this arrangement will be found at p. 26.

Mr. Scott was examined before the Royal Commission on Scientific Instruction, &c., in the month of May, and his evidence, which may be expected to appear shortly, gives copious details on the history and management of the Office.

Inasmuch, however, as even the scientific portion of the public seem to be hardly familiarly acquainted with the subject, it seems to the Committee advisable, in the present Report, to review at some length the operations of their Office in the three departments into which it is subdivided, and to compare them with the development of the same branches of the science in other countries. These three departments are as follows:

- I. Ocean Meteorology.
- II. Weather Telegraphy.
- III. Land Meteorology of the British Islands.

I.—OCEAN METEOROLOGY.

The systematic prosecution of enquiries relating to the Meteorology of the Ocean may be said to have been first placed on a sound basis by Mr. Marsden, Secretary to the Admiralty, who at the end of last century (in 1784) proposed to divide the surface

Origin of the
science of Ocean
Meteorology.

of the sea into a certain number of squares, and to consider the observations geographically, dealing with those taken in each square by themselves, instead of treating each voyage by itself, and publishing, *e. g.*, mean results for each month, without regard to any change in the ship's position during the month.

It is needless to say that it was Maury who set the example of an extensive sphere of operations in the course above indicated, but his charts, copious as was the amount of information embraced by them, were unavoidably defective as regards minute accuracy, owing to the fact that at the time he commenced his operations, now about 30 years ago, the instrumental appliances for the registration of the phenomena were very poor as compared with those now in use.

The Meteorological Department of the Board of Trade, from its first establishment under Admiral FitzRoy in 1855, laid the greatest stress on the importance of the selection of observers and the supply of first-class instruments, duly tested before issue, and the Committee have been guided by the same principles, attaching weight to the *quality*, as contrasted with the *quantity*, of the records to be obtained.

In order that nothing should be wanting on the part of the newly-founded Office to secure the accuracy of the instruments employed, almost the first action of the Board of Trade in 1855 was to invite the Kew Committee of the British Association to devise improvements in the instrumental appliances for Marine observations, and the most important outcome of their deliberations was the recommendation of the Kew pattern Marine Barometer, the principle of which has been universally adopted as that best suited for use at sea.

Issue of instru-
ments.

The Office possesses a large stock of these and other instruments, and its practice as to the collection of observations is to supply on loan to captains a set of instruments properly verified at Kew, which are returned to the Office for recomparison with standards as soon as the voyage is over. The loan is granted on condition of observations being taken with the instruments, and entered in a log supplied for the purpose, which is sent into the Office when filled. The instruments supplied to a ship consist of—

- 1 Marine barometer (Kew pattern),
- 6 Thermometers with a thermometer screen,
- 4 Hydrometers,

and in exceptional cases an azimuth compass is added.

Observations made with instruments which have not been supplied or authentically verified by the Office, are not employed in the investigations. Aneroid readings are never used.

Supply to the
Royal Navy.

The foregoing remarks apply to the Merchant Service. As regards the Royal Navy, H.M. ships are supplied with Meteorological instruments under an arrangement with the Admiralty, and the Meteorological observations are returned to that Department in the form adopted in the Naval Service. It is voluntary

whether the Meteorological log of this Office is kept in addition: some valuable logs are, nevertheless, from time to time received from H.M. ships.

In addition to the supply of instruments direct from the Office Agencies. in London, a stock is kept at some of the more important seaports, *e.g.*, at Liverpool, Glasgow and Aberdeen, the Agents in charge of them receiving a fee for each case of issue and return, and a further fee for each observer obtained through him who furnishes first-class observations. The names of all applicants for instruments are submitted to Captain Toynbee for approval prior to the supply.

As soon as a log is received at the Office it is examined and classified according to its quality, and an acknowledgment is immediately made to the captain sending it; and at the same time if explanations on any points arising out of the inspection of the log are found to be requisite, he is requested to furnish the information while the circumstances are still fresh in his memory. Replies received from the captain are at once noted in the log for future reference when the observations are discussed.

To each observer who has obtained the mark "excellent" a Presentation of Pilot Charts. copy of the Atlantic Pilot Charts, or of the Wind and Weather Charts of the Atlantic, Pacific, and Indian Oceans, published by the Admiralty, is presented. Observers who have already received these charts, and who may continue to observe for the Office, have the special thanks of the Committee for each register which has received the mark of "excellent." They also receive such publications of the Office as are likely to be of interest to them.

The names which have been added during the financial year to the list given in last year's Report are as follows:—

Presentation of Admiralty Charts.

Captain's name.	Ship.
Becket, Alexander - - -	"City of Perth."
Comley, William Guise, R.N.R. - - -	S.S. "Hong Kong."
Dobson, Charles Meadows - - -	S.S. "Beta."
Freeman, Thomas W. - - -	S.S. "Wisconsin."
Longley, Herbert - - -	S.S. "Yorkshire."
Maples, Charles - - -	"Genii."
Owen, John - - -	"W. G. Russell."
Smith, William Charles - - -	"Kingdom of Saxony."

*Jackson, Robert, R.N. - - -	H.M.S. "Glasgow."
Jones, Theodore Morton, R.N. - - -	Do.
Nares, George Strong, R.N. - - -	H.M.S. "Challenger."
*Tizard, T. H., R.N. - - -	Do.

The Committee do not feel themselves at liberty to present Admiralty Charts to officers in the Royal Navy; they receive the letters of thanks.

In Appendix II. will be found a list of the observers whose logs have been classed as "excellent," since the beginning of the year 1869. Some of the gentlemen mentioned in the list have been regular observers for the Office for many years.

* Navigating Lieutenant.

Localities
whence obser-
vations are
being derived.

The geographical distribution of the vessels in which observations were being taken at the close of the year 1874 was as follows:—

	Voyages.					Ships.
To Baffin's Bay or Greenland	-	-	-	-	-	3
„ East Coast, North America	-	-	-	-	-	10
On East Coast, North America	-	-	-	-	-	4
To West Coast, North America	-	-	-	-	-	4
„ West Indies	-	-	-	-	-	4
„ East Coast, South America	-	-	-	-	-	2
„ West Coast, South America	-	-	-	-	-	7
„ East Coast, Africa	-	-	-	-	-	1
„ Australia and New Zealand	-	-	-	-	-	17
„ India, viâ the Cape	-	-	-	-	-	16
„ India, viâ Suez	-	-	-	-	-	3
In Indian Seas	-	-	-	-	-	1
To China Seas, viâ Suez	-	-	-	-	-	3
„ Mediterranean Ports	-	-	-	-	-	1
„ Home Ports	-	-	-	-	-	2
„ Archangel	-	-	-	-	-	1
						79

The Committee regret that the number of observers who are co-operating with them remains small when compared with the strength of the Mercantile Navy, as will be seen from the figures just quoted: but the duty of observing regularly and frequently entails a considerable degree of responsibility on anyone who undertakes it, and if the captain is not supported by a good staff of officers it is simply impossible that the log should be properly filled.

Collection of
observations.

Circulars have been issued to the various shipping offices, &c. in connexion with the Board of Trade, and it is hoped that by constantly keeping before the eyes of captains the objects and aims of the Office the services of such among them as have a real interest in the science will be secured for the Office.

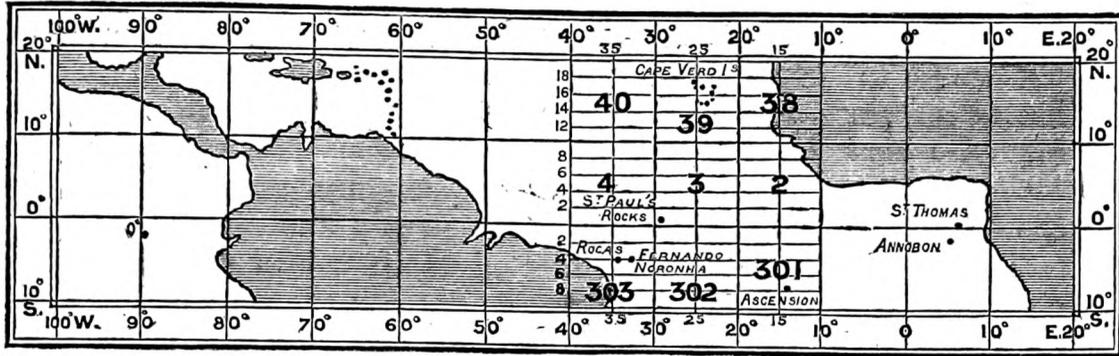
The method employed by the Royal Meteorological Institute of the Netherlands, the only other office extensively engaged in this branch of Science, in the collection of observations, is to appoint in each seaport a committee of shipowners, the members of which use their personal influence in inducing captains to become observers. It is stated that the results of this system are satisfactory.

Progress of
discussions,
Equatorial
region of the
Atlantic.

As regards the progress of the discussions carried on by the staff, it was mentioned in the last report that the treatment of the materials for the entire district of nine ten-degree squares, Nos. 38-40, 2-4, and 301-303, extending from 20° N. to 10° S., and 10°-40° W., as shown in the subjoined chart, was expected to be completed by the end of the year 1874.

This has been the case, and the results are now in process of publication in the form of monthly charts, but not to the same degree of minuteness as the charts already published for Square III., which contain the information sifted into two-degree squares. The charts now in course of publication are subdivided into areas of

5° of longitude by 2° of latitude as shown in the diagram, and each chart contains the data of three ten-degree squares. Equatorial region of the Atlantic.



It will be seen that the island of Ascension falls within the area now under treatment, and accordingly the detailed observations made at that island in the years 1863-5, by Lieutenant Rokeby, R.M., are being discussed, and the results will be embodied in the forthcoming publication. Observations at Ascension.

For the two years into which these observations extend we have the wind direction and velocity recorded continuously by a self-registering anemometer, and almost hourly observations, by eye, of pressure, temperature, and other meteorological phenomena. It is consequently considered that a thorough investigation should be made of the observations which have cost so much time and care in collecting, and are rendered the more interesting from the fact of the island being situated in the heart of the S.E. Trade wind, the wind being there S.E. almost without exception throughout the year. By referring the winds to 32 points of the compass it is believed that the discussion will exhibit a diurnal and annual march of the direction and velocity of the S.E. Trade.

It is hoped that the results to be deduced will form a valuable addition to the information obtained from observations made on board ships traversing this part of the ocean, and will also add to our knowledge of the extent and regularity of the ordinary fluctuations in the tropics.

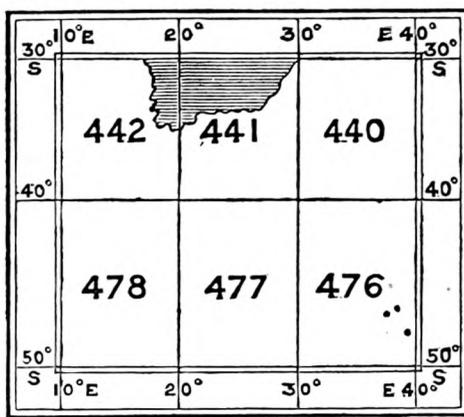
The material available for that part of the Atlantic between the parallels of 20° N. and 10° S., which lies east and west of the nine squares which are being discussed, is so scanty that its discussion would not be likely to lead to any practical results; this will easily be conceived from the fact that 59 per cent. of the entire information in the office for the whole district was concentrated in the central Square III.

The Committee have therefore decided to turn their attention to another region in order to subject it to a process of examination similar to that which has been bestowed on the belt of the Atlantic Doldrums, and they have had little hesitation in selecting the south point of Africa, where the tracks of all vessels trading by long sea to India and China, and those outward bound to Australia, lie within narrow limits of latitude. The district will therefore afford a copious store of observations, and their discussion may be expected to yield results of great importance to navigation, and of interest South point of Africa.

South point of
Africa.

to science. In the first place it is hoped that in that proverbially stormy part of the sea it may be finally ascertained *which track affords the most favourable winds, the greatest immunity from gales, and consequently the easiest passage.* Moreover, light will be thrown on the irregularities in the sea surface temperature which have long since attracted the notice of the Dutch meteorologists, and on which M. Cornelissen has published valuable communications. The currents too, in the region under examination are specially interesting, and as yet insufficiently known.

The actual district to be treated is shown in the subjoined chart, and the degree of minuteness to which the area will be subdivided will, it is hoped, be the same as in the case of the nine squares of the equatorial region of calms and rains already mentioned.



Relative value
of old and new
materials.

The Committee would here observe that it has been often remarked that their chief attention should be directed to the utilization of the more recent materials, and that the store of old logs should be considered as of more secondary importance. Such an opinion as this is affected by a serious misconception of the mode of dealing with the subject of Ocean Meteorology enforced by the nature of the materials at hand for discussion.

It cannot be too well understood that it is not possible to produce mean results of any value from recent logs. Observations taken at sea are not like records obtained from land stations. The ship is constantly changing her position, so that it is only from the comparison of a number of observations made in different ships at or near the same spot and at the same seasons in successive years that we can ever hope to obtain materials for the calculation of mean values.

Synoptic charts
of Atlantic.

The chief inquiry the solution of which can be attempted by the use of recent observations alone, is the construction of synoptic charts of weather, but for this purpose a large number of observations taken at the same period and in the same district are requisite. It is hardly needful to say that these conditions cannot easily be fulfilled, as say 100 ships observing on any one day between the parallels of 40° and 60° in the North Atlantic would be the very least which might be expected to afford anything approaching to a complete representation of the conditions of

weather prevailing over that portion of the earth's surface at the time.

In the last Report it was mentioned that invitations had been issued to British shipowners to lend to the Office any logs of ships in the Atlantic during the month of August 1873, in order to aid in tracing the history of the hurricane which swept the Eastern seaboard of the United States and wrought great damage on the coasts of Nova Scotia at that time.

Storms of August 1873 in Atlantic.

280 logs have been received in compliance with the invitation, and Captain Toynbee has commenced the examination and discussion of the material on a principle similar to that already employed by him in the case of the "City of Boston" gale.*

It may be hoped that, as apparently more material is available for the present investigation than has existed in the case of any previous inquiry of a similar nature, additional light may be thrown by it on the real facts of wind motion in cyclones—a subject which even at the present day is the theme of discussion,—and thereby the knowledge may be enlarged, on which are based the rules for avoiding such storms altogether, or for dealing with them when encountered.

In the last Report it was mentioned that a sub-committee consisting of five members had been appointed by the Vienna Meteorological Congress to arrange for the assemblage of a Conference to reconsider the decisions of the Brussels Maritime Conference in 1853. These gentlemen decided that the Conference should be of a private character. The meeting in question took place in London from August 31 to September 3, at the Meteorological Office. As regards its results, it is remarkable to find that although the first promoters of the Conference had urged as the principal ground for its being convened that the regulations for filling the log adopted at Brussels had been too stringent, the members, when assembled, passed by a large majority rules hardly differing in any important particular from those emanating from the Brussels meeting; the only deviations, in fact, being a demand for increased information, viz., the entry of "Course and Distance by Log every four hours," in order to facilitate a closer approximation to the true position of the ship from time to time than was previously possible, and a request that the wind should be given for the actual time of observation, and not estimated for a certain number of hours previously.

Conference on Maritime Meteorology.

In fact, the Committee cannot but feel that the practical experience of the Office carried on under their superintendence was highly honoured by the fact that the draft Log and the Instructions for Observers, prepared by their own Marine Superintendent, Captain Toynbee, were, by the resolution of the Conference, appended to the Report of its proceedings. It should here be remarked that the Log and Instructions just referred to are almost *identical* with the modified form of the Brussels Log

* "A Discussion of the Meteorology of that part of the Atlantic lying north of 30° N. for the eleven days ending February 8, 1870," by Captain H. Toynbee. Official No. 13. London: Stanford.

Conference on
Maritime
Meteorology.

adopted by Admiral FitzRoy at the first institution of the Meteorological Department; in fact, the Office may almost say that its practice has been unaltered from the first, and is now handed on for general adoption.

In Part II. will be found the several Resolutions adopted at the Meeting.

It may be hoped that the tendency of this Conference will be towards the more extensive prosecution of studies bearing on Ocean Meteorology, inasmuch as the institutions whose attention is specially devoted to the subject at present are very few in number. In fact, with the exception of the Royal Meteorological Institute of the Netherlands, the United States Naval Observatory, the Deutsche Seewarte, and the Meteorological Office, it can hardly be said that original investigations bearing on this branch of science have been published of late years by any office in any country, although the Hydrographical Department of our Admiralty and the Dépôt des Cartes et Plans of the French Navy have both furnished several most important contributions to our knowledge of Ocean Meteorology.

Appendix IV. contains a list of the contents of the publications issued by the Office during the year, in continuation of that given in the Report for 1873, p. 45.

Stock of
instruments.

In Appendix V. will be found a list of all the instruments supplied to ships in the Royal Navy during the year, with a statement of the entire stock and distribution of instruments standing on the books to the account of the Admiralty on the 31st December 1874. This latter statement is prepared from the latest returns furnished by the storekeepers at the respective dockyards, &c.

Appendix VI. gives similar information with regard to the Board of Trade instruments.

II. WEATHER TELEGRAPHY.

Condition of
stations.

There has not been any change of importance in this department of the Office during the year, and the service has on the whole been performed with satisfactory regularity, unless on such occasions as that of October 21, when the communication along many telegraph lines was interrupted by the violence of the storm.

It is, however, much to be regretted that the condition of the cable to the Shetlands has hardly been permanently improved since the date of the last Report. Connexion was certainly re-established in the beginning of August, and the wire worked satisfactorily until the end of the year, but after that time the service speedily became less regular, and ceased altogether on the 23rd of January 1875.

The stations were, as usual, inspected during the year, with five exceptions, Cambridge, Oxford, St. Ann's Head, Sumburgh Head, and Yarmouth. A list of the stations with the observer's names will be found at Appendix VII.

Inasmuch as there appears to be an impression among some meteorologists that the observations made at telegraphic reporting

stations ought to be available for climatological inquiries, it may perhaps not be amiss to explain what such stations are, as a general rule, capable of affording, and what reasons exist for their deficiencies in certain respects, as compared with ordinary observing stations.

Difficulties of organization of reporting stations.

In the first place the choice of a station is necessarily determined by the existence of telegraphic communication, and this implies in most cases that the reporting stations are situated in towns. It is hardly necessary to say that under such circumstances the observations of temperature, rain, and wind are of minor value as compared with those obtainable under more favourable conditions of exposure, inasmuch as in many towns it is absolutely out of the question for men, in the position of telegraphic reporters, to obtain the use of a very open space for the erection of their thermometer screen or rain gauge within a reasonable distance of their residence or reporting office.

To take a single instance where a satisfactory exposure has been obtained, viz., Leith; the thermometer screen and rain gauge are erected on the Links at a considerable distance from the telegraph office, so that much labour is entailed on the reporter as compared with that falling upon an observer who can have his thermometers in his own garden.*

In view of considerations like these it will at once be admitted that it is needless to publish mean results for other elements than barometrical pressure and rainfall for ordinary telegraphic stations. The accuracy of barometrical observations does not depend on the exposure; and as regards the rainfall, local differences in measurement are so great that absolute accuracy may be considered unattainable, and the figures furnished by gauges erected in the best conveniently attainable situations are sufficiently accurate for practical purposes, as indicating the approximate amount of fall in the districts in which the respective stations are situated.

There is yet another reason for the somewhat exceptional nature of telegraphic reports, the duty of reporting demands constant attendance and punctuality, and it therefore cannot be discharged by anyone whose avocations interfere with these requirements.

In many outlying stations the choice of observers is exceedingly limited, and it is impossible to find the same class of observers as would be looked for in establishing a station for climatological purposes; but for several of the stations, *e.g.*, at the observatories of Oxford, Cambridge, and Bidston, and at Plymouth, the services of very high class observers have been secured.

In fact the exceptional character of telegraphic reporting stations is recognized by every one who has ever had the slightest experience in their management.

On the whole the Committee may point to the fact that their system of telegraphic observation, defective though it admittedly is, when compared with the strict requirements of the science, is

* The Committee are very glad to say that permission has at last (June 1875) been obtained from the proper authorities to have the thermometers and rain gauge at North Shields transferred from the Post Office premises to Dockway Square, which affords very good conditions of exposure.

Errors in tele-
graphic reports.

allowed to be the most complete in Europe as regards the character of its observers, the control exerted over them by inspection and correspondence, the outfit of its stations, and the care taken to introduce improvements, *e.g.*, in thermometric exposure whenever the possibility is offered, to ensure accuracy in the published reports, and to correct errors when detected. The last-named task is the most difficult of fulfilment of any, for it is only in the case of barometrical readings and to a slight extent as regards temperature, that an approach to accuracy in the publication of observations received by telegraph is attainable. In the case of the barometer the differences of reading between adjacent stations are usually so small, and follow such regular laws that a comparison of the reports reveals the existence of even slight errors. Serious mistakes in temperature are also detected by the same means, but as regards the other elements, especially the rainfall, and at times even the wind, slight discrepancies between the reports from the same line of coast are to be expected under ordinary circumstances, owing to the differences of local conditions of exposure, &c., so that it is impossible at first sight to say whether such discordances are simply due to telegraphic errors or to real differences in the phenomena observed.

Manuscript
reports.

The system of the receipt of monthly sheets from the stations, containing the copy of the observations actually taken, enables the Office to exert a considerable check on the accuracy of transmission of the reports, and care is taken that any *mean* results published by the Office, *e.g.*, of rainfall, shall be compiled from such manuscript reports, as telegraphic reports are untrustworthy as authority for minute calculations, owing to the fact that such messages, transmitted in cipher, afford little internal evidence of their correctness or the contrary.

In fact, inasmuch as weather telegraphy must be carried on by means of the ordinary telegraphic staff, it is hopeless to expect such accuracy in transmission of the reports as is requisite if the data are to form the basis for precise calculations day by day. We have also the difficulty to encounter, at least at present, that as soon as a serious storm occurs the communication along the lines is very uncertain, if it be not entirely interrupted by the breakage of wires.

In the face of facts such as these, all who have had practical experience of weather telegraphy have long since admitted that such stations are to be placed under a totally different category from those which furnish the information for climatological inquiry.

We may now contrast the service of this country in regard of weather telegraphy with those at present existing elsewhere in Europe, excluding from our view the magnificent organization of the United States, whose signal service spends for its own share not far from the total expenditure of the collective governments of Europe on the same object.*

* The cost of the signal service U.S.A. is upwards of 50,000*l.*, and this does not include any salaries.

Weather telegraphy depends for its success almost entirely on the amount of money which can be devoted to it; if the information is to be improved in quantity, in frequency of reception, or in quality, whether this last implies a higher class of observations or increased accuracy in transmission, the cost is at once raised, as these conditions imply a more extensive use of the telegraph and longer hours of attendance in the office and at the stations.

Cost of improvements in service.

The Office receives, or would receive, were the Continental telegraphic communications and that with the Shetlands perfect, 51 reports every morning, and 9 every afternoon, except on Sundays. The observations are taken on Sundays as on other days, but are not received at the Meteorological Office until Monday morning, when the report for Sunday is made out. The stations are situated along the entire coast of the Continent, from Christiansund, in lat. 63° N., to Corunna, in lat. 43° , with four stations on the coast of the Baltic, and one at Cape Sicié in the Mediterranean.

British organization.

The system is unfortunately most defective along our own western coasts, owing to the imperfections of telegraphic communication in those thinly-peopled and mountainous districts. The only stations along the line in question are Valencia, Green-castle on Lough Foyle, Ardrossan, and Stornoway. The Committee are not without hopes that they may be able to carry out the idea, proposed in their last Report, of establishing a station at Mullaghmore, a low lying point on the south side of Donegal Bay, not far from Sligo.

Stations on the west coast.

The possibility of deriving benefit, as regards the probable weather of these islands, from constant reports from America has frequently been inserted in the newspapers and in scientific journals, but the experience of the Office, which for four years received daily reports free of charge from Heart's Content by the liberality of the Anglo-American Telegraph Company, is not favourable to the idea of incurring expense for such a service. Not only was little benefit derived from such isolated and unsupported reports, but the subsequent study of the weather recorded in ship's logs has shown that atmospheric disturbances, though they may cross the Atlantic occasionally from shore to shore, in most instances undergo such changes in their progress, that the fact of the severity of a storm on the coast of America is no gauge of its probable character when it arrives on our shores.

Reports from stations over the Atlantic.

The Committee need only refer to their last Report for the reasons which are there given for the comparative inutility to us of reports from stations even so near as the Azores, and although it must be granted that Newfoundland lies more in the track of storms crossing the Atlantic than the group of islands named, yet the experience of those who have paid most attention to Atlantic weather appears to show that the area of origin of most of our storms lies some distance to the eastward even of Newfoundland.

The information received from the Continent is obtained by way of exchange, for which arrangements exist with France, Holland, Hamburg, Denmark, Norway, and Sweden.

Interchange of
information
with the
continent.

In France the Office interchanges information with two distinct organizations, the Ministère de la Marine and the Observatory.

From the former it receives daily reports from six stations, Cape Grisnez, St. Mathieu (Brest), Grognon (L'Orient), Isle d'Aix (Rochefort), Biarritz, and Cape Sicié (Toulon), and supplies in return a daily summary of the weather over the area covered by the British system of reports, and in addition warnings whenever requisite, which are hoisted along the French coast from Dunkerque to Nantes.

From the Observatory it receives reports from Paris, Charleville, Lyons, Brussels, and Corunna, and sends in return copies of the daily reports received from Valencia, Greencastle, Thurso, Scarborough, Yarmouth, and Scilly, and from Greencastle a Sunday report in addition.

From Holland it receives daily reports from the Helder, and sends occasional warnings in return, as will be explained farther on.

From the Scandinavian systems and Hamburg the Office receives reports from Christiansund, Skudesnaes, and Oxö (near Christiansand), in Norway, from Skagen and Fanö in Denmark, from Haparanda, Hernosand, Stockholm, and Wisby in Sweden, and from Cuxhaven, and supplies in return daily reports from Yarmouth, Valencia, and Thurso (the last twice daily), which are sent from these islands to Christiania, and Copenhagen, and distributed from the latter place to Stockholm and Hamburg, and also cautionary telegrams of a similar character to those sent to Utrecht.

Any cost incurred in transmission of these telegrams over the British lines falls on the Office ; but, as regards the French telegrams, their transmission is free over the French wires ; while in the case of the messages crossing the North Sea, a free transit has been most liberally granted by the Great Northern Telegraph Co.

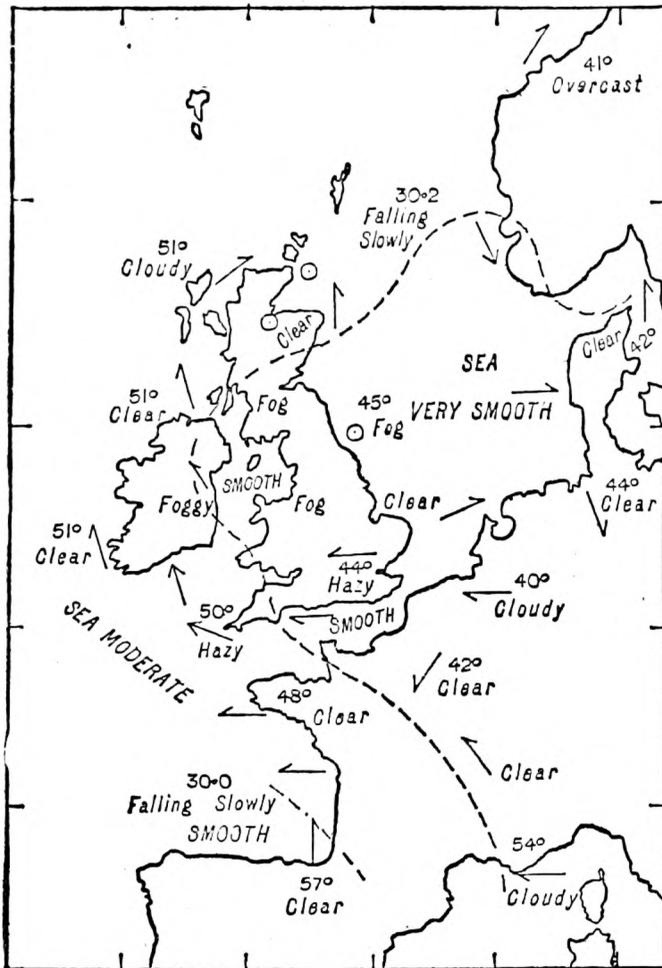
Preparation of
Daily Weather
Report.

The daily observations are taken at 8 a.m., Greenwich time, and most of the telegrams arrive in London about 9 o'clock, when the Intelligence Department of the Post Office extracts from them the portions required for its wind and weather reports. They are then at once transmitted to the Office by the private wire. About two hours are required for their reduction, discussion, and the preparation of the Daily Weather Report, copies of which are ready by about 11 a.m., and are at once supplied for the afternoon issue of several of the London papers. A wind chart for the day is also drawn for the "Shipping Gazette." A brief telegraphic resumé of the weather is despatched to the Marine Ministry in Paris, and if necessary, telegraphic intelligence of storms or of atmospherical disturbance is sent to our own coasts and to foreign countries. Later in the day the foreign telegrams, and subsequently the afternoon reports, come in. The Daily Weather Charts are drawn by noon, and forwarded to the lithographers to be printed. The copies for postal distribution are received at the Office at about 3.30 p.m. The total number of copies issued every day is about 530.

The list of institutions and persons who receive the Charts free will be found at Appendix VIII.

In the last Report it was mentioned that the Committee were in hopes of being able to furnish Weather Charts for issue in the daily papers. These hopes have at last been carried into fulfilment, and from the 1st of April 1875 a chart of the subjoined character has appeared in the "Times." Weather charts in newspapers.

The following description of the process of production of these charts, which appeared in "Nature" of April 15, may not be without interest :



EXPLANATION.

In the above Chart the dotted lines are "isobars" or lines of equal barometrical pressure, the values for the lines being given at the end in figures, thus, "30.4." The shade temperature is given in figures for several places on the coast, and the weather prevailing at 8 a.m. is recorded in words. The arrows fly with the wind, the force of which is shown by barbs and feathers, thus, \rightarrow = light, \rightarrow = fresh to strong, \rightarrow = a gale, and \rightarrow = a violent gale. \odot signifies calm. The state of the sea is given in capitals.

block, which is now an outline chart of the British Islands, is then placed under the pantagraph drill, which reduces the original drawing, furnished from the Meteorological Office, to one fourth. The isobaric curves and wind arrows are put on direct from the drawing, the figures and words by means of templates, in order to ensure uniformity in the type.

"The instant the block is engraved it is ready to be stereotyped, and

"The method of preparation of the chart seems simple enough at present, but it has been the fruit of much thought, as the problem of producing, in the space of an hour, a stereotype fit for use in a Walter machine has not been solved without many and troublesome experiments.

"In the first place a material had to be provided which would admit of being engraved rapidly without burr or chipping, and would without further preparation serve as a mould for type metal. Secondly, drill pantagraphs had to be adapted to engrave the lines, and to be furnished with a gauge so as to vary their depth at pleasure.

"The actual process is as follows:—The outline of the land is kept standing, and the composition is run in a mould bearing this outline on one face. The

Weather charts in newspapers. then it is a simple matter to adapt it in the usual manner to the cylinder of the machine.

“The initiative in this new method of weather illustration is due to Mr. Francis Galton, and the practical details have been carried out by Messrs. Shanks and Johnson, of the Patent Type Founding Company.

“It is hardly necessary to allude to the value of such charts as these as a means of leading the public to gain some idea of the laws which govern our weather changes. As soon as they appear in our afternoon papers, we may hope for a more intelligent comprehension of the difficulties which beset any attempt to foretell the weather of these islands for the space of even 24 hours.

“We may safely say that with these charts we have not seen the end of weather illustration, which was set on foot more than four years ago by Sir W. Mitchell in the “Shipping Gazette,” and has been continued daily; but whatever improvements may hereafter be introduced in the process, it must be remembered that the credit of breaking the egg is due to the gentleman we have named.”

Continental organizations.

It may now be interesting to give a brief review of what is being done in other European countries in the way of Weather Telegraphy.

France.

France takes the lead both as regards the seniority of its arrangements, which date from nearly 20 years past, and the extent of its international exchanges.

Its reports are published daily in the *Bulletin International*, which has appeared regularly since 1858, and contains a weather chart for the whole of Europe; but if anything were wanted to prove the truth of what has been stated above,—of the entire dependence of the service on the perfection of telegraphic arrangements,—it is to be found in an examination of the daily charts of the *Bulletin International* at a time of continued atmospherical disturbance, when for days in succession the reports from distant stations are entirely absent, and the chart consequently blank, at a time when full information would be of most interest and importance. It is to be hoped that Weather Telegraphy will not always be liable to fail at the most critical times.

Scandinavia.

The next extensive system is that of the three Scandinavian countries, which publish their reports conjointly in the *Bulletin Météorologique du Nord*, issued at Copenhagen.

Russia, too, has a telegraphic organization of considerable magnitude, and issues a lithographic bulletin, as do also Austria and Spain, while the other countries of Europe for the most part content themselves with the dissemination of their weather observations by the agency of the public press.

International telegraphic code.

The Committee are glad to say that the hopes mentioned in the last Report of the adoption of an international telegraphic code for Europe have been fulfilled by the resolution of the Permanent Committee of the Vienna Congress recommending such a step.

The code proposed has been introduced in most European countries, being only subject to such modifications as are requisite to adopt it to the foreign and English scales, as will be seen from the scheme given at p. 39, Part II. The code adopted differs but

slightly from that which has been hitherto in use in the British isles, with the exception that the use of mixed letters and figures in the groups has been discarded, in order to return to the exclusive employment of figures, as in the code originally devised by Admiral FitzRoy.

The intelligence of storms which is sent out from the Office varies in character, according to the requirements of the place which receives it. In Appendix IX. will be found a list of the stations which are furnished with signals, in accordance with circular 717 of the Board of Trade, issued in February 1874. These stations were, at the end of December, 130 in number, situated, 64 in England, 15 in Wales, 32 in Scotland, 13 in Ireland, 3 in the Isle of Man, and 3 in the Channel Islands. Lamps for night use are supplied to a few of the stations. All the stations have been established under, and are in accordance with, the terms laid down in the circular, excepting the Royal dockyards, which are of course under Admiralty management. The messages sent consist of an order to hoist the signal, accompanied by a brief explanation of the reasons why it is to be hoisted. The message is posted up for the information of the public as soon as it is received. It continues in force for 48 hours, *and no longer*, from the time of its issue from London, unless modified by a subsequent telegram, which is frequently sent, either when the danger is known to have passed over, or when there are signs of the approach of another storm.

Telegraphic
weather in-
telligence.

In addition to the foregoing, a telegram consisting of reports of the atmospherical pressure and the wind at the most important stations, is sent daily to the Underwriters' Rooms, Liverpool, the entire expense of the transmission being borne by that association.

All intelligence sent to the coasts is also forwarded to Lloyd's Rooms, where it is at once posted up for the information of the members.

The intelligence of storms which is supplied to foreign countries is of a two-fold character. Warnings to
foreign
countries.

To the Ministère de la Marine at Paris warnings are issued in the same form as to our own coasts, but these are only destined for the portion of the French coast which lies within a reasonable distance of our own shores.

The Committee, when the arrangement in question was originally set in action, stipulated that their warnings were not to extend farther to the southward than Nantes, and accordingly for the purposes of these telegrams the coast of France is divided into two districts. North from Dunkerque to Cap la Hague, and West from Cap La Hague to Nantes.

To the Meteorological establishments of the other countries which exchange information with the Office no direct warnings of storms are issued unless in rare instances, but a regular service of cautionary telegrams is in action by which the London Office transmits to Utrecht and Copenhagen, and to Christiania when

necessary, a telegram containing the most important barometrical readings and wind observations, whenever the total amount of barometer difference over the area covered by the network of the British system amounts to 0·7 in. In speaking of this area, the extreme stations are disregarded, such as those on the Baltic, Christiansund, Cap Sicié in the Mediterranean, and Corunna, inasmuch as in winter it would be a rare occurrence for a difference of 0·7 in. not to be apparent over an area embracing so large a portion of Europe.

These warning telegrams are regularly transmitted from Copenhagen to Stockholm and Hamburg, but whenever the conditions of weather appear urgent, a special telegram is sent from London to the latter town.

Comparison of
warnings with
weather in
1874.

The comparison has been instituted between the warnings issued and the weather experienced on our coasts, as was the case in the four previous years. The method of testing the warnings is as follows: The intelligence issued is compared with the weather experienced on the coasts, as recorded by the various continuously self-recording anemometers, by the telegraphic reporters, and by the several gentlemen who have volunteered to observe for the Office, and whose names will be found at p. 27.

The coasts were subdivided into nine districts, as will be seen in the subjoined table. Two large tracts of coast are entirely omitted. The west of Ireland from the Shannon to Malin Head, and the west of Scotland from the Mull of Cantyre to Cape Wrath. No warnings were issued to any place within the limits indicated, except to Galway, and the amount of information as to weather received from the coasts in question is as yet very scanty.

It should be remembered that in analysing the reports, “all observations of the wind in which the force exceeded 7 (a ‘moderate gale’) or the velocity exceeded 40 miles an hour, have been quoted as instances of the occurrence of a gale; but it has not been considered that the signal was hoisted late or was hauled down too soon, unless the force of 9 (a ‘strong gale’) or the velocity of 50 miles an hour was reached prior to the issue of the order to hoist, or subsequent to the issue of the order to lower.”

In the summaries all cases in which the signal has been shown to be late by one single report of force 9, or of the velocity of 50 miles an hour, have been specially noted in the remarks and marked with a *p*.

All telegrams which have been late, owing to the intervention of a Sunday, or owing to telegraphic errors, are marked with an *s*.

RETURN of the Result of the Comparison between the Warnings issued and the Weather experienced in 1874.

Coasts.	Total No. of Orders to hoist and repetitions.	Warnings justified by subsequent Gales, Force 8 and upwards.	Warnings justified by subsequent strong Winds, Forces 6 and 7.	Warnings not justified by subsequent Weather.	Warnings late, Force 9 reached at two Stations before issue.	Warnings partially late, Force 9 reached at one Station before issue.	Warnings late, owing to Sundays, or Telegraphic Errors.	Storms for which no Warning was issued.
Ireland, South -	37	17	6	6	4	4	—	Apr. 13 ^s , Sept. 22, Oct. 21.
„ East -	43	19	15	8	—	1	—	Jan. 18 ^s , Sept. 22, Oct. 21.
Scotland, East -	35	15	9	10	—	1	—	Jan. 11 ^s , Jan. 18 ^s , Jan. 26 ^s , Apr. 16, Aug. 6, Oct. 21, Dec. 8, Dec. 11.
„ West (Clyde)	42	15	21	5	—	1	—	Jan. 18 ^s , Mar. 27, Oct. 21.
England, North-west	41	25	7	6	1	1	1	Oct. 21.
„ West -	37	19	12	5	—	—	1	Oct. 21.
„ South -	36	17	14	4	—	1	—	Oct. 21, Nov. 29.
England, South-east-	19	5	11	3	—	—	—	Sept 21 ^p , at entrance of channel.
„ East -	27	12	9	5	—	1	—	Dec. 11 ^p , in eastern portion of channel.
Totals -	317	144	104	52	5	10	2	Oct. 21, Nov. 29.
Per-centages -	—	45·4	32·8	16·4	1·6	3·2	0·6	Jan. 18 ^s , Oct. 21, Nov. 29.

If these figures be compared with those for the previous years in which the system has been checked, we arrive at the following result in per-centages :

—	Warnings justified			Warnings not justified by subsequent Weather
	By subsequent Gales.	By subsequent strong Winds.	Total.	
1870	46·7	21·7	68·4	22·4
1871	46	17·7	63·7	22·0
1872	61	19·5	80·5	11·9
1873	45·2	34·0	79·2	16·8
1874	45·4	32·8	78·2	16·4

It will be seen that the results for the years 1873–4 are nearly identical with each other, and a closer investigation into the reason of the excess in the figures in the first column for the year 1872, has shown that it was attributable to the fact that in the comparison for that year the occurrence of force 7, called in Beaufort's scale a "moderate gale," was considered as entitling the result of the warning to be entered in the first column, instead of force 8, a "fresh gale," as assumed in the other years in which force 7 was reckoned among the "strong winds."

The correctness of this explanation of the discrepancy is confirmed by the fact that the per-centage of "total warnings justified" remains almost identical in the last three years.

Success of
warnings.

It must always be remembered that as the Office has necessarily to issue its warnings on the first signs of the approach of a storm, and before its character and course have fully declared themselves, in several cases it has only winds of forces 6 and 7 to show as justifications of its cautionary telegrams. The warnings may therefore be considered as right in principle, though hardly necessary for large ships, as distinguished from smaller craft.

As in former years, instances of serious failure of the warnings to give timely notice of storms have not been absent in the year 1874. The storm of October 21, almost the most serious of the year, came on so rapidly during the night-time, subsequent to the receipt of the afternoon reports of the previous day, that no warnings could be issued by the Office. It does not seem that the funds at present at the disposal of the Committee will enable the Office to give timely warning of such gales as that in question, as for that purpose much more frequent telegrams—in fact an almost constant service on the coast and at the Office—would be required, and such an arrangement would involve a *materially* increased expenditure, as the present organization of the postal services would not allow of any use of the wires to outlying stations during the night hours.

The experience gained of the restoration of the use of the cones as signals of the probable direction of the wind in an apprehended storm, has been on the whole satisfactory; the only failures having been in the case of a few storms which were expected to commence to blow from the south-eastward at our northern stations, but set in from the north-east, “backing” to north, owing to the fact that the centre of the storm took a more southern course than had been anticipated by the Office.

“Probabilities.”

As indicated in the last Report, tentative forecasts of weather (“probabilities”) have been prepared daily in the Office by direction of the Committee for more than a year. The results of a comparison of these with the weather experienced has led to the conviction that, while they have turned out perfectly correct in a large majority of instances for the south-east of England, the district for which it is, of course, easiest to draw them in London, their *daily* publication would not be of great utility, inasmuch as it is only occasionally that the conditions are so marked that a definite forecast suitable for publication in the daily press could be issued 18 hours in advance.

This result is only what may be expected when we consider the exceptional position of the United Kingdom as regards its weather. An extension of the telegraphic system, if attainable, would be indispensable; but, as already explained, this extension would be one hundredfold more valuable to the westward, whence we can hardly hope to obtain it, than to the south-eastward and eastward, whence additional information is of course to be had from the Continent. It has frequently been asserted that information from central Europe and Russia would enable us to form a correct judgment of our own chances of weather, but as yet no proofs have been produced of this statement, and the experience of the Office

distinctly controverts any such idea in the present condition of weather knowledge.

The Committee have hailed with great pleasure the publication, at his own expense, by Captain Hoffmeyer, Director of the Danish Meteorological Institute, of his Synoptic Charts of Europe and the North Atlantic (in so far as the land observations made in the Danish Colonies and in Newfoundland afford information), and they sincerely hope that the public appreciation of the work, as evidenced by the list of subscribers, may be such as will enable him to continue an undertaking of such value for the purposes of international weather study. Hoffmeyer's charts.

It was stated in the last Report that the Office had entered cordially into the proposal made at the Vienna Congress in 1873, by Brigadier-General Myer, in relation to the organization of a system of really synchronous observations at 0h. 43m. p.m. Greenwich mean time. Synchronous observations.

It may here be observed that this was not the first occasion on which the importance of such observations for the purposes of weather study has been urged on meteorologists. In the very first Report of the Meteorological Department (for 1857), Admiral FitzRoy dwelt on the necessity for such simultaneous observations in times of atmospherical disturbance; but some years prior to that date, Professor Buys Ballot, in a paper in Volume IV. of the *Ergänzungs-Bände* to Poggendorff's *Annalen* had insisted on the value of synchronous operations for the science. Early proposals for synchronous observations.

The invitation to British observers to join in the work was at once responded to, and upwards of 60 observers resident in the United Kingdom joined in the work, while the Army Medical Department has from some of its foreign stations supplied most valuable contributions to the stock of materials.

The list of those who have co-operated in the scheme will be found at Appendix X.

The number of Fishery Barometers issued on loan to small ports and fishing stations has been increased by nine, and there are now 129 stations on our coasts supplied by the Office with barometers for public use. They are situated, 49 in England, 5 in Wales, 44 in Scotland, 29 in Ireland, and 2 in the Isle of Man. See Appendix XI. Fishery barometers.

III.—LAND METEOROLOGY OF THE BRITISH ISLES.

The observatories have continued in regular working order throughout the year, and were all inspected as usual by Mr. Scott.

The publication of the Quarterly Weather Report has been continued, and the part for the first quarter of 1874 is in the press. The rate of issue of the successive quarterly numbers is ruled entirely by the progress of the work of reproducing the curves by means of Galton's and Wagner's pantographs, in which process it is impossible to ensure the requisite accuracy of execution if the operations be hurried. The resignation of Mr. F. Steventon, Quarterly Weather Report.

who left the Office in the course of the year to undertake the post of Assistant at the Mauritius observatory, produced a vacancy in the staff trained to the use of the pantagraph, and considerable loss of time was incurred in the necessary education of his successor.

Redetermina-
tion of instru-
ment scales.

Another very serious cause of retardation of the work of the pantagraph room at the close of the year has been the necessity of re-determining carefully the scales originally supplied for the thermographs, as explained in Part II. This has involved a long series of comparisons and calculations, which could not have been effected until the lapse of a series of years had enabled the Office to accumulate a large number of thermograms covering an extensive range of temperature, and affording the opportunity of repeated measurements of the same reading on different curves.

Special cha-
racter of the
published
curves.

It must be remembered that the plates of the Quarterly Weather Report are absolutely unique, nothing at all approaching them for minuteness in the way of a continuous record having ever been attempted; and as to accuracy, the greatest care is taken to render the impressions from the copper plates accordant with the tabulations from the original photographic curves, to the extent of half a degree for the thermometer, and one hundredth of an inch for the barometer.

Some idea of the difference between the character of this and all previous publications of meteorological results may be gathered from the consideration that, while the continuous curves were originally destined to allow meteorologists to obtain from them the observations corresponding to any epoch of time required for any special investigation, within the limits of accuracy which have just been quoted, they of course provide the means of testing the correctness of most of the statements contained in the text of the Report. *In no other publication of a similar nature in any country is there a direct and immediate gauge afforded of the precision of almost every numerical statement.* The cost of this process of publication is very great, and it entirely excludes the possibility of attempting the detailed discussion of the observations at the different observatories, as long as the pecuniary resources at the disposal of the Committee are not increased.

Publication of
hourly tabula-
tions.

The preparation of lithographed copies of the hourly tabulations, as indicated in the last Report, has been carried out for the year 1874, but the number of subscribers towards the expense of copying the figures has not exceeded 15! The Committee have, however, distributed copies *gratis* to important libraries and scientific societies at home and abroad. They have also resolved to continue the preparation of similar sheets for the year 1875, adding to the information already given, the hourly values of vapour tension at the observatories for 1875.

In the last Report a summary of the resolutions of the Vienna Congress was given, and among them some of the most important were those relating to international meteorology.

It will be remembered that at that meeting a Permanent Committee was appointed to see to the carrying out of the Resolutions

of the Congress, and among the proposals of that committee, contained in its report, which has recently appeared, was the suggestion of forms for the publication of observations of an international character from a limited number of stations in each country, in order to facilitate climatological inquiries. Anyone who has ever attempted to extract information from the various meteorological publications in existence hitherto, must at once have been struck by their total want of accordance as to either the information conveyed or the form in which it is presented in the several countries. Not only were the hours of observation different (and uniformity in this respect, however desirable, is apparently at present admitted to be utterly unattainable), but the actual phenomena which were the subjects of observation were not the same in many instances.

International
publication of
results.

The Vienna Congress therefore undertook the task of attempting to call into existence a real international publication, and the members deemed it advisable, as a first step, to propose that at least it should be recommended to publish the observations and mean results, on definite forms, and on the same size of paper, so that the returns for different countries could be bound up together.

Each country was to be invited to contribute its quota to the common stock of information, by publishing actual observations from a number of stations proportional to its territorial area.

The carrying out of this course of action fell to the Permanent Committee, who have devised the forms which are published in its Report and given in Part II. of this Report (p. 43) and have proposed the following inferior limit for the number of stations among the several European governments.

Norway	-	-	-	10	Germany	-	-	-	12
Sweden	-	-	-	10	France	-	-	-	12
Denmark with Iceland and Faroe	-	-	-	6	Austria and Hungary	-	-	-	15
Great Britain and Ireland	-	-	-	15	Turkey	-	-	-	10
Russia in Europe	-	-	-	50	Switzerland	-	-	-	5
„ Asia	-	-	-	100	Italy	-	-	-	12
Netherlands	-	-	-	2	Spain, Portugal and Azores	-	-	-	12
Belgium	-	-	-	2	Greece	-	-	-	3

It remains open for the directors of the individual systems not only to select the stations which are best suited for the purpose, but also to increase at pleasure the minimum number above given.

It is naturally of importance that these 15 stations, which fall to our share over and above the seven observatories in connexion with the Office, should be distributed pretty uniformly over these islands; and accordingly the opportunity seemed to be offered, by this proposed international publication, for instituting satisfactory relations of co-operation between the office and the several independent organizations of observers in the United Kingdom, in order that the information to be published should be as fairly representative of our climate as possible.

In the month of November an invitation was issued to the Meteorological Society (of London) to supply to the Office

Arrangements
with the
Meteorological
Society.

certain returns from several of its newly-established stations. The proposal was at once favourably received, as might have been foreseen from the satisfactory character of the preliminary negotiations for conjoint action mentioned in the last Report, and the terms of agreement were speedily settled. The most important of these are as follows:—

Verified copies of detailed observations at 9 a.m. and 9 p.m. are to be supplied monthly from at least five stations in consideration of a minimum payment of 25*l.* per annum, and from any further number of stations agreed upon at 5*l.* per annum per station.

Verified copies of mean monthly values to be supplied from certain other of the society's stations, not exceeding 20, at the rate of 2*l.* 10*s.* per annum per station.

Proposals to
Scottish
Meteorological
Society.

A similar invitation was issued to the Scottish Meteorological Society, but up to the end of June 1875 it cannot be said to have led to a satisfactory result, as the council of that body, while professing their readiness to co-operate in any work of an international character, are unwilling to enter into such an arrangement as that which has been so cordially accepted by the London Society.

Inasmuch as a new "lustrum" of five years will commence with January 1, 1876, it is hoped that the arrangements for international publication in Europe will be in regular operation by that period, even though, for our part, some districts of the United Kingdom may be but poorly represented, but the Committee have resolved to make a commencement of this publication even for the years 1873 and 1874.

For the former of these they are publishing *in extenso* the observations from Parsonstown (observer Ralph Copeland Ph. D.), inasmuch as in the comparative absence of all information bearing on the meteorology of the interior of Ireland, it is thought that good observations from a station in the centre of the island would always be acceptable to meteorologists.

Stations for
which results
are being
published.
1873.

The stations for which mean results are being published for 1873 are, in addition to Parsonstown:

Sandwick Manse	-	Observer	Rev. C. Clouston, LL.D.
Seaham Harbour	-	"	G. H. Aird.
Durham Observatory	-	"	J. J. Plummer, M.A.
Hull	-	"	Rev. W. P. Mackay, D.D.
Dublin	-	"	J. W. Moore, M.D.

1874.

For the year 1874 the Parsonstown observations will again be published in full, the observer, however, being J. Dreyer from August, Dr. Copeland having left the observatory; while the list of stations appearing in the table of mean results will be augmented by three:

Leicester Museum	-	Observer,	W. J. Harrison.
Oscott, St. Mary's College, Warwickshire	-	Rev. S. Whitty.	
Chigwell Row, Essex	-	J. Campbell,	M.D., R.N.

In the other stations the only change has been that Mr. Plummer, at Durham, was succeeded by Mr. G. Goldney in the course of the year.

With the year 1875 the arrangements with the Meteorological Society above noticed came into operation, and for that year the following is the list of stations which have commenced observing for the Meteorological Office, for the most part on the 1st of January, and whose returns will be published, either in full, or as monthly summaries of mean results at the end of the year.

Arrangements for publication for 1875.

Names of Stations.	Observers.	Remarks.
ENGLAND.		
Chatham - - -	Qr.-Master Sergt. Conroy.	
Chigwell Row - - -	J. Campbell, R.N.	
Durham - - -	G. A. Goldney.	
Giggleswick - - -	Rev. G. Style, M.A.	
Hastings - - -	A. E. Murray, F.M.S.	
Hull - - -	Rev. W. P. Mackay, D.D.	
Leicester - - -	W. J. Harrison.	
Norwich - - -	J. Quinton, junr.	
A Oscott - - -	Rev. S. Whitty.	
Seaham - - -	G. H. Aird.	
SCOTLAND.		
A Sumburgh Head (Shetlands).	W. Lawrence - - -	The instruments are about to be removed to Fair Isle.
Glenalmond (Perthshire)	Rev. W. P. Robinson, M.A.	
IRELAND.		
Dublin - - -	J. W. Moore, M.D.	
A Markree Castle (Sligo) -	W. Doberck, Ph. D., for Col. Cooper, F.R.A.S.	
A Parsonstown (Birr Castle)	J. Dreyer, M.A., for the Earl of Rosse, F.R.S.	

The stations marked A in the preceding list are those for which it is intended to publish the observations *in extenso* on Form A (see App. II. p. 43).

The following is the list of stations in connexion with the Meteorological Society whence returns are received for publication A, in full, or B, as monthly summaries, in pursuance of the arrangements already mentioned.

STATIONS, A.

Aysgarth, Yorkshire - - -	-	-	Rev. F. W. Stow.
Buxton, Derbyshire - - -	-	-	E. J. Sykes.
Calcethorpe, Lincolnshire -	-	-	D. G. Briggs.
Carmarthen - - -	-	-	G. J. Hearder, M.D.
Dartmoor Prison - - -	-	-	R. E. Power, L.R.C.P.
Strathfield Turgiss, Hants -	-	-	Rev. C. H. Griffith.

STATIONS, B.

Audley End, Essex - - -	-	-	Mr. J. Bryan.
Bath - - -	-	-	C. S. Barter, M.B.
Cheadle - - -	-	-	J. C. Philips.
Crowborough Beacon - - -	-	-	C. L. Prince, M.D.
Hillington, Norfolk - - -	-	-	Rev. H. Ffolkes.
Marlborough - - -	-	-	Rev. T. A. Preston.

Volunteer
observers.

Returns of various degrees of completeness are received from the following observers, in addition to the monthly copies of the observations taken at all the telegraphic stations.

Names of Stations.	Observers.
ENGLAND.	
Acrise, Kent - - - - -	G. C. Woollet.
Barnstaple, Devonshire - - - - -	T. Mackrell.
Brighton, Sussex - - - - -	F. E. Sawyer, F.M.S.
Chiswick (Royal Horticultural Society), Middlesex	G. H. Fiesser.
Cooper's Hill (Indian Civil Engineering College)	H. McLeod, F.C.S.
Helston, Cornwall - - - - -	M. P. Moyle, M.D.
Killingholme, Lincolnshire - - - - -	Rev. J. Byron.
Rugby, Warwickshire - - - - -	J. M. Wilson, F.R.A.S.
Saffron Walden, Essex - - - - -	J. G. Bellingham.
Sheffield, Yorkshire - - - - -	W. F. Cooper, F.M.S.
Shipston-on-Stour, Worcestershire - - - - -	Finlay Dun.
Silloth, Cumberland - - - - -	Rev. F. Redford, F.R.S.E.
Winchester, Hants - - - - -	Rev. G. Richardson.
SCOTLAND.	
Annanhill - - - - -	W. H. Dunlop.
IRELAND.	
Dromore (Coleraine) - - - - -	Mrs. Torrens.
Dungloe (Templecrone Rectory) - - - - -	Rev. A. Delap.
Ennis (county Clare) - - - - -	J. Hill, C.E.

Registrar
General's
Reports.

The Committee have received an intimation from the Local Government Board to the effect that the Registrar General does not at present contemplate calling on them to supply information for the various Meteorological Tables published in his Reports.

In the last Report it was stated that Mr. Scott was engaged in the preparation of a set of "Instructions in the Use of Meteorological Instruments." The work is now completed and will be published in the course of the year 1875.

Sea tempera-
ture observa-
tions.

The arrangements alluded to in the last Report, between the Office and the Trinity House and Commissioners of Irish Lights respectively, have been concluded satisfactorily, and on the 1st of January observations of sea temperature were commenced at the following stations :—

ENGLAND.		Morecambe Bay Lightship.
Fern Islands	Lighthouse.	Bahama Bank "
Dudgeon	Lightship.	IRELAND.
Leman and Ower	"	Kish Lightship
Galloper	"	Arklow, South "
South Sand Head	"	Coning Beg "
Owers	"	Daunt's Rock "
Seven Stones	"	

Time will show to what extent observations made under such conditions as are available at lightships will serve for investigations into the intricate problem of determining the changes of sea temperature round our coasts.

LIBRARY.

Appendix XII. contains a list of the donations made to the library during the year. Most of these have been received in return for the publications of the Office. In addition a few volumes have been purchased.

In consequence of the constant reference which is made to the Office for information on meteorological questions, it has been endeavoured to collect a small library containing the standard works on meteorology, and the subjects allied to that science. The Committee are glad to say that they have already succeeded in obtaining many important works.

The library at present consists of nearly 2,000 volumes, and above 2,000 pamphlets, exclusive of charts and MS. records of observations. The pamphlets are bound in convenient volumes for reference. The books, &c. are lent to the staff of the Office, under the usual regulations.

EXPENDITURE.

The disbursements during the year ended 31st March 1875 have exceeded those of the preceding year by the amount of 1,689*l.* 9*s.* 3*d.* The following table shows the general distribution of the expenditure under the several heads of service :—

General abstract.

—	1873-74.			1874-75.			Increase.			Decrease.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Office salaries, &c. -	1,275	12	3	1,314	19	0	39	6	9	—	—	—
„ rent, attendance, and contingencies -	817	3	1	798	19	8	-	-	-	18	3	5
Observatories -	3,506	6	3	3,799	7	10	293	1	7	—	—	—
Telegraphy -	2,184	9	4	3,387	17	8	1,203	8	4	—	—	—
Ocean Meteorology -	2,212	10	4	2,384	6	4	171	16	0	—	—	—
Totals	£	9,996	1 3	11,685	10 6	1,707	12 8	18	3 5			

Net increase, 1,689*l.* 9*s.* 3*d.*

This abstract does not give a complete representation of the financial state of the Office. This will be better seen by referring to the statements in Appendix I.

The increase under the head of *Observatories* is entirely due to transactions on account of our colonial Meteorological establishments, the directors of which have greatly availed themselves of

the assistance of the Office in purchasing self-recording instruments. The cost incurred on this account is of course repaid by the recipients, the Office deriving no profit from the transactions.

The greatest increase falls under *Telegraphy*. It will be seen, on referring to the last Report, that a large amount due under this head was outstanding on the 31st March 1874 ; this has now been paid off. Another cause of increase has been the outfit of all storm-signal stations with new apparatus. And, further, a comparison of the statements of warnings issued this year and last (Reports, 1873, p. 16, and 1874, p. 21), shows that there has been a greater amount of activity in this branch during the current year.

Under *Ocean Meteorology* the increase is partly due to special expenses of the Marine Staff, and partly to purchases of instruments for foreign and colonial establishments.

On the left-hand side of Appendix I. will be found a statement of the amount received for such commissions, from which, as above explained, the Office derives no profit whatever, the work being undertaken for the sake of furthering the cause of Meteorological Science in general.

Available
balance.

Finally, the statements in Appendix I. show that the amount standing to the credit of the Committee on March 31 was 1,826*l.* 15*s.* 5*d.* and that, after deducting liabilities, &c., the estimated *available* balance was 1,053*l.* 1*s.* 5*d.* against 1,165*l.* 12*s.* 8*d.* last year. These figures show that the expenditure of the year has exceeded the actual income by about 112*l.* The parliamentary grant is wholly expended in the Meteorological service of the country, and, indeed, owing to the increased impulse given to the science, the greatest care is necessary in the management of the finances, to keep the expenses within the limits of the amount voted to the Office.

SUMMARY.

The Committee subjoin the usual summary of the operations of the Office during the year.

Mr. Scott, the director, attended the meeting of the Permanent Committee of the Vienna Congress, which was held at Utrecht in September, and the report of that Committee has been published in English.

Mr. Scott was also examined at considerable length before the Royal Commission on Scientific Instruction, &c., and his evidence will shortly be published in the Report of that Commission.

I. *Ocean Meteorology*.—The number of $\frac{1}{2}$ barometers afloat in the Merchant Service on the 1st January 1875 was 83, as compared with 82 in the preceding year. In addition, all the ships in commission in the Royal Navy have, as usual, received all their meteorological instruments from the Office.

Fifty-three gentlemen have sent in logs which have received the mark of "Excellent."

The Monthly Charts for Square III. in the Atlantic have been published, and the Monthly Charts for the entire region of the Atlantic from 10° W. to 40° W., and from 20° N. to 10° S., are in a very advanced state and will be published within the year 1875.

It has been decided to take up the region lying about the south points of Africa, as the next district for examination. This extends from 10° E. to 40° E., and from 30° S. to 50° S.

The logs of 280 ships, which were in the Atlantic Ocean at the time of the storms of August 1873, have been received at the Office, and their discussion has been taken in hands.

The International Maritime Conference alluded to in the last Report was held in London at the Meteorological Office early in September. A copy of the resolutions adopted at that conference will be found at p. 34.

The cost of this department has been 2,384*l.* 6*s.* 4*d.*

II. *Weather Telegraphy.*—There has been no change of importance in this department during the year, but the greatest care has been taken to improve the condition of the stations and the character of the reports wherever possible.

Information is regularly interchanged with all the adjacent continental nations excepting Belgium, and warnings of storms are issued to the coasts of Norway, Denmark, Germany, Holland, and France.

Storm warning signals are hoisted at 64 stations in England, 15 in Wales, 32 in Scotland, 13 in Ireland, 3 in the Isle of Man, and 3 in the Channel Islands.

The results of total success of the warnings have been 78·2 per cent. as compared with 79·2 in 1873 and 80·5 in 1872.

The Daily Weather Charts have been issued to the number of above 500 copies, and the arrangements for the publication of charts in the newspapers have been completed. (The publication in the "Times" commenced April 1st, 1875.)

The number of observers co-operating in the scheme of Synchronous Observations at 0h. 43m. p.m. has exceeded 60.

An international code for Meteorological telegraphy has been devised by the Permanent Committee of the Vienna Congress, and adopted by the Office and by several European nations. The number of stations supplied with Fishery barometers is 129, situated 49 in England, 5 in Wales, 44 in Scotland, 29 in Ireland, and 2 in the Isle of Man.

The cost of this department has been 3,387*l.* 17*s.* 8*d.*, but this has included the payment of a sum of over 750*l.* due to the Post Office at the date of the close of accounts for 1873-4.

III. *Land Meteorology of the British Islands.*—The publication of the Quarterly Weather Report and the issue of the lithographed copies of the hourly tabulations has been continued, and for the year 1875 the hourly values of vapour tension will be added.

It has been found necessary to devise a new method of tabulating the thermograms, and the scales of the thermometers at the observatories have been redetermined at the Office, and new tabulating instruments engraved where necessary.

It has been resolved to commence the publication of returns from stations auxiliary to the Seven Observatories, on a plan suggested by the Permanent Committee of the Vienna Congress.

Arrangements have been concluded with the Meteorological Society (of London) by which that society supplies copies of returns from certain of its stations for publication by the Office, in consideration of the payment of a certain sum of money.

The cost of this department has been 3,799*l.* 7*s.* 10*d.*

Office.—The expenses of management in salaries and wages have been 1,314*l.* 19*s.* 0*d.*

The other charges incident on the Office for rent, furniture, postage, &c. have amounted to 808*l.* 19*s.* 8*d.*

PART II.

(1.) THE INTERNATIONAL MARITIME CONFERENCE.

The Conference consisted of 25 members, belonging respectively to every maritime country of consequence in Europe, except Sweden and Turkey. India and China were also represented. The following is the list of the gentlemen who attended :—

- | | | |
|---------------|---|--|
| Austria - | - | R. Müller, Director of the Imperial Royal Hydrographic Office at Pola. |
| Belgium | - | F. van Rysselberghe, Navigation School, Ostend. |
| Bengal - | - | H. F. Blanford, Secretary Meteorological Committee, Calcutta. |
| China - | - | J. D. Campbell, Inspectorate General of Maritime Customs, London. |
| Denmark | - | Capt. N. Hoffmeyer, Director of the Royal Danish Meteorological Institute at Copenhagen. |
| France - | - | A. De la Marche, Ministry of Marine, Paris.
C. Sainte Claire Deville, Inspector of French Meteorological Stations, Paris. |
| Germany | - | W. H. von Freeden, Director of the "Deutsche Seewarte" at Hamburg.
H. A. Meyer, Commissioner for investigating the German Seas, Kiel.
G. Neumayer, Hydrographer, Berlin.
Capt. Stempel, Imperial Navy. |
| Great Britain | - | R. J. Mann, M.D., President of the Meteorological Society, London.
Rear-Admiral M. F. Nolloth (Representative of the Admiralty).
R. H. Scott, F.R.S., Director of the Meteorological Office, London.
Capt. H. Toynbee, Marine Superintendent, Meteorological Office (Representative of the Board of Trade). |
| Holland | - | Prof. Buys Ballot, Director of the Royal Meteorological Institute of the Netherlands, Utrecht.
Capt. J. E. Cornelissen, Marine Superintendent, &c. |
| Italy - | - | Capt. N. Canevaro, Naval Attaché to the Royal Italian Legation, London. |
| Norway | - | H. Mohn, Director of the Royal Norwegian Meteorological Institute at Christiania. |
| Portugal | - | J. C. de Brito Capello, Director of Nautical and Meteorological Observations; Observatory of the Polytechnic School, Lisbon. |
| Russia - | - | A. Moritz, Director of the Observatory at Tiflis.
Capt. M. Rikatcheff, Central Physical Observatory, St. Petersburg. |
| Spain - | - | Capt. J. N. Montojo, Spanish Navy.
,, C. Pujazon, Director of the Marine Observatory, San Fernando. |

Professor Buys Ballot was elected President, and Captain Hoffmeyer and Mr. Scott secretaries. The Conference met on the 31st August, and it at once subdivided itself into two sub-committees, dealing with the various questions connected with 1, "Obser-

vations," and 2, "Discussions." Each sub-committee held four sittings, and at the closing meeting of the Conference the several resolutions framed by the sub-committees were adopted, in most cases unanimously.

The Conference completed its labours on the afternoon of the 2nd September and on Thursday (3rd), by kind permission of the Astronomer Royal, the members went to Greenwich in the morning, where they were conducted over the Magnetical and Meteorological Department by Mr. Glaisher. In the afternoon they spent some hours at Kew Observatory, where they were received by Mr. Jeffery, and in the evening the whole party were entertained at dinner, at the Star and Garter.

On the 4th several members availed themselves of the great courtesy of the War Office, and repaired to Woolwich, where they were conducted over the Arsenal by Colonel Field and other officers connected with that Department. Finally, on September 5th they inspected the Meteorological Office, where the meetings of the Conference had been held, and paid special attention to the arrangements there existing for reproducing the records of the photographic and other instruments.

The following are the resolutions adopted by the Conference:—

MARITIME CONFERENCE.

Resolved—"That there should be but one form of Meteorological Register for the Navies and Merchant Services, and that those who cannot fill the log should keep part of it."

1.—OBSERVATIONS.

Columns 1 to 6.*—*Date and Position of the Observations.*

Questions.	Resolutions.
Is it your opinion that a fresh column should be added, headed "Course and distance by the log in every watch of four hours?"	That an additional column should be given in the log for "Course and distance." That the course should be expressed in degrees, and not in points. That the question of hours, 4-hourly periods, as proposed by Captain Toynbee, should be adopted.

Columns 7 and 8.—*Currents.*

That observations on the "direction and rate" of currents be transferred to the column for Remarks.

Column 9.—*Magnetic Variation.*

Is it desirable to give an additional column for the "Direction of ship's head"?	That an additional column be given in the log for the direction of the ship's head, and the amount of heel to port or starboard. That the total compass-error and not variation only be given. That the Conference expresses its opinion that the lettering on the English compass should be adopted by all nations for meteorological purposes.
--	--

* The numbers of the columns refer to the Brussels abstract log.

Columns 10 and 11.—*Wind Direction and Force.*

Questions.

Resolutions.

Is it possible to employ an anemometer at sea, so as to give trustworthy results?

That a decided answer to this question cannot at present be given, but it is desirable that various anemometers should be tested by special ships, and a special form of four extra columns should be prepared for the purpose of recording such observations.

Can the use of the Beaufort scale be made universal?

That the use of the Beaufort scale should be continued, with the addition of the amount of sail which Beaufort's ship would have carried had she been rigged with double topsails. Also that the direction and force of the wind should be recorded at the *time* of observation, and not estimated for a certain number of previous hours.

Also, that they should be recorded every two hours.

Columns 12 and 13.—*Barometer.*

To what degree of minuteness is it necessary to observe this instrument?

To one-hundredth of an inch at sea, or its equivalent in the metric scale.

Columns 14 and 15.—*Thermometers, Dry Bulb and Wet Bulb.*

Should these observations be required from all ships?

That wet and dry bulb observations are desirable, and should be obtained whenever possible.

Column 16.—*Forms and Direction of Clouds.*

Is this column sufficient, or should any notice be taken of more than one stratum of clouds?

That the upper and lower clouds should be recorded in separate columns, and that the direction from which *upper* clouds come should be recorded when possible.

Column 17.—*Proportion of Sky Clear.*

Is it not advisable to substitute for this heading "Proportion of sky clouded"?

That it is preferable to give the proportion of sky clouded instead of the entry "proportion of sky clear," as recommended by the Brussels Conference.

Column 18.—*Hours of Rain, Fog, Snow, &c.*

Is it desirable to retain this heading, or to substitute for it and No. 23, a column headed "Weather by Beaufort Notation"?

That it is desirable to retain this heading, but that the use of Beaufort's Notation may be continued by those accustomed to it.

Column 19.—*State of the Sea.*

Should this be given according to a numerical scale?

That a numerical scale (0 — 9) be adopted, and that an extra column should be given to the observation. The direction of the sea swell, or the different swells, to be given in the original column.

Columns 20 to 22.—*Temperature of Sea Surface, Specific Gravity, Temperature at Depths.*

Is it desirable to retain these columns, or can the observations when taken be inserted in the column for "Remarks"?

That the first two columns should be retained.

That sea temperatures at depths should not be required from all ships, and should be recorded in the "Remarks."

Column 23.—*Weather.**Vide* the resolution on Column 18.Column 24.—*Remarks.*

Questions.

Resolutions.

That the "Remarks" as asked for by the Brussels Conference should be adopted, with the exception of the observations of temperature with coloured bulbs at sea.

II.—INSTRUMENTS.

What patterns of instruments should be employed for any observations which may require them?

That the question of the precise pattern of instruments is not of very great importance, so long as they satisfy the tests applied at the several central Institutions, and are compared with standard instruments; but it is recommended that they shall be of a pattern as easy as possible for reading.

Is there any reasonable possibility of introducing the metric and centigrade systems for general use at sea?

The recommendation respecting the use of the metric and centigrade systems as expressed at the Vienna congress was approved, and it was recommended that a table of conversion should be entered in each log to enable Captains to compare barometers which have different scales.

III.—INSTRUCTIONS.

Is it possible to devise a general form of Instructions to ensure uniformity in regard of methods of observation and registration?

That the Instructions should be suited to the log now proposed by the Conference, but modified to meet the various requirements of different nations.

The Conference requested that Capt. Toynbee's proposed form of log should be lithographed and the English "Instructions" printed for circulation amongst its members.

IV.—OBSERVERS.

What control should be exercised over the Observers as to their instruments and registers?

That it is necessary that all instruments should be compared with standard instruments, either at the central or the filial institutions (if such exist), before and after the voyage; and that the corrections and date, &c., of the comparison should be entered in the log.

Is it desirable that all instruments employed should be the property of the central establishment, and *lent* to the observers?

That it is desirable that the instruments should be the property of the central office.

That it is necessary that a careful examination should be made into the quality of the observations recorded, and that the attention of the observers should be specially directed to any errors which may have been detected.

V.—CO-OPERATION OF THE ROYAL NAVY.

Questions.

To what extent can ships of war assist in forwarding the ends of meteorological inquiry?

Resolutions.

The Royal Navy can furnish more complete observations than are possible on board merchant ships, as, *e.g.*, Deep-sea soundings and temperatures.

Observations in unfrequented parts of the sea.

Special experiments.

It is most desirable that the duty of observing should be intrusted to some responsible Officer.

It is therefore resolved that the Authorities of the Navies shall be requested to continue to give such assistance to the prosecution of meteorological science as circumstances shall permit.

A Report was handed in which had been drawn up by a number of the members who were in the Naval Services of some of the countries represented, and it was decided that the following resolutions which it contained should be adopted in lieu of those given above:—

1. “ It is very important that the organisation of meteorological inquiry, as regards the Navies of all countries, should be arranged in accordance with the principles and stipulations laid down by the Conference for Marine Meteorology generally; and it is further important that the results of all observations made on board ships of war in any country should be rendered accessible for discussion by the central station for maritime meteorology in that country, without prejudice to any subsequent publication by the respective Naval Authorities.

2. “ The Conference, while admitting that the introduction of measures calculated to improve the condition of meteorological inquiries in the Navy must be left to the Authorities of the respective Navies, is nevertheless of opinion that all care should be taken to secure uniformity as to mode of observation, and especially to provide for the comparison of all instruments used with the respective standard instruments of the Central Institutes.

3. “ The Conference considers it to be its duty to request that those entrusted with the management of scientific affairs on board men of war will lend their strenuous support in securing from the Naval Authorities in each country such regulations as will place meteorological inquiry on board such ships in as favourable a position as may be deemed consistent with the execution of the ordinary duties of the Service, and will also induce the commanders to render to such inquiries all the assistance and furtherance in their power. The Conference, knowing that such regulations must be framed according to the requirements of each country, expresses, nevertheless, its opinion that, inasmuch as meteorological observations require considerable experience, they should be entrusted to experienced officers on board suitable vessels.

4. “ Although the Conference is of opinion that, as far as the general scope of meteorological inquiry goes, the same form of register should be supplied to merchant ships as to men of war, it declares it will be most desirable that, besides the regular observations, a more extended scale for scientific inquiry should be adopted on board ships of war, as in such cases there is a large number of suitable officers, as well as more means for carrying on the service. As examples of observations which are of importance for the development of Maritime Meteorology, over and above the regulations embodied in the scientific instructions given to Naval expeditions for the special purpose of the advancement of science, the following suggestions may be enumerated:—

(*a.*) “ Possibility of carrying out accurate observations on the velocity of the wind by anemometers at sea.

(*b.*) “ Possibility of employing rain-gauges satisfactorily at sea.

(*c.*) “ Observations with Regnault’s and other hygrometers, and experiments on the best mode of observing wet and dry thermometers, and the best position to place them in on board ship.

(*d.*) "Currents at the surface and at depths to be observed with great minuteness, with the special object of defining their limits.

(*e.*) "The comparison of various instruments, among which are expressly mentioned that of aneroids with mercurial barometers. It is further deemed very desirable that frequent comparisons should be instituted between the instruments used at sea and meteorological stations on shore in various countries.

(*f.*) "Deep-sea soundings and temperatures, with specimens of water.

(*g.*) "The collecting of information on Ocean Meteorology at outlying stations.

(*h.*) "The furnishing of synchronous observations at 0h. 43m. G. M. T., in accordance with the suggestion and request of the United States Signal Office."

VI.—DISCUSSION.

Questions.

Can general suggestions be thrown out as to the most profitable mode of discussing the observations?

Resolutions.

That it is desirable that every Institution should publish the observations and results in such a manner that every foreign institute can incorporate them with its own observations and results in the easiest way possible; that is, by preserving the number of observations, together with any means derived from them, for single square degrees.

That it is further desirable that, whatever charts be published, the results for single square degrees should be published in a tabular form.

That it seems desirable for the use of the sailor that each chart should have reference to only one element, or, at least, only to elements closely related to each other.

VII.—SUBJECTS OF INQUIRY.

To what extent can a division of labour, as regards subjects of inquiry, be carried out in a spirit of fairness to the collecting and discussing establishments respectively?

That the division of labour, as regards investigations, can only be carried out by mutual agreement between the several institutions; and each institution should announce to other institutions what investigations it proposes to undertake.

It is very desirable that such divisions of labour should be effected.

VIII.—SAILING DIRECTIONS.

In how far are purely practical investigations, such as the preparation of sailing directions, admissible for a scientific institution?

That the sailor wants the result of experience alone, and he must receive assurance that his observations have been turned to use. When these results of experience have been given, the theorist may point out the reason why certain routes are the best.

It was resolved, that Capt. Toynebee's remarks on the programme should be printed in full, with extracts from the remarks of other gentlemen, should they contain important suggestions.

(2.) INTERNATIONAL CODE FOR WEATHER TELEGRAPHY.

The following system has been proposed by the Permanent Committee of the Vienna Congress for general adoption (*vide* their Report p. 13).*

The messages consist of six groups of five figures each, which are as follows:—

1°	2°	3°
* * * * *	* * * * *	* * * * *
B B B W W	S S H T T (Eng.)	B B B W W
	* * * * *	
	S H T T T (Cont.)	
4°	5°	6°
S S H T T (Eng.)	T' T' R R R (Eng.)	M M m m Sea
S H T T T (Cont.)	T' T' T' R R (Cont.)	

* Data refer to the previous evening.

Decimal points are always disregarded, and in the case of the barometer the first figure is also omitted, as this must, under ordinary circumstances, be 7 for continental stations (millimetres), or either 2 or 3 for British stations (inches). Thus:—

763·5 mm. is telegraphed as	-	635
29·34 in. " "	-	934
30·03 " "	-	003
and for Temperature:—		
25°·3C " "	-	253

B=Air pressure at sea level and 32° F. and to 0·1 mm. or 0·01 in.

T=Dry bulb thermometer to 0°·1C or 1°·0 F.

T'=Wet bulb thermometer to 0°·1 C, or 1°·0 F. For temperatures below 0°, 50° C are to be added. In other words, with Temperatures below 0° C, no sign (+ or —) is to be used, but the reading is to be increased by 50. So, *e.g.* for — 5°·3 C, 553 would be telegraphed.

M.=Max. } Temperature, to 1°·0 C, or 1°·0 F.
m.=min. }

W=Wind direction (*true*, not magnetic) referred to 16 of the 32 points, being only the even numbers:

N = 32, E = 8, S = 16, W = 24.

S=Wind-force (Beaufort scale). For the continent, when the force exceeds 9, this figure will be recorded in the proper group, and at the end of the telegram the force should be repeated in words.

R=Rain to 1mm. or 0·01 in. In the Norwegian Telegrams in winter 99 means "Fall during the night" without its being measured.

Sea=Sea disturbance 0—9.

0=dead calm.	4=moderate.	7=high.
1=very smooth.	5=rather rough.	8=very high.
2=smooth.	6=rough.	9=tremendous.
3=slight.		

* "Report of the Permanent Committee of the first International Meteorological Congress at Vienna." Published by authority of the Meteorological Committee, London. Potter and Stanford. 1875. Price 1s. 6d.

H=Hydrometeors or weather, as follows :

0	State of sky	Quite clear.	5	Rain.
1		$\frac{1}{4}$ clouded.	6	Snow.
2		$\frac{1}{2}$ „	7	Dust-haze (Höhenrauch.)
3		$\frac{3}{4}$ „	8	Fog.
4		Overcast.	9	Thunderstorm.

The occurrence of Hail, Sheet Lightning, Aurora, &c., should be added in words at the end of the telegram.

Instead of the Maximum the Temperature at 2 p.m. can be given.

If there is no Minimum thermometer at a station, and the sea disturbance is not observed, the sixth group is omitted.

The data for pressure, temperature, wind direction and force, are in the British Isles for 6 p.m. and 8 a.m. ; for the Continent for 9 p.m. and 7 a.m. in general.

(3.) FORMS FOR PUBLICATION OF OBSERVATIONS FROM STATIONS OF THE SECOND ORDER.

The Permanent Committee have recommended the forms given on pp. 43–46 for general adoption.

If the language of the country is other than German, French, or English, the headings of the columns are to be given in one of these languages, in addition to the special language of the country.

In these monthly tables the maxima and minima of pressure and temperature are to be given by Egyptian figures.

In the relative humidity, perfect saturation can either be given by three figures (100) or, by omitting the figure (1), by giving only the two figures (00).

In the column "Remarks," it is desirable, in order to indicate the duration or the epoch of hydrometeors, &c., to employ symbols which are generally intelligible, and accordingly to add to the respective symbols for hydrometeors either the hour of the beginning and end, in which the forenoon hours are marked *a* (a.m.) and the afternoon hours *p* (p.m.). ● 10 a — 4 p would therefore indicate "rain from 10 a.m. to 4 p.m., civil time."

Or where this is not possible, to give by means of additional figures, 1, 2, or 3, whether the hydrometeor in question had occurred at or before the 1st, 2nd, or 3rd period of observation. ☼ 3 would indicate "fog at or before the 3rd period of observation" about 9h. or 10h. in the evening; ☼ 1·3 would mean "fog at the time of or before the first and last periods of observation, *i.e.*, morning and evening."

As to the further order or arrangement of the individual monthly tables of this form in the annual volumes of the Central Offices, the majority of the Committee thinks that at present it should be left to the editors of these books whether they will, as has been hitherto generally the case, print the tables for each station for the same month one after another, in which case monthly parts may be issued; or whether they, as will be the case in future in Norway, Sweden, Denmark, Austria, Russia, and Saxony, will only give complete yearly volumes, in which the 12 monthly tables for one station, arranged in pairs one under another (4 months to one opening), should follow immediately one after another.

In accordance with the wish of several Directors of Central Institutes, the Committee thinks it desirable to give an *inferior limit* for the number of stations of the Second Order, which are at least necessary for the study of the general phenomena of weather in each country, and observations from which should be published *in extenso* in the method above given.

	Country.	No.
Norway	- - -	10
Sweden	- - -	10
Denmark, with Iceland and Faroe	- - -	6
Great Britain and Ireland	- - -	15
Russia in Europe	- - -	50
Russia in Asia	- - -	100
Netherlands	- - -	2
Belgium	- - -	2
Germany	- - -	12
France	- - -	12
Austria and Hungary	- - -	15
Turkey	- - -	10
Switzerland	- - -	5
Italy	- - -	12
Spain, Portugal (and Azores)	- - -	12
Greece	- - -	3

It remains open for the directors of the individual systems not only to select the stations which are best suited for the purpose, but also to increase at pleasure the minimum number above given.

For the publication of monthly and yearly resumés for all stations of the second order, the Committee proposes the form which has been devised by Dr. Jelinek, pp. 44, 45.

For want of room the 16 wind directions are reduced to eight. This reduction is to be made in the same way as that from 32 directions to 16, according to the resolution of the Congress on the 11th September 1873.

The definition of clear and cloudy days is:—

“Clear” when the mean cloud	- - -	< 2
“Cloudy” „ „	- - -	> 8

The number of days with aurora, with the maximum temperature under or equal to 32° (days without thaw), and with the minimum of temperature under or equal to 32° (days of frost), further the giving of the mean force of the wind, &c. may, when there is room, either be included in these tables, or even given specially with other remarks in the Appendix to the yearly volume.

These tables are to be given apart from the former ones in the yearly volume.

As for the means of daily humidity and pressure it seems desirable to arrange the calculation so that they shall accord as nearly as possible with true daily means.

With regard to the form of publications of *other* meteorological observations of each country the Committee thinks that it should leave the most perfect freedom to the Directors.

Plan for Publication of the Monthly and Yearly Results for Stations of the
Second Order

AND

Plan for the Publication of Actual Observations.

In case the text of the Publication is in any other language than French, German, or English, the headings of the different columns are to be given in one of these languages in addition to their original language.

The hours 7, 1, 9 have been given in the Forms; for these, any other combination of hours, accepted by the Vienna Congress may be substituted.

187 ____.

Station _____ . $\lambda =$ _____ . $\phi =$ _____ . H = _____ .

Months.	Mean Pressure.	Air Temperature.									Tension of Vapour.				Relative Humidity.			
		7.	1.	9.	Mean.	Means of		Absolute Min. and Max.			7.	1.	9.	Mean.	7.	1.	9.	Mean.
						Min.	Max.	Min.	Date.	Max.								
January -																		
February -																		
March -																		
April -																		
May -																		
June -																		
July -																		
August -																		
September -																		
October -																		
November -																		
December -																		
Year -																		

Station _____ . $\lambda =$ _____ . $\phi =$ _____ . H = _____ .

January -																		
February -																		
March -																		
April -																		
May -																		
June -																		
July -																		
August -																		
September -																		
October -																		
November -																		
December -																		
Year -																		

Station _____ . $\lambda =$ _____ . $\phi =$ _____ . H = _____ .

January -																		
February -																		
March -																		
April -																		
May -																		
June -																		
July -																		
August -																		
September -																		
October -																		
November -																		
December -																		
Year -																		

Station _____ . $\lambda =$ _____ . $\phi =$ _____ . H = _____ .

January -																		
February -																		
March -																		
April -																		
May -																		
June -																		
July -																		
August -																		
September -																		
October -																		
November -																		
December -																		
Year -																		

λ = The longitude of the station.

ϕ = The latitude of the station.

H = Height above mean sea level.

187_____.

ht = _____ . *hr* = _____ Station.

Months.	Amount of Cloud.				Rainfall.			Weather. No. of Days of							Wind. No. of Observations of									
	7.	1.	9.	Mean.	Total.	Max.	Date.	Rain.	Snow.	Hail.	Thunder Storms.	Clear Sky.	Over- cast.	Gales.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.	
January -																								
February -																								
March -																								
April -																								
May -																								
June -																								
July -																								
August -																								
September -																								
October -																								
November -																								
December -																								
Year -																								

ht = _____ . *hr* = _____ Station.

January -																								
February -																								
March -																								
April -																								
May -																								
June -																								
July -																								
August -																								
September -																								
October -																								
November -																								
December -																								
Year -																								

ht = _____ . *hr* = _____ Station.

January -																								
February -																								
March -																								
April -																								
May -																								
June -																								
July -																								
August -																								
September -																								
October -																								
November -																								
December -																								
Year -																								

ht = _____ . *hr* = _____ Station.

January -																								
February -																								
March -																								
April -																								
May -																								
June -																								
July -																								
August -																								
September -																								
October -																								
November -																								
December -																								
Year -																								

ht=Height of the Therm. above the ground in feet.

hr=Height of the Raingauge above the ground in feet.

(4.) IMPROVEMENTS IN THE METHOD OF TABULATION OF THERMOGRAMS.

The only important modification of procedure in connection with the automatic instruments has been as regards the tabulation of the thermograms, the method now followed being on a totally different principle from that described in the Report for 1867, p. 34, where it is said that the glass scale "is set by the readings" of the standard thermometer which are nearest the beginning "and ending of the curve." This rule was altered in the Report for 1868, p. 38, to read as follows:—"The tabulating instrument" should be set from the observation hours where there is little "thermometric fluctuation." Experience has, however, shown that even when the latter method of tabulation has been employed the curve readings at times would not agree with the intermediate standard readings within the limits of accuracy required.

This was evidently, in the main, due to what is termed "bagging," or in other words to the curvature of the assumed base line of the photograph, a defect which has from the first been detected in the barograms, inasmuch as a base line for their tabulation is mechanically produced by the photographic process.

In the regulations for the thermograph, Report 1868, p. 65 (9), the possible existence of this cause of error in the thermograms was recognized, but no principles for its detection were laid down, nor indeed was any simple method of doing so at that time possible, for the white lines on the photographs, called in the Report for 1867 "fiducial lines," are not sufficiently constant in their appearance to serve for that purpose.

After some time the Committee, owing to the experience gained in the reproduction of the curves for publication, where they are necessarily referred to a straight line, decided to have their instruments altered by piercing the metallic framework of the thermometer so as to allow of the production of a photographic trace at a definite temperature, which should at the same time afford a fiducial line for setting the tabulating scale and allow of the easy detection of any divergence from horizontality in its own course.

It has also been rendered possible by the comparison of an extensive range of readings of the curves and also of the distance apart of the several white lines on the thermograms above mentioned, obtained by measuring their distances from the new fiducial lines, to determine within what limits the pairs of thermometers originally supplied had "very nearly the same scale value," so as to be measurable by the same tabulating scale.

The result has shown that in more than one instance the scales of the thermometers had not been at first determined with the requisite accuracy, and it became necessary to furnish new ones.

The whole of the work connected with the measurements referred to has been carried out in the Office, and the new glass scales required have been engraved in the Office by the use of Wagner's pantagraph.

391
265
575

1031

APPENDIX.

APPENDIX I.

METEOROLOGICAL OFFICE : ACCOUNT OF RECEIPTS AND PAYMENTS for the year ending 31st March 1875.

RECEIPTS.	
Balance from year 1873-4 -	£2,290 12 2
Parliamentary Vote -	10,000 0 0
Commissions for Instruments -	725 1 7
Subscriptions for D.W. Charts -	297 2 11
Subscriptions to Hourly Obsns. -	14 0 0
Subscriptions for Danish synoptic charts -	17 1 6
Subscriptions for M.S. Weather Reports -	15 0 0
Supply of Meteorological data, &c. -	23 16 11
	<hr/>
Interest on deposit account -	1,092 2 11
	129 10 10

PAYMENTS.	
OFFICE:	
Salary of Director -	800 0 0
„ Two Clerks -	339 15 0
Office-keeper and Messenger -	175 4 0
	<hr/>
	£1,314 19 0
Rent of Office -	534 12 0
Fuel and gas -	41 18 5
Furniture and fittings, &c. -	26 12 3
	<hr/>
	603 2 8
Postage -	79 18 4
Printing and books -	21 14 7
Attendance, and other Contingencies -	94 4 1
	<hr/>
	195 17 0
LAND METEOROLOGY:	
Expenses at Observatories -	2,644 3 11
New instruments (colonies, &c.) -	391 12 9
Computations -	763 11 2
	<hr/>
	3,799 7 10
Telegraphy -	2,139 8 9
Inspections, issue of D.W. Charts, &c. -	583 2 3
Computations -	665 6 8
	<hr/>
	3,387 17 8
OCEAN METEOROLOGY:	
Marine Superintendent	450 0 0
Supply and Return of Instruments, &c.:	
Admiralty -	265 15 0
Mercantile Marine	575 4 11
Computations and Care of Instruments -	1,093 6 5
	<hr/>
	2,384 6 4
	<hr/>
	11,685 10 6
Cash in hand -	60 12 7
Advance to Valencia Observatory -	50 0 0
Bank of England account London and Westminster Bank -	545 10 8
	<hr/>
	1,826 15 5
	<hr/>
	£13,512 5 11
	<hr/>
	£13,512 5 11

£13,512 5 11

Examined and compared with the vouchers and found correct.

June 4, 1875. (Signed) W. J. SMYTHE, Major-General, } Auditors.
WARREN DE LA RUE, }

BALANCE SHEET, 31st March 1875.

To sundry creditors -	1,015 10 0
„ probable net surplus -	1,053 1 5
	<hr/>
	2,068 11 5
	<hr/>

By cash (as above)-	1,826 15 5
„ sundry debtors -	241 16 0
	<hr/>
	2,068 11 5
	<hr/>

APPENDIX II.

LIST of CAPTAINS (and Officers) who have received from the Committee a Copy of the Admiralty Charts, to 31st March 1875 (see Report, p. 7). The figures opposite to each show the number of Special Letters of Thanks written to each Observer in acknowledgment of "Excellent" Registers *subsequently* returned to the Office.

Captain's Name.	Letters of Thanks.	Ship.
Almond, Thomas Michael, F.R.A.S.	1	"Decapolis."
Angel, John Fry - - -	—	"Twilight."
Balderston, Richard James -	—	"Rajmahal."
Banner, Frederick William -	3	"Lady of the Lake," and "Kenilworth."
Barwood, William Richford -	1	"Fugitive."
Becket, Alexander - - -	—	"City of Perth."
Blake, Edwin John - - -	4	"Gilbert Thompson," "Gitana," and "Sydney Daeres."
Bouchette, Francis Baines -	1	S.S. "European."
Brooks, Samuel - - -	2	S.S. "City of Brooklyn."
Brown, Robert - - -	1	S.S. "Moravian."
Bruce, John - - -	3	"City of Adelaide," and S.S. "Australian."
*Bythesea, John (V. C.), R.N. -	2	H.M.S. "Phæbe."
Campbell, Archibald - - -	4	S.S. "Britannia," and S.S. "Europa."
Capper, Edward Hall - - -	1	"Palm Tree."
<i>Carruthers, Forrest Priest</i> - -	2	"Minero."
Comley, William Guise, R.N.R. -	1	S.S. "Hong Kong."
<i>Davidson, Charles</i> - - -	—	"Perseverance."
Dobson, Charles Meadows - - -	—	S.S. "Beta."
<i>Donkin, Thomas, R.N.R.-</i> - - -	2	"Inverness."
Ellery, William - - -	3	"Bowfell."
Fernie, Alexander Durwood - -	—	"Sir John Lawrence."
Finlay, James - - -	2	"Duncairn."
Freeman, Thomas W. - - -	1	S.S. "Wisconsin."
Fry, Alfred - - -	1	"Foam."
Gaye, Gerrard - - -	2	"Eliza Shaw."
*Goodenough, James G., R.N. -	1	H.M.S. "Pearl."
*†Hosken, Henry, R.N. - - -	—	Do.
Grange, James - - -	—	S.S. "Acantha."
Gray, David - - -	1	S.S. "Eclipse."
Gray, John - - -	1	S.S. "Mazinthien" and S.S. "Hope."
Gray, John McDonald - - -	4	"Speranza."
Greenwood, William - - -	4	S.S. "Scotia" and "Assaye."
Grigs, George, R.N.R. - - -	2	S.S. "Helvetia," and S.S. "France."
<i>Harris, David</i> - - -	1	S.S. "Medway."
Hassell, Thomas Edward - - -	2	"Mervyn."

* Pilot charts not presented.

† Navigating Lieutenant.

Names of Officers, deceased, *in italics*.

Captain's Name.	Letters of Thanks.	Ship.
Hayes, James - - -	5	S.S. "Ptolemy" and S.S. "Camoens."
Hayward, George Olive - -	2	S.S. "Durley."
Heggum, Edward Carl V. - -	6	"Czar."
Henderson, Henry - - -	5	"Hope," and S.S. "Cleveland."
†Hodding, Samuel White - -	—	"Indus."
Holdich, John Peach, R.N.R. -	1	"Agra."
*Hopkins, John O., R.N. - -	—	H.M.S. "Liverpool."
Hunter, David - - -	4	S.S. "Alpha" and S.S. "Delta."
*§Jackson, Robert - - -	1	H.M.S. "Glasgow."
Johnson, Charles, R.N.R. - -	1	"St. Lawrence."
Jones, Arthur Arundel - - -	2	"Victoria Nyanza," and "Chevy-chase."
Jones, George Henry - - -	4	S.S. "Nile," and S.S. "Niger."
*Jones, Theodore Morton - -	1	H.M.S. "Glasgow."
Kennedy, Charles William - -	2	S.S. "Scotia," and S.S. "Baltic."
Kennedy, James Branch, R.N.R. -	—	S.S. "Blue Cross."
Kerr, Alexander - - -	1	"Ardgowan."
Kerr, Thomas Coulter, R.N.R. -	1	"Durham."
Lecky, Squire Thornton Stratford, R.N.R., F.R.G.S.	2	S.S. "Uruguay" and S.S. "Halley."
Leportier, Theodore - - -	1	"Kate."
Lewis, John Thomas, R.N.R. - -	1	S.S. "Scotia," and S.S. "Chaldea."
Lindsay, Henry Kay - - -	1	"Valparaiso."
Longley Herbert - - -	—	S.S. "Yorkshire."
Lunham, Robert Dowe - - -	4	S.S. "Berar," S.S. "Durley" and "Charles Howard."
*MacDonald, John - - -	—	S.S. "Europa."
McKechnie, Duncan Ferguson - -	3	"Cottica."
Mackellar, D. E. - - -	—	Observations at Rapa Island.
Mackie, Thomas - - -	—	S.S. "Mazinthien."
Maddison, John, R.N.R. - - -	—	"Anglesey."
Manning, Henry - - -	—	S.S. "Kangaroo."
Maples, Charles - - -	—	"Genii."
Martyn, John Artis - - -	10	S.S. "Siberia" and S.S. "Samaria."
*Mayne, Richard C., R.N., C.B. -	1	H.M.S. "Nassau."
†Menzies, Charles James - - -	1	S.S. "Austrian" and S.S. "Sarmatian."
Moore, Thomas - - -	—	"W. E. Gladstone."
Morton, John D'Arcy - - -	—	"Henry Bath."
Mossop, Clement - - -	2	"Candahar."
Mouland, John Elsey - - -	1	S.S. "Batavia."
Murphy, Michael - - -	—	S.S. "Tarifa."
*Nares, George Strong - - -	1	H.M.S. "Challenger."
Newton James William - - -	—	S.S. "Grenadier."
Owen, John - - -	—	"W. G. Russell."
†Paterson, James Forrest - - -	2	S.S. "Moravian."
Pearson, Charles William - - -	6	"S.S. "Strathclyde."
*Perry, John L., R.N. - - -	2	H.M.S. "Orontes."
†*Petch, John A. R., R.N. - - -	2	H.M.S. "Phœbe."
Petrie, Peter Conrad - - -	1	S.S. "Patagonia."
Potts, Thomas Crosby - - -	4	"Tenasserim."

* Pilot Charts not presented.

† Second Officer.

‡ Chief Officer.

§ Navigating Lieutenant.

Names of Officers, deceased, *in italics*.

Captain's Name.	Letters of Thanks.	Ship.
Price, James John - -	5	"Sorata."
Rawley, Charles, R.N.R. - -	1	"Star of the North."
Raymond, Charles Tenzer - -	3	"British India" and "British Consul."
Reid, Carson William - -	1	"Lord Strathnairn."
Renaut, Charles Henry - -	3	"Celaeno" and "Glenlora."
†Scott, Fergus - - -	—	S.S. "Hotspur."
†Scott, George Alexander Brown - -	—	S.S. "Nestorian."
*Sharp, William H., Staff Com., R.N.	—	H.M.S. "Liverpool."
*Shortland, P. F., R.N. - - -	—	H.M.S. "Hydra."
Simpson, Alexander - - -	4	"Traveller."
<i>Smith, David, F.R.A.S.</i> - - -	—	"Wiltshire."
Smith, William Charles - - -	—	"Kingdom of Saxony."
Smith, William Henry, R.N.R. - -	5	S.S. "Hibernian," S.S. "Peruvian," and S.S. "Scandinavian."
Stanhope, John - - -	—	"Decision."
Steele, John - - -	1	S.S. "Erl King."
Stephen, John George - - -	1	S.S. "Moravian" and S.S. "St. Patrick."
Stuart, George Rennie - - -	2	"Otago."
Stuart, William Henry - - -	4	"Richmond."
Sutherland, James Taylor - - -	1	"Maggie" and "Glenesk."
Symington, William - - -	6	"Northfleet," "Flying Venus," and S.S. "Hong Kong."
*Tandy, Dashwood G., R.N. - - -	1	H.M.S. "Nassau."
Tilmouth, Robert J. C. - - -	—	"Peeress."
Townsend, William Henry - - -	—	"Valentine and Helene."
Trench, Chas. E. Le Poer - - -	1	"Newcastle."
<i>Tucker, John Worth</i> - - -	—	"John Temperley."
Tully, Thomas - - -	1	"Baroda."
*†Vine, William W., R.N. - - -	2	H.M.S. "Orontes."
Vowell, Michael - - -	1	"Kelso" and "Undine."
Wadham, Thomas Littleford - - -	2	"Vere."
Walker, John Burnett - - -	—	S.S. "Erik."
Watkins, Thomas - - -	—	"Emulation."
Watson, William - - -	11	S.S. "Palmyra" and S.S. "Parthia."
Wherland, Frederick, R.N.R. - - -	4	"Galatea."
Wight, Henry Potts - - -	2	"Gosforth."
Wilcox, Henry George, R.N.R. - - -	—	"St. Lawrence."
Williams, James Agnew - - -	—	S.S. "Wisconsin."
Wylie, James - - -	1	S.S. "Austrian" and S.S. "Sarmatian."

In addition the Committee have presented barometers to two gentlemen who have formerly kept registers for the office, but have now retired from the sea, viz., to Capt. A. D. Wood in 1867, and to Capt. Isaac Gales in 1870. A set of instruments was also presented to Capt. Alfred Fry in 1868.

* Pilot Charts not presented.

† Chief Officer.

‡ Navigating Lieutenant.

Names of officers deceased, *in italics*.

APPENDIX III.—SHIPS supplied and DOCUMENTS returned during the year 1874.

The number of ships supplied with standard instruments and meteorological registers during the year 1874 was 78. This number does not include ships in the Royal Navy, all of which are supplied with instruments by the Meteorological office, but in which the keeping of a special meteorological register is optional.

The number of meteorological registers and documents received during the year 1874, and registered in the office, amounted altogether to 198, of which 103 were returned from ships, and 95 from land stations, generally outside the British Isles.

LIST of DOCUMENTS received from LAND STATIONS.

Place.	Observer.	No. of Documents.	Nature of Observations.
Abaco (Bahamas)	Lightkeeper	1	"Lighthouse" Register, July - December, 1874.
Angra do Heroismo (Azores)	-	12	One observation daily. November 1873 to October 1874.
Belize	S. Cockburn	1	11 : January to June 1874, and monthly means (Aneroid barometer).
Bermuda	Dockyard Authorities	12	Anemometrical Records, November 1873 to October 1874, and accounts collected by Gen. Lefroy relating to hurricanes of August 19 - 24, 1873.
Cape Pembroke (Falklands)	Lightkeeper	1	"Lighthouse" Register July - December 1873.
Cay Sul (Bahamas)	Lightkeeper	1	"Lighthouse" Register, March 1873 to February 8, 1874.
China Sea	Capt. T. Donkin	1	Typhoon, September 1873.
Durham	J. J. Plummer, M.A.	1	Summary of meteorological results for 1873.

LIST of DOCUMENTS—continued.

Place.	Observer.	No. of Documents.	Nature of Observations.
Funchal (Madeira)	- - -	12	One observation daily, from November 1873 to October 1874.
Gibraltar	Serjeant J. Brewster	12	Two observations daily and monthly means, December 1873 to November 1874.
Heligoland	Lightkeeper	6	Eight observations daily, from December 1873 to May 1874.
Mogador (Morocco)	French Consul	3	Three observations daily, from January 1872 to August 1874. (Aneroid barometer and French measures.)
Patras (Greece)	Rev. H. A. Boys	15	One observation daily, August 1873 to October 1874.
Punta Arenas (Patagonia)	Capt. R. C. Mayne, R.N.	1	Mean barometer 185½ - 1860; Mean thermometer 1854 - 1865.
St. John's (Newfoundland)	J. Delany	12	Three observations daily, December 1873 to November 1874.
St. Thomas	F. H. Jahneke	1	Charts and documents relating to Cyclones in West Indies from 18th - 26th August and 26th September to 9th October 1873.
Selkirk (Manitoba)	Wm. R. Flett	1	One observation daily, September to December 1873.
Sombbrero	Lightkeeper	1	"Lighthouse" Register from November 1873 to April 1874.
Woosung (China)	C. D. Braysher	1	One observation daily during 1873.
		95	

LIST OF DOCUMENTS received from SHIPS.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
Adams, J. T.	Soukar	1,304	Savill & Temple, London	Towards Canterbury, N.Z.	2
Almond, T. M.	Decapolis	632	T. B. Walker, London	Brisbane	6
Balderston, R. J.	Rajmahal	1,302	T. Brocklebank, Liverpool	Calcutta	7
Becket, Alexander	City of Perth	1,189	G. Smith & Sons, Glasgow	Melbourne	7
Bennett, E. C.	Medea	1,066	J. H. Carmichael, Greenock	Calcutta, Surinam, and home	7
Bird, G. E., R.N.R.	S.S. Kafir	613	Union Steamship Co.	To Natal	1
Bond, Edward	Indiana	300	T. Seed, Fleetwood, Lancaster	Amoor river, Siberia	3
Brett, E. E.	Strathearn	246	Harrison & Co., Liverpool	Old Calabar (W. C. A.)	1
"	Ardgillas	410	"	West Coast of Africa	3
Brown, A. J.	Vere	396	Anderson & Co., London	Jamaica	3
Bruce, John	South Australian	1,040	Devitt & Moore, London	Adelaide	5
Carruthers, George	Minero	478	C. C. Lewis, Brentwood, Essex	Chili	6
Comley, W. G., R.N.R.	S.S. Hong Kong	1,221	E. H. Watts, London	China, via Suez	4
Crombie, W. A.	Prince of Wales	182	Aberdeen Lime Co.	Archangel, two voyages	3
Cruikshank, William	Richard Wright	1,353	J. Nevins, St. John's, N.B.	Bombay, Calcutta, and home	9
Cunningham, Andrew	Surrey	1,089	G. Marshall, London	To Sydney, Calcutta, Demerara, and home from St. Vincent.	9
Dobson, C. M.	S.S. Beta	1,014	Smith, Hill, & Co. Hull	Constantinople, Odessa, and back to Altona	2
Donkin, Thomas	Inverness	725	J. & R. Grant, London	To Sydney, Hong Kong, and Foochow	7
Douglas, Charles	Malabar	1,219	H. Green, Blackwall	Melbourne	6
Eales, James	Sir Robert Sale	704	J. D. J. Teigh, London	To Calcutta	9
Ellery, William	Bowfell	1,002	T. & R. Brocklebank, Liverpool	Calcutta, thence to Adelaide, Mauritius, and Bombay.	8
Faithful, Henry	Haddon Hall	1,416	R. Alexander, Liverpool	Sydney	4
Freeman, T. W.	S.S. Wisconsin	3,700	Liverpool and Gt. Western Steam Co., Ltd., Liverpool.	New York, five voyages	4
"	"	"	"	"	4

LIST of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
Gaudin, James	Lady Lampson	412	Hudson's Bay Co.	Vancouver Island	8
Gaye, Gerrard	Eliza Shaw	696	C. Shaw, London	Yokohama, New York, and home	9
Gedge, W. S., R.N.R.	Celæno	702	Rhoades & Sons, London	Wellington	7
Goodenough, J. G., R.N.	Pearl	2,187	H.M.S.	New Zealand and Australia	4
Gray, David	S.S. Eclipse	435	J. Arbuthnot, Peterhead	At Australian Stations	4
Gray, John	S.S. Hope	452	R. Kidd, Peterhead	Greenland, Spitzbergen, and home	6
Gray, J. McDonald	Speranza	455	W. Nicholson, Sunderland	Greenland	6
Greenwood, William	Gareloch	1,177	P. Kintoul, Glasgow	Valparaiso	6
Gun, A. F.	Golden Fleece	1,257	Carmichael & Co., Greenock	Calcutta, Moumein, and home	8
Harland, Charles	Nelly	407	J. C. Brooks, Newfoundland	Calcutta, Demerara, and New York	7
Hassell, T. E.	Mervyn	288	R. J. & W. Poole King, Bristol	Wellington, U. S.	3
Hayes, James	S.S. Camoens	1,053	"	On West Coast of Africa	7
Heggum, E. C. V.	Rozelle	1,286	Brazil and R. Plate S. L. Co.	From West Coast of Africa	3
Hilliard, A. J.	S.S. Dacia	1,470	R. Cuthbert, Greenock	Trading on South-east Coast of America	2
Holdich, J. P., R.N.R.	Agra	821	India Rubber Telegraph Co.	Calcutta, New York, and home	7
Horne, James	John Allan	734	Bilborough & Parsons, Liverpool	Marseilles	3
Johnson, Chas., R.N.R.	St. Lawrence	1,094	J. H. Allen, London	West Indies	9
Jones, G. H.	S.S. Niger	1,125	J. Lawrence, London	To Canterbury (N. Z.), Newcastle, San Francisco, and home.	11
Jones, T. M., R.N.	Glasgow	3,037	C. M. Norwood, London	Negapatam, Cocanada, Marseilles, and home.	8
"	"	"	H.M.S.	Madras	6
"	"	"	"	Odessa, two voyages	4
"	"	"	"	From Seychelles to Trincomalee, Colombo, and Aden.	4
"	"	"	"	On East India Stations	4
"	"	"	"	From Trincomalee to Mauritius, Johanna, and Zanzibar.	4

LIST of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
^s Kennedy, J. B., R.N.R. Kerr, Alexander	S.S. Baltic Ardgowan	2,209 1,283	Ismay, Imrie, & Co. Liverpool G. Adam, Greenock	New York, six voyages Calcutta, Bombay, and home	4 8
Leet, J. R., R.N., acting Captain. Longley, Henry	Princess Charlotte S.S. Yorkshire	4,122 1,771	H.M.S. W. H. Tindall, London	Off Hong Kong China, Japan, Calcutta, and home, via Suez.	15 days 5
Lunham, R. D. " "	S.S. Charles Howard " "	1,021 "	J. Ryde, London " "	Buenos Ayres " "	2 3
McEwen, J. P. McKechnie, D. F. " " Manning, E. Maples, Charles Martyn, J. A. " " Maxwell, W. F. Mayne, R. C., R.N. Miller, A. J. Mouland, J. E.	Sherbro Cottica " " S.S. Kafir Genii S.S. Java " " Guinare Nassau Tiger S.S. Batavia	351 319 " " 613 975 2,696 " " " " 877 1,028 2,553 170 2,306 737 1,248	H.M. Col. Steamer A. Pearson, Glasgow " " Union Steamship Co. MacIntyre & Co., Liverpool J. Burns, Glasgow " " H.M. hired ship H.M.S. De Wolf & Co., Liverpool J. Burns, Glasgow W. Baxter, Aberdeen H.M.S. Tyne Steam Shipping Co., Newcastle-on-Tyne. J. Thomas, Liverpool	To, at, and from West Coast of Africa - Two voyages to, and one from Surinam Surinam Voyage to Natal Rio Janeiro, Bassein, and home New York, six voyages " five " On Coast of Newfoundland and Labrador Magellan Strait to Rio, 1st May 1869 Newfoundland Boston, four voyages; Boston and New York, one. Cumberland Gulf Bermuda to Halifax, Azores, Bahia, Cape of Good Hope, and Kerguelen Island. Trading between Newcastle and London Monte Video, Callas, and home	12 4 4 1 9 4 4 5 — 3 4 13 11 5 7
Murray, Alexander Nares, G. S., R.N. Newton, J. W. Owen, John	Perseverance Challenger S.S. Grenadier W. G. Russell	170 2,306 737 1,248	W. Baxter, Aberdeen H.M.S. Tyne Steam Shipping Co., Newcastle-on-Tyne. J. Thomas, Liverpool	Cumberland Gulf Bermuda to Halifax, Azores, Bahia, Cape of Good Hope, and Kerguelen Island. Trading between Newcastle and London Monte Video, Callas, and home	13 11 5 7

LIST of DOCUMENTS, &c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
¹² Parish, Comr., J. E., R.N.	Princess Charlotte	4,122	H.M.S. -	Off Hong Kong	4
¹³ Pearson, C. W.	" S.S. Strathclyde	1,951	Burrell & McLaren, Glasgow	" Bombay, via Suez	4
Phillips, E.	" Sea Chief	1,083	G. Smith, Hampstead, Middlesex	" To Aden and home from Madras	3
Potts, T. C.	Tenasserim	1,419	T. & R. Brocklebank, Liverpool	Calcutta	2
Prehn, C. C.	Eleanor	428	J. J. Holdsworth, Minories	Bassorah (via Suez), Algoa Bay, and home	9
Price, J. J.	Sorata	332	C. C. Dawson, London	Jamaica	7
"	"	"	"	"	8
Raymond, C. T.	British Consul	1,266	British Shipowners Co.	San Francisco	3
Renaut, C. H.	Glenlora	764	Saville & Temple, London	Wellington, N. Z.	10
Shaw, Gilbert	S.S. Alpha	653	W. Cunard, Halifax	From Halifax to St. Thomas } 4 voyages and back, via Bermuda.	7
"	"	"	"	"	3
"	S.S. Beta	1,014	Smith, Hill, & Co., Hull	"	35 days.
"	S.S. Delta	644	W. Cunard, Halifax	"	2
"	"	"	"	"	3
"	"	"	"	"	1
Simpson, Alexander	Traveller	195	Alex. Simpson	" Iviglut thence to Stettin, Iviglut, and home.	18
"	"	"	"	"	18 days.
¹⁴ Smith, —	Worcester	-	Training Ship	"	1
Smith, Alexander	Hannah and Mary	365	J. M. Rankin, Sutherland	Off Greenhithe	6
Smith, W. C.	Kingdom of Saxony	538	A. Gosman, London	Singapore	4
¹⁵ Smith, W. H., R.N.R.	S.S. Peruvian	1,432	Allan, Brothers, Glasgow	Madras	9
"	"	"	"	Halifax, one voyage; Baltimore, via Halifax, four voyages; Quebec, one voyage; Portland, one voyage.	8
"	"	"	"	Quebec, four voyages; Portland, via Halifax, one voyage	6
"	"	"	"	Portland, three voyages; Quebec, one voyage.	4

LIST OF DOCUMENTS, &c.—*continued.*

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
Stuart, W. H.	Richmond	183	Board of Trade	At Bahamas	17
Symington, William	S.S. Hong Kong	1,881	E. H. Watts, London	China, via Suez, one voyage	5
"	S.S. Hankow	2,331	"	Bombay, via Suez	3
Thomson, J. M.	St. Vincent	891	Devitt & Moore, London	Peru	6
Thomson, S. J.	Chevy Chase	678	J. Ravenscroft, Liverpool	West Coast of South America	7
Trench, C. Le Poer	Newcastle	1,137	H. Green, Blackwall	Sydney, San Francisco, and home	9
Tully, Thomas	Baroda	1,364	T. Brocklebank, Liverpool	Calcutta	7
Unknown	Falcon	-	-	In China Seas	-
Wadham, T. L.	Vere	396	J. Anderson, London	Jamaica	3
Watson, William	S.S. Parthia	3,167	J. Burns, Glasgow	New York, two voyages; Boston, two voyages.	4
"	"	"	"	Boston, two voyages; New York, two voyages.	4
"	"	"	"	"	3
¹⁷ Wharton, W. J. L., R.N.	Shearwater	913	H.M.S.	Between Cape of Good Hope and Rodriguez Island.	16 days.
Wherland, Fredk., R.N.R.	Galatea	1,447	Norwood & Co., Liverpool	Melbourne, San Francisco, and home	10

In cases distinguished by marginal numbers the Meteorological Registers were kept chiefly by officers, as follows:—

- ¹ Kept by R. Ladd, 2nd Officer.
- ² Kept by H. Hoskin, Navigating Lieutenant.
- ³ Kept by T. W. Webster, Navigating Lieutenant.
- ⁴ Assisted by A. A. Boyle.
- ⁵ Kept by R. Jackson, Navigating Lieutenant.
- ⁶ Kept by St. George Armstrong Williams, 2nd Officer.
- ⁷ Kept by Dr. T. J. Sunning.

- ¹¹ Kept by T. H. Tizard, Navigating Lieutenant and A. Havergal, Navigating Sub-Lieutenant.
- ¹² Kept by T. W. Webster, Navigating Lieutenant.
- ¹³ Kept by boys under superintendence of Rev. W. T. Read, M.A.
- ¹⁴ Kept by boys under superintendence of J. Ridditch.
- ¹⁵ Assisted by J. Ridditch.
- ¹⁶ Extract from log.
- ¹⁷ Extract from log.

APPENDIX No. IV.

CONTENTS of the PRINCIPAL PUBLICATIONS issued.

Continued from Report for 1874.

Official No.

19. QUARTERLY WEATHER REPORT for 1873. 4to.

This contains the usual continuous traces of the self-recording Instruments at the seven British and Irish Observatories, with a chronicle of the weather. It also contains tables showing the Monthly Rainfall at 48 stations, and the following Appendices:—I. Mean Monthly Results from the continuous Records, and Five-day Means of the same, in both English and French measures. II. Diagram of the Rainfall of London District, being a discussion by Mr. G. Dines, for the 60 years 1813–72. III. Returns from certain stations in the United Kingdom, furnished by volunteer observers, on the forms proposed by the Permanent Committee of the Vienna Congress.

20. CHARTS of METEOROLOGICAL DATA for SQUARE 3, Lat. 0–10° N., Long. 20–30° W.; and REMARKS to accompany the MONTHLY CHARTS. 1874. Folio and Quarto.

The Charts show the best routes across the Equator for each month. About 75,000 Observations were discussed in this Investigation, and the Remarks extend to 319 pp. 4to., and contain, in addition to the Data given on the Charts, Extracts relating to Currents, Clouds, Sea Temperature, Specific Gravity, Wind, Weather, Natural History, &c. In an Appendix is given a Discussion of Four-hourly Means of Barometer and Air and Sea Temperature, for each month and for the year, in the Northern and Southern Halves of the Square, and from these have been calculated the Constants in the Periodical Expression for the Diurnal Variations, and therefrom the most probable Values for each hour of the day, &c. &c.

21. REPORT of the PROCEEDINGS of the METEOROLOGICAL CONGRESS at VIENNA. 1874. 8vo., pp. 97.

This Congress was held at Vienna in the year 1873, and was attended by 32 delegates from various countries. The Report contains Protocols and Appendices referring to the various meetings. The matters treated by the Congress were subdivided into—1° Instrumental. 2° Reduction of Observations. 3° Weather Telegrams. 4° Maritime Meteorology. 5° Organisation. 6° Publication of Observations, &c. The Supplement contains several valuable contributions, among which may specially be mentioned Papers on Determination of Air Temperature; on a Simple Wind Gauge; on Exposure of Thermometers; Observations of Humidity, &c.

23. REPORT of the PROCEEDINGS of the CONFERENCE for MARITIME METEOROLOGY. 1875. 8vo., pp. 61.

This Conference was held in London in 1874, and was attended by 24 gentlemen representing every maritime country of importance except the United States and Sweden. The Report contains a series of Resolutions drawn up for the purpose of obtaining uniformity in Observations made at Sea, and proposed new Instructions for the Guidance of English Captains and Observers. It also contains contributions from several gentlemen unable to attend the Conference.

24. INSTRUCTIONS in the USE of METEOROLOGICAL INSTRUMENTS. In the press.

APPENDIX V.

INSTRUMENTS supplied, &c. to the Royal Navy.

Per Account.	Baro- meters.	Ane- roids.	Thermometers.			Hydro- meters.
			Ordinary.	Max.	Min.	
January 1st, 1874, afloat - - -	179	391	880	31	56	154
Issued in 1874 - - -	67	93	358	36	39	38
	246	484	1,238	67	95	192
Returned in 1874 - - -	55	93	277	31	31	45
January 1st, 1875, afloat - - -	191	391	961	36	64	147

INSTRUMENTS supplied, &c. for use at Naval Stations.

January 1st, 1874, in use - - -	45	75	64	13	12	10
Issued in 1874 - - -	18	22	66	20	21	18
	63	97	130	33	33	28
Returned in 1874 - - -	6	4	17	3	6	—
January 1st, 1875, in use - - -	57	93	113	30	27	28

DISPOSITION OF ADMIRALTY INSTRUMENTS on January 1st, 1875.

Afloat in Royal Navy - - -	191	391	961	36	64	147
In use at stations - - -	57	93	113	30	27	28
In store at M.O. - - -	125	69	78	30	26	67
" Chatham - - -	1	11	18	2	2	16
" Sheerness - - -	7	8	20	3	4	19
" Portsmouth - - -	6	6	31	8	9	26
" Devonport - - -	3	5	6	3	3	16
" Queenstown - - -	1	3	4	1	1	8
" Gibraltar - - -	4	5	—	—	—	4
" Malta - - -	3	5	12	—	—	28
" Halifax - - -	3	5	5	5	6	13
" Bermuda - - -	6	9	12	3	3	16
" Jamaica - - -	4	6	19	3	3	8
" Cape of Good Hope - - -	1	10	29	—	—	31
" Trincomalee - - -	3	2	12	—	—	—
" Hong Kong - - -	10	17	47	3	5	21
" Coquimbo - - -	2	—	1	1	—	23
" Sydney - - -	1	—	—	—	—	—
Under repair - - -	11	—	1	1	1	—
Total, January 1st 1875 - - -	439	645	1,369	129	154	471
Destroyed and lost during 1875 - - -	1	29	283	28	18	14

APPENDIX VI.

INSTRUMENTS, &c. supplied to Mercantile Marine.

Per Account.	Baro- meters.	Com- passes.	Thermometers.			Hydro- meters.
			Ordinary.	Max.	Min.	
January 1st, 1874, afloat -	82	—	510	—	—	314
Issued in 1874 -	67	1	390	—	—	230
Returned in 1874 -	149	—	900	—	—	544
	66	—	417	—	—	231
January 1st, 1875, afloat -	83	1	483	—	—	313

INSTRUMENTS at Stations, viz., Telegraph Offices, Observatories,
Navigation Schools, Lightships, &c.

January 1st, 1874, in use	100	3	211	49	57	55
Issued in 1874 -	7	—	70	15	16	—
Returned in 1874 -	107	3	281	64	73	55
	9	—	28	15	19	1
January 1st, 1875, in use	98	3	253	49	54	54

DISPOSITION of Board of Trade Instruments, on Jan. 1st, 1875.

In merchant ships -	83	1	483	—	—	313
In use at stations -	98	3	253	49	54	54
In store at M.O. -	60	45	301	8	6	87
At Liverpool agency -	5	8	29	—	—	19
„ Aberdeen „ -	5	—	37	—	—	20
„ Glasgow „ -	1	—	6	—	—	4
„ Dundee „ -	—	—	4	—	—	3
„ Hull „ -	—	—	—	—	—	—
Under repair -	3	—	5	1	1	—
Total, Jan. 1st, 1875	255	57	1,118	58	61	500
Lost, &c. during 1874	30	—	332	36	39	52

APPENDIX VII.

LIST of STATIONS reporting Meteorological Observations by Telegraph to the Office, with the Observers.

Sumburgh Head	-	W. Lawrence	-	-	-	Schoolmaster.
Stornoway	-	J. Smith	-	-	-	Gardener.
*Thurso	-	J. Trotter	-	-	-	_____
Wick	-	J. Sinclair	-	-	-	Watchmaker.
Nairn	-	W. D. Penny	-	-	-	Schoolmaster.
Aberdeen	-	J. McCormack	-	-	-	Telegraph Clerk.
Leith	-	J. Turnbull	-	-	-	Do.
Shields	-	J. Irvine	-	-	-	Do.
*Scarborough	-	F. Shaw, F.M.S.	-	-	-	Do.
York	-	C. Wakefield	-	-	-	Curator of Museum.
Nottingham	-	E. J. Lowe, F.R.S.	-	-	-	Highfield Ho. Observatory
Ardrossan	-	W. McNeil	-	-	-	Telegraph Clerk.
*Greencastle(Moville)	-	J. McGladery	-	-	-	Do.
Donaghadee	-	J. MacGowan, jr.	-	-	-	Do.
Kingstown	-	G. Mitchell	-	-	-	Keeper of Sailor's Home.
*Holyhead	-	J. Tilston	-	-	-	Do.
Liverpool	-	J. Hartnup, junr.	-	-	-	Bidston Observatory.
*Valencia	-	E. O'Sullivan	-	-	-	Telegraph Clerk.
Roche's Point	-	W. Kennedy	-	-	-	Do.
Pembroke	-	J. C. Walker	-	-	-	Do.
Portishead	-	W. Sandford	-	-	-	Station master.
*Scilly	-	W. Thomas	-	-	-	Signalman.
Plymouth	-	J. Merrifield, LL.D., F.R.A.S.	-	-	-	Teacher of Navigation.
Hurst Castle	-	R. T. Jobbins	-	-	-	Telegraph Clerk.
Dover	-	J. Costello	-	-	-	Telegraph Clerk.
*London	-	F. Gaster, F.M.S.	-	-	-	_____
Oxford	-	J. Lucas	-	-	-	Radcliffe Observatory.
Cambridge	-	H. Todd	-	-	-	Observatory.
Yarmouth	-	G. T. Watson	-	-	-	Secretary, Sailor's Home.

Summary :

England and Wales	-	-	-	16
Scotland	-	-	-	8
Ireland	-	-	-	5

Those marked with an asterisk, report twice daily. The office also receives daily reports from 22 places on the Continent.

APPENDIX VIII.

LIST of PERSONS, PLACES, &c. to which the Daily Weather Report has been supplied, free of cost, to 31st December.

Newspapers :

Daily News.
 Echo.
 Express.
 Globe.
 Hour.
 Lloyds' Shipping List.
 Mark Lane Express.
 Mechanics' Magazine.
 Morning Advertiser.
 Observer.
 Pall Mall Gazette.
 Shipping and Mercantile Gazette (with special daily chart).
 Standard (Morning and Evening).
 Times (1st and 2nd editions).

For Exhibition at following Seaports :

Banff. Barrow-in-Furness. Belfast. Blackpool. Boscastle. Bournemouth. Broughty Ferry. Buckie. Budehaven. Carnarvon. Cowes. Cromer. Cullercoats. Deptford Yard. Dover. Exeter (2 copies). Falmouth. Great Grimsby. Hastings. Hayle.	Holyhead. Hull. Kingstown. Lancaster. Nairn. Newquay. Plymouth. „ G. W. Docks. Port Dinorwic. Porthcawl. Portland. St. Ann's Head. Scarborough. Silloth. Teignmouth. Thurso. Ventnor. Weston-super-Mare. Wick. Yarmouth.
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In exchange for Observations, &c. :

Aird, G. H., Seaham.
 Barnes, R. H.
 Barnstaple Meteorological Committee.
 Cambridge Observatory.
 Clouston, Rev. C., Sandwick, Orkney.

In exchange for Observations, &c.—cont. :

Cooper, Col., F.R.A.S., Markree, nr. Sligo.
 Cooper, W. F., F.M.S., Sheffield.
 Crossley, L. J., Halifax.
 Curtis, Prof. A. H., Galway.
 Durham University Observatory.
 Fernley Observatory, Southport.
 Greenwich Observatory.
 Griffith, Rev. C., F.M.S., Strathfield Turgiss.
 Hills, Staff Comr., Liverpool.
 Hoskins, Dr. S. E., F.R.S., Guernsey.
 Jersey, Submarine Telegraph Company.
 Jobbins, R. T., Hurst Castle.
 Jones, G. J., Lymington.
 Kingston, G. T., M.A., Toronto.
 Liverpool Observatory.
 Lowe, E. J., F.R.S., Nottingham.
 Mackay, Rev. W. P., D.D., Hull.
 Malleson, Rev. F., Broughton-in-Furness.
 Miller, S. H., F.R.A.S., Wisbech.
 Moore, Dr. J. W., Dublin.
 Morris, E. E., Bedford.
 Moyle, M. P., F.R.C.S., Helston.
 Murray, A. E., F.M.S., Hastings.
 Northumberland, Duke of, Alnwick.
 Pim, Captain, Bedford, R.N., M.P., Editor of "The Navy."
 Prince, C. L., F.R.A.S., Tunbridge Wells.
 Quinton, J. Jr., Norwich.
 Radcliffe Observatory, Oxford.
 Richards, W. H., Penzance.
 Rosse, Earl of, F.R.S., Parsonstown.
 Royal Horticultural Society.
 Royal Indian C.E. College, Staines.
 Rugby Natural History Society.
 Sawyer, F. E., F.M.S., Brighton.
 Stewart, Dr. Balfour, F.R.S., Manchester.
 Stow, Rev. F. W., F.M.S., Aysgarth, Yorkshire.
 Sutherland, A., Carrickfergus.
 Style, Rev. G. J., Giggleswick, near Settle.
 Walker, J. C., St. Ann's Head.
 Whitehouse, W. O., F.M.S., Hampstead.
 Whitty, Rev. S., Oscott.
 Woollett, C., Acrise.
 Yorkshire Philosophical Society.

Government Offices, Societies, &c. :

The Queen.
 The Principal Government Offices : 50 copies.
 "Achilles," H.M.S., Portland.
 Association of Underwriters, Liverpool.
 Do. Lloyd's.
 "Britannia," H.M.S., Dartmouth.
 British Museum.
 Calcutta, Meteorological Committee.
 Devonport Dockyard, 3 copies.
 " Commander-in-Chief.
 Greenwich, R.N. College.

Government Offices, Societies, &c.—cont. :

Ireland, Lord Lieutenant.
„ Geological Survey.
Meteorological Society, London.
Patent Office.
Portsmouth, Commander-in-Chief.
Reuter's Telegram Company.
Royal Artillery Institution.
Royal Military Academy.
Royal Society.
Royal United Service Institution.
Scottish Meteorological Society.
Sheerness Dockyard.
“ Squirrel ” H.M.S., Devonport.
Staff College.
United Service Institution.

Foreign Places :

Christiania, Meteorological Institute.
Constantinople, Imperial Meteorological Observatory.
Copenhagen, Meteorological Institute.
Emden, Dr. Prestel.
Hamburg, German Ocean Observatory.
Lisbon, Observatory.
Madrid, Royal Observatory.
Paris, Meteorological Observatory, Montsouris.
„ Meteorological Society.
„ Ministry of Marine.
„ Observatory.
„ M. Harold Tarry.
Rome, Ministry of Agriculture.
St. Petersburg, Central Physical Observatory.
Stockholm, Meteorological Institute.
Upsala, University Observatory.
Utrecht, Royal Meteorological Institute.
Vienna, Imperial Meteorological Institute.
Washington, Smithsonian Institution.
„ United States Naval Observatory.
„ Chief Signal Officer, War Office.

APPENDIX IX.

TELEGRAPHIC WEATHER INTELLIGENCE.

The following stations, having been approved by the Board of Trade, are supplied with telegraphic information of storms free of expense, and “ drum ” and “ cone ” signal shapes have been furnished to most of them, all further expenses attendant on the maintenance and repair of

the apparatus being borne locally. The stations are situated, 79 in England and Wales, 32 in Scotland, 13 in Ireland, 3 in the Isle of Man, and 3 in the Channel Islands.

NORTH.	WEST.	SOUTH.	EAST.
SCOTLAND. EAST COAST.	ENGLAND, N.W.	ENGLAND, S.W.	ENGLAND, E.
Kirkwall.	Silloth.	Ifracombe.	Tynemouth.
Inverness.	Maryport.	Barnstaple.	S. Shields.
Nairn.	Workington.	Port Isaac.	Sunderland.
Burghead.	Whitehaven.	Boscastle.	Middlesborough.
Lossiemouth.	Ramsey.	Newquay.	Redcar.
Buckie.	Douglas.	Hayle.	Whitby.
Portsoy.	Castletown.	Pendennis.	Filey.
Banff.	Barrow.	Scilly.	Withernsea.
Fraserburgh.	Morecambe.	Penzance.	Hull.
Peterhead.	Fleetwood.	Falmouth.	Goole.
Aberdeen.	Blackpool.	Plymouth, four	Grimsby.
Stonehaven.	Lytham.	stations.	Boston.
Montrose.	Runcorn.	Teignmouth.	Sutton Bridge.
Broughty Ferry.	Southport.	Exeter.	Lynn.
St. Andrews.	Liverpool.	Exmouth.	Cromer.
Dundee.	Queensferry.		
Anstruther.	Hawarden.	ENGLAND, S.	ENGLAND, S.E.
St. Monance.	Mostyn.	Guernsey.	Yarmouth.
Burntisland.		St. Helier, Jersey.	Southwold.
Alloa.	ENGLAND, W.	Gorey, Jersey.	Ipswich.
Grangemouth.	Bangor	Weymouth.	Harwich.
Bo'ness.	Port Penrhyn.	Poole.	Chatham.
Granton.	Holyhead.	Cowes.	Sheerness.
Leith.	Carnarvon.	Ventnor.	Faversham.
Fisherrow.	Port Dinorwic.	Portsmouth.	
Dunbar.	Aberystwith.	Littlehampton.	
Eyemouth.	Milford.	Brighton.	
	Pembrey.	Newhaven.	
	Llanelly.	Hastings.	
	Swansea.	Rye.	
	Briton Ferry.	Dover.	
	Porthcawl.		
	Penarth.		
	Cardiff.		
	Newport.		
	Weston-super-		
	Mare.		
FIRTH OF CLYDE.	Burnham.		
Glasgow.			
Greenock.	IRELAND, E.		
Rothesay.	Belfast.		
Campbeltown.	Howth.		
Girvan.	Kingstown.		
	IRELAND, S. and W.		
	New Ross.		
	Dunmore, East.		
	Dungarvan.		
	Youghal.		
	Queenstown.		
	Passage.		
	Cork.		
	Tralee.		
	Limerick.		
	Galway.		

Circular No. 717.

TELEGRAPHIC WEATHER INTELLIGENCE.

Board of Trade, February 14th, 1874.

THE Board of Trade have been informed by the Meteorological Committee that they are now prepared to re-introduce the use of Admiral FitzRoy's signals (cones and drum) with slightly modified significations, and that the change will take effect on and after 15th March 1874.

The signals to be used will consist of:—

- 1°. Cone, point downwards for Southerly gales ; S.E. round by S. to N.W.
- 2°. Cone, point upwards for Northerly gales ; N.W. round by N. to S.E.
- 3°. Drum, *with cone*, to indicate the probable approach of a *very heavy gale* from the direction indicated by the cone.

The drum will not be used without the cone.

The signals are to be kept hoisted *during the daylight only*, until 48 hours have elapsed from the time *the telegram was despatched*, unless countermanded. At night, lanterns may be used wherever the local authorities deem it desirable to do so, as pointed out in the explanatory pamphlet* sent herewith, copies of which are supplied for gratuitous distribution.

It will be seen from the pamphlet in question that the meaning of the signals is that an atmospherical disturbance exists (which will be explained in the telegram), and will probably, but not *necessarily*, cause a gale at the place warned, *from the direction* indicated by the signal.

The Meteorological Office will supply the canvas shapes and lanterns to such places as require them, on loan, but in all cases the local authorities must undertake the charges incidental to the hoisting of the signal, such as flagstaff and gear, oil, &c., and also to the keeping of the apparatus in repair, painting, &c., as directed by the Circular No. 278, dated 30th November 1867.

THOMAS GRAY.

APPENDIX X.

LIST of STATIONS from which DAILY SYNCHRONOUS OBSERVATIONS (at Oh. 45m. p.m. G. M. T.) have been received.

Stations.	Observers.	Remarks.
ENGLAND AND WALES.		
Barnstaple - - -	W. Knill, for T. Mackrell -	Ceased 31st May, 1874.
Battersea, St. John's Col.	Rev. J. Faunthorpe -	„ 15th June, 1874.
Bradford - - -	J. McLandsborough	—
Bywell - - -	J. Dawson - - -	Ceased 31st July, 1874.

* The "explanatory pamphlet" referred to is a circular entitled "Telegraphic Weather Intelligence," printed in large type on four pages, so as to be posted up on a board.

Stations.	Observers.	Remarks.
Cambridge - -	H. Todd.	—
Cardington - -	J. McLaren.	—
Carlisle - -	J. Beil, for J. Cartmell.	—
Chatham, School of Military Engineering - -	Quarter-master Sergeant Conroy - -	Commenced in Oct. 1874.
Dartmoor - -	R. E. Power, F.R.C.S.	—
Dover - -	J. Costello.	—
Durham Observatory - -	J. Plummer, M.A.	—
Eccles - -	T. Mackereth.	—
Falmouth Observatory - -	The Staff.	—
Gloucester County Asylum - -	E. Toller.	—
Greenwich Observatory - -	The Staff, for Sir G.B. Airy	—
Guernsey - -	Dr. Hoskins, F.R.S.	—
Halifax, Moorside - -	L. J. Crossley.	—
Helston - -	Dr. Moyle.	—
Holyhead - -	J. Tilston.	—
Jersey (St. Helier) - -	A. P. Amy.	—
Kew Observatory - -	The Staff.	—
Lampeter - -	E. James - -	Ceased at end of Jan. 1874.
Leicester (Museum) - -	W. J. Harrison.	—
Liverpool Observatory (Bidston). - -	J. Hartnup, Jun.	—
Llandudno - -	J. Nicol, M.D.	—
Marlborough College - -	Rev. T. A. Preston, M.A.	Ceased 15th Dec., 1874.
Nottingham - -	E. J. Lowe, F.R.S.	—
Osborne - -	J. R. Mann - -	Ceased 31st Jan. 1875.
Oscott (St. Mary's Col.) - -	Rev. S. Whitty.	—
Oxford, Radcliffe Obs. - -	J. Lucas, for Rev. R. Main, F.R.S.	—
Plymouth - -	J. Merrifield, L.L.D., F.R.A.S.	—
Portishead - -	W. Sandford - -	Ceased 31st December 1874.
Pwllheli (Coehy foel) - -	W. Jones - -	Ceased 31st Jan., 1874.
Scarborough - -	F. Shaw, F.M.S.	—
Sheffield - -	W. F. Cooper, F.M.S.	—
Shields (North) - -	J. Irvine.	—
Sidmouth - -	J. Ingleby Mackenzie - -	Ceased 31st May, 1874.
Silloth - -	Rev. F. Redford, M.A., F.R.S.E.	—
Somerleyton - -	Rev. J. Steward, M.A.	—
St. Ann's Head (Milford Haven) - -	J. C. Walker.	—
Stonyhurst Observatory - -	The Staff.	—
Strathfield Turgiss - -	Rev. C. H. Griffith, M.A.	—
Streatley - -	Rev. J. Slatter.	—
Taunton - -	Rev. W. Tuckwell - -	Ceased 30th April, 1874.
Truro (Royal Institution) - -	W. Newcombe.	—
Wisbeach - -	S. H. Miller, F.M.S. - -	Ceased 31st Jan., 1875.
Worthing - -	W. J. Harris, F.M.S.	—
Yarmouth (Norfolk) - -	G. T. Watson.	—
York (Museum) - -	C. Wakefield - -	Ceased 30th Sept., 1874.
SCOTLAND.		
Aberdeen Observatory - -	W. Boswell.	—
Annanhill - -	W. H. Dunlop - -	Ceased 16th Jan., 1875.
Ardrossan - -	W. McNeil.	—
Glasgow Observatory - -	J. Gray.	—
Nairn - -	W. D. Penny.	—
Orkneys, Sandwick - -	Rev. C. Clouston, L.L.D.	—
Stornoway - -	J. Smith.	—
Sumburgh Head - -	W. Lawrence.	—
Thurso - -	J. Trotter.	—
Wick - -	J. Sinclair - -	Ceased 15th March, 1874.

Stations.	Observers.	Remarks.
IRELAND.		
Armagh Observatory	S. Call for Dr. Robinson.	—
Banbridge	J. Smyth, M.A., C.E.	Ceased 31st August, 1874.
Donaghadee	J. McGowan.	—
Dublin	J. W. Moore, M.D.	Ceased 31st Dec., 1874.
Galway, Queen's College	B. G. Clare, for Professor Curtis.	—
Kingstown	G. Mitchell.	—
Markree Castle	R. Smith (for Col. Cooper)	Ceased 31st Jan., 1874.
Moville	J. McGladery	„ 31st Oct., 1874.
Parsonstown	R. Copeland and J. Dreyer for Lord Rosse.	—
Roche's Point	W. Kennedy.	—
Valencia Observatory	The Staff.	—

BRITISH COLONIES, POSSESSIONS, &C.

Barbadoes*	T. H. Hunt, A.H.C.†	Commenced July 1874. Barometer broken at end of Sept. 1874. No observations since.
Bermuda	Sergeant J. Freeman, A.H.C.	Commenced July 1874. Barometer broken <i>very</i> soon after. No observations since.
Cape of Good Hope	Sergt. D. E. Hunt, A.H.C.	Commenced July 1874.
Colombo	Sergeant. W. F. Hopkins, A.H.C.	„ August, 1874.
Gibraltar	S. Sergeant J. Brewster, A.H.C.	„ May 16th, 1874.
Halifax, N.S.	Corporal J. Thompson, A.H.C.	„ June 1st., 1874.
Malta	Priv. E. Dowling, A.H.C.	„ „
Nassau (Bahamas)	Surgeon-Maj. J. Jamieson, M.D.	„ August, 1874.
Natal	Priv. G. Salmon, A.H.C.	„ October 1, 1874.
Scutari, British Cemetery	Serg. W. H. Lyne, R.E.	„ March 1, 1874.
Sierra Leone	Surgeon A. Johnston.	—

SUMMARY.

—	No. which commenced.	No. ceased, to May 1875.
England and Wales	49	12
Scotland	10	2
Ireland	11	4
Colonies and British Possessions	11	0*
Total	81	18

* It is hoped that when the barometers at Barbadoes and Bermuda are repaired, the returns will again be sent in.

† A.H.C.—Army Hospital Corps.

APPENDIX XI.

FISHERY BAROMETERS.

LIST of PLACES supplied with FISHERY BAROMETERS.

Those supplied during the years 1867-74 are distinguished by an asterisk.

Shetland Isles.—Sandsair, Lerwick.

Orkney Isles.—Burray. Kirkwall.*

Scotland, east coast.—Stroma, Staxigoe, Wick, Sarclet, Lybster, Dunbeath,* Portmahomack, Cromarty, Avoch, Nairn, Burghead, Portessie, Port Knockie, Portsoy,* Whitehills, Gardenstown, Rosehearty, Pitullie, Inverallochy,* Findon, Portlethen, Stonehaven,* Arbroath, Broughty Ferry, St. Andrews, Crail, Cellardyke, St. Monance,* Burntisland, Newhaven.

England, east coast.—Berwick, Beadnell, North Shields, South Shields, West Hartlepool, Staithes, Scarborough, Filey, Flamborough, Bridlington Quay, Withernsea, Hull, Lynn, Wells, Gorleston, Harwich,* Brightlingsea,* Wivenhoe,* Margate, Deal, Kingsdown, Dover.

England, south coast.—Bognor,* Portsea, St. Helens and Ventnor*(2) (Isle of Wight), Gorey (Jersey), Poole, Weymouth, Portland, Budleigh-Salterton, Cawsand, Mevagissey, Gorranhaven, Devoran, Penryn, Falmouth, Newlyn, Mousehole.

England, south-west coast.—St. Ives, Hayle, Port Isaac, Boscastle,* Fremington, Burnham, Highbridge.

Wales.—Briton Ferry,* Swansea, Angle,* Milford, Abersoch.*

England, north-west coast.—Fleetwood, Morecambe, Maryport.

Isle of Man.—Port St. Mary,* Peel.

Scotland, south-west coast.—Port Patrick,* Stranraer.

Ireland, east coast.—Cushendall,* Belfast, Bangor, Strangford, Ardglass, Carlingford,* Greenore,* Dundalk, Malahide,* Howth, Kingstown, (2).

Ireland, south coast.—Dungarvan, Kinsale,* Crookhaven.*

Ireland, west coast.—Valencia, Dingle, Tralee, Ballina,* Tribane,* Killybegs,* Teelin,* Burton Port, Bunbeg.

Ireland, north coast.—Dunfanaghy, Rathmullen, Buncrana,* Greencastle,* Portrush.*

Scotland, west coast.—Campbeltown,* Portree (Isle of Skye) Plockton.

Hebrides, Stornoway, Cromore, Babyle, Obb, Ness.

SUMMARY of INSTRUMENTS on SERVICE.

England and Wales ..	-	-	-	-	57
Scotland ..	-	-	-	-	44
Ireland ..	-	-	-	-	28

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APPENDIX XII.

DONATIONS RECEIVED DURING THE YEAR 1874.

Presented by Societies, Institutions, &c.

Algiers - -	Observatoire National -	Panorama Météorologique du Climat d'Alger. Observations météorologiques (33 tables and one diagram), Jan. 1872. Perturbation Atmosphérique (seven tables and one diagram), 15 - 17 March 1873. Rainfall observations, 1862 - 74. Rain and evaporation, 1859 - 67. Résumé des observations météorologiques, 1873, July - November. By M. Bulard.
Berlin - -	K. Hydrographisches Bureau.	Hydrographische Mittheilungen. II. Jahrgang. Nos. 1-25.
	” ”	Nachrichten für Seefahrer, V. Jahrgang. Nos. 1-51.
	” ”	Bericht über Wetter-Telegraphie und Sturm-Warnungen. Die Grundlagen der gaussischen Theorie und die Erscheinungen des Erdmagnetismus im Jahre, 1829, von A. Erman and H. Petersen. By Dr. G. Neumayer.
	K. Statistisches Bureau -	Preussische Statistik XXVII. (Monthly means of Pressure, Temperature, &c. for 1872.) By H. W. Dove, F.R.S.
Birmingham -	Free Libraries - - -	Catalogue of books. History of the Birmingham free libraries.
Bombay - -	Colaba Observatory -	Report for year ending 30th June 1874. By C. Chambers, F.R.S.
Brussels -	Observatoire Royal -	Annales, Tome XXII.
	” -	Observations des Phénomènes Périodiques, 1872. Annales Météorologiques, 1872 - 3. L'Aurore Boréale du 4 Fevrier 1874. By MM. A. & E. Quetelet.
Calcutta - -	Meteorological Office -	Meteorological Report for 1873.
	” -	Abstract of Observations, Oct. 1873 to Aug. 1874.
	” -	Weekly Report of Rainfall, Decr. 1873 to Octr. 1874.
	” -	Telegraphic Reports, Decr. 1873 to Octr. 1874.
	” -	The Winds of Northern India. On the Climate of Bengal. By H. F. Blanford.
	Surveyor General's Office	Abstracts of the Results of Hourly Observations, Oct. 1873 to Sept. 1874. By Col. Thuillier, F.R.S.
Carlsruhe -	Meteorologische Central-Station.	Beobachtungen der badischen Stationen, Oct. 1873 to Sept. 1874. Berichte, 1872-73. By Dr. F. Sohncke.

Christiania	-	Norske Meteorologiske Institut.	Meteorologiske Jagttagelser i Norge, 1873, pp. 121-156.
		" "	Meteorologisk Aarbog, 1873, pp. 1-8.
		" "	Praktisk Veiledning til Benyttelser af de Met. Telegrammer. Bidrag til ost-Ishavets Klimatologie og Meteorologie. Luftens Temperatur i og udenfor Christiania, &c. Om visse Virkninger af Stromme paa Vandets og Luftens Temperatur. Alberts Expedition til Spids-bergen (Novr. and Decr. 1873.) By Professor H. Mohn, and by the University.
Colombo (Ceylon).		Surveyor General's Office	Monthly Results of Meteorological Observations, Novr. 1873 to Sepr. 1874. Rainfall returns, 1870 to 1873. Results, 1870 to 1873. By Lt.-Col. A. B. Fyers, R.E.
Copenhagen	-	Danske Meteorologiske Institut.	Observations at Danish Stations, pp. 85-108.
		" "	Bulletin Météorologique du Nord, for 1874. Weather charts from 1st Feb. 1874. By Capt. N. Hoffmeyer.
		K. Danske Videnskabernes Selskab.	Forhandlinger, Nos. 1-3, 1873 and No. 1, 1874. Tables Météorologiques 1866-73, by Prof. C. Holten. By Prof. J. Steenstrup.
Cracow	-	K. K. Sternwarte	Meteorologische Beobachtungen, November 1873 to October 1874.
		"	Materyaly do Klimatografii Galicyi. Rok, 1873. By Dr. F. Karlinski.
Dublin	-	Inspector of Irish Fisheries	Reports, 1871-2.
Edinburgh	-	Royal Society - Scottish Meteorological Society.	Proceedings, Session 1872-3. Journal, Nos. 36-42.
Falmouth	-	R. Cornwall Polytechnic Society.	Report for 1873.
Fiume	-	I. R. Academia di Marina	Meteorological Observations, Oct. 1873 to August 1874. Results 1873.
Frankfort o M.		Physikalisches Verein	Jahresbericht, 1853-73. By Dr. J. Wallich.
Geneva	-	Bibliothèque Universelle	Archives des Sciences, Vols. XLIX.—LI.
		Société Géographique	Le Globe, Vol. XII., Nos. 4-6.
Greenwich	-	Royal Observatory	Report of the Astronomer Royal to the Board of Visitors, 1874.
		"	Weekly Returns to Registrar-General, Vol. XXXV.
		"	Daily Weather Reports for the year. By Sir G. B. Airy, K.C.B., F.R.S.
Gorizia	-	-	Osservazioni delle Stazioni Meteorologica, July 1873 to April 1874, except January and February.
Hamburg	-	Deutsche Seewarte	Jahresbericht, 1873. "Hansa" for 1874. Wetterbericht for 1874.
		" "	Deutsche Nordpolarfahrt, Pt. IV.
		" "	Die Zweite deutsche Nordpolarfahrt in den Jahren, 1869-70. Vols. I. and II. By W. H. v. Freeden, and Captain C. Koldewey.

Havana	-	R. Colegio de Belen	-	Observaciones magneticas y meteorologicas, 1872 By R. P. A. Viñes.
Helsingfors	-	Société des Sciences de Finlande.	-	Klimatologiska Jakttagelser i Finland, Vols I. and II. Forhandlingar, Vols. XIV - XVI. Observations Magnétiques, Vols. I.-IV. Observations Météorologiques, Vols. I. - IV.
Hobarton	-	R. Society of Tasmania	-	By M. L. Lindelöf. Monthly Notices of Papers and Proceedings, 1870 and 1872. By F. Abbott, F.R.A.S.
Hong Kong	-	Government Civil Hospital	-	Meteorological Observations made at Victoria, Oct. 1873 to Sept. 1874.
		Harbour Office	- -	Meteorological Observations taken at Praya West and Victoria Peak, Oct. 1873 to May 1874.
		"	- -	China Coast Meteorological Register, Dec. 1873 to Nov. 1874.
Kew	- -	Observatory	- - -	Report of the Kew Committee, November 1873 to October 1874.
Kiel	- -	Ministerial Commission zur Untersuchung der deutschen Meere.	- -	Untersuchungen über physikalische Verhältnisse des westlichen Theiles der Ostsee. Tafeln zur Berechnung der Beobachtungen an den Küsten. Ergebnisse der Beobachtungsstationen an den deutschen Küsten. 1873. Jan. - Dec. 1874. Jan. - Feby. By Drs. Meyer and Karsten.
Kremsmünster-	-	Sternwarte	- - -	Resultate aus den im Jahre 1870 angestellten meteor. Beobachtungen. By Dr. A. Reslhuber.
Lahore	- -	Meteorological Department for the Punjab.	- -	Meteorological Report for 1873. By Dr. A. Neil.
Leipzig	-	Sternwarte	- -	Übersicht der Resultate aus den meteor. Beobachtungen angestellt auf den K. sächsischen Stationen. September 1873 to September 1874. Meteorologische Beobachtungen angestellt auf der Leipziger Universitäts Sternwarte, 1873. By Dr. C. Bruhns.
London	- -	Admiralty	- - -	Tide Tables for 1875.
		"	- - -	Nautical Almanac, 1873-7.
		"	- - -	Catalogue of Charts, &c.
		"	- - -	Hydrographic Notices of H.M.S. "Challenger" &c.
		"	- - -	Index to Nautical Magazine, 1832-70. By the Hydrographer.
		Army Medical Department.	- - -	Report for the year 1872.
		Board of Trade	- -	Report of Wrecks, Casualties, &c. Jan.-June, 1873.
		British Association	- -	Report for 1873.
		Colonial Office	- -	Returns from various Colonies and Settlements.
		India Office	- - -	Returns from various Observers in India.
		"	- - -	Report of the Great Trigonometrical Survey of India, 1872-3. By Col. J. T. Walker, R.E., F.R.S.

London - -	India Office - - -	Catalogue of Maps, &c. of India and other parts of Asia.
	London Institution - -	Journal, Vol. IV., Nos. 23-24.
	Medical Department of the Navy.	Reports, 1872-3.
	Meteorological Society -	Quarterly Journal, Vol. II., Parts 9-12.
	Royal Astronomical Society	Monthly Notices, Vol. XXXIV., Nos. 3-9. Vol. XXXV., No. 1.
	Royal Geographical Society	Proceedings, Vol. XVIII., Nos. 1-5.
	" -	Journal, Vol. XLIII.
	Royal Horticultural Society	Journal, Vol. IV., Nos. 14-15.
	Royal Institution of Great Britain.	Proceedings, Vol. VII., Nos. 59-61.
	Royal National Lifeboat Institution.	Journal, Nos. 91-4.
	Royal Society - - -	Proceedings, Vol. XXII., Nos. 149-155.
	" - - -	" XXIII., No. 126.
	Royal United Service Institution.	Journal, Vol. XVII., No. 75 and App. XVIII., Nos. 76-78.
	" - - -	Lectures addressed to Officers of Volunteer Corps.
Society of Arts - - -	Journal, Vol. XXII., Nos. 1, 104-1, 153.	
Standards' Department -	Report, 1873-4, &c.	
Trinity House - - -	Report on Fog Signals.	
Lyons - - -	Commission Météorologique.	Reports, 1871-2. By M. E. Lafon.
Madrid - - -	R. Observatorio - - -	Daily Weather Reports 1874. By Sr. Aguilar.
Manchester - -	Literary and Philosophical Society.	Proceedings, Vols. VIII.-X. Vol. XIII. Nos. 6-12. " XIV. " 1-5.
	" - - -	Index to Vol. XII. Memoirs, Vol. IV.
	The Owens College - - -	Essays and Addresses by Professors and Lecturers.
Mauritius - -	Meteorological Society - -	On a Periodicity of Cyclones and Rain-fall in connexion with the Sunspot Periodicity. By C. Meldrum, M.A.
Melbourne - -	Flagstaff Observatory - -	Monthly Record of Results of Observations in Meteorology, Terrestrial Magnetism, &c., June 1873 to July 1874.
	" - - -	Results of Observations, 1872, Vol. I. By R. J. Ellery, F.R.S.
Milan - - -	R. Observatorio - - -	Osservazioni astronomiche e fisiche sulla grande cometa del 1862. Osservazioni di stelle cadenti durante l'anno, 1872. By Sr. G. V. Schiaparelli.
Modena - - -	" - - -	Sulle variazioni non periodiche della pressione atmosferica. I venti impetuosi. Di una cronaca fiammalini. Le variazioni del vento. By Prof. D. Ragona.
Moncalieri - -	Osservatorio del R. Collegio Carlo Alberto.	Bullettino Meteorologico: Vol. VII., Nos. 5-6. " VIII., Nos. 8-12. " IX., Nos. 1-3.
	" - - -	Osservazioni meteor. fatte nelle stazioni presso le Alpi Italiane, December 1873 to November 1874. By Sr. F. Denza.
	" - - -	
Montpellier - -	Comité Météorologique de l'ouest Méditerranéen.	Bulletin du Département de l'Hérault.

Munich	-	K. Sternwarte	-	-	Meteorologische und magnetische Beobachtungen, July to December, 1873.
		„	-	-	Beilage, Nos. 17-18. By Dr. J. v. Lamont, Director.
Naples	-	Specola Reale	-	-	Osservazioni meteoriche, November 1873 to October 1874. By Sr. Brioschi.
New York	-	Central Park Observatory			Abstract of Registers from S.R. Instruments, April to November, 1874. By Prof. D. Draper.
		State Library	-	-	Report, 1872-3. Subject Index, 1872. Meteorology, 1850-63. Annual Report of Trustees, 1873.
Oxford	-	Radcliffe Observatory			Results of Meteorological Observations, 1871.
		„	-	-	Mean monthly values of the pressure and air temperatures, &c., 1828-52. Report for 1874. By Rev. R. Main, F.R.S.
Palermo	-	R. Osservatorio	-	-	Bullettino Meteorologico:— Vol. IX., Nos. 7-12. Vol. X., Nos. 1-4. By Sr. G. Cacciatore.
Paris	-	Académie des Sciences	-	-	Comptes-Rendus Hebdomadaires, Vol. LXXVIII. „ LXXIX., Nos. 1-23.
		Association Scientifique de France.			Bulletin Hebdomadaire, Nos. 324-374.
		Dépôt des Cartes et Plans			Annales Hydrographiques: Part 4 of 1873. Parts 1 and 2 of for 1874.
		„	-	-	Récherches sur les chronomètres, cah. 8 et 9.
		„	-	-	Phares des Côtes. By Captain A. Le Gras.
		Ministère de la Marine, &c.			Revue Maritime et Coloniale. Vols. XL.-XLIII.
		Observatoire de Paris	-	-	Atlas Météorologique, 1869-71. Bulletin International, 1874. By U. J. Le Verrier.
		„	„	-	Bulletin Mensuel, Nos. 24-35.
		Observatoire Météorologique de Montsouris.			Annuaire Météorologique, 1874. By M. Marié-Davy.
		„	„	-	Résumé des Observations Centralisées, 1869-72.
		Service Hydrométrique, (Seine.)			Observations sur les Cours d'Eau et de la Pluie, 1872.
		„	„	-	Observations pluviométriques, 1869-71.
		„	„	-	Feuilles, 1-7, &c. By M. E. Belgrand.
		„	„	-	
Perpignan	-	Commission Météorologique des Pyrénées Orientales.			Bulletin Météorologique, 1873.
Pesth	-	K. Ung. Anstalt für Meteorologie, &c.			Jahrbücher, 1872, II. Bd. By Dr. G. Schenzl.
Philadelphia	-	Franklin Institute	-	-	Journal, Vols. XLVII. and XLVIII.
		American Phil. Society	-	-	Proceedings, Vol. XII., No. 89. „ XIII. „ XIV., No. 92.

Pola	-	-	K.K. Hydrographisches Amt.	Meteorologische Beobachtungen, December 1873 to November 1874. Resultate, 1864-73. By Lieut. Pick.
			" "	Mittheilungen aus dem Gebiete des Seewesens. Vol. I., No. 12. Vol. II., Nos. 1-11. By M. R. Müller, Director.
Porto Rico	-		Department of Public Works.	Meteorological Observations, October 1873 to April 1874.
Prague	-	-	K.K. Sternwarte	Magnetische and Meteorologische Beobachtungen, 1872-3. Jan. - July, 1874. By Dr. C. Hornstein.
Rome	-		Ministero d' Agricoltura, &c.	Meteorologia Italiana,— 1873, pp. 141-274. 1874, pp. 1-120.
			" "	Bollettino Decadico— 1873-4, pp. 1-144.
			" "	Riassunto delle Osservazioni fatte nel settenio, 1866-72.
			Osservatorio del Collegio Romano.	Bullettino Meteorologico— Vol. XII., No. 12. Vol. XIII., Nos. 1-11.
			" "	Studii intorno ai diametri solari, &c. Studio delle burrasche del clima di Roma, by G. Lais. By Padre A. Secchi.
Roorkee	-	-	Meteorological Department of N.W. Provinces of India.	Report for 1873. By Murray Thompson, M.D.
St. Petersburg			Central Physical Observatory.	Annalen, 1872. Bulletins, 1874. Simultane Witterungs Beobachtungen, Jan. - Aug., 1874. Sturmbahnen für Europa in den Jahren, 1872-4. Über die Bestimmung des Luftdrucks. Über einen einfachen Verdünnungs-messer für Sommer und Winter. Die magnetische Declination in St. Petersburg. By J. Mielberg.
			" "	Repertorium für Meteorologie, Bd. III. Bestimmung der Anemometer Constanten. By F. Dohrandt.
			" "	Über die Abhängigkeit des klimatischen Charakters der Winde von ihrem Ursprunge. By Dr. W. Köppen. By Dr. H. Wild.
San Fernando	-	-	Observatorio de Marina	Annales, 1872-73. By Don C. Pujazon.
Singapore	-	-	Convict Jail Hospital	Meteorological Observations, November 1873 to August 1874. By H. L. Randell, M.D.
Stockholm	-	-	Meteorologiska Central-Anstalten.	Väderleks-Bulletin, July-Sept. 1874. By Dr. R. Rubenson.
			Observatoire	Ableitung der Declinationen aus den am Verticalkreise der Polkowaer Sternwarte in den Jahren 1842-49, angestellten Beobachtungen, and 7 excerpt papers. By Prof. H. Gyldén.
Stonyhurst	-	-	Observatory	Results of Magnetical and Meteorological Observations for 1873. By the Rev. S. J. Perry, S.J., F.R.S.

Stuttgart	-	Polytechnische Schule	-	Witterungsbericht für 1872. Mittlere Bewölkung zu Stuttgart, 1826-70. Übersicht über die Witterungsverhältnisse Württembergs; Aug 1873 - Apr. 1874, and year 1873. By Dr. H. Schoder.
Tiflis	-	Phys. Observatorium	-	Inhaltsverzeichniss zum Bibliotheks-Katalog. By H. Kiefer.
		" "		J. B. Biots. Tafeln zur Berechnung barometrischer Höhenmessungen. By H. Kiefer. By Dr. H. Moritz.
Toronto	-	Education Office	-	Journal of Education, Vol. XXVII.
		"	-	Annual Report of Schools, 1872. By the Rev. E. Ryerson, D.D.
		Magnetical Observatory	-	Monthly Meteorological Register, May to December 1871 and 1873.
		"	-	General Meteorological Register, 1873.
		"	-	Report of Meteorological Office, 1873. By G. T. Kingston, M.A.
Trieste	-	R. Accademia di Commercio e Nautica.		Osservazioni Meteorologiche, November 1873 to October 1874. Results for 1873. By Prof. V. Farolfi.
		" "		
Turin	-	R. Osservatorio Astronomico.		Bollettino Meteorologico ed Astronomico, 1872.
		" "		Determinazioni del diametro solare. By G. Mazzola.
		" "		Effemeridi del sole, &c. By G. Mazzola. By Sr. A. Dorna.
Upsala	-	Observatoire	-	Bulletin Météorologique Mensuel: Vol. V., Nos. 11-13. Vol. VI., Nos. 1-5. By. M. G. Svanberg.
Utrecht	-	K. Nederlandsch Meteor. Institut.		Jaarboek, 1870 and 1873.
		" "		Différences des Écartés Barométriques simultanés en Néerlande, &c. December 1865 to November 1873.
		" "		Gemiddelde Barometerstand en Stormen rond Afrika's Zuidpunt.
		" "		Sur la signification du Congrès Météor. de Vienne pour l'avenir de la Météorologie.
		" "		Telegraphic Reports for 1874. By Dr. Buys Ballot and Capt. J. E. Cornelissen.
Vienna	-	Commission für die Adria		III. Bericht, 1870-72. By Dr. H. Lorenz.
		K. K. Central Anstalt für Meteorologie, &c.		Beobachtungen, December 1873 to October 1874.
		" "	-	Jahrbücher, 1871-2.
		" "	-	Telegraphische Witterungsberichte, 1874.
		" "	-	Rapport sur les Travaux du Congrès International des Météorologistes (1873). By Dr. C. Jelinek.
		Oesterreichische Gesellschaft für Meteorologie.		Zeitschrift, Bd. IX. By Dr. J. Hann.

Washington	- Hydrographic Office	-	N.W. and W. Coasts of Spain and coast of Portugal; Madeira; the Salvages and the Canary Islands; the Azores, or Western Islands; the West Coast of Africa, Vol. I. Coast of Brazil, Vol. I. By Lieut. Comr. Gorringe.
	"	-	The Navigation of the Atlantic Ocean; Tables for finding the distance of an object by two bearings; Fourth Supplement to Papers on the Gulf Stream. By Commodore R. H. Wyman, U.S.N.
	Smithsonian Institution	-	Report for 1871-2. Miscellaneous Collection, Vols. IX. and X.; Contributions to Knowledge, Vols. XVII. and XVIII.; The Constants of Nature, Part I. By F. W. Clarke, S.B., U.S.
	"	"	- Geological Survey of Montana, Idaho, Wyoming, and Utah, 1872. By F. V. Hayden.
	"	"	- Problems of Rotary Motion. By Major Barnard, LL.D.
	"	"	- The Transatlantic Longitude. By B. A. Gould.
	"	"	- Converging series expressing the ratio between the diameter and circumference of a circle. By W. Ferrel.
	"	"	- Instructions for Observations of Thunderstorms. Directions for constructing Lightning Rods. Temperature Chart of the United States. By Prof J. Henry.
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	War Office	- -	- Monthly Weather Review, December 1873 to October 1874. Daily Weather Charts and Reports, December 1873 to October 1874. Instruction to Observer Sergeants. Report for 1873. Meteorological Record, January to September, 1874. By Brigadier-Gen. A. J. Myer, U.S.A.
Wellington, N.Z.	Observatory	- -	- Meteorological Observations at various Stations, 1873.
	"	- -	- Meteorological Observations at Wellington, January to August, 1873. By J. Hector, M.D., F.R.S.
Zürich	- Meteor. Central Anstalt der schweizerischen naturforschenden Gesellschaft.	-	Meteorologische Beobachtungen, Aug. 1873 to Oct. 1874. Ueber den täglichen Gang der Temperatur in Bern. By A. Weilenmann. By Dr. R. Wolf.

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Barnard Major, L.L.D. -	-	See Washington.
Baumhauer, E. H. v. -	-	Sur un Météorographe universel destiné aux Observatoires solitaires.
Belavenetz, Capt. R.I.N. -	-	Russian Nautical Magazine, Nos. 10–12 for 1873, Nos. 1–8 for 1874.
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Capello, Sr. -	-	Conference for Maritime Meteorology.
Carl, Dr. Ph. -	-	Repertorium für Physik. Vol. IX., No. 6., Vol. X. Nos. 1–5.
Chambers, F. -	-	The diurnal variations of the wind and barometric pressure at Bombay.
Chase, P. E. -	-	Velocity of primitive undulation. Jupiter-Cyclical rainfall.
Clarke, F. W. -	-	See Washington.
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Cundall, H, J. -	-	Abstract of Meteorological register at Charlottetown, P. Edward's Id., 1873.
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Dohrandt, F. -	-	See St. Petersburg.
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Stewart, Dr. B. F.R.S.	-	-	Preliminary experiments on a magnetized copper wire.
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Weilenmann, A.	-	-	See Zürich.
Zurcher, F.	-	-	Voyage Scientifique autour du monde de la Corvette Anglaise "Challenger," by C. Martins.

APPENDIX XIII.

LIST of PERSONS in the EMPLOYMENT of the METEOROLOGICAL COMMITTEE on December 31st, 1874, with their Occupations and Amount of Salary.

Name.	Duties.	Salary	
		Yearly.	Weekly.
		£ s. d.	£ s. d.
<i>Office.</i>			
Robert H. Scott -	Director of the office - - -	800 0 0	—
J. S. Harding, jun. -	Correspondence, Accounts, Library -	230 0 0	—
J. S. Harding, sen.	} Copying, accounts of stores, registry of documents, &c. }	—	1 18 6
T. D. Bell - - -		—	1 8 0
<i>Land Meteorology (Observatories).</i>			
R. H. Curtis - -	} Reproduction of observatory curves by pantagraphs, and preparation for publication. }	150 0 0	—
A. J. Rigby - -		—	1 18 6
C. H. Thompson -		—	1 3 0
C. Stodart - -		—	2 2 0
J. A. Curtis - -	} Discussion of returns, and com- putations. }	100 0 0	—
H. N. Cobley -		—	1 0 0
R. Sargeant -		—	1 0 0
<i>Land Meteorology (Telegraphy).</i>			
F. Gaster - - -	} Preparation of weather reports and computations. }	170 0 0	—
W. L. Dallas - -		92 0 0	—
F. Brodie - - -		78 0 0	—
G. G. Francis -		—	1 8 0
H. Chivers - - -		—	0 12 0
<i>Ocean Meteorology.</i>			
Capt. H. Toynbee -	Marine Superintendent - - - -	400 0 0	—
R. Strachan - - -	Care of instruments and reduction of meteorological returns.	240 0 0	—
C. Harding - - -	} Discussion of data and compu- tations. }	160 0 0	—
*W. G. James - -		100 0 0	—
T. E. Allen - - -		100 0 0	—
J. W. McVeagh -		—	1 3 0
*V. Sandiford -		—	1 3 0
<i>Commissionaire</i> -	Messenger - - - - -	—	1 1 0
Rev. Thos. Kerr -	Director of Valencia Observatory -	250 0 0	—

* Resigned since the 31st December, and the names of H. Harries and H. F. Green added instead.

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of the Meteorological Committee.**

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 2. Instructions for Meteorological Telegraphy. New Edit. (1875.) 6*d*.
 3. Fishery Barometer Manual. 6*d*.
 4. Charts of Surface Temperature, South Atlantic Ocean. 2*s*.6*d*.
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 6. Report for 1869. Presented to Parliament. 10*d*.
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 8. Barometer Manual. 1*s*.
 9. Quarterly Weather Report, 1870.—Parts I. to IV. Price 5*s*. each.
 10. Report for 1870. Presented to Parliament. 10*d*.
 11. Contributions to our Knowledge of the Meteorology of Cape Horn and the West Coast of South America. Price 2*s*. 6*d*.
 12. Currents and Surface Temperature of the North Atlantic Ocean, from the Equator to Lat. 40° N., for each month of the year, with a General Current Chart. Price 2*s*. 6*d*.
 13. A Discussion of the Meteorology of the Part of the Atlantic lying North of 30° N. for the Eleven Days ending 8th February 1870. Price, with Book of Charts, 5*s*.
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 15. Report for 1871. Presented to Parliament. 10*d*.
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 17. Report for 1872. Presented to Parliament. 1*s*.
 18. Contributions to our Knowledge of the Meteorology of the Antarctic Regions. Price 2*s*.
 19. Quarterly Weather Report, 1873.—Parts I. to IV. Price 5*s*. each.
 20. Charts of Meteorological Data for Square 3. Lat. 0° – 10° N. Long. 20° – 30° W., and Remarks to accompany the Monthly Charts. Showing the Best Routes across the Equator for each Month. 20*s*.
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