

APPEN-

Abstract of Receipts and Expenditure

		<i>Receipts.</i>		
1875.			£ s. d.	£ s. d.
Jan. 1.	Balance from last year..	16 13 8
April	Dividend on £200 New 3 per Cents.		2 19 6	
June	Do. £800 M. S. & L. R. 4½ Deben- ture Stock		17 17 0	
Oct.	Do. £200 New 3 per Cents.		2 19 6	
Dec.	Do. £800 M. S. & L. R. 4½ Deben- ture Stock		17 17 0	
				41 13 0
June	Meteorological Office.—Copies of Returns from Six Stations on Form A, January to June			15 0 0
Dec.	Subscriptions for 1873	5	1 0	
	Do. for 1874	24	11 0	
	Do. for 1875	208	1 6	
	Do. for 1876	4	0 0	
	Entrance Fees	45	4 0	
	Life Composition Fees	60	0 0	
				346 17 6
Dec.	Sale of Publications. By Assistant Secretary	15	19 5	
	Do. By Williams and Strahan	0	8 4	
				16 7 9

£436 11 11

DIX I.

for the Year ending December 31st, 1875.

<i>Expenditure.</i>		£	s.	d.	£	s.	d.
1875.							
<i>Journal—</i>							
Printing Nos. 13—16	77	4	6				
Illustrations	11	9	0				
Authors' Copies	8	3	6				
Registrar-General's Reports	6	4	0				
					103	1	0
<i>Printing, &c.—</i>							
General Printing	14	4	0				
Stationery	6	15	9				
Books and book-binding ..	5	12	5				
					26	12	2
<i>Salaries—</i>							
Assistant Secretary	125	0	0				
Computer.....	14	19	0				
					139	19	0
<i>Office Expenses, &c.—</i>							
Rent and Housekeeper... ..	28	17	0				
Repairs, Furniture and Coals.....	12	11	3				
Postage and Receipt Stamps	23	16	2				
Parcels and Petty Expenses	4	9	1				
Refreshments at Meetings	8	12	0				
					78	5	6
<i>Observations—</i>							
Inspection of Stations	20	0	0				
Printing Forms and Observation Books	13	7	6				
Phenological Phenomena.—Reports, Instructions, and Forms	9	17	6				
Bright-bulb Thermometers <i>in vacuo</i>	3	15	0				
					47	0	0
<i>Miscellaneous—</i>							
Subscriptions overpaid returned.....	5	0	0				
Bankers' Commission on Country Cheques	0	2	1				
					5	2	1
					399	19	9
Balance at Bank of England, December 31st, 1875	29	12	5				
Balance in hands of Assistant Secretary	6	19	9				
					36	12	2
					£436	11	11

HENRY PERIGAL, *Treasurer.*

Examined, compared with the Vouchers, and found correct, January 11th, 1876.

G. M. WHIPPLE,	} <i>Auditors.</i>
E. G. ALDRIDGE,	

APPENDIX I.—Continued.
Abstract of Assets and Liabilities for the year ending December 31st, 1875.

Liabilities.		Assets.	
	£ s. d.		£ s. d.
Sundry Creditors	4 0 0	By Society's Money invested in New 3 per Cents., £200 at 94	188 0 0
Excess* of Assets over Liabilities	1259 2 2	" Society's Money invested in M. S. and L. R. 4½ De- benture Stock, £800 at 111	888 0 0
			1076 0 0
		" Subscriptions of the year uncollected	48 10 0
		" Do. former years unpaid	21 10 0
		" Entrance Fees unpaid	3 0 0
		" Meteorological Office.—Copies of returns from six stations on Form A, July to December	15 0 0
		" Ditto. Monthly summaries from seven stations on Form B for the year 1875	17 10 0
			105 10 0
		" Furniture, Fittings, &c.	25 0 0
		" Instruments	20 0 0
			45 0 0
		" Cash in hands of Bank of England, December 31st, 1875	29 12 5
		" Cash in hands of Assistant Secretary	6 19 9
			36 12 2
			£1263 2 2
			£1263 2 2

G. M. WHIPPLE, }
E. G. ALDRIDGE, } Auditors.

* This Excess is exclusive of the Value of the Library and Stock of Publications.

The Society has to deplore the loss by death of two of its Fellows, viz.:—

ROBERT SAVIGNAC STEDMAN, M.R.C.S., elected into the Society, November 27th, 1855.

THEODORE HENRY MAINE WALROND, November 19th, 1873.

ROBERT SAVIGNAC STEDMAN, M.R.C.S., was born in 1827, and was educated at Tunbridge School. He entered Guy's Hospital in 1845, where he gained the esteem of all who knew him. He became a medical practitioner at Sharnbrook, Bedford, where he practised till the time of his death, which occurred on the 30th of December, 1874.

He was very popular in the neighbourhood, and his kindness, intelligence, and devotion, gained for him many warm friends. Mr. Stedman was appointed Health Officer of the northern half of the Bedford Union in 1873, and immediately devoted himself to his new labours in the most thorough manner, providing himself with all the new appliances required for exercising his arduous duties with great energy. He published an exhaustive report, remembered by the writer of this notice as a most complete and carefully arranged summary of every thing bearing on the sanitary condition of the district.

Mr. Stedman was one of those country medical practitioners who, possessing a good knowledge of many departments of science, amid active and incessant professional engagements, manage to find time for scientific study and investigation; and he was an excellent representative of that large class of highly intelligent and well-educated thoughtful doctors for which our country is eminently distinguished; men who, though unable to write books and dissertations, in no small degree help to diffuse correct scientific information, and assist in checking the spread of some of those shallow and extravagant conjectures which are being recklessly sown broadcast amongst us at this time. Mr. Stedman was greatly interested in the Meteorological Society, and though it was not possible for him to contribute elaborate memoirs to our transactions, he was an active Fellow of the Society, and frequently attended our meetings. Gifted with great activity and energy of mind and body, he scarcely relaxed work during the last few years of his life, although suffering from serious illness; and was cut off ere he had reached his forty-eighth year, in the midst of his self-denying labours.

APPENDIX II.

THE METEOROLOGICAL OFFICE. Robert H. Scott, M.A., F.R.S., Director.—*Marine Meteorology.* The operations of this branch of the Office have been the completion of the charts, and the discussion of the data for the entire equatorial region of the Atlantic, and the Society will be in a much better position than at present to judge of the work of the Office when the charts, &c. now in the press, for the nine squares (Lat. 10° S.—20° N., Long. 10°—40° W.), of which Square 3 forms the centre, are published. In these charts, as dealing with a larger area, and stretching from shore to shore of the Atlantic, are given not only charts of

the same character as those for Square 3, described in the last Report, (though for larger areas, owing to comparative deficiency of material), but also diagrams showing the direction of wind in connection 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 variation from month to month of the localities in which they are seen, and also appearances of submarine volcanic action in certain localities. By these investigations it is believed that important light has been thrown on several subjects of general as well as of special interest. It is hoped that this work will appear in the course of the ensuing summer.

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 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, which will be prosecuted in due course: the question of the best method of dealing with that district being under consideration.

For the inquiry into the weather of the North Atlantic, in August, 1873, the Office has obtained the loan of 280 logs, and the investigation is now in progress. It is hoped that light will be thrown on the actual formation of, and the subsequent modifications in, the serious storms of that month, so that some attempt may be made to solve the vexed problem of the precise direction of the motion of the air in cyclones in reference to the position of the centre of the disturbance.

Weather Telegraphy. There has been no change of importance during the year in the system of collection of information and issue of storm warnings.

The results of the latter for the year 1874, as given in the Parliamentary Returns, show a total percentage of success of 78.

If it were asked in what particular directions the British system of Weather Telegraphy could most advantageously be developed, the following suggestions may be made:—

A. The supply of cheap self-recording instruments to our principal stations, so that the reporters should be able to furnish intelligence as to the changes which have taken place immediately previous to the epoch for which the report is framed.

B. Additional stations at well-selected points on our West coast, as at Mullaghmore, on Donegal Bay, and at high levels, as at Settle, in Yorkshire. The former especially to give more accurate indications of wind, which from our present stations is often necessarily incorrect, owing to the precipitous character of our western coasts, which affects the direction and force of the wind. The latter to furnish means for a study of the differences of atmospherical conditions in a vertical direction, which has yielded very valuable results whenever it has been prosecuted.

C. Additional reports daily. This is a most pressing want; it has been partially met by the enterprise of the public press: the 'Times' having begun (Jan. 1876) to bear the expense of an evening message from some stations.

D. Improved accuracy in transmission of the reports.

E. Extension of the area covered by our reports. This raises the question of international exchanges, and in this particular it must be remembered that stations are not of equal value, for a report from an outlying post, as Valencia or Sumburgh Head, is worth to the continental meteorologists many times more than a report from a continental station is to us.

The extension of our system westwards, were it possible, would be of incalculable value, but America, and even Newfoundland, are too distant for us to reason with any degree of certainty on what the changes taking place there may portend to us.

Reports from the Azores, if supported by others from Spain and Portugal, would be of value, but they would require confirmation. At least two simul-

taneous reports from independent stations in that group of islands would be required, in order to afford means for checking doubtful statements or errors in telegraphy.

F. An increase of the staff of the Office.

To summarize. More information from existing stations, a large extension of our area of observation, and a reinforcement of the staff for weather study, are the chief requirements of our telegraphic system at present.

The chief feature of novelty in the arrangements for publication of daily reports during 1875, has been the appearance since April 1, in several of the metropolitan and provincial papers of daily weather charts, drawn at the Office, and produced in the form of stereotype blocks by the Patent Type Founding Company. Since January 1, 1876, these arrangements have undergone an important modification, as indicated above, for the 'Times' has agreed to defray the expense of an extra service of reports for 6 p.m. daily (including Sundays), and the charts which now appear in that paper are drawn specially under this agreement.

The co-operation of the Office with the U. S. Chief Signal Office in the synchronous observations, goes on without modification.

Land Meteorology of the British Islands. There is not much of novelty to report in the proceedings of this branch. The issue of the Quarterly Weather Report goes on steadily, and the tables for the various volunteer stations in connection with the Office, for the year 1874, are in the press. As soon as these have been printed, the similar tables for 1875, including returns from the Society's Stations, as intimated in the last report, will be taken in hand and completed without unnecessary delay.

SCOTTISH METEOROLOGICAL SOCIETY.—The work of the Society during the past year, in addition to the regular work of the Office, has been the publication of Papers on—

1. *The Influence of Weather on Mortality from Different Diseases and at Different Ages.* By Mr. Buchan and Dr. A. Mitchell.
2. *On a New Iron Barometer.* By Mr. Stevenson, Hon. Sec.
3. *On a Self-registering Anemometer.* By Mr. Stevenson, Hon. Sec.

Also the following, which are in type, and will be shortly published in the Society's Journal:—

1. Report on all Ozone Observations made by the Society's Observers up to end of 1875.
2. On the Flowering of Spring Plants.
3. On Formation of Clouds.

In addition to the above, Mr. Buchan has written a Paper on the 'Diurnal Barometric Oscillations. Part I.' dealing with the oscillation from A.M. max. to P.M. min., over the whole globe. The Society being unable to publish this discussion, it was offered to, and has already been published by, the Royal Society of Edinburgh, in their Transactions.

An inquiry has been set afoot into the cause or causes of the earliness or lateness of Salmon Rivers, by means of observations made with thermometers continuously immersed in the rivers, and in the sea immediately adjoining their mouths, and by gauging of the water of the rivers. The observations have been going on for some time.

ROYAL OBSERVATORY, GREENWICH. Sir G. B. Airy, K.C.B., F.R.S., Astronomer Royal.—The meteorological work of the Magnetical and Meteorological Department of the Royal Observatory is carried on generally in the same way as for many years past. The direction, velocity, and pressure of the wind, and the amount of rain, are registered automatically (by Osler's and Robinson's Anemometers), and the variations of atmospheric pressure, temperature of the air, and temperature of evaporation, by photographic means; a sufficient number of eye observations of the barometer, and of the dry and wet bulb thermometers, being daily taken for the necessary determination of zero values for the photographic traces. Observations of the daily maximum and minimum temperature of the air, of evaporation, and of radiation, &c. are in addition taken in the ordinary way.

Previous to the year 1875, the graduations of our thermometers rested fundamentally upon those of a standard thermometer (the property of Mr. Glaisher), which derived its authority from comparison with original thermometers constructed by the late Rev. R. Sheepshanks in the course of his work of restoring the National Standard of Length. During the year 1875, however, by the kindness of the Kew Committee of the Royal Society, and the Director of the Meteorological Office, a new standard thermometer, prepared at Kew, has been supplied to the Royal Observatory, and all thermometer readings are now referred to this standard. Our comparisons appear to indicate that the Kew Standard reads, on the average, about $0^{\circ}2$ lower than that of Mr. Glaisher.

The rain is collected at the Royal Observatory in gauges placed at five different elevations, varying from 50 feet to 5 inches above the surface of the ground. In addition to which, since the beginning of the year 1876, rain has been also collected in a gauge set up at the Police Ship, 'Royalist,' at an elevation of 17 feet above the level of the river Thames.

The vane of Osler's Anemometer made, during the year 1875, eleven complete revolutions in the direction N, E, S, W.

The weather was generally unfavourable for observations of the August and November meteors. The night of November 14 was, however, fine, and a strict watch was maintained throughout; but, owing to the brightness of the moon, only large meteors could be seen. One meteor was recorded on the night of Nov. 13, and twenty-five on the night of Nov. 14. Some of those observed on the latter night do not belong to the ordinary November stream.

The volume of Magnetical and Meteorological Observations, for the year 1873, has been lately published. The information and results contained therein are given in a shape similar to that which has been followed for some years.

Weather reports are sent daily, weekly, or at other intervals to the Paris Observatory, the United States War Department, the Registrar-General, the Meteorological Office, and to various newspapers.

The results of the reduction of the photographic records of the thermometers, from 1848 to 1868, are nearly ready for the printer. Considerable progress has now also been made with the reduction of the corresponding photographic records of the barometer from 1854 to 1873. The barometric results are also being grouped with reference to the Moon, in order to discover whether there exists any measurable Lunar Atmospheric Tide.

It is in contemplation to establish at the Royal Observatory an Electrometer on Sir W. Thomson's plan, for the purpose of obtaining a continuous photographic record of atmospheric electricity.

ROYAL OBSERVATORY, EDINBURGH. Professor C. Piazzi Smyth, F.R.A.S., Astronomer Royal for Scotland.—The amount of input of public funds at the Royal Observatory, Edinburgh, on account of Meteorology, during the past year, has been £120, and the consequent output of work, agreeably to orders, has been the computation of the bi-diurnal observations made at 55 stations of the Scottish Meteorological Society, and their due condensation and arrangement for the reports, printed monthly and quarterly, of the Registrar-General of Births, Deaths, &c., in Scotland.

In the course of the last very rainy summer, the Edinburgh Astronomer was led to recognise a particular set of lines, sometimes coalescing into a broad band, in the spectrum of daylight, which affected a very marked prominence over other lines and bands therein, whenever the atmosphere was charged with watery vapour of high temperature, or more particularly when rain was imminent from the south-east direction; and as that is a quarter from which the barometer is generally very little affected, the daily observation of, or looking out for, this peculiar 'rain band,' might prove, he hoped, a useful adjunct to the ordinary means at the command of Meteorologists when attempting forecasts of the weather for short intervals of time.

KEW OBSERVATORY. Samuel Jeffery, Superintendent.—The several self-recording instruments for the continuous registration respectively of Pressure, Temperature, Humidity, Wind (Direction and Velocity), and Rain have been

maintained in regular operation as usual. The daily standard eye-observations for the control of the automatic records have been made regularly.

In addition to the regular work of Kew as one of the self-recording Observatories in connection with the Meteorological Office, the duty of examining and checking the work of all the seven Observatories of the same character has been carried on, in accordance with the method described in the Report of the British Association for 1869.

The only change as regards the photographic instruments has been the substitution of copper chimneys for the gas-jets for the glass chimneys formerly in use, an alteration which has proved to be beneficial.

The result of a careful comparison of the thermogram tabulations at the several observatories, obtained by the use of the fiducial lines traced on the curves by photography, with the standard readings, has shown that the original glass scales supplied (the values for which had been determined at Kew in 1868) were not in all instances sufficiently exact, and new scales have accordingly been supplied where requisite.

The Self-recording Electrometer continues in operation. Some imperfection, of which the cause was not clearly ascertained, interrupted the continuity of the action of the instrument in August; but this was overcome and the record resumed. Experiments for obtaining the scale-value have been made by the use of a battery of 100 Bunsen's cells.

The observations with Thermometers at different levels on the Pagoda in Kew Gardens were resumed in November 1874, after an interval of a few months, and were continued until March, when the experiments were concluded, having lasted over nearly two years. The results have been sent to the Meteorological Office, at the expense of which Department the investigation was conducted.

A commencement has been made of the observation of Solar Radiation at Kew, and Thermometers for that purpose ("Black bulbs *in vacuo*" by different makers) have been placed in the grounds and read regularly.

The Registering Sundial invented by Mr. J. F. Campbell, F.G.S., which has been in operation for several years at the Office of the Local Government Board, 8 Richmond Terrace, Whitehall, has been transferred to Kew, and is in action at the Observatory. It consists of a glass sphere and wooden bowl, and the effect is measured by the amount of wood charred by the sun's action in the course of six months. Experiments are in progress to obtain a satisfactory daily record of the duration of the sun's heating-action by a similar method.

The verification department continues to exhibit increased activity, and, in more than one respect, important steps have been taken with the view of augmenting its efficiency. The following meteorological instruments have been verified—

Barometers, Standards.....	67
„ Marine and Station	126
	193
Aneroids.....	21
Thermometers, ordinary Meteorological	1238
„ Boiling-point Standards	64
„ Mountain	20
„ Clinical	1439
	2761

In addition, 272 Thermometers have been tested at the melting-point of mercury.

This department shows a very satisfactory increase in utility, as is proved by the following statement, showing the fees paid for the verification of Barometers and Thermometers during the three years 1873-75:—

	Barometers.			Thermometers.			Total.		
	£	s.	d.	£	s.	d.	£	s.	d.
1873	72	5	0	110	17	6	183	2	6
1874	55	10	0	157	16	0	213	6	0
1875	88	7	0	214	17	0	303	4	0

The increase has been mainly under the head of instruments received from opticians.

The Committee have it in contemplation to improve the utility of Kew for the verification of instruments by opening an office in London for their receipt, so as to relieve opticians from the trouble of sending the instruments to Kew, and fetching them back again.

13 Standard Thermometers have been calibrated and divided at Kew.

The following miscellaneous instruments have also been verified:—

Hydrometers	150
Rain-gauges.....	3
Dial Anemometers (Robinson's)	6

A Thermograph has been tested, and its scale-values determined for the Mauritius Observatory.

The apparatus devised by Mr. F. Galton for facilitating the verification of Thermometers, which was mentioned in the last Report, has been erected, and has been found of great service, especially in the way of affording means of maintaining high temperatures for a considerable length of time.

A number of tubes of exceptional range, for the construction of Standard Thermometers, have been added to those at present in stock.

With reference to the testing of Anemometers, as mentioned in the last Report, with the hope that the experiments with artificial rotation would be resumed on a future occasion, it has been found that the large expense which would be entailed to provide a suitable apparatus for use at Kew would exceed the resources of the Observatory. These investigations have therefore not been carried out.

It has appeared desirable to replace the Cathetometer used in connection with the Standard Barometer by a new instrument; and accordingly such an apparatus is in process of construction. As soon as this is completed, it is intended to institute a comparison between the Standard Barometers at Kew and Greenwich, the Astronomer Royal having most readily consented to such an operation.

The other branches of scientific work carried on at the Observatory, Magnetical, Solar, &c. have been regularly proceeded with as usual during the past year.

RADCLIFFE OBSERVATORY, OXFORD. Rev. R. Main, M.A., F.R.S., Radcliffe Observer.—The whole system of observations mentioned in the last Report, for January 1875, has been rigorously kept up till the present time, including the daily observations made at Oh. 45m., Oxford mean time, in connection with the simultaneous observations made throughout a large portion of the northern hemisphere, as proposed by General Myer, U. S. A.

The reductions of the observations are relatively in the same state of forwardness as they were at this time last year, and the volume for 1873 is completely printed, and will be ready for distribution in a few days.

CAMBRIDGE OBSERVATORY. Professor J. C. Adams, M.A., F.R.S.—The meteorological work at this Observatory has been carried on by Mr. Todd, as in former years, the observations being made at 8 a.m. and 6 p.m., for the Meteorological Office;—these have been reduced, and a Yearly Summary published in the 'Cambridge Chronicle.'

The observations at Oh. 45m. p.m. G. M. T. have been regularly made for the American Government. A Stevenson's Thermometer Stand was erected in the summer, and is found to answer better than the old one.

STONYHURST OBSERVATORY. Rev. S. J. Perry, S.J., F.R.S.—During the course of the past year no new instruments have been added, and no new series of observations started; but the complete set of self-recording instruments, magnetical and meteorological, have been kept in constant use, and the monthly determinations of the elements of terrestrial magnetism have never been interrupted.

The series of magnetic observations made at Kerguelen for five months, and also at the Cape of Good Hope, at Bombay, Aden, Port-Saïd, Malta, Palermo, Naples, Rome, Florence, and Turin, on occasion of the Transit of Venus Expedition, are

due to the Stonyhurst observers who formed part of the expedition. These observations are at present being reduced here.

Observations at all the even hours, day and night, were carried on for five months, with a complete set of meteorological instruments, at Kerguelen; but these results were handed over to the Government on our arrival in England. It is to be hoped that this series of observations, which cost very great labour, and which ought to afford a fair knowledge of the spring and summer weather in the most important island of the South Indian Ocean, will not remain unreduced.

The series of photographic records of the declination and horizontal force of the Earth's magnetism have been measured and partly reduced; the vertical force curves are being commenced. This series was started in 1867.

The monthly tables of meteorological results continue to be printed for private circulation, and the Annual Report has been somewhat enlarged.

MOORSIDE OBSERVATORY, HALIFAX. Louis J. Crossley, F.M.S.—The work at this Observatory continues as usual. Observations are made four times during the day, and the self-recording instruments continue in constant operation. The Pressure Anemometer was taken down some time since, as it was not working satisfactorily; it may probably be replaced.

VIII. *An improvement in Aneroid Barometers.* By the Honourable RALPH ABERCROMBY, F.M.S.

[Received December 14th, 1875.—Read February 16th, 1876.]

THE improvement consists in jewelling the ends of the arbor of the index hand, like the ordinary pivots of a watch, and making the hand work underneath the cap, instead of in the usual manner.

The advantages gained are:—

1. Increased sensitiveness;
2. Increased definiteness of the indications;
3. Diminished influence of weather on the bearings.

If an Aneroid of the ordinary construction, which has been at rest for some time, is tapped, the hand will move a little up or down, according to the general direction of the change of atmospheric pressure. But even then the indications cannot be relied on. The position of the hand will shift along the dial from $\cdot 01$ in. to $\cdot 02$ in., or even $\cdot 05$ in., according to the portion of the case which is tapped, the strength of the tap, and the position of the hand on the dial. The motion is also generally greater with a damp South-West wind, than with a dry East wind.

This "indefiniteness of the indications" exists in every Aneroid I have ever tried, which includes the productions of the leading London makers.

I had the greatest trouble from this defect during my researches on the "Barometric Fluctuations during Squalls and Thunderstorms," the results of which were recently laid before this Society;* and though it is shown in that paper how, by great care, good results may be obtained, still the defect of indefiniteness was so serious that I determined to try and devise a remedy.

An examination of the movements of many aneroids convinced me that

*Quarterly Journal, Vol. II. page 450.