

# REPORT



OF THE

## METEOROLOGICAL COMMITTEE OF THE ROYAL SOCIETY,

For the Year ending 31st December 1875.

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

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LONDON:

PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE,  
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY,  
FOR HER MAJESTY'S STATIONERY OFFICE.

1876.

[C.—1536.] *Price 4d.*

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## P R E F A C E .

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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.

✕ Lieut-General R. STRACHEY, R.E., C.S.I.

May 1876.



# R E P O R T

For the year ending 31st December 1875.

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THE administration of the Office has remained unaltered during the year 1875, being vested in Mr. Robert H. Scott as Director, and Captain Henry Toynbee as Marine Superintendent. Introductory-

The Committee have, however, to lament the death of Sir Charles Wheatstone, who had for the last four years filled the place among them which had been left vacant by the death of Professor W. A. Miller.

In the last Report mention was made of the then forthcoming eighth Report of the Royal Commission on Scientific Instruction. Report of  
Royal Commis-  
sion on  
Scientific In-  
struction. This document appeared in the course of the year 1875, and the Committee would quote the expression of opinion of that Commission which is found at p. 25 of that Report.

“ With respect to Meteorology, we are of opinion that the operations of the Meteorological Office have been attended with great advantage to science and to the country. The subject of Meteorology is a very vast one, and any scheme for its proper cultivation and extension must comprise—

“ 1. Arrangements for observing and recording Meteorological facts.

“ 2. Arrangements for the reduction, discussion, and publication of the observations.

“ 3. Researches undertaken for the purpose of discovering the physical causes of the phenomena observed.

“ The resources placed at the disposal of the Committee are inadequate to cover the whole of this wide field; and, having due regard to all the circumstances of the case, we believe that, in selecting certain parts of it as the objects of their special attention, they have been guided by a sound discretion.

“ We are also disposed to consider that although, as we have already said, the Meteorological Committee occupies an anomalous position, no other form of organization could advantageously have been adopted under the actual conditions. We think, however, that if, as we shall herein-after recommend, a Ministry of Science should be established, the head of the Meteorological Office should be made responsible to the ‘ Minister.’ ”

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The work of the Office will, as usual, be considered under its three subdivisions:—

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

#### I.—OCEAN METEOROLOGY.

Issue of  
Instruments.

The method which has been followed by the Office in 1875, as in the preceding years, in the study of the Meteorology of the Sea has been to supply instruments of the best quality, and duly verified at Kew Observatory, to captains of merchant vessels on loan, on condition of their returning the instruments, and the log of the observations made with them, to the Office at the completion of the voyage. The regular outfit of a ship consists of—

- 1 Barometer (Kew pattern).
- 6 Thermometers, with a thermometer screen.
- 4 Hydrometers.

The observations are recorded in a regular Form of Log, which is supplied with the instruments, while for the actual entry of the observations a Rough Book is supplied, which is retained by the captain, its contents having been copied into the Meteorological Log.

Supply to the  
Royal Navy.

As regards the Royal Navy, Her Majesty's ships have been supplied by the Office with all the Meteorological instruments used in the service ever since the Office was founded in 1854. In these cases there is no condition enforced as to the return of observations to the Meteorological Office, for as a matter of course the records of observations are returned to the Admiralty. It is therefore perfectly optional with the observers whether or not they keep the Meteorological Log of the Office in addition to the regular record of observations required by the rules of the service. The Committee are glad to say that they receive several Logs of very high value from Her Majesty's ships.

Agencies.

In order to meet the requirements of this system a stock of instruments is kept at the Office in London, and in addition to the supply of instruments direct from the Office, a stock is also 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.

Examination  
of logs.

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.

All hydrographical notices contained in the logs received during the year were at once copied and transmitted to the Hydrographical Department of the Admiralty as usual.

To each observer who has obtained the mark "excellent" a 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 1875-6 to the list given in last year's Report are as follows:—

*Presentation of Admiralty Charts.*

Captain's name.	-	-	-	Ship.
Bennett, Edwin Charles	-	-	-	"Thessalus."
* Blackie, A. H., R.N.R.	-	-	-	"Melpomene."
Blair, John	-	-	-	"Arouca."
Campbell, Hugh	-	-	-	"Burdwan."
Cruikshank, William	-	-	-	"Richard Wright."
Faithfull, Henry	-	-	-	"Haddon Hall."
† Horner, A. C., M.R.C.S.	-	-	-	S.S. "Pandora."
Latham, Frederick William	-	-	-	"Sumatra."
Miller, A. John	-	-	-	"Camperdown."
Prehn, Carl Christian	-	-	-	"Eleanor."
Shaw, Gilbert	-	-	-	S.S. "Beta."
Warden, William	-	-	-	S.S. "Alpha."
Young, Allen	-	-	-	S.S. "Pandora."
<hr/>				
‡ Broad, George A., R.N.	-	-	-	H.M.S. "Valorous"
§ Gray, F. J., R.N.	-	-	-	H.M.S. "Nassau."
Havergal, Arthur, R.N.	-	-	-	H.M.S. "Challenger."
¶ Jones, Loftus Francis, R.N.	-	-	-	H.M.S. "Valorous."
Pollard, George N. A., R.N.	-	-	-	H.M.S. "Nassau."
Thomson, Frank Tourle, R.N.	-	-	-	H.M.S. "Challenger."

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

The following figures show the total number of logs, and the number of first-class logs, classed "excellent," which have been

\* Chief officer, now Captain.  
 ‡ Navigating Lieutenant.  
 § Lieutenant.

† Surgeon.  
 || Navigating Sub-Lieutenant.

Quality of logs. received each year from the *Mercantile Marine* since the management of the Office has been under the Meteorological Committee.

Year.	Total No. of Logs received.	No. of Excellent Logs.	% of Excellent Logs.	Year.	Total No. of Logs received.	No. of Excellent Logs.	% of Excellent Logs.
1867	21	7	33	1872	110	64	58
1868	50	10	20	1873	92	52	57
1869	67	21	31	1874	88	56	64
1870	81	41	51	1875	78	56	72
1871	150	72	48				

The office has lost two of its best observers during the year 1875, and the Committee would here record their sincere grief at the death of Commodore J. G. Goodenough, which has been a serious loss to the science. During the two years' duration of his command on the Australian station he, being ably supported by his Navigating Lieutenant Mr. Hosken, had sent them more than one log of very high character, from the comparatively rarely visited seas in which he met his death. More recently the untimely death of Captain F. J. Gray of the "Nassau," has deprived the office of the services of an officer of very high promise, who had already supplied very valuable data for the east coast of Africa.

Localities whence observations are being derived.

The geographical distribution of the voyages on which observations were being taken at the close of the year 1875 was as follows :

Voyages.	Ships.
To Baffin's Bay or Greenland	- - - 6
„ East Coast, North America	- - - 9
On East Coast, North America	- - - 2
To West Coast, North America	- - - 3
„ West Indies	- - - 3
„ West Coast, South America	- - - 8
„ Australia and New Zealand	- - - 18
„ India, viâ the Cape	- - - 25
„ India, viâ Suez	- - - 2
„ China	- - - 3
„ Mediterranean Ports	- - - 3
„ Home Ports	- - - 3
„ Baltic	- - - 1

The Committee cannot but regret that the number of observers who were co-operating with them in 1875 still remains small when compared with the strength of the Merchant navy of England, as will be seen from the figures just quoted, but it must be remembered that the duty of observing regularly and frequently entails a considerable amount of responsibility, so that

it is necessary that the captain should be supported by a zealous staff of officers, if he is to keep a full log. It is, however, not by any means the case that the goodness of the log depends on the size of the vessel.

In order to bring before the notice of possible observers the nature of the work of the Office, circulars have been issued in 1875, as in the preceding year, to the various shipping offices, &c., in connexion with the Board of Trade, and by these means much valuable co-operation in the work of observing has been secured.

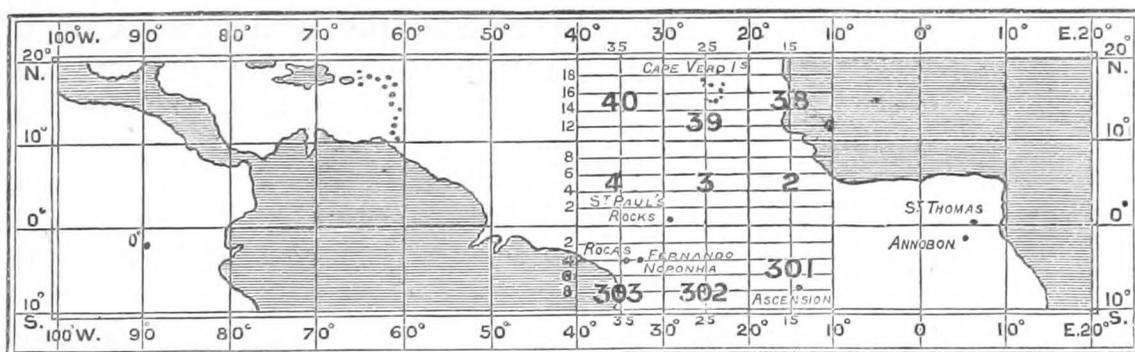
Collection of observations.

It has been frequently remarked that the efforts of the office should be principally directed to the procuring of observations from the less frequented parts of the sea, but no matter how desirable such a mode of procedure would be, it has been hitherto impracticable to carry it out. Observations at sea are only obtainable in quantity from the tracks of the regular voyages, and when the comparatively small proportion of ships at sea, which are really observing, is taken into account it will easily be seen that there is little chance of amassing material for any district which is not traversed by some of the ocean highways.

Irregular distribution of materials available.

As regards the progress of the discussions carried on by the staff during the year now under consideration, the work has been retarded considerably by the resignation of two practised computers, and the consequent training of their successors. It was stated in the last Report that the charts for the entire district of nine ten-degree squares extending from 20° N. to 10° S. latitude and from 10° to 40° W. longitude, as shown in the subjoined woodcut, were completed and in process of publication. The charts 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.

Progress of discussion, 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 which will appear in 1876.

Observations at Ascension.

For the two years over which the observations extend we have the wind direction and velocity recorded continuously by a self-registering anemometer, and almost hourly observations by eye, of the barometer, thermometers, and meteorological phenomena in general.

Equatorial  
Region of the  
Atlantic.

In addition to the charts now under consideration, stretching from shore to shore of the Atlantic, which are similar to those previously published for the central square (3) in the diagram, though the means are taken for larger areas (owing to comparative deficiency of material) there are given also diagrams showing the direction of wind in connexion with atmospherical pressure and temperature, and of ocean currents with sea-temperature.

There is also given a tabular statement contrasting the specific gravity of the sea in the easterly [going] or "Guinea" current and in the westerly currents due to each trade-wind.

In the Remarks copious quotations are made from the logs in relation to the various phenomena which come under the seaman's observation, such as the weather, the wind, the motion of the clouds in relation to the lower wind, the direction of the swell, the colour and luminosity of the sea, and the current rips; as well as information relating to the birds, fish, and insects that are met with, and the change from month to month of the localities in which they are seen, and also appearances of submarine volcanic action in certain localities.

Results obtained from the  
discussion.

By these investigations it is believed that important light has been thrown on several subjects of general as well as of special interest.

1. As to the tendency of the wind blowing along a coast-line to draw round a cape.
2. As to the relation of the surface-temperature and the currents of the sea near the equator to the westerly gales of high northern and southern latitudes in their respective winters; as to the dipping of a cold current under a warm one, and the variation with the seasons in the amount of easterly current near the equator.
3. As to a probable relation between the well-known rollers of Ascension and St. Helena and the winter gales of the North Atlantic, and a corresponding relation of the rollers on the west coast of Africa to the winter gales of high southern latitudes.
4. As to the remarkable difference in direction of the wind in December on opposite sides of the Cape Verd Islands, being *easterly* to the westward and *north-north-east* to the eastward of them.
5. As to the remarkable unsteadiness and gustiness of the north-east trade with a clear sky in Square 40 (lat.  $10^{\circ}$ - $20^{\circ}$  N., long.  $30^{\circ}$ - $40^{\circ}$  W.), in certain months.
6. As to the difference between the wind and weather of Square 303 (lat.  $0^{\circ}$ - $10^{\circ}$  S., long.  $30^{\circ}$ - $40^{\circ}$  W.), off Cape St. Roque and its neighbourhood, and those of the Squares lying to the eastward of that point, more especially in regard of the fact that in certain months the wind in Square 303, during the squalls which frequently occur, constantly changes, between south-east and south-south-west, in such a way that the seaman finds very great difficulty in working to the southward if he approaches too near the Brazilian coast.

7. As to the relation of the upper currents of the atmosphere (indicated by cloud motion) to the lower winds—*e. g.*, how the equatorial margin of one Trade appears to rise above the edge of the other Trade; how the upper clouds move from the north-east over the south-west monsoon on the coast of Africa; and how sometimes clouds move from the south-east, the sky looking very heavy towards that quarter, while the surface wind is steady from south-west.
8. As to the relation between heavy dew and sea-temperature in some parts and at certain seasons, and the connexion between mist (haze) and African dust.
9. The *Diagrams* give a picture of Maury's "wedge-shaped doldrums" which any sailor can understand, and the *Remarks* show the weather experienced in them.

Equatorial Region of the Atlantic. Results obtained from the discussion.

In these discussions the object of the Meteorological Office has been to determine the meteorological statistics of limited portions of the ocean in each separate month by means of results obtained by discussion of original observations extracted from the logs in the Office.

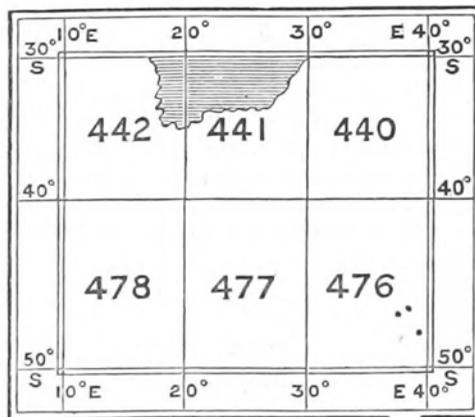
The text of these charts is in the press in an advanced stage of preparation for publication, and it will appear in the course of the year 1876.

The material available for the 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 91 per cent. of the entire information in the Office for the whole district was concentrated in the nine Squares in question.

The Office having thus completed the examination of the district close to the Equator in the Atlantic Ocean, about the most important and interesting to the navigator and meteorologist of any region in the world, has commenced in 1875 the investigation of the meteorology of another great district lying on the high road between Europe and the Indian and Australian seas, that of the Cape of Good Hope. This work is now fully in operation.

South point of Africa.

The actual district to be treated is shown in the subjoined chart, and the degree of minuteness to which the discussion will be carried will, it is hoped, be the same as in the case of the Atlantic Equatorial region just noticed.



Information supplied to Indian Government.

It need hardly be stated that the stores of observations existing in the Office are far more extensive than the present staff could cope with, and accordingly the Committee have gladly closed with a proposal made to them in 1875 by the India Office to supply to that office a copy of all the materials in their possession for the Northern Indian Ocean and the Bay of Bengal for the month of January, the cost of preparation of the observations for discussion and of copying being borne by the India Office.

Proposals to Holland and Germany.

The Committee made proposals in the course of last autumn for an arrangement of a similar nature to the above to the Meteorological Institute of Utrecht, and the Deutsche Seewarte at Hamburg, as regards the districts which they have respectively undertaken to investigate, but without success.

Investigation into weather of August 1873 in Atlantic.

The investigation into the Atlantic weather, during the month of August 1873, has made steady progress during the year. Invitations were sent in 1874 to all British shipowners to lend to the Office any logs of ships which were in the Atlantic during that month, and no less than 280 logs have been received in compliance with the invitation. Captain Toybee 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.\*

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 1874, p. 59.

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 1875. 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.

This Department of the Office has hardly exhibited any change of importance during the year 1875, and it must be stated that the cable to the Shetlands, the unsatisfactory condition of which was noticed last year, remains still virtually useless for meteorological purposes. The want of reports from Sumburgh Head has been a most serious defect in the system of Weather Telegraphy of North-West Europe during the year.

The stations were all inspected in the course of the year, with the exception of Nottingham, Bidston, and Ardrossan. The list of the stations, with the observers' names, will be found in Appendix VII.

\* "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. Toybee. Official No. 13. London: Stanford.

As regards the general condition of the stations, much that was originally objectionable has been improved in successive years, and at present 16 out of the 29 stations are provided with the Stevenson's thermometer-screen. Changes at stations.

At North Shields a very great improvement was effected in the course of the year by the removal of the thermometers and rain gauge to an open site in Dockwray Square.

At Cambridge, also, a great improvement has been effected by the thermometers being shifted to a more satisfactory position, and exposed in a Stevenson's screen.

The observer at Sumburgh Head has been changed, Mr. Lawrence having removed to Fair Isle, while his place has been taken by the Reverend W. Brand.

At Greencastle (Moville) too a change has occurred, Mr. Lowry having undertaken the duties of reporting in place of Mr. M'Gladery who has resigned.

At present only 11 of the observers are telegraph clerks, and all are distinctly and immediately responsible to the Office.

The Office may fairly claim for its service a higher degree of scientific accuracy and completeness than exists in any *at present* in operation in Europe. It must always be remembered that, as a rule, telegraphic stations are not likely to be good stations for general climatology, the conditions which determine the choice of locality being widely different in the two cases.

A difficulty in dealing with Weather Telegraphy is to be found in the frequency of telegraphic errors, which renders any absolute dependence on figures received by telegraph impossible. Some idea of the extent to which this evil affects the scientific prosecution of weather study, and interferes with the formation of correct views of the essential facts, with the promptitude that is required for the practical application of the deduced results—the issue of warnings to the coasts—may be gathered from the fact that in the case of one single station, Oxford, 49 errors were detected (on receipt of the original MS. messages) in the space of 18 months, which were all proved to be due to inaccurate transmission, and to these must be added a considerable number which had been discovered at first inspection of the telegrams (owing to the glaring discrepancy of the reports from those of adjacent stations), and had been corrected by repetition of the message. Telegraphic errors.

This number gives about 32 errors per annum; so that on this hypothesis there would be  $32 \times 29$  or 928 errors from British stations coming in every year, which it is apparently impossible to detect by simple inspection of the telegrams.

Of errors in barometrical and thermometrical readings as received by telegraph and suspected from their discrepancy *inter se*, the Office discovers more than 1,000 every year, frequently eliciting a correction by repetition of the telegram and correspondence with the observers.

The practice of the Office in the collection, discussion, and dissemination of Meteorological information obtained by telegraphic reports has proceeded in 1875 as in former years. The following is a brief abstract of the process.

Organization of the reporting system.

The Office receives, or would receive, were the telegraphic communications with Corunna and with the Shetlands perfect, 51 reports every morning, and nine 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. (This statement has been modified since January 1, 1876, as will be seen further on.) The stations are situated along the entire coast of the Continent from Christiansund, in lat.  $63^{\circ}$  N., to Corunna, in lat.  $43^{\circ}$  N., with four stations on the coast of the Baltic, and one at Cap Sicié in the Mediterranean.

The information received from the Continent in accordance with various arrangements is obtained from France, Holland, Hamburg, Denmark, Norway, and Sweden.

Cost of information.

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 Company.

The Committee of late have paid at press rates for the transmission of reports to the Office, in consideration of allowing the Post Office to extract from the messages *en route* any information it may require.

Process of discussion and issue of information.

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, where the majority of them usually arrive by 10 a.m.\* 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. Charts are then drawn for publication in the newspapers.

Daily Weather Charts.

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 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.

\* Since the 1st January 1876, arrangements have been made with the "Times" by which the Office is kept open daily until 9 p.m., and on Sunday evenings also from 6 to 9 p.m., and reports are received from certain stations for 6 p.m., so as to admit of the preparation of a special chart by that journal. The extra expense incurred by these operations is borne by the "Times," and the cost will not be far short of 500*l.* a year. The arrangement has been approved by the Board of Trade.

† This resumé is afterwards transmitted from Paris to Florence, where it is received for the benefit of the Italian naval service; this arrangement has been made in 1875.

The list of institutions and persons who received the charts free in 1875 will be found at Appendix VIII.

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. Storm warn-  
ings.

These stations were, at the end of December 1875, 130 in number, situated:

64 in England,	13 in Ireland,
15 in Wales,	3 in the Isle of Man, and,
32 in Scotland,	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.

In addition to the foregoing, a telegram consisting of reports of the atmospherical pressure and the wind at 14 of the most important stations, was sent as usual daily to the Underwriters' Rooms, Liverpool, the entire expense of the transmission being borne by that association, and a very similar message has been forwarded since the month of June last to the editor of "Saunders' News Letter," Dublin.

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.

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. Warnings to  
France.

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. Intelligence to  
the Continent.

A comparison has been instituted between the warnings issued in 1875 and the weather experienced on our coasts, as was the case in the five 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

Results of warnings.

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 pp. 20-21.

Mode of testing warnings.

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 either 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 1875.

Coasts.	Total No. of Orders to hoist and repetitions.	Warnings justified by subsequent gales, Force 8 and upwards.	Warnings justified by subsequent strong Winds, Force 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	31	15	7	6	—	3	—	Mar. 5, Sept. 27, Dec. 31.
„ East	37	10	17	10	—	—	—	Feb. 24 <sub>p</sub> , Sept. 27, Nov. 9.
Scotland, East	22	8	8	5	—	—	1	Jan. 24 <sub>p</sub> , Feb. 24, Sept. 27, Nov. 13 <sub>p</sub> , Nov. 19, Dec. 24.
„ West (Clyde)	28	9	7	11	—	—	1	Sept. 27, Nov. 19 <sub>p</sub> , Dec. 24.
England, North-west	32	16	12	4	—	—	—	Feb. 24 <sub>p</sub> , July 15 <sub>p</sub> , Sept. 27, Nov. 19.
„ West	50	12	13	4	—	1	—	Sept. 27 <sub>s</sub> , Nov. 19 <sub>p</sub> .
„ South	33	14	13	6	—	—	—	Sept. 27 <sub>s</sub> , Nov. 6, Nov. 19.
England, South-east	15	4	7	4	—	—	—	Jan. 24, Nov. 13.
„ East	20	14	8	2	—	1	—	March 9, Sept. 27, Nov. 13, Dec. 24 <sub>p</sub> .
Totals	248	102	87	52	—	5	2	
Per-centages	—	41.1	35.1	21.0	—	2.0	0.8	

Results of warnings.

Mode of testing warnings.

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 pp. 20-21.

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 either 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 1875.

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	- 31	15	7	6	—	3	—	Mar. 5, Sept. 27 <sub>s</sub> , Dec. 31.
" East	- 37	10	17	10	—	—	—	Feb. 24 <sub>p</sub> , Sept. 27 <sub>s</sub> , Nov. 9.
Scotland, East	- 22	8	8	5	—	—	1	Jan. 24 <sub>p</sub> , Feb. 24, Sept. 27 <sub>s</sub> , Nov. 13 <sub>p</sub> , Nov. 19, Dec. 24.
" West (Clyde)	28	9	7	11	—	—	1	Sept. 27 <sub>s</sub> , Nov. 19 <sub>p</sub> , Dec. 24.
England, North-west	32	16	12	4	—	—	—	Feb. 24 <sub>p</sub> , July 15 <sub>p</sub> , Sept. 27 <sub>s</sub> , Nov. 19.
" West	- 30	12	13	4	—	1	—	Sept. 27 <sub>s</sub> , Nov. 19 <sub>p</sub> .
" South	- 33	14	13	6	—	—	—	Sept. 27 <sub>s</sub> , Nov. 6, Nov. 19.
England, South-east	15	4	7	4	—	—	—	Jan. 24, Nov. 13.
" East	- 20	14	3	2	—	1	—	March 9, Sept. 27 <sub>s</sub> , Nov. 13, Dec. 24 <sub>p</sub> .
Totals -	- 248	102	87	52	—	5	2	
Per-centages -	- —	41·1	35·1	21·0	—	2·0	0·8	

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: Analysis of results, 1870-75.

	Warnings justified			Warnings not justified by subsequent Weather.
	By subsequent Gales.	By subsequent strong Winds.	Total.	
1870	46·7	21·7	<b>68·4</b>	22·4
1871	46	17·7	<b>63·7</b>	22·0
1872	61	19·5	<b>80·5</b>	11·9
1873	45·2	34·0	<b>79·2</b>	16·8
1874	45·4	32·8	<b>78·2</b>	16·4
1875	41·1	35·1	<b>76·2</b>	21·0

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."

It must always be remembered that as the Office has to issue its warnings on the appearance of the first premonitory symptoms of a gale, it frequently has only winds of forces 6 and 7 to show in justification of its warnings. These winds are, however, quite as much as ordinary yachts and coasting craft can easily face, especially if they come suddenly and with a considerable change in the direction of the wind.

It will be noticed that the per-centage of warnings justified by severe gales has been 41·1 instead of 45·4 (in 1874), while the per-centages of warnings not justified by subsequent weather has been 21·0 as compared with 16·4 in the previous year. These results are attributable partly to the fact that fewer serious gales occurred in 1875 than in 1874, and partly to the circumstance that by the new International Telegraphic Code the observers no longer necessarily report the strongest wind which has been felt by them, but only the wind actually blowing at definite hours of the days. By this means several strong breezes have undoubtedly escaped notice.

The Office has from the first 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 time. The invitation issued to British observers to join in the scheme 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 work in 1875 will be found in Appendix X. Synchronous observations.

In the course of the last two years Capt. Hoffmeyer, Director of Hoffmeyer's charts.

the Meteorological Institute of Copenhagen has commenced the publication of daily synoptic charts of Europe, based on the Daily Telegraphic Reports of various countries. This work is issued to subscribers, and the result of the first year's issue has been a pecuniary loss to him. It is a matter of serious consideration among the meteorological organizations of Europe, in what way this undertaking can best be supported and forwarded.\*

Fishery barometers.

Fishery Barometers are issued on loan to small ports and fishing stations,—and up to the end of the year 132 stations on our coasts had been supplied by the Office with barometers for public use. They were situated, 52 in England, 5 in Wales, 44 in Scotland, 29 in Ireland, and 2 in the Isle of Man. See Appendix XI.

### III.—LAND METEOROLOGY OF THE BRITISH ISLANDS.

Observatories.

This branch is conducted mainly by means of the seven self-recording observatories. There have been no changes during the year, excepting that in August the Committee were deprived by death of the services of the Reverend Thomas Kerr, who had discharged the duties of Director of Valencia Observatory since its establishment in 1867, with great ability and attention. His place has been filled by Mr. J. E. Cullum, formerly engaged at Kew.

It seems hardly necessary to state further particulars than those already in print in the Introduction to the Quarterly Weather Report for 1870 in reference to these establishments.

Their cost.

The annual allowance to each, which is intended to cover the current expenses of management and of keeping the instruments in action, is as follows :

Aberdeen, 250 <i>l.</i>	Valencia, 540 <i>l.</i>	Falmouth, 265 <i>l.</i>
Glasgow, 250 <i>l.</i>	Stonyhurst, 200 <i>l.</i>	Kew, 250 <i>l.</i>
Armagh, 206 <i>l.</i>		

The exceptions to the regular sum of 250*l.* a year are thus explained :

At Valencia the entire cost of the establishment is borne by the Office; the figure given is the average for the six years 1869–74 inclusive. At Falmouth, the Royal Cornwall Polytechnic Society is allowed a sum of 15*l.*, in consideration of the extra expense incurred for rent for the observatory. At Stonyhurst and Armagh, the cost falls short of 250*l.*, at the latter station the Committee only pay the cost of maintenance and the assistant's salary. The figures given are the average for the same years as in Valencia.

In addition Kew receives a further sum of 400*l.* per annum in consideration of its undertaking the duty of examining the work of all the observatories before sending it to the Office.

The subsequent treatment of the returns is divided into two branches, the numerical computations and the preparation of the plates for the Quarterly Weather Report.

Computations.

The computations are simply the calculation of mean results

\* The Meteorological Committee have recently (February 1876) resolved to subscribe for copies of these Charts for distribution to captains, and to furnish Captain Hoffmeyer, free of cost, with information relating to the Atlantic from their logs.

for five day and monthly periods, and the extraction of maximum and minimum values for temperature and pressure, which are published in the Quarterly Weather Report. There are no funds available for more elaborate discussion of the materials.

Since January 1874 the hourly tabulations have been lithographed and distributed. The cost in time of preparing and copying these for the lithographer, including the calculation of hourly vapour tension, is 21 days per month for one person. Practically it occupies the entire time of one person.

Issue of hourly tabulations.

The methods of preparation of the plates of the Report are fully described in the annual Reports of the Committee for 1870 and 1871. The accuracy aimed at is 0.02 in. for the barometer and 0.5 F. for the thermometer.

Quarterly Weather Report.

The instrumental appliances are in great measure perfectly unique and have been invented specially for the work by Mr. Galton and Mr. De La Rue. The copper-plates are supplied by the Stationery Office with the standing portion produced by the electrotyping process, and are engraved and etched in the Meteorological Office.

The work of preparation of the plates has been seriously retarded during the year 1875 by the fact that Wagner's pantagraph was for some time under repair.

In addition anemograms are received from the following stations, which are all provided with anemographs similar to those erected at the observatories. In the case of Halifax, Mr. Crossley supplies also barograms and thermograms, in addition to most liberally lending to the Committee the anemometer which has been erected at Seaham, free of charge, by the kindness of Mr. Eminson, and with the sanction of the Marquis of Londonderry.

Station.	Supplied by.	Superintended by.
Alnwick Castle	- Duke of Northumberland, K.G.	F. Holland, Esq.
Halifax	- L. J. Crossley, Esq.	L. J. Crossley, Esq.
Holyhead	- Meteorological Committee	Harbour authorities.
Orkney	- "	Rev. C. Clouston, LL.D.
Seaham	- L. J. Crossley, Esq.	G. H. Aird, Esq.
Yarmouth	- Meteorological Committee	Secretary Sailors' Home.

In addition to the foregoing observatories the office is in connexion with a number of other stations, whence returns of various degrees of completeness are received.

Stations of second order.

The office has not in the first years of its existence published results from such stations, as it did not seem necessary to do so, and such a measure would give an appearance of rivalry in publication between itself and the General Register Office, but since the Permanent Committee of the Vienna Congress in 1874 have called for the publication of returns of this nature for international objects, the Committee have commenced such a publication.

The Vienna Congress undertook the task of attempting to call into existence a real international publication, and the members of the Permanent Committee have 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

International stations.

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.

Distribution among European States.

The carrying out of this course of action fell to the Permanent Committee who have devised the forms which are published in its Report (p. 47), and have proposed the following inferior limit for the number of stations for the several European governments:—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.

International stations.

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 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.

Arrangements with the Meteorological Society.

An agreement was therefore entered into between the office and the Meteorological Society, as explained in the Report for 1874, in virtue of which the Society supplies certain returns from some of its stations for publication by the Office with similar returns from its own stations, and the arrangements in question came into operation with the year 1875. The following is the list of stations which commenced observing for the Meteorological Office, for the most part on the 1st of January 1875, and whose returns are being published, either in full, or as monthly summaries of mean results.

Stations of second order in connection with the Office.

Names of Stations.	Observers.
<b>ENGLAND.</b>	
Chatham, Kent - - - - -	Captain J. Fellowes, R.E.
Chigwell Row, Essex - - - - -	J. Campbell, M.D., R.N.
Durham, Durham - - - - -	G. A. Golduey.
* Giggleswick, Yorkshire - - - - -	Rev. G. Style, M.A.
Hastings, Sussex - - - - -	A. E. Murray, F.M.S.
Hull, Yorkshire - - - - -	Rev. W. P. Mackay, D.D.
Leicester - - - - -	W. J. Harrison.
Norwich - - - - -	J. Quinton, junr.
λ Oscott, Warwickshire - - - - -	Rev. S. Whitty.
Seaham, Durham - - - - -	G. H. Aird.
* St. Aubin's, Jersey - - - - -	J. E. Vibert, M.A.
* Uppingham, Rutlandshire - - - - -	Rev. G. Mullins.
<b>SCOTLAND.</b>	
* Glenalmond, Perthshire - - - - -	Rev. W. P. Robinson, M.A.
Sandwick Mause, Orkneys - - - - -	Rev. C. Clouston, LL.D.

\* The year's series not complete.

Names of Stations.	Observers.
<b>IRELAND.</b>	
Dublin - - - - -	J. W. Moore, M.D.
A Markree Castle, Sligo - - - - -	Anna Doberck, for Col. Cooper, F.R.A.S.
A Parsonstown (Birr Castle), King's Co. - - - - -	J. Dreyer, M.A., for the Earl of Rosse, F.R.S.

The stations marked A in the preceding list are those for which the observations are being published for 1875 *in extenso*.

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. Returns supplied by the Meteorological Society.

**STATIONS, A.**

Buxton, Derbyshire - - - - -	E. J. Sykes, Esq., F.R.A.S.
Calcethorpe, Lincolnshire - - - - -	D. G. Briggs, Esq.
Carmarthen - - - - -	G. J. Hearder, M.D.
Dartmoor Prison, Devonshire - - - - -	R. E. Power, L.R.C.P.
Hawes, Yorkshire - - - - -	Rev. J. D. Parker, LL.D.
Strathfield Turgiss, Hants - - - - -	Rev. C. H. Griffith.

**STATIONS, B.**

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

The returns from these stations are published in the form of Appendices to the Quarterly Weather Reports, and it is intended that the detailed Returns on Form A should be issued separately, so that they can be bound up with similar Returns from other countries so as to form an International Summary of Meteorological records.

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. Extra stations

Names of Stations.	Observers.
<b>ENGLAND.</b>	
Acrise, Kent - - - - -	G. C. Woollett.
Alnwick Castle, Northumberland - - - - -	F. Holland, for the Duke of Northumberland, K.G.
Barnstaple, Devonshire - - - - -	W. Knill.
Brixham, Devonshire - - - - -	J. Scivill, Harbour Master.
Chiswick (Royal Horticultural Society), Middlesex - - - - -	J. K. M. L. Farquhar.
Cooper's Hill (Indian Civil Engineering College) Surrey - - - - -	H. McLeod, F.C.S.
Gorleston, Norfolk - - - - -	R. J. C. Day, Piermaster.
Helston, Cornwall - - - - -	M. P. Moyle, M.D.
Killingholme, Lincolnshire - - - - -	Rev. J. Byron.

Names of Stations.	Observers.
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, Warwickshire - - -	Finlay Dan.
Silloth, Cumberland - - -	Rev. F. Redford, F.R.S.E.
Southport, Lancashire - - -	J. Baxendell, F.R.A.S.
Winchester, Hampshire - - -	Rev. G. Richardson.
<b>IRELAND.</b>	
Dromore (Coleraine), Co. Derry - - -	Mrs. Torrens.
Ennis, Co. Clare - - -	J. Hill, C.E.

### LIBRARY.

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 upwards of 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.

Analysis of expenditure.

The disbursements during the year ending 31st March 1876 have fallen short of those of the preceding year by the amount of 294*l.* 19*s.* 10*d.* The following table shows the general distribution of the expenditure under the several heads of service :—

—	1874-75.	1875-76.	Increase.	Decrease.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Office salaries, &c. -	1,314 19 0	1,365 11 6	50 12 6	—
" rent, attendance, and contingencies -	798 19 8	890 16 6	91 16 10	—
Observatories -	3,799 7 10	3,924 1 0	124 13 2	—
Telegraphy -	3,387 17 8	3,007 1 4	—	380 16 4
Ocean Meteorology -	2,384 6 4	2,203 0 4	—	181 6 0
Totals	£ 11,685 10 6	11,390 10 8	267 2 6	562 2 4

Net decrease, 294*l.* 19*s.* 10*d.*

This abstract does not give a complete representation of the

financial position of the Office, which will be better seen by referring to the statements in Appendix I. Analysis of expenditure.

The increase under the head of *Observatories* is chiefly due to transactions on account of Meteorological establishments in our colonies and in foreign countries, &c., the directors of which have availed themselves in 1875, even to a greater extent than in previous years, of the assistance of the Office in procuring instruments from London makers. The cost incurred on this account is of course repaid by the respective establishments, as shown in the financial statements in Appendix I.

Telegraphy shows a considerable decrease, owing to the fact, which was explained in the Report for 1874, that the payments made in that year included certain arrears due to the Post Office for services performed at an earlier date, for which application had not previously been made.

Finally, the statements in Appendix I. show that the amount standing to the credit of the Committee on March 31, 1876, was 1,278*l.* 9*s.* 1*d.*, and that, after deducting liabilities, &c., the estimated *available* balance was 900*l.* 9*s.* 6*d.* against 1,053*l.* 1*s.* 5*d.* at the corresponding period of 1875. These figures show that the expenditure of the year has exceeded the actual income by about 150*l.*

In fact, it is only by the most careful management of the finances that the Office can be conducted so as to keep reasonably within the limits of expenditure prescribed for it by the Parliamentary Grant. The surplus to the credit of the Committee is what, after nine years, remains of the unexpended balance of the Parliamentary Grant in 1867-8, in which year, the first of the management of the Office by the Committee, the operations of the Office had not received their complete development.

### SUMMARY.

The Committee have to lament the death of one of their members, Sir Charles Wheatstone; with this exception the administration of the Office has remained unaltered during the year.

The eighth report of the Royal Commission on Scientific Instruction appeared in the course of the year; the remarks of the Commissioners bearing upon the work of the Meteorological Office will be found on p. 5 of this Report.

I. *Ocean Meteorology*.—The Office has continued its practice of lending standard instruments to merchant captains willing to observe for it, and also the regular supply of all meteorological instruments to the Royal Navy. The number of barometers afloat on the 1st January 1876 as compared with that for 1875 was as follows:— Ocean Meteorology.

	1876.	1875.
Merchant service - - -	93	83
Royal Navy (including aneroids)	577	582

Fifty-six observers in the *Mercantile Marine* alone have sent in logs which received the mark of "Excellent." A complete list of documents received during the year will be found in Appendix III. The geographical distribution of the voyages

Ocean Meteorology.

on which observations were being taken at the close of the year will be found on p. 8.

The publication of the Monthly Charts and explanatory text for the district of the Atlantic lying between latitude  $20^{\circ}$  N. and  $10^{\circ}$  S., and longitude  $10^{\circ}$  to  $40^{\circ}$  W. (see p. 9), has been unavoidably delayed, but is now nearly completed. This investigation will throw important light on several subjects of general as well as of special interest.

The investigation of another great district of the greatest importance to navigators, viz., that of the Cape of Good Hope, has also been undertaken, and the work is now fully in operation (see p. 11).

The Office has also undertaken to supply the Indian Government with a tabulated copy of the observations in their possession for the Northern Indian Ocean and the Bay of Bengal. The part for the month of January is now completed (June, 1876).

The investigation into the Atlantic weather during the month of August 1873 has made steady progress.

The disbursements made during the financial year for this department have been 2,203*l.* 0*s.* 4*d.*

Weather Telegraphy.

II. *Weather Telegraphy.*—There has been no change of importance during the year. Nearly all the stations have been inspected, and improvements effected at some, notably at North Shields and Cambridge.

The Office has continued to exchange telegraphic information with nearly all adjacent continental nations and to issue warnings of storms to Denmark, France, Germany, Holland, and Norway. A daily summary is sent to France and thence to Italy.

Storm warning signals are hoisted at 130 stations, namely:—64 in England, 15 in Wales, 32 in Scotland, 13 in Ireland, 3 in the Isle of Man, 3 in the Channel Islands.

The results of total success of the warnings have been 76.2 per cent. as compared with 78.2 in 1874 (see p. 17).

Daily Weather Charts have been issued to the number of above 500 copies, and the publication of charts in the London and country newspapers has been continued.

Since January 1876, special arrangements have been made with the "Times," with the approval of the Board of Trade, for the supply of an evening chart from observations taken at 6h. p.m., the extra expense incurred being borne by that paper.

The supply of synchronous observations taken at 0h. 43m. G. M. T. to the Signal Office in Washington has been continued. The list of observers joining in the work will be found in Appendix X.

The number of Coast stations supplied with "Fishery" barometers is 132, viz.:—In England, 52; in Scotland, 44; in the Isle of Man, 2; in Wales, 5; in Ireland, 29.

The Office claims for its telegraphic service a higher degree of

scientific accuracy and completeness than exists in any *at present* in operation in Europe.

The disbursements made during the financial year for this department have been 3,007*l.* 1*s.* 4*d.*

III. *Land Meteorology of the British Islands.*—The work of this department has continued in operation without material alteration. At p. 18 will be found a statement of the regular allowances made to each of the seven observatories established by the Committee. The continuous curves and the calculated means are published in the Quarterly Weather Reports. The hourly tabulated values and the calculated vapour tension are lithographed and distributed monthly.

Land Meteorology of the British Islands

In addition to the seven observatories, the Office is in connexion with a number of other stations (see p. 20) whence returns of various degrees of completeness are received, and the arrangements with the Meteorological Society of London, referred to in last report, for the supply of returns from certain of its stations, have been continued, the Office paying a certain sum for this information.

Returns from 9 of these stations in Great Britain and Ireland, in addition to the *monthly results* from a number of other stations, are published, in accordance with the wish expressed at the International Congress of Vienna.

The disbursements made on account of this department have been 3,924*l.* 1*s.* 0*d.*

*Office.*—An active interchange of publications with Foreign and Colonial Establishments has been kept up, and a list of presents received in exchange will be found in Appendix XII. A complete classified catalogue of the books in the possession of the Office has been made.

Office.

The expenses of management in salaries and wages have been 1,365*l.* 11*s.* 6*d.*

The other charges incident on the Office for rent, contingencies, postage, &c. have been 890*l.* 16*s.* 6*d.*

In the month of July 1875 the Treasury announced their intention of instituting an inquiry, firstly, into the results hitherto attained by the Office, and, secondly, into the best method of administration of the funds supplied by the Government for the service of Meteorology.

Treasury inquiry into the Office.

A Committee was nominated for this purpose in the month of November, consisting of the following members:—

Sir W. Stirling Maxwell, Bt., M.P.	R. W. Lingen, Esq., C.B.
T. Brassey, Esq., M.P.	D. Milne Home, Esq., F.R.S.E.
T. H. Farrer, Esq.	Lieutenant-General R. Strachey,
Fras. Galton, Esq., F.R.S.	R.E., C.S.I., F.R.S.
J. D. Hooker, M.D., C.B., P.R.S.	

The sittings of the Committee did not commence before the close of the year.

# APPENDIX.

## APPENDIX I.

### METEOROLOGICAL OFFICE : ACCOUNT OF RECEIPTS AND PAYMENTS for the year ending 31st March 1876.

RECEIPTS.	PAYMENTS.
Balance from year 1874-5 - £1,826 15 5	
Parliamentary Vote - -10,000 0 0	
Receipts from various sources:—	
H. Mohn - 66 0 0	OFFICE:
H. De Vismes - 4 1 0	Salary of Director - 800 0 0
J. E. Vibert - 11 1 0	"    Two Clerks - 399 11 0
Power Brothers - 2 18 4	Office-keeper and Messenger - 166 0 6
Bishop of Rupert's Land - 15 11 0	<u>£1,365 11 6</u>
G. T. Kingston - 161 3 3	Rent of Office - 534 12 0
R. Maguire - 1 5 0	Fuel and gas - 33 15 3
Duke of Marlborough - 1 19 0	Furniture, fittings, &c. - 57 7 3
Dr. Forster - 8 7 0	<u>625 14 6</u>
Capt. Hoffmeyer - 5 2 0	Postage - 60 10 4
Gregor, Turnbull, & Co. - 1 0 0	Printing and books - 43 0 10
Kew Committee - 7 13 0	Attendance, and other Contingencies - 161 10 10
C. Meldrum - 7 6 0	<u>265 2 0</u>
R. Rubenson - 4 17 0	
E. Hubbard, M.P. - 1 2 0	LAND METEOROLOGY:
E. R. Owen - 1 2 6	Expenses at Observatories - 2,593 2 11
C. Wille - 47 5 0	New instruments (commissions, &c.) - 474 11 5
J. B. Whitaker - 10 10 0	Computations - 856 6 8
R. M. Barrington - 1 14 6	<u>3,924 1 0</u>
J. Quinton, jr. - 3 3 0	Telegraphy - 1,744 12 0
H. Story - 9 0 0	Inspections, issue of D. W. Charts, &c. - 485 7 8
Rev. J. Taylor - 4 0 0	Computations - 777 1 8
Rev. M. T. Mackay, D.D. - 2 5 6	<u>3,007 1 4</u>
Major Smythe, R.A. - 1 2 9	OCEAN METEOROLOGY:
Board of Trade - 27 8 0	Marine Superintendent - 400 0 0
Dunsink Observatory - 7 18 6	Supply and Return of Instruments, &c.:—
W. F. Cooper - 4 2 6	Admiralty - 394 17 6
A. O. Walker - 3 8 6	Mercantile Marine - 420 5 5
R. J. Ellery - 8 9 4	Computations and Care of Instruments - 987 17 5
Patent Type Founding Co. - 5 8 6	<u>2,203 0 4</u>
Sundry small amounts - 8 14 6	<u>11,390 10 8</u>
Subscriptions to D. W. Charts - 282 4 1	Cash in hand - 84 2 7
Subscriptions to Capt. Hoffmeyer's Charts - 42 2 7	Advance to Valencia Observatory - 50 0 0
Subscriptions to Hourly Obsns. - 14 0 0	Bank of England - 414 15 4
<u>783 5 4</u>	London and Westminster Bank - 729 11 2
Interest on Deposit Account - 58 19 0	<u>1,278 9 1</u>
<u>£12,668 19 9</u>	<u>£12,668 19 9</u>

Examined and compared with the vouchers and found correct.

31st May 1876. (Signed) Rosse, FRANCIS GALTON, } Auditors.

#### BALANCE SHEET, 31st March 1876.\*

To sundry creditors - 900 1 10	By balance of receipts and payments account - 1,278 9 1
probable net surplus - 909 9 8	"    sundry debtors - 531 2 3
<u>1,809 11 4</u>	<u>1,809 11 4</u>

\* The value of stock of instruments, &c., is not included in this statement.

## APPENDIX II.

LIST of CAPTAINS (and Officers) who have received from the Committee a Copy of the Admiralty Charts, to 31st March 1876 (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 returned to the Office.

Captain's Name.	Letters of Thanks.	Shlp.
*Aird, A. D. - - -	1	S.S. "Prussian."
Almond, Thomas Michael, F.R.A.S.	3	"Decapolis."
Angel, John Fry - - -	1	"Twilight."
Balderston, Richard James - - -	2	"Rajmahal."
Banner, Frederick William - - -	4	"Lady of the Lake," and "Kenilworth."
*Baker, Thomas - - -	1	"Zoroaster"
Barwood, William Richford - - -	2	"Fugitive."
Becket, Alexander - - -	1	"City of Perth."
Bennett, E. C. - - -	1	"Thessalus."
Blackie, A. H., R.N.R. - - -	1	"Melpomene."
Blair, J. - - -	1	"Arouca."
Blake, Edwin John - - -	5	"Gilbert Thompson," "Gitana," and "Sydney Dacres."
Bouchette, Francis Baines - - -	2	S.S. "European."
Brooks, Samuel - - -	3	S.S. "City of Brooklyn."
Brown, Robert - - -	2	S.S. "Moravian."
Bruce, John - - -	4	"City of Adelaide," and S.S. "Australian."
*Bythesea, John (V. C.), R.N. - - -	2	H.M.S. "Phœbe."
Campbell, Archibald - - -	5	S.S. "Britannia," and S.S. "Europa."
Campbell, H. - - -	1	"Burdwan."
Capper, Edward Hall - - -	2	"Palm Tree."
<i>Carruthers, Forrest Priest</i> - - -	3	"Minero."
Comley, William Guise, R.N.R. - - -	2	S.S. "Hong Kong."
Cruickshank, William - - -	1	"Richard Wright."
<i>Davidson, Charles</i> - - -	1	"Perseverance."
Dobson, Charles Meadows - - -	2	S.S. "Beta."
<i>Donkin, Thomas, R.N.R.</i> - - -	3	"Inverness."
Ellery, William - - -	6	"Bowfell."
Faithfull, Henry - - -	1	"Haddon Hall."
Fernie, Alexander Durward - - -	1	"Sir John Lawrence."
Finlay, James - - -	3	"Duncairn."
Freeman, Thomas W. - - -	3	S.S. "Wisconsin,"
Fry, Alfred - - -	3	"Foam."
Gales, I. C. - - -	1	"Flechero."
Gaye, Gerrard - - -	3	"Eliza Shaw."
*Goodenough, James G., R.N. - - -	1	H.M.S. "Pearl."
†Goodsall, W. - - -	1	S.S. "Kangaroo."
Grange, James - - -	1	S.S. "Acantha."
Gray, David - - -	3	S.S. "Eclipse."
*Gray, F. J., R.N. - - -	1	H.M.S. "Nassau."
Gray, John - - -	3	S.S. "Mazinthien" and S.S. "Hope."
Gray, John McDonald - - -	7	"Speranza."
Greenwood, William - - -	6	S.S. "Scotia" and "Assaye."
Grigs, George, R.N.R. - - -	3	S.S. "Helvetia," and S.S. "France."
*Haran, Dr. T. J., R.N. - - -	1	H.M.S. "Agincourt."

\* Pilot charts not presented.

† Chief Officer.

Names of Officers, deceased, in italics.

The wind observations are examined in order to ascertain the method employed by each observer, to decide what correction for compass error is to be applied, and to see that the records have been consistently entered.

Finally, the "Remarks" column is to be read, and portions of its contents are to be marked for extraction.

The results of the examination are entered in the log in red ink.

When the examination is complete, the work of preparation begins. This consists in carrying out the instructions entered in red ink in the log, and is always done in pencil. It may be classified under the following heads:—

1. Interpolation of the ship's position at each hour for which the observations are extracted, and notation of the ten-degree square and one-degree subsquare to which each observation belongs.
2. Transference of the current observations, which are given at intervals of 24 hours, to their midway position.
3. Application of instrumental corrections to each reading.
4. Correction of the observations of wind, sea, and cloud motion for compass error.

When the preparation has been completed the copying into data books is undertaken.

The Meteorological Committee having decided in 1867 to sift the data into one degree squares for each month, the following method was devised for carrying out that object. Monthly books are prepared for each ten-degree square for the part of the ocean under discussion from time to time. These books are paged so as to represent the *unit* figures of the *degrees* of latitude and longitude of the position in which a given observation was taken. For instance, an observation recorded in  $8^{\circ} 45'$  N. or S. and  $0^{\circ} 18'$  E. or W. would be entered on page 80 of the Data Book for the month, and for the ten-degree square in which it had been taken, and 80 would be considered to be the number of the subsquare to which it belonged. The same page receives all observations taken between  $8^{\circ}$  and  $9^{\circ}$  N. or S. lat. and between  $0^{\circ}$  and  $1^{\circ}$  E. or W. long. The same number 80 would equally represent all observations recorded between  $18^{\circ}$  and  $19^{\circ}$  lat. and  $10^{\circ}$  and  $11^{\circ}$  long., each ten-degree square having its one-degree subsquares numbered similarly, but every Data Book bears the number of the ten-degree square to which it refers.

The ten-degree squares are numbered on the following system. Square 1 commences with lat.  $0^{\circ}$  N. and longitude  $0^{\circ}$  W., and the numbering is carried on with increasing W. longitude until the circuit of the globe is completed with Square 36. The first number in the southern hemisphere is 300 and the last in the zone nearest the equator is 335.

The following diagram shows the way in which the pages in the Data Books are numbered.

All pages having a number *commencing* with the same digit have the same *unit* figure for their degree of *latitude*, whilst all *ending* with the same digit have the same *unit* figure for their degree of longitude.

By using the numbers of the subsquares in quoting extracts from a log, the locality of an observation is shown to a degree, but in the Data Book itself the minutes of latitude and longitude are given with each entry.

10 W.		Square 1.										Square 36.										10 E.	
10 N.		9	8	7	6	5	4	3	2	1	0	0	1	2	3	4	5	6	7	8	9	10 N	
		of Greenwich.																					
9	99	98	97	96	95	94	93	92	91	90	90	91	92	93	94	95	96	97	98	99	9		
8	89	88	87	86	85	84	83	82	81	80	80	81	82	83	84	85	86	87	88	89	8		
7	79	78	77	76	75	74	73	72	71	70	70	71	72	73	74	75	76	77	78	79	7		
6	69	68	67	66	65	64	63	62	61	60	60	61	62	63	64	65	66	67	68	69	6		
5	59	58	57	56	55	54	53	52	51	50	50	51	52	53	54	55	56	57	58	59	5		
4	49	48	47	46	45	44	43	42	41	40	40	41	42	43	44	45	46	47	48	49	4		
3	39	38	37	36	35	34	33	32	31	30	30	31	32	33	34	35	36	37	38	39	3		
2	29	28	27	26	25	24	23	22	21	20	20	21	22	23	24	25	26	27	28	29	2		
1	19	18	17	16	15	14	13	12	11	10	10	11	12	13	14	15	16	17	18	19	1		
0	09	08	07	06	05	04	03	02	01	00	00	01	02	03	04	05	06	07	08	09	0		
Equator.	09	08	07	06	05	04	03	02	01	00	00	01	02	03	04	05	06	07	08	09	Equator		
0	09	08	07	06	05	04	03	02	01	00	00	01	02	03	04	05	06	07	08	09	0		
1	19	18	17	16	15	14	13	12	11	10	10	11	12	13	14	15	16	17	18	19	1		
2	29	28	27	26	25	24	23	22	21	20	20	21	22	23	24	25	26	27	28	29	2		
3	39	38	37	36	35	34	33	32	31	30	30	31	32	33	34	35	36	37	38	39	3		
4	49	48	47	46	45	44	43	42	41	40	40	41	42	43	44	45	46	47	48	49	4		
5	59	58	57	56	55	54	53	52	51	50	50	51	52	53	54	55	56	57	58	59	5		
6	69	68	67	66	65	64	63	62	61	60	60	61	62	63	64	65	66	67	68	69	6		
7	79	78	77	76	75	74	73	72	71	70	70	71	72	73	74	75	76	77	78	79	7		
8	89	88	87	86	85	84	83	82	81	80	80	81	82	83	84	85	86	87	88	89	8		
9	99	98	97	96	95	94	93	92	91	90	90	91	92	93	94	95	96	97	98	99	9		
10 S.	9	8	7	6	5	4	3	2	1	0	0	1	2	3	4	5	6	7	8	9	10 S.		
10 W.	Square 300.										Square 335.										10 E.		
		Meridian																					

The further discussion of the observations after they have been transferred to data books involves questions which, as has been stated in the body of the report, at present engage the attention of the Council, and with regard to which they have not as yet arrived at a decision.

Besides the treatment of the observations in order to deduce mean and climatological results, it is also possible to utilize observations made at sea for the production of synoptic charts.

Two publications of this nature have been prepared in the Office, No. 13, on the weather over the Atlantic in February 1870, when the SS. "City of Boston" was lost, and the work now in the press, No. 32, on the weather over the Atlantic in August 1873.

It, must, however, be remembered that for the construction of synoptic charts the materials existing in the Office are, in a great measure, unavailable, and it is therefore necessary to make special efforts in order to obtain a sufficiency of synchronous observations.

## APPENDIX II.

LIST of CAPTAINS (and Officers) who have received a Presentation Copy of Charts (*see* Report, p. 6). The figures opposite to each show the number of Special Letters of Thanks written to each Observer in acknowledgment of "Excellent" Registers returned to the Office.

Captain's Name.	Letters of Thanks.	Ship.
*Aird, A. D. - - -	1	S.S. "Prussian."
†Allen, Frederick W. - - -	1	"Collingwood."
Almond, Thomas Michael, F.R.A.S.	5	"Decapolis."
Angel, John Fry - - -	1	"Twilight."
Balderston, Richard James - - -	3	"Rajmahal" and "Tenasserim."
<i>Banner, Frederick William</i> - - -	4	"Lady of the Lake," and "Kenilworth."
*Baker, Thomas - - -	1	"Zoroaster"
Barlow, Arthur Edward - - -	1	S.S. "Nizam."
Barron, William - - -	2	S.S. "Sultan."
Barwood, William Richford - - -	2	"Fugitive."
Becket, Alexander - - -	3	"City of Perth."
Bennett, Edwin Charles - - -	4	"Thessalus."
Blackie, Alexander Hamilton, R.N.R.	2	"Melpomene."
Blair, John - - -	2	"Arouca."
Blake, Edwin John - - -	5	"Gilbert Thompson," "Gitana," and "Sydney Dacres."
Blomfield, Harry - - -	1	"Thomas Stephens."
Bouchette, Francis Baines - - -	2	S.S. "European."
Broad, George A., Nav. Lt., R.N.	1	H.M.S. "Valorous."
Brooks, Samuel - - -	3	S.S. "City of Brooklyn."
Brown, Alfred John - - -	2	"Maroon."
Brown, Robert - - -	2	S.S. "Moravian."
Bruce, John - - -	5	"City of Adelaide," and S.S. "Australian."
Buehan, James - - -	3	"Commewyne."
Bythesea, John (V. C.), R.N.	2	H.M.S. "Phœbe."
Caborne, Warren Frederick, F.M.S.	1	"Waitara."
Campbell, Archibald - - -	5	S.S. "Britannia," and S.S. "Europa."
Campbell, Hugh - - -	3	"Burdwan" and "Rajmahal."
Capper, Edward Hall - - -	2	"Palm Tree."
Carpenter, Lieut. Alfred, R.N.	2	H.M.S. "Nassau."
<i>Carruthers, Forrest Priest</i> - - -	3	"Minero."
Cato, Wilson Robert - - -	2	S.S. "Hibernia."
Churchill, Orford, Lt., R.N.	1	H.M.S. "Ariel."
Conley, William Guise, R.N.R.	2	S.S. "Hong Kong."
<i>Cruikshank, William</i> - - -	1	"Richard Wright."
<i>Davidson, Charles</i> - - -	1	"Perseverance."
Dobson, Charles Meadows - - -	5	S.S. "Beta."
<i>Doukin, Thomas, R.N.R.</i> - - -	3	"Inverness."
Ellery, William - - -	7	"Bowfell" and "Baroda."
Faithfull, Henry - - -	1	"Haddon Hall."
Fernie, Alexander Durward - - -	1	"Sir John Lawrence."
Finlay, James - - -	3	"Duncairn."
Frederick, George C., Sub. Lt., R.N.	3	H.M.S. "Fawn."

\* Charts not presented.

† Chief Officer.

Names of Officers, deceased, *in italics*.

Captain's Name.	Letters of Thanks.	Ship.
Freeman, Thomas W. - -	5	S.S. "Wisconsin" and S.S. "Nestor."
Fry, Alfred - - -	3	"Foam."
Gales, Isaac Chapman - -	1	"Flechero."
Gaye, Gerrard - - -	5	"Eliza Shaw" and "Ænone."
* Goodenough, Commodore James G., R.N.	1	H.M.S. "Pearl."
*† Goodsall, Walter - - -	1	S.S. "Kangaroo."
Gordon, James - - -	2	"City of Oxford."
Grange, James - - -	1	S.S. "Acantha."
Gray, David - - -	5	S.S. "Eclipse."
* Gray, F. J., R.N.	1	H.M.S. "Nassau."
Gray, John - - -	5	S.S. "Mazinthien" and S.S. "Hope."
Gray, John McDonald - -	3	"Speranza" and "Melpomene."
Gray, Samuel B. - - -	1	"Letterewe."
Greenwood, William - -	7	S.S. "Scotia," "Assaye," and "Gareloch."
Grigs, George, R.N.R. - -	3	S.S. "Helvetia," and S.S. "France."
Haran, Dr. T. J., R.N. - -	1	H.M.S. "Agincourt."
Harris, David - - -	2	S.S. "Medway."
Hassell, Thomas Edward - -	3	"Mervyn."
Hayes, James - - -	7	S.S. "Ptolemy" and S.S. "Camoens."
Hayward, George Olive - -	2	S.S. "Durley."
Hayward, J. J., Paymaster, R.N.	1	H.M.S. "Hydra."
Heggum, Edward Carl V. - -	10	"Czar" and "Rozelle."
Henderson, Henry - - -	5	"Hope," and S.S. "Cleveland."
† Hepworth, Campbell, M. W. - -	1	S.S. "Hibernia."
† Hodding, Samuel White - -	3	"Indus."
Holdich, John Peach, R.N.R. - -	4	"Agra" and "Behington."
Hopkins, John O., R.N. - -	1	H.M.S. "Liverpool."
Horner, Mr. A. C., M.R.C.S. - -	1	S.S. "Pandora."
Hosken, Henry, Staff Com., R.N.	1	H.M.S. "Pearl."
*† Hunt, J. - - -	1	"Avonside."
Hunter, David - - -	5	S.S. "Alpha" and S.S. "Delta."
Innes, George - - -	2	"Silistria" and "Agnes Rose."
Jackson, John Nugent - - -	2	"Knowsley Hall."
Jackson, Robert, Staff Com., R.N.	1	H.M.S. "Glasgow."
Johnson, Charles, R.N.R. - -	4	"St. Lawrence."
Jones, Arthur Arundel - - -	3	"Victoria Nyanza," and "Chevy-chase."
Jones, George Henry - - -	8	S.S. "Nile," "S.S. "Quang-se," and S.S. "Niger."
Jones, Loftus Francis, R.N. - -	1	H.M.S. "Valorous."
Jones, Theodore Morton, R.N. - -	3	H.M.S. "Glasgow."
Kennedy, Charles William - -	3	S.S. "Scotia," and S.S. "Baltic."
Kennedy, James Branch, R.N.R. - -	1	S.S. "Blue Cross."
Kerr, Alexander - - -	4	"Ardgowan."
Kerr, Thomas Coulter, R.N.R. - -	2	"Durham."
Latham, Frederick W. - - -	1	"Sannatra."
Lecky, Squire Thornton Stratford, R.N.R., F.R.G.S.	3	S.S. "Uruguay" and S.S. "Halley."
Leportier, Theodore - - -	2	"Kate."
Lewis, John Thomas, R.N.R. - -	2	S.S. "Scotia," and S.S. "Chaldea."
Lindsay, Henry Kay - - -	2	"Valparaiso" and "Rokeby Hall."

\* Charts not presented.

† Chief Officer.

‡ Second Officer.

Names of Officers, deceased, *in italics*.

Captain's Name.	Letters of Thanks.	Ship.
Longley, Herbert - -	5	S.S. "Yorkshire."
Lunham, Robert Dowe - -	7	S.S. "Berar," S.S. "Durley" "Charles Howard" and "Sumatra."
*MacDonald, John - -	1	S.S. "Europa."
<i>McKechnie, Duncan Ferguson</i> - -	5	"Cottica."
Mackellar, D. E. - -	1	Observations at Rapa Island.
Mackie, Thomas - -	1	S.S. "Mazinthien."
Maddison, John, R.N.R. - -	1	"Anglesey."
Manning, Henry - -	1	S.S. "Kangaroo."
Maples, Charles - -	3	"Genii" and "Riversdale."
Marshall, David - -	2	"Ardgowan" and "Lady Octavia."
Martyn, John Artis - -	14	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."
Mesnard, Thomas - -	1	"Mistley Hall."
Miller, A. John - -	1	"Camperdown."
<i>Moore, Thomas</i> - -	1	"W. E. Gladstone."
Morrish, Samuel - -	1	"Pendragon."
Morton, John D'Arcy - -	1	"Henry Bath."
<i>Mossop, Clement</i> - -	3	"Candahar."
Mouland, John Elsey - -	5	S.S. "Batavia."
Murdoch, Henry - -	2	"Denbighshire."
Murphy, Michael - -	1	S.S. "Tarifa."
Napier, Richard Henry, R.N. - -	6	H.M.S. "Nassau."
Nares, Sir George Strong, R.N., F.R.S. - -	2	H.M.S. "Challenger."
Newton, James William - -	1	S.S. "Grenadier."
North, William George - -	1	S.S. "West Riding."
Owen, John - -	2	"W. G. Russell."
Owen, Robert - -	1	"Victoria Cross."
Parry, Moses - -	1	"Queen of Cambria."
†Paterson, James Forrest - -	2	S.S. "Moravian."
Pearson, Charles William - -	10	S.S. "Strathclyde" and S.S. "Strathleven."
Peebles, Robert - -	2	"Margaret Galbraith" and "Otago."
Perry, John L., R.N. - -	2	H.M.S. "Orontes."
Petch, John A. R., Staff Com., R.N. - -	2	H.M.S. "Phœbe."
Petrie, Peter Conrad - -	2	S.S. "Patagonia."
Pollard, Lt. G. N. A., R.N. - -	4	H.M.S. "Nassau."
Potts, Thomas Crosby - -	8	"Tenasserim."
Prehl, Carl Christian - -	3	"Eleanor" and "Mikado."
<i>Price, James John</i> - -	10	"Sorata."
‡Pritchard, Charles E., R.N. - -	1	H.M.S. "Ariel."
Rachburn, John, R.N.R. - -	1	"Airlie."
Randall, William - -	1	"Iron Cross."
Rawle, Charles, R.N.R. - -	1	"Star of the North."
Raymond, Charles Tenzer - -	6	"British India," "British Consul," and "Cicero."
Reid, Carson William - -	2	"Lord Strathmairn."
Rebaut, Charles Henry - -	7	"Celaeno," "Glenlora," and "Pleione."
Ruthven, Jocelyn Fitzgerald, R.N.R. - -	1	"Whittington."

\* Charts not presented.

† Chief Officer.

‡ Navigating Sub-Lieutenant.

Names of officers deceased, *in italics*.

Captain's Name.	Letters of Thanks.	Ship.
St. John, Henry Craven, R.N. -	2	H.M.S. "Sylvia."
†Scott, Fergus -	1	S.S. "Hotspur."
†Scott, George Alexander Brown -	1	S.S. "Nestorian."
Scott, William -	1	"Alliance."
Sharp, William H., Staff Com., R.N.	1	H.M.S. "Liverpool."
Shaw, Gilbert -	4	S.S. "Beta."
Shearer, George -	1	"Early Morn."
Shortland, R. Adm. P. F., R.N. -	1	H.M.S. "Hydra."
Simpson, Alexander -	8	"Traveller."
<i>Smith, David, F.R.A.S.</i> -	1	"Wiltshire."
Smith, William Charles -	4	"Kingdom of Saxony" and "Kingdom of Sweden."
Smith, William Henry, R.N.R. -	11	S.S. "Hibernian," S.S. "Peruvian," and S.S. "Scandinavian."
Stanhope, John -	1	"Decision."
Steele, John -	2	S.S. "Erl King."
Stephen, John George -	2	S.S. "Moravian" and S.S. "St. Patrick."
Stuart, George Rennie -	6	"Otago," "Oamaru," and S.S. "Nemesis."
Stuart, William Henry -	5	"Richmond."
Sutherland, James Taylor -	3	"Maggie" and "Glenesk."
Symington, William -	12	"Northfleet," "Flying Venus," S.S. "Hong Kong," and S.S. "Hankow."
*Tandy, Comr. Dashwood G., R.N.	1	H.M.S. "Nassau."
Thomson, Frank Tourle, R.N. -	3	H.M.S. "Challenger."
Tilmonth, Robert J. C. -	1	"Peeress."
Tizard, Thomas H., Staff-Com. R.N.	1	H.M.S. "Challenger."
Townsend, William Henry -	1	"Valentine and Helene."
Trench, Chas. E. Le Poer -	5	"Newcastle."
<i>Tucker, John Worth</i> -	1	"John Temperley."
Tully, Thomas -	2	"Baroda."
Turner, Edward Wrake -	3	"Mertola."
Vine, William W., Staff Com., R.N.	3	H.M.S. "Orontes."
Vowell, Michael -	2	"Kelso" and "Undine."
Wadham, Thomas Littleford -	5	"Vere" and "The Murray."
Walker, John Burnett -	1	S.S. "Erik."
Warden, William -	4	S.S. "Alpha."
Waring, William -	2	S.S. "Atalanta."
Watkins, Thomas -	1	"Emulation."
Watson, William, F.M.S. -	16	S.S. "Palmyra," S.S. "Parthia," and S.S. "Algeria."
Wharton, William J. L., R.N. -	3	H.M.S. "Fawn."
†Wheeler, Francis S., R.N. -	2	H.M.S. "Sylvia."
Wherland, Frederick, R.N.R. -	6	"Galatea."
Wight, Henry Potts -	6	"Gosforth," "Dunalistair," and "Taranaki."
Wilcox, Henry George, R.N.R. -	4	"St. Lawrence" and S.S. "Glenfinlas."
Williams, James Agnew -	1	S.S. "Wisconsin."
Wylie, James -	2	S.S. "Austrian" and S.S. "Sarmatian."
Young, Sir Allen, R.N.R. -	2	S.S. "Pandora."

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.

\* Charts not presented.

† Chief Officer.

‡ Navigating Sub-Lieutenant.

Names of officers deceased, *in italics*.

## List of DOCUMENTS, &amp;c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
Jones, G. H.	S.S. Niger	1,123	C. Norwood, London	Odessa, one voyage; Cronstadt, one voyage.	3
"	S.S. Nile	1,081	"	Revel, one voyage	21 days.
"	S.S. Dwina	817	"	Cronstadt, one voyage	18 days.
14 Jones, T. M., R.N.	Glasgow	3,037	I.L.M.S.	From Zanzibar to Seychelles, Trincomalee, Calcutta, and Madras.	4
15 "	"	"	"	Home from India	5
Kempe, E. A.	Golden Gate	899	J. Lyne, Liverpool	San Francisco	8
Kerr, Alexander	Ardgowan	1,283	G. Adam, Greenock	Bombay	8
Latham, Frederick	Sematra	774	T. & R. Brocklebank, Liverpool	Calcutta	8
16 Lindsay, Lord	Stm. Yt. Venus	191	Lord Lindsay, London	Mauritius	7
Longley, Henry	S.S. Yorkshire	1,771	W. Tindall, London	Calcutta, via Suez	3
17 Lautit, Alexander	Rodney	1,447	J. Devitt, London	To Melbourne	3
Lunham, R. D.	S.S. Charles Howard	1,021	J. Ryde, London	Monte Video	3
Mackay, J. R.	S.S. Australia	1,384	J. Henderson, Glasgow	Halifax, N. S.	1
McKechnie, D. F.	Cottica	319	A. Pearson, Glasgow	Surinam	3
18 Malcoha, G. J., R.N.	Briton	1,870	I.L.M.S.	Aden to Zanzibar	22 days.
Maples, Charles	Riversdale	1,430	J. MacIntyre, Liverpool	Calcutta	9
19 Marshall, J. N.	Cambridgeshire	"	"	Melbourne	5
Martyn, J. A.	S.S. Cuba	845	C. McIver, Liverpool	New York, five voyages	4
Miller, A. J.	Camperdown	1,209	W. H. De Wolf, Liverpool	To Callao and from Lotus Island	6
Moulant, J. E.	Batavia	2,553	J. Burns, Glasgow	Boston, seven voyages; New York, three voyages.	7
"	S.S. Calabria	1,730	C. McIver, Liverpool	New York	20 days.

LIST of DOCUMENTS, &c.—*continued.*

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
<sup>20</sup> Nares, G. S., R.N.	Challenger	2,306	H.M.S.	Kerguelen Island, to Melbourne, New Zealand, Fiji Island, Arcoo Island, and Hong Kong.	10
Owen, John	W. G. Russell	1,248	J. Thomas, Liverpool	Aden, Rangoon, Akyab, and home	10
Owen, Robert	Albertine	1,523	R. Avery, N. Shields	Rangoon	8
<sup>21</sup> Parish, J. E., R.N.	Princess Charlotte	4,122	H.M.S.	Off Hong Kong	6
Pearson, C. W.	S.S. Strathclyde	1,951	Burrell & McLaren, Glasgow	Bombay, via Suez, three voyages	9
Potts, T. C.	Tenasserim	1,419	T. & R. Brocklebank, Liverpool	Calcutta	6
Prehn, C. C.	Eleanor	428	J. J. Holdsworth, Minorics	Bussorah, Algoa Bay, and home	10
Price, J. J.	Sorata	332	C. C. Dawson, London	Jamaica	3
Renaut, C. H.	Crusader	991	Mrs. Bowes, Kent	Canterbury, New Zealand, and home	6
<sup>22</sup> Ryder, H. C. G., R.N.	Vigilant	985	H.M.S.	From Gibraltar to Trincomalee, via Suez	2
<sup>23</sup> St. John, H. C., R.N.	Sylvia	877	H.M.S.	China and Japan, via Suez	11
Shaw, Gilbert	S.S. Beta	677	W. Cunard, South Kensington	Eight voyages between Halifax and St. Thomas, via Bermuda.	5
Simpson, Alexander	Traveller	195	A. Simpson	Three voyages to and from Iviglut, and three voyages to and from Copenhagen.	12
<sup>24</sup> Smith, J. H., R.N.R.	Worcester	-	Training Ship	Off Grecubitic	3
Smith, W. H., R.N.R.	S.S. Scandinavian	1,811	Allan Brothers, Glasgow	Quebec, four voyages; Baltimore, two voyages; Portland, three voyages.	8
<sup>25</sup> Soady, J. C., R.N.	Invincible	6,034	H.M.S.	English Channel and Mediterranean	3
Stuart, G. R.	Oamaru	1,306	Albion Shipping Co., Glasgow	Otago, N. Z.	6
Sutherland, J. T.	Glenesk	191	J. Warrack, Leith	River Plate	7
Synington, William	S.S. Hankow	2,331	E. H. Watts, London	Hankow, via Suez	5
"	"	"	"	Madras and Calcutta, via Suez	3

## List of Documents, &amp;c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
Trench, C. Le Pover	Newcastle	1,137	H. Green, Blackwall	Melbourne	7
"	"	"	"	Australa	4
<sup>26</sup> Underdown	Illinani	2,579	Pacific Steam Navigation Co., London.	To Rio Janeiro, Monte Video, and Valparaiso.	37 days.
Wadhams, T. L.	The Murray	963	Anderson & Co., London	Adelaide	7
Warden, William	S.S. Alpha	514	W. Cunard, Halifax, N.S.	Three voyages between Halifax and St. Thomas, via Bermuda.	5
Watson, William	S.S. Parthia	2,035	C. Meyer, Liverpool	New York, three voyages; Boston, six voyages.	7
<sup>27</sup> Wharton, W. J. Esq., R.N.	Shearwater	913	H.M.S.	At Zanzibar, Cape of Good Hope, Mauritius, Rodriguez Island, East Coast of Africa, and home, via Suez.	25
"	"	"	"	Surveying in Bosphorus and Dardanelles.	4
Wherland, Frederick, R.N.R.	Galatea	1,447	Norwood & Co., Liverpool	Port Philip, San Francisco, and home	9
Wight, H. P.	Dunahistor	1,686	W. Groullee, Dundee	Calcutta	8
Wileox, H. G., R.N.R.	S.S. Gendinbas	1,366	J. McGregor, London	China, via Suez	4
<sup>28</sup> Williams, Edmund	M-ropo	1,054	W. Saville, London	Lyttleton	6

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

- <sup>1</sup> Assisted by T. R. Hudson and A. Fisher.
- <sup>2</sup> Kept by T. J. Haran, R.N., Staff-Surgeon.
- <sup>3</sup> Kept by R. Lamb, 2nd Officer.
- <sup>4</sup> Kept by Officers of Transport of Venus party, under the direction of Captain G. L. Tupman.
- <sup>5</sup> Assisted by R. W. Harvey, 1st Officer, and R. L. Webster, 2nd Officer.
- <sup>6</sup> Kept by the Boys.
- <sup>7</sup> Kept by R. Boston, Navigating Lieutenant.
- <sup>8</sup> Kept by H. Pearce, Surgeon.
- <sup>9</sup> Kept by Sydney A. Holt, F.R.G.S., Lieutenant.
- <sup>10</sup> Kept by Holt, and G. N. A. Pollard, F.R.G.S., Lieutenant.
- <sup>11</sup> Kept by G. N. A. Pollard, F.R.G.S., Lieutenant.
- <sup>12</sup> Kept by R. Jones, Mate.
- <sup>13</sup> Kept by R. Jackson, Navigating Lieutenant.
- <sup>14</sup> Kept by Dr. R. Copeland.
- <sup>15</sup> Kept by F. W. Allen, 2nd Officer.
- <sup>16</sup> Kept by J. Gaster, Chief Officer.
- <sup>17</sup> Kept by T. H. Tizard, Staff-Commander, and A. Havergal, Navigating Lieutenant.
- <sup>18</sup> Kept by T. W. Webster, Navigating Lieutenant.
- <sup>19</sup> Kept by G. W. Balliston, Navigating Lieutenant.
- <sup>20</sup> Kept by F. S. Wheeler, Navigating Sub-Lieutenant.
- <sup>21</sup> Kept by the Boys, under the superintendance of Rev. W. T. Read, M.A.
- <sup>22</sup> Kept by T. F. Pollen and C. V. Smith, Sub-Lieutenants.
- <sup>23</sup> Kept by Major Fabury, R.E., and Corporal Sharp, R.E.

## LIST OF DOCUMENTS, &amp;c.—continued.

Captain's Name.	Ship.	Tons.	Owners.	Voyage.	Months of Register.
Trench, C. Le Poer	Newcastle	1,137	H. Green, Blackwall	Melbourne	7
"	"	"	"	Australia	4
26 Unknown	Illimani	2,579	Pacific Steam Navigation Co., London.	To Rio Janeiro, Monte Video, and Valparaiso.	37 days
Wadham, T. L.	The Murray	903	Anderson & Co., London	Adelaide	7
Warden, William	S.S. Alpha	514	W. Cunard, Halifax, N.S.	Three voyages between Halifax and St. Thomas, via Bermuda.	5
Watson, William	S.S. Parthia	2,035	C. McIver, Liverpool	New York, three voyages; Boston, six voyages.	7
27 Wharton, W. J. L., R.N.	Shearwater	913	H.M.S.	At Zanzibar, Cape of Good Hope, Mauritius, Rodriguez Island, East Coast of Africa, and home, via Suez.	25
"	"	"	"	Surveying in Bosphorous and Dardanelles.	4
Wherland, Frederick, R.N.R.	Galatea	1,447	Norwood & Co., Liverpool	Port Philip, San Francisco, and home	9
Wright, H. P.	Dunalistair	1,686	W. Crondiace, Dundee	Calcutta	8
Wilcox, H. G., R.N.R.	S.S. Glenfinlas	1,366	J. McGregor, London	China, via Suez	4
28 Williams, Edmund	Merope	1,054	W. Saville, London	Lyttleton	6

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

- 1 Assisted by T. R. Spertson and A. Fisher.
- 2 Kept by T. J. Haran, R.N., Staff-Surgeon.
- 3 Kept by R. Ladd, 2nd Officer.
- 4 Kept by Officers of Transit of Venus party, under the direction of Captain G. L. Tupman.
- 5 Assisted by R. W. Harvey, 1st Officer, and R. L. Webster, 2nd Officer.
- 6 Kept by the Boys.
- 7 Kept by H. Hosken, Navigating Lieutenant.
- 8 Kept by H. Pearde, Surgeon.
- 9 Kept by Sydney A. Holt, F.R.G.S., Lieutenant.
- 10 Kept by ditto, and G. N. A. Pollard, F.R.G.S., Lieutenant.
- 11 Kept by G. N. A. Pollard, F.R.G.S., Lieutenant.
- 12 Kept by E. Jones, Mate.
- 13 Kept by E. Jackson, Navigating Lieutenant.
- 14 Kept by Dr. E. Copeland.
- 15 Kept by F. W. Allen, 2nd Officer.
- 16 Kept by J. Gaster, Chief Officer.
- 17 Kept by T. H. Tizard, Staff-Commander, and A. Havergal, Navigating Lieutenant.
- 18 Kept by T. W. Webster, Navigating Lieutenant.
- 19 Kept by G. W. Balliston, Navigating Lieutenant.
- 20 Kept by F. S. Wheeler, Navigating Sub-Lieutenant.
- 21 Kept by the Boys, under the superintendance of Rev. W. T. Read, M.A.
- 22 Kept by T. F. Pullen and C. V. Smith, Sub-Lieutenants.
- 23 Kept by Major Palmer, R.E., and Corporal Sharp, R.E.

## APPENDIX IV.

CONTENTS of the PRINCIPAL PUBLICATIONS issued up to  
December 31st, 1875.

*Continued from Report for 1874.*

Official  
No.

24. INSTRUCTIONS in the USE of METEOROLOGICAL INSTRUMENTS.  
1875. 8vo., pp. 118.  
This work has been prepared to replace in some way Sir H. James' Instructions, which are now out of print. The first portion of the book, referring to the Barometer, is nearly a reprint of the *Board of Trade Barometer Manual* (1871) but somewhat re-arranged. The latter part contains descriptions of all the various instruments in use, with remarks on Weather Observations, &c. The appendices contain some of the most useful tables for meteorological reductions, some of which have been specially calculated.
25. QUARTERLY WEATHER REPORT for 1874. (In the press.)
27. CHARTS of METEOROLOGICAL DATA for the Nine  $10^{\circ}$  Squares of the Atlantic which lie between  $20^{\circ}$  N. and  $10^{\circ}$  S. and extend from  $10^{\circ}$  to  $40^{\circ}$  W., with accompanying remarks. (In the press.)  
A summary of this paper has appeared (Non-Official No. 10) under the title "Physical Geography of the Atlantic," being a paper read by Captain H. Toynbee, Marine Superintendent, Meteorological Office, before the British Association at Bristol in August 1875, and it shows the best routes across the Equator in each month of the year, with discussions of the pressure, temperature, winds, &c. for the district included in the above limits, with charts for each month.
28. METEOROLOGY of JAPAN. (In the press.)
30. QUARTERLY WEATHER REPORT for 1875. (In the press.)
-

## APPENDIX V.

## INSTRUMENTS supplied, &amp;c. to the Royal Navy.

Per Account.	Baro- meters.	Ance- roids.	Thermometers.			Hydro- meters.
			Ordinary.	Max.	Min.	
January 1st, 1875, afloat	191	391	961	36	64	147
Issued in 1875	60	85	345	45	45	44
Returned in 1875	251 60	476 90	1,306 266	81 38	109 31	191 39
January 1st, 1876, afloat	191	386	1,040	43	78	152

## INSTRUMENTS supplied, &amp;c. for use at Naval Stations.

January 1st, 1875, in use	57	93	113	30	27	28
Issued in 1875	5	6	10	6	7	—
Returned in 1875	62 14	99 13	123 50	36 19	34 20	28 11
January 1st, 1876, afloat	48	86	73	17	14	17

## DISPOSITION of ADMIRALTY INSTRUMENTS on January 1st, 1876.

Afloat in Royal Navy	191	386	1,040	43	78	152
In use at stations	48	86	73	17	14	17
In store at M.O.	115	53	185	29	22	70
" Chatham	1	7	12	2	2	12
" Sheerness	11	14	13	5	9	19
" Portsmouth	2	3	5	1	—	19
" Devonport	9	16	32	5	5	18
" Queenstown	1	3	4	1	1	8
" Gibraltar	1	2	—	—	—	4
" Malta	1	10	31	2	1	32
" Halifax	3	5	5	5	6	13
" Bermuda	5	10	13	3	3	16
" Jamaica	4	5	19	2	3	8
" Cape of Good Hope	2	6	17	—	—	31
" Trincomalee	1	1	3	—	—	—
" Hong Kong	12	18	42	4	5	21
" Coquimbo	2	1	1	1	—	23
" Sydney	—	—	—	—	—	—
Under repair	34	23	—	—	—	—
Total, January 1st 1876	443	649	1,495	120	149	463
Destroyed and lost during 1875	—	2	224	22	16	8

In addition to the instruments specified above, the Office has a considerable number of miscellaneous instruments on the Admiralty account which have been obtained for special investigations. Among these may be counted about 50 thermometer screens.

APPENDIX VI.

INSTRUMENTS, &c. supplied to Mercantile Marine.

Per Account.	Baro- meters.	Com- passes.	Thermometers.			Hydro- meters.
			Ordinary.	Max.	Min.	
January 1st, 1875, afloat -	83	1	483	—	—	313
Issued in 1875 -	78	—	481	—	1	312
Returned in 1875 -	161	1	964	—	1	625
January 1st, 1876, afloat -	68	—	409	—	1	255
January 1st, 1876, afloat -	93	1	555	—	—	370

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

January 1st, 1875, in use	98	3	253	49	54	54
Issued in 1875 -	9	—	32	5	4	10
Returned in 1875 -	107	3	285	54	58	64
January 1st, 1876, in use	9	—	39	8	9	14
January 1st, 1876, in use	98	3	246	46	49	50

DISPOSITION of Board of Trade Instruments, on Jan. 1st, 1876.

In merchant ships -	93	1	555	—	—	370
In use at stations -	98	3	246	46	49	50
In store at M.O. -	22	45	40	12	11	27
At Liverpool agency -	2	8	30	—	—	10
„ Aberdeen „ -	8	—	36	—	—	28
„ Glasgow „ -	4	—	26	—	—	16
„ Dundee „ -	1	—	10	—	—	7
„ Hull „ -	2	—	12	—	—	8
Under repair -	4	—	—	—	—	—
Total, Jan. 1st, 1876	233	57	955	58	60	516
Lost, &c. during 1875	52	—	200	34	40	53

As in the case of the Admiralty instruments, the Office possesses a considerable stock of miscellaneous instruments for special investigations. The most important of these are 137 Fishery Barometers and upwards of 200 thermometer screens.

## APPENDIX VI.

## INSTRUMENTS, &amp;c. supplied to Mercantile Marine.

Per Account.	Baro- meters.	Com- passes.	Thermometers.			Hydro- meters.
			Ordinary.	Max.	Min.	
January 1st, 1875, afloat -	83	1	483	—	—	313
Issued in 1875 - -	78	—	481	—	1	312
Returned in 1875 -	161	1	964	—	1	625
	68	—	409	—	1	255
January 1st, 1876, afloat -	93	1	555	—	—	370

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

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	9	—	39	8	9	14
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## DISPOSITION of Board of Trade Instruments, on Jan. 1st, 1876.

In merchant ships -	93	1	555	—	—	370
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In store at M.O. -	22	45	40	12	11	27
At Liverpool agency -	2	8	30	—	—	10
„ Aberdeen „ -	8	—	36	—	—	28
„ Glasgow „ -	4	—	26	—	—	16
„ Dundee „ -	1	—	10	—	—	7
„ Hull „ -	2	—	12	—	—	8
Under repair -	4	—	—	—	—	—
Total, Jan. 1st, 1876	233	57	955	58	60	516
Lost, &c. during 1875	52	—	200	34	40	53

As in the case of the Admiralty instruments, the Office possesses a considerable stock of miscellaneous instruments for special investigations. The most important of these are 137 Fishery Barometers and upwards of 200 thermometer screens.

## APPENDIX VII.

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

Sumburgh Head	-	Rev. W. Brand	-	-	-	Minister.
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. Lowry	-	-	-	Schoolmaster.
Donaghadee	-	J. MacGowan, jr.	-	-	-	Telegraph Clerk.
Kingstown	-	G. Mitchell	-	-	-	Keeper of Sailors' 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, Sailors' 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, and is organizing an interchange with Germany which will probably add several other stations to the list.

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

*In exchange for Observations, &c. :*

Aird, G. II., Seaham.  
 Barnstaple Meteorological Committee.  
 Cambridge Observatory.

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\* The new arrangements with the "Times," in virtue of which special charts for 6 p.m. are supplied to that paper, commenced January 1st, 1876.



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

Patent Office.  
Pembroke, Captain Superintendent.  
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 :*

Algiers, Meteorological Service.  
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.	Ilfracombe.	Tynemouth.
Inverness.	Maryport.	Barnstaple.	S. Shields.
Nairn.	Workington.	Port Isaac.	Sunderland.
Burghhead.	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 stations.	Grimsby.
Stonhaven.	Lytham.	Teignmouth.	Boston.
Montrose.	Runcorn.	Exeter.	Sutton Bridge.
Broughty Ferry.	Southport.	Exmouth.	Lynn.
St. Andrews.	Liverpool.		Cromer.
Dundee.	Queensferry.	ENGLAND, S.	ENGLAND, S.E.
Anstruther.	Hawarden.	Guernsey.	Yarmouth.
St. Monance.	Mostyn.	St. Helier, Jersey.	Southwold.
Burntisland.	ENGLAND, W.	Gorey, Jersey.	Ipswich.
Alloa.	Bangor.	Weymouth.	Harwich.
Grangemouth.	Port Penrhyn.	Poole.	Chatham.
Bo'ness.	Holyhead.	Cowes.	Sheerness.
Granton.	Carnarvon.	Ventnor.	Faversham.
Leith.	Port Dinorwic.	Portsmouth.	
Fisherrow.	Aberystwith.	Littlehampton.	
Dunbar.	Milford.	Brighton.	
Eyemouth.	Pembrey.	Newhaven.	
	Llaelley.	Hastings.	
	Swansea.	Rye.	
	Briton Ferry.	Dover.	
	Portheawl.		
	Penarth.		
	Cardiff.		
	Newport.		
	Weston-super- Mare.		
FIRTH OF CLYDE.	Burham.		
Glasgow.	IRELAND, E.		
Greenock.	Belfast.		
Rothesay.	Howth.		
Campbeltown.	Kingstown.		
Girvan.	IRELAND, S. and W.		
	New Ross.		
	Dundimore, 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 0h. 43m. p.m. G. M. T.) have been received.

Stations.	Observers.	Remarks.
ENGLAND AND WALES.		
Bradford	J. McLandsborough	—
Cambridge	H. Todd.	—
Cardington	J. McLaren.	—
Carlisle	J. Beil. for J. Cartmell.	—

\* 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.
Chatham, School of Military Engineering.	J. Conroy.	—
Dartmoor - - -	R. E. Power, L.R.C.P.	—
Dover - - -	J. Costello.	—
Durham Observatory - -	J. Plummer, M.A.	Ceased 31st March 1875.
Eccles - - -	T. Mackereth.	—
Falmouth Observatory -	The Staff.	—
Gloucester County Asylum	E. Toller - - -	Ceased 31st Jan. 1875.
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's) - -	A. P. Amy.	—
Kew Observatory - - -	The Staff.	—
Leicester (Museum) - - -	W. J. Harrison.	—
Liverpool Observatory (Bidston).	J. Hartnup, Jun.	—
Llandudno - - -	J. Nicol, M.D. - - -	Ceased 31st May 1875.
Nottingham - - -	E. J. Lowe, F.R.S.	—
Oscott (St. Mary's Col.)	Rev. S. Whitty.	—
Oxford, Radcliffe Obs. - -	J. Lucas, for Rev. R. Main, F.R.S.	—
Plymouth - - -	J. Merrifield, LL.D., F.R.A.S.	—
Scarborough - - -	F. Shaw, F.M.S.	—
Sheffield - - -	W. F. Cooper, F.M.S.	—
Shields (North) - - -	J. Irvine - - -	Ceased 15th July 1875.
Silloth - - -	Rev. F. Redford, M.A., F.R.S.E.	—
Somerleyton - - -	Rev. J. Steward, M.A. - -	Ceased 15th July 1875.
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 - - -	Irregular.
Truro (Royal Institution)	W. Newcombe.	—
Wishbeach - - -	S. H. Miller, F.M.S. - - -	Ceased 31st Jan. 1875.
Worthing - - -	W. J. Harris, F.M.S. - - -	Ceased 15th June 1875.
Yarmouth (Norfolk) - - -	G. T. Watson.	—

## SCOTLAND.

Aberdeen Observatory - -	The Staff.	—
Annanduff - - -	W. H. Dunlop - - -	Ceased 16th Jan. 1875.
Ardrossan - - -	W. McNeil.	—
Glasgow Observatory - -	The Staff.	—
Nairn - - -	W. D. Penny.	—
Orkneys, Sandwick - - -	Rev. C. Clouston, LL.D.	—
Sornoway - - -	J. Smith.	—
Sumburgh Head - - -	W. Lawrence - - -	Ceased 30th April 1875.
Thurso - - -	J. Trotter.	—

## IRELAND.

Armagh Observatory - - -	S. Call for Dr. Robinson.	—
Donaghadee - - -	J. McGiowan.	—
Galway, Queen's College	B. G. Clare, for Professor Curtis.	—
Kingstown - - -	G. Mitchell.	—
Parsonstown - - -	J. Dreyer for Lord Rosse.	—
Roche's Point - - -	W. Kennedy.	—
Valencia Observatory - -	The Staff.	—

Stations.	Observers.	Remarks.
<b>BRITISH COLONIES, POSSESSIONS, &amp;C.</b>		
Barbadoes - -	T. H. Hunt, A.H.C.*	From 16th March 1875.
Cape of Good Hope - -	Sergt. D. E. Hunt, A.H.C.	Ceased 31st July 1875.
Colombo - -	Sergeant. W. F. Hopkins, A.H.C.	" "
Gibraltar - -	S. Sergeant J. Brewster, A.H.C.	—
Halifax, N.S. - -	Corporal J. Thompson, A.H.C.	Ceased 31st May 1875.
Malta - -	Priv. E. Dowling, A.H.C.	—
Nassau (Bahamas) - -	Surgeon-Maj. J. Jamieson, M.D.	—
Natal - -	Priv. G. Salmon, A.H.C.	—
Scutari, British Cemetery	Serg. W. H. Lyne, R.E.	—
Sierra Leone - -	Surgeon A. Johnston.	—

SUMMARY.

England and Wales - -	38	
Scotland - -	9	
Ireland - -	7	
Colonies and British Possessions - -	10	
Total - -	64	

\* A.H.C.—Army Hospital Corps.

## APPENDIX XI.

## FISHERY BAROMETERS.

## LIST of PLACES supplied with FISHERY BAROMETERS.

Those supplied during the years 1867-75 are distinguished by an asterisk.

*Shetland Isles.*—Saudsair, 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, Roseheart, Pitullie, Inverallochy,\* Findon, Portlethen, Stonehaven,\* Arbroath, Broughty Ferry, St. Andrews, Crail, Cellardyke, St. Monan,\* 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, Ryde and Ventnor\* (2) (Isle of Wight), Gorey (Jersey), Haslar Hospital,\* Poole, Weymouth, Portland, Budleigh-Salterton, Cawsand, Mevagissey, Gorranhaven, Devoran, Portscath,\* 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, Bumbeg.

*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	-	-	-	-	-	59
Scotland	-	-	-	-	-	44
Ireland	-	-	-	-	-	29
						—
						132
						—

APPENDIX XII.

DONATIONS RECEIVED DURING THE YEAR 1875.

Presented by Societies, Institutions, &c.

Algiers -	-	Service météorologique de l'Algérie.	Bulletin Mensuel, 1874, Part II. pp. 1-232. Note sur les nivellements barométriques. By Captain H. Brocard.
Berlin -	-	K. Hydrographisches Bureau.	Hydrographische Mittheilungen. III. Jahrgang. Nos. 1-6. Nachrichten für Seefahrer, V. Jahrgang. No. 52. VI. Jahrgang. Anleitung zu wissenschaftlichen Beobachtungen auf Reisen. By Dr. G. Neumayer. See also Hamburg.
		" "	
		" "	
		K. Statistisches Bureau -	Preussische Statistik. No. 32 : Klimatologie von Deutschland, 1848-1872. Nos. 33 and 34 : Monthly means of Pressure, Temperature, &c. for 1873-4. By H. W. Dove, F.R.S. (See also Dove.)
Bombay -	-	Colaba Observatory	- Report for year ending 30th June 1875. By C. Chambers, F.R.S.
Brussels -	-	Observatoire Royal	- Annales, 1874-5. 1876, pp. 1-32.
		"	- Note sur la température de l'hiver 1874-5. Quelques nombres caractéristiques relatifs à la température de Bruxelles.
		"	- La direction de l'aiguille aimantée à Bruxelles en 1875. Etoiles filantes ; les Perséides en 1875. La tempête du 12 Mars 1876. Eléments climatologiques de la ville de Bruxelles pendant la période décennale 1864-75. Notice sur l'observatoire. Sur la période de froid du mois de Décembre 1875. By M. E. Quetelet.
Calcutta -	-	Meteorological Office	- Meteorological Report for 1874.
		"	- Abstract of Observations, Sept. 1874 to July 1875.
		"	- Weekly Report of Rainfall, Nov. 1874 to Oct. 1875.
		"	- Telegraphic Reports, Nov. 1874 to Oct. 1875.
		"	- Report of the Midnapore and Burdwan cyclone of the 15th and 16th Oct. 1874, by W. G. Willson.
		"	- Administration Report, 1874-5.
		"	- On some evidence of the variation of the sun's heat. By H. F. Blanford.
		Surveyor General's Office	Abstracts of the Results of Hourly Observations, Oct. 1874 to Aug. 1875. By Col. Thuillier, F.R.S.
Carlsruhe -	-	Meteorologische Central-Station.	Beobachtungen der badischen Stationen, Oct. 1874 to Oct. 1875. Berichte, 1874. By Dr. F. Sohncke.

Christiania	-	Norske Meteorologiske Institut.	Meteorologisk Aarvog, 1873.
		" "	Oversigt over Veirforholdene i Norge, 1874. By Professor H. Mohn.
Colombo (Ceylon).		Surveyor General's Office	Monthly Results of Meteorological Observations, Oct. 1874 to Sept. 1875. Rainfall returns, 1874. Meteorological observations in Ceylon, 1870-74, and in Colombo 1874. By Lt.-Col. A. B. Fyers, R.E.
Copenhagen	-	Danske Meteorologiske Institut.	Bulletin Météorologique du Nord, 1875. Weather charts, Dec. 1874 to Dec. 1875. Maanedts-oversigt over Veirforholdene, Feb. to Oct. 1875. Meteorologisk Aarvog, 1873, pp. 109-116. By Capt. H. Hoffmeyer.
		K. Danske Videnskabernes Selskab.	Forhandlinger, No. 23, 1874, No. 1, 1875.
		" "	Tables Météorologiques 1874, by Prof. C. Holten. By Prof. J. Steenstrup.
Cork	-	Royal Institution	Meteorological observations, 1874.
Cracow	-	K. K. Sternwarte	Meteorologische Beobachtungen, November 1874 to October 1875.
		"	Materyaly do Klimatografii Galicyi. Rok, 1874. By Dr. F. Karlinski.
Dublin	-	Commissioners of National Education.	Report, 1873.
Edinburgh	-	Royal Society	Proceedings, Session 1873-4.
		Scottish Meteorological Society.	Journal, Nos. 43-46.
Falmouth	-	R. Cornwall Polytechnic Society.	Report, 1872.
Fiume	-	I. R. Accademia di Marina	Meteorological Observations, Sept. 1874 to Sept. 1875. Results 1874.
Frankfort o M.		Physikalisches Verein	Jahresbericht, 1874. By Dr. J. Wallich.
Geneva	-	Bibliothèque Universelle	Archives des Sciences, Vols. LII-LIV.
		Société Géographique	Le Globe, Vol. XIII., Nos. 1-4.
Gorizia	-	-	Osservazioni delle Stazioni Meteorologiche, May 1874 to June 1875.
Greenwich	-	Royal Observatory	Report of the Astronomer Royal to the Board of Visitors, 1875.
		"	Magnetical and meteorological observations for 1872.
		"	Weekly Returns to the Registrar-General, Vol. XXXVI.
		"	Daily Weather Reports for the year. By Sir G. B. Airy, K.C.B., F.R.S.
Hamburg	-	Deutsche Seewarte	Wetterbericht for 1875.
		" "	Annalen der Hydrographie und maritimen Meteorologie, Vol. III. By Dr. G. Neumayer. (See also Berlin.)
Havana	-	R. Colegio de Belen	Observaciones magneticas y meteorologicas, 1873. By R. P. A. Viñes.
Hobartou	-	R. Society of Tasmania	Monthly Notices of Papers and Proceedings, 1873. By F. Abbott, F.R.A.S.

Hong Kong	-	Government Civil Hospital	Meteorological Observations made at Victoria, Oct. 1874 to Sept. 1875.
		Harbour Office	China Coast Meteorological Register, Dec. 1874 to Nov. 1875. By Captain H. G. Thomsett, R.N.
Kiel	-	Ministerial Commission zur Untersuchung der deutschen Meere.	Ergebnisse der Beobachtungs-stationen an den deutschen Küsten 1874, March to December. Jahresbericht, 1872-3. By Drs. Meyer and Karsten.
Leicester	-	Literary and Philosophical Society.	Report of the Meteorological section.
Leipzig	-	Sternwarte	Resultate aus den meteorologischen Beobachtungen, 1871. Monatliche Übersicht der Resultate, Oct. to Dec. 1874, and Results, 1874; Jan. to Aug., 1875. Protokolle der Verhandlungen des permanenten Comités. By Dr. C. Bruhns.
Lemberg	-	University	Meteorologische Beobachtungen. 1872, Nov. and Decr.; 1873 and 1874; 1875, Jan. and Feb.
Lisbon	-	Observatory	Congresso Meteorologico de Vienna, 1875. Instrukções para as Observações meteorologicas maritimas. By the late M. Fradesso.
Liverpool	-	Mersey Docks and Harbour Board.	Report of the Astronomer to the Marine Committee, 1873-4. By J. Hartnup, F.R.A.S.
London	-	Admiralty	Tide Tables for 1876.
		"	Red Sea Pilot.
		"	S. American Pilot, Part I.
		"	African Pilot, Parts I. and II.
		"	Hydrographic Notices, 1875.
		"	Reports on Ocean Soundings and Temperature.
		"	Manual and Instructions for the Arctic Expedition, 1875. By the Hydrographer.
		Army Medical Department.	Report, 1873.
		Board of Trade	Report of Wrecks, Casualties, &c. July 1873 to June 1874.
		British Association	Report for 1874.
		Colonial Office	Returns from various Colonies and Settlements.
		India Office	Returns from various Observers in India.
		"	Report of the Great Trigonometrical Survey. By Col. J. T. Walker, R.E., F.R.S.
		London Institution	Journal, Nos. 25 and 26.
		Medical Department of the Navy.	Report, 1874.
		Meteorological Society	Quarterly Journal, Parts 13-16.
		"	Report on Observations of Luminous Meteors, 1860-61.
		"	On some general Connotations of Magnetism. By P. E. Chase.
		"	On Comparative Observations of Solar Radiation. By Rev. F. W. Stow.
		"	Results of Meteorological Observations made at Toronto, 1854-62. By G. T. Kingston.
		"	And some other Papers.
		Royal Astronomical Society	Monthly Notices, Vol. XXXV., Nos. 2-9. Vol. XXXVI., No. 1. Memoirs, Vol XL.

London -	Royal Geographical Society	Proceedings, Vol. XIX., Nos. 1-7.
	"	Journal, Vol. XLIV.
	Royal Institution of Great Britain.	Proceedings, Vol. VII., Nos. 62-63.
	Royal National Lifeboat Institution.	Journal, Nos. 95-98.
	Royal Society - - -	Proceedings, Vol. XXIII., Nos. 157-162.
	" - - -	" Vol. XXIV., No. 164.
	Society of Arts - - -	Journal, Vol. XXIII., Nos. 1,154-1,206.
Lyons -	Commission Météorologique.	Report, 1873.
		By M. E. Lafon.
Madrid -	R. Observatorio - - -	Daily Weather Reports, 1875.
		By Sr. Aguilar.
Manchester -	Literary and Philosophical Society.	Proceedings, Vol. XIV.; Vol. XV., Nos. 1-3.
Mauritius -	Meteorological Society -	Meteorological Observations for 1873.
		By C. Meldrum, M.A., F.R.S.
Melbourne -	Flagstaff Observatory -	Monthly Record of Results of Observations in Meteorology, &c., Aug. 1874 to May 1875.
	" " - - -	Results of Observations, 1873, Vol. II.
		By R. J. Ellery, F.R.S.
Milan	R. Observatorio - - -	Osservazioni astronomiche diverse, 1871-4.
	" - - -	By G. Tempel.
	" - - -	Resconto delle operazioni fatte a Milano nel 1870, &c.
	" - - -	Le sfere omocentriche di endosso, di callippo et di Aristotele.
		By Sr. G. V. Schiaparelli.
Modena -	" - - -	Sulle Burrasche del 19 e del Feb. 25. 1875.
		By Sr. D. Ragona.
Moncalieri -	Observatory - - -	Bullettino Meteorologico:
	" - - -	Vol. VII., No. 7.
	" - - -	" IX., Nos. 4-9.
	" - - -	Osservazioni meteor. fatte nelle stazioni presso le Alpi Italiane, December 1874 to July 1875.
	" - - -	Riassunti, 1872-3, 1873-4.
	" - - -	Osservazioni della declinazione magnetica.
		Sulla distribuzione della Pioggia in Italia, 1871-2.
	" - - -	Il Congresso Internazionale dei Meteorologi riunito a Vienna.
	" - - -	Osservazioni delle meteore luminose, 1874-5, 1875-6.
		By Sr. F. Denza.
Munich -	K. Sternwarte - - -	Meteorologische und magnetische Beobachtungen, January to June, 1874.
		By Dr. J. v. Lamont.
Naples -	Specola Reale - - -	Osservazioni meteoriche, November 1874 to September 1875. Sul Pianeta Dice, by A. de Gasparis.
		By Sr. Brioschi.
New York -	Central Park Observatory	Abstract of Registers from S. R. Instruments, 1875. Report for 1873.
		By Prof. D. Draper.
Norwich -	Meteorological Society -	Meteorology of Norwich, 1874.
		By J. Quinton, junr.
Oxford -	Radcliffe Observatory -	Results of Meteorological Observations, 1872.

Oxford	Radcliffe Observatory	Report for 1875. By the Rev. R. Main, F.R.S.
Palermo	R. Osservatorio	Bullettino Meteorologico:— Vol. X., Nos. 5-12. By Sr. G. Cacciatore.
Paris	Académie des Sciences	Comptes-Rendus Hebdomadaires. Vol. LXXIX., Nos. 24-26, " LXXX. " LXXXI., Nos. 1-24.
	Association Scientifique de France.	Bulletin Hebdomadaire, Nos. 375-425. Bulletin Mensuel Météorologique, Tome III.
	Dépôt des Cartes et Plans	Annales Hydrographiques: Part 3-4 of 1874. Parts 1-3 of 1875.
	" "	Phares des Côtes.
	" "	Vents et Courants, by MM. Ploix et Caspari. By Captain A. Le Gras.
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	" "	Bulletin Mensuel, Nos. 36-47. By M. Marié-Davy.
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Perpignan	Commission Météorologique des Pyrénées Orientales.	Bulletin Météorologique, 1874.
Philadelphia	Franklin Institute	Journal, Vol. XCIX.†
	American Phil. Society	Proceedings, Vol. XIV., Nos. 93-4.
Pola	K.K. Hydrographisches Amt.	Meteorologische Beobachtungen, December 1874 to November 1875.

Pola	-	-	K.K. Hydrographisches Amt.	Mittheilungen aus dem Gebiete des Seewesens. Vol. II., No. 12. Vol. III., Nos. 1-11. By Dr. R. Müller.
Prague	-	-	K.K. Sternwarte	Magnetische und meteorologische Beobachtungen, 1875, pp. 1-24. By Dr. C. Hornstein.
Punjab	-	-	Sanitary Administration	Report, 1874.
Rome	-	-	Ministero d' Agricoltura, &c.	Meteorologia Italiana,— 1874, pp. 121-244. 1875, pp. 1-124.
			„ „	Bollettino Decadico— 1874, pp. 145-400.
			„ „	Bollettino Idrografico, 1873.
			„ „	Norme per le osservazioni meteoriche. By Sr. J. Cantoni.
			Osservatorio del Collegio Romano.	Bullettino Meteorologico— Vol. XIII., No. 12. Vol. XIV., Nos. 1-11. By Padre A. Secchi.
Rugby	-	-	Natural History Society	Report, 1874.
St. Petersburg			Central Physical Observatory.	Annalen, 1869 and 1873. Meteor. Bulletin, 1875. Simultane Witterungs-Beobachtungen, Sept. to Decr., 1874. Repertorium für Meteorologie, Bd. 4. Meteor. und magnetische Beobachtungen in St. Petersburg, 1873 and 1874. Jahresbericht 1873 and 1874. Neues Heber-Barometer. Weitere Ergänzungen zur Instruction für meteorologische Stationen. La Conférence diplomatique du mètre réunie à Paris au printemps de 1875. By Dr. H. Wild.
			Ministère de la Marine Impériale.	Wind charts from observations taken at 11 Lighthouses and Lightships. Instructions for keeping Meteorological Journal on board men-of-war. Practical Meteorology: Translation of "The Weather Book." By Capt. H. Treskoffsky.
			„ „	Instructions for making observations on hydrometry, temperature, currents &c. Newest investigations on the physical qualities of the Baltic and German Ocean. By Captain R. B. Ivanoff.
			„ „	Meteorology of Russia. By A. Wojekoff.
San Fernando	-	-	Observatorio de Marina	Hurricanes in the Philippines, 1872-4. By Sen. Villavicencio. Conférence sobre Meteorologica maritima celebra en Londres en 1874. By Captain C. Pujazon.
Singapore	-	-	Convict Jail Hospital	Meteorological Observations, September to December 1874.
Stockholm	-	-	Meteorologiska Central-Anstalten.	Väderleks-Bulletin, 1875. Vägledning vid begagnande Väderleks-Karter. Om temperatur och fuktighets förhållandena i de nedersta luftlagren vid daggens bildande. By Dr. R. Rubenson.

Stonyhurst	-	Observatory	- - -	Report, 1874. By the Rev. S. J. Perry, S.J., F.R.S.
Stuttgart	-	Polytechnische Schule	-	Witterungsbericht für 1873-4. Übersicht über die Witterungsverhältnisse Württembergs, May 1874 to July 1875, and year 1874. Die mittlere Vertheilung der Tage mit Niederschlag zu Stuttgart. By Dr. H. Schoder.
Toronto	-	Education Office	- -	Journal of Education, Vol. XXVIII.
		Magnetical Observatory	-	Monthly Meteorological Register, 1874. General Meteorological Register, 1874. Report of Meteorological Office, 1874. By G. T. Kingston, M.A.
		Parliament Library	-	Sessional Papers, Vols. VII. and VIII. Catalogue of the Library.
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Upsala	-	Observatoire	- -	Bulletin Météorologique Mensuel: Vol. VI., Nos. 6-12. Vol. VII., Nos. 1-5. Isforhallandena i Sverige under vintrarna, 1871-2 och 1872-3, af J. A. Cronwall.
		"	- -	Om nattfrosterna i Sverige, 1871-3, by H. E. Hamberg.
		"	- -	Sur les Courants supérieurs de l'atmosphère. By Dr. H. H. Hildebrandsson.
Utrecht	-	K. Nederlandsch Meteor. Instituut.	-	Jaarboek. 1874.
		"	"	Rapport du Comité Permanent du Premier Congrès Meteor. international de Vienne, 1874. By Dr. H. Buys Ballot.
Vienna	-	K. Akademie der Wissenschaften.	-	Über die Wasserabnahme in den Quellen, Flüssen und Strömen bei gleichzeitiger Steigerung der Hochwasser in den Culturländern, von G. Wex.
		K. K. Central Anstalt für Meteorologie, &c.	-	Report of the Academy on the above. Beobachtungen, November 1874 to October 1875. Jahrbücher, 1873. Telegraphische Witterungsberichte, 1875. Meteor. Beobachtungen, an 10 Stationen in Oesterreich, 1874-5. By Dr. C. Jelinek.
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		K. K. Sternwarte	-	Meteor. Beobachtungen, 1868-71. By Dr. C. Littrow.
Washington	-	Department of Agriculture.	-	Report of Commissioners of Agriculture, 1872, 1873. Monthly Reports, 1874.
		Hydrographic Office	-	5th and 6th Supplement to Papers on the Gulf-Stream. Rio de la Plata. Deep Sea Soundings in the North Pacific Ocean. The Navigation of the Pacific Ocean, China Seas, &c., West Coast of Africa, Vol. II. By Commodore R. H. Wyman, U.S.N.

Washington	Smithsonian Institution -	Report for 1873. By Prof. J. Henry.
	U. S. Naval Observatory -	Astronomical and Meteorological Observations, 1872. Meteorological Observations, 1873. By Admiral Davis, U.S.N.
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Zürich	- Meteor. Central-Anstalt der schweizerischen naturforschenden Gesellschaft.	Meteorologische Beobachtungen, Nov. 1874 to July 1875. By Drs. Wolf and Billwiller.

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Bushell, R.	-	-	Neston, Rainfall of 1873-4.
Carl, Dr. G.	-	-	Repertorium für Physik. Vol. X., No. 6.; Vol. XI., Nos. 1-5.
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"	"	-	Sull' Ecclesi Solare totale del 3 Giugno 1839.
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Croll, J., F.R.S.	-	-	On the Glacial Epoch.
"	"	-	The Wind theory of Oceanic Circulation ; Objections answered. Further remarks on the " Crucial-Test " Argument.
"	"	-	The " Challenger's " Crucial-Test of the Wind and Gravitation theories of Oceanic Circulation.
Cundall, H. J.	-	-	Abstract of Meteorological Register at Charlottetown, P. Edward's Id., 1874.
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De La Rue, W., D.C.L., F.R.S.	-	-	Auxiliary Tables for determining the angle of position of the Sun's Axis and the Latitude and Longitude of the Earth referred to the Sun's Equator.
Deville, C. Sainte Claire.	-	-	Sur les variations ou inégalités périodiques de la temp°. Notes 10 and 11.
Dove, H. W., F.R.S.	-	-	Über die Zurückführung der jährlichen Temperatur auf die ihr zum Grunde liegenden Bedingungen, 2 <sup>te</sup> Abhandlung. Über das mittlere Fortschreiten ungewöhnlicher Wärme-erscheinungen über die Erdoberfläche. Über die klimatischen Verhältnisse von Palastina. Über einen merkwürdigen Blitzschlag. Über die Übereinstimmung der Witterungserscheinungen in den ungewöhnlich trockenen Jahren, 1857, 1858, 1874. Über den allgemeinen Character milder Winter. Kühler Mai nach mildem Januar, und Nachtrag. See also Berlin.
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"	"	-	Weather Statistics during Small-pox Epidemic in Kilmarnock of 1873-4.
Dymond, W. P., F.M.S.	-	-	Meteorology of West Cornwall and Scilly, 1870-74, and observations of Sea Temperature, 1872-74.
Estourgies, L.	-	-	Les Courants de la Mer et de l'Atmosphère.
Ferrel, W.	-	-	Tidal Researches.
Freden, W. H.	-	-	Jahresbericht der Norddeutsche Seewarte, 1874. " Hansa," 1875. Deutsche Nordpolarfahrt, Vol. II., Part 2, by Capt. C. Koldewey.
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"	"	-	Untersuchungen über die Veränderlichkeit der Tages-temperatur.
"	"	-	Das specifische Gewicht des Eismeerwassers in Beziehung auf die Theorie der Meeresströmungen.

Hellmann, Dr. G. -	-	Die täglichen Veränderungen der Temperatur der Atmosphäre in Norddeutschland.
Hennessy, H. -	-	On the physical properties of water in relation to terrestrial climate. On the vertical movements of the atmosphere considered in connection with storms and changes of Weather. On an inverted Lunar halo and a Lunar rainbow. Notes on the laws which regulate the distribution of isothermal lines. On the formation of ground ice in the bed of the River Dodder.
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Hutchison, Graham	-	A Treatise on the Causes and Principles of Meteorological Phenomena.
Jones, G. J. -	-	Meteorology of Lynnington, 1874.
Lancaster, A. -	-	La Sécheresse des mois de Février, Mars et Avril 1875.
Loomis, Prof., E. -	-	Examination of United States Weather Maps for 1872-3.
Leudesdorf, Dr. M.	-	Nachrichten über die Gesundheitszustände in verschiedenen Hafenplätzen, Vol. IX.
McLandsborough, J., C.E., F.R.A.S., F.M.S.	-	The Mortality and Meteorology of Bradford from January 1869 to January 1875. Meteorology of Bradford, 1874.
Maily, E. -	-	Essai sur la vie et les ouvrages de Mr. L. A. J. Quetelet.
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Neil, A., M.R.C.S.	-	Meteorology of the Punjab, 1874.
Pastorelli, F. -	-	Catalogue of Standard Meteorological Instruments.
Petermann, Dr. A.	-	Mittheilungen, Vol. XX., No. 12.; Vol. XXL, Nos. 1-11. Ergänzungsheft, Nos. 39-43.
Prestel, Dr. -	-	Die Polarbänder als Aeroklinoskop. Über den Barometersturz am 22 November 1873, und den Einfluss des Mondes auf das Wetter.
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Prestwich, Prof. J., M.A., F.R.S.	-	On the origin of the Chesil Bank.
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Purser, E., M.A. -	-	Meteorological Table of Smyrna for 1864-74.
Rawson, Govr. R. W., C.B.	-	Monthly Returns of Rainfall and Meteorological Observations in Barbadoes, November 1874 to March 1875. Map of Daily Rainfall, November 1874 to March 1875. Report on the Rainfall of Barbadoes for 1874.

Richards, W. H. -	-	Abstract of the Weather at Penzance and neighbourhood, 1874.
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Roscoe, H. E., F.R.S.	-	On a S.R. method of measuring the intensity of the chemical action of total daylight.
Sawyer, F. E., F.M.S.	-	The Meteorology of Sussex.
Scheiber, Dr. P. -	-	Theorie eines neuen Thermometers.
Schück, Capt. A. -	-	Die Wege des Oceans für Segelschiffe.
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Strachey, Lt.-Gen., F.R.S.	-	On the Annual Means of 13 years at London. Address to the Geographical Section of the British Association, 1875.
Symons, G. J., F.M.S.	-	Monthly Meteorological Magazine for 1875; British Rainfall for 1874; and some old works by various authors given in exchange.
Tennent, R.	-	The theory of the causes by which Storms Progress in an easterly direction over the British Isles, and why the barometer does not always indicate real vertical pressure.
Toynbee, Capt. H.	-	On the Normal Circulation and Weight of the Atmosphere in the North and South Atlantic Oceans, so far as it can be proved by a steady Meteorological Registration during five Voyages to India.
Wheatstone, Sir C.	-	Description of a new S. R. Barometer; N. Bryson, F.R.S.E. An Investigation of the Principles upon which a new S. R. Barometer may be constructed; J. Stevelly. Recherches sur la cause des variations barométriques; by A. Peltier, and some other papers.
Wojeikoff, Dr. A. -	-	Die atmosphärische Circulation.

## APPENDIX XIII.

LIST of PERSONS in the EMPLOYMENT of the METEOROLOGICAL COMMITTEE on December 31st, 1875, 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 -	240 0 0	—
T. D. Bell -	Assistance in do., registering of documents, &c.	80 0 0	—
J. S. Harding, senr. -	Office keeper -	—	1 18 6
<i>Land Meteorology (Observatories).</i>			
R. H. Curtis - -	} Reproduction of observatory curves by pantagraphs, and preparation for publication.	160 0 0	—
A. J. Rigby - -		—	1 18 6
C. H. Thompson -		—	1 6 0
C. Stodart - -	} Discussion of returns, and computations.	—	2 2 0
J. A. Curtis - -		110 0 0	—
H. N. Cobley - -		—	1 3 0
R. Sargeant - -		—	1 3 0
<i>Land Meteorology (Telegraphy).</i>			
F. Gaster - -	} Preparation of weather reports and computations.	180 0 0	—
W. L. Dallas - -		100 0 0	—
F. Brodie - -		86 0 0	—
G. G. Francis - -		80 0 0	—
H. Chivers - -		—	0 14 0
<i>Ocean Meteorology.</i>			
Capt. H. Toynbee -	Marine Superintendent - - -	400 0 0	—
R. Strachan - -	Charge and disposal of instruments and reduction of meteorological returns.	250 0 0	—
C. Harding - -	} Discussion of data and computations.	170 0 0	—
T. E. Allen - -		110 0 0	—
H. Harries - -		—	1 15 0
W. Allingham - -		—	1 18 6
H. F. Green - -		—	0 12 0
<i>Commissionaire</i> - Messenger - - - - -			
J. E. Cullum -	Superintendent of Valencia Observatory.	150 0 0	—

Mr. John Dallas has been engaged in the Telegraph branch since 14th February 1876 at a weekly salary of 17. 10s.

**LIST OF PUBLICATIONS, &c. issued under the Authority  
of the Meteorological Committee.**

**OFFICIAL.**

- No. 1. Report for 1867. Presented to Parliament. 1s.
2. Instructions for Meteorological Telegraphy. 6d.
3. Fishery Barometer Manual. 6d.
4. Charts of Surface Temperature, South Atlantic Ocean. 2s.6d.
5. Report for 1868. Presented to Parliament. 5d.
6. Report for 1869. Presented to Parliament. 10d.
7. Quarterly Weather Report for 1869.—Parts I. to IV.  
5s. each. [Stanford.]
8. Barometer Manual. 1s. [Out of Print. New Edition in  
the Press.]
9. Quarterly Weather Report for 1870.—Parts I. to IV.  
5s. each. [Stanford.]
10. Report for 1870. Presented to Parliament. 10d.
11. Contributions to our Knowledge of the Meteorology of Cape  
Horn and the West Coast of South America. 2s. 6d.  
[Stanford.]
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. 2s. 6d.  
[Stanford.]
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, 5s. [Stanford.]
14. Quarterly Weather Report for 1871.—Parts I. to IV.  
5s. each. [Stanford.]
15. Report for 1871. Presented to Parliament. 10d.
16. Quarterly Weather Report for 1872.—Parts I. to IV.  
5s. each. [Stanford.]
17. Report for 1872. Presented to Parliament. 1s.
18. Contributions to our Knowledge of the Meteorology of the  
Antarctic Regions. 2s. [Stanford.]
19. Quarterly Weather Report, 1873.—Parts I. to IV. 5s. each.  
[Stanford.]
20. Charts of Meteorological Data for Square 3. Lat. 0° - 10° N.  
Long. 20° - 30° W., and Remarks to accompany the  
Monthly Charts, which show the Best Routes across the  
Equator for each Month, &c. 20s.
21. Report of the Proceedings of the Meteorological Congress  
at Vienna. 1s. [Stanford.]
22. Report for 1873. Presented to Parliament. 4d.
23. Report of the Proceedings of the Conference on Maritime  
Meteorology held in London, 1874. 2s.
24. Instructions in the Use of Meteorological Instruments.  
1s. 6d.

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25. Quarterly Weather Report for 1874.—Parts I. and II., January to March. 5s. each.
26. Report for 1874. Presented to Parliament. 6d.
27. Charts of Meteorological Data for the Nine 10° Squares of the Atlantic which lie between 20° N. and 10° S., and extend from 10° to 40° W., with accompanying Remarks. [In the Press.]
28. Contributions to our Knowledge of the Meteorology of Japan. 1s. [Stanford.]
29. Report for 1875. Presented to Parliament.
30. Quarterly Weather Report, 1875. [In the Press.]

**NON-OFFICIAL.**

- No. 1. Report to the Committee on the Connexion between Strong Winds and Barometrical Differences.—By Robert H. Scott, Director of the Office. 6d.
2. Report to the Committee on the Meteorology of the North Atlantic.—By Captain H. Toynbee, Marine Superintendent. 1s.
3. Report to the Committee on the Use of Isobaric Curves.—By Captain H. Toynbee, Marine Superintendent. 1s.
4. Routes for Steamers from Aden to the Straits of Sunda and back. Translated from a Paper issued by the Royal Meteorological Institute of the Netherlands. 6d.
5. On the Winds, &c. of the North Atlantic along the Tracks of Steamers from the Channel to New York. Translated from a Paper issued by the Deutsche Seewarte, Hamburg. 6d.
6. Report of the Proceedings of the Meteorological Conference at Leipzig. 1s.
7. Notes on the Form of Cyclones in the Southern Indian Ocean.—By C. Meldrum, Esq., M.A., F.R.A.S. 6d.
8. Report on Weather Telegraphy and Storm Warnings. Presented to the Meteorological Congress at Vienna. 6d.
9. Report of the Permanent Committee of the Vienna Congress for 1874. 1s. 6d.
10. On the Physical Geography of that part of the Atlantic which lies between 20° N. and 10° S., and extends from 10° to 40° W. A Paper read before the British Association at Bristol, in August 1875, by Capt. Toynbee, F.R.A.S., F.R.G.S., Marine Superintendent. 1s. 6d.
11. Report of the Permanent Committee of the Vienna Congress for 1876. [In the Press.]

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Printed by GEORGE F. EYRE and WILLIAM SPOTTISWOODE,  
Printers to the Queen's most Excellent Majesty.

For Her Majesty's Stationery Office.