

1896.
—
VICTORIA.

THIRTIETH REPORT

OF THE

BOARD OF VISITORS

TO

THE OBSERVATORY;

TOGETHER WITH THE

REPORT OF THE GOVERNMENT ASTRONOMER

FOR THE PERIOD FROM 31ST MAY, 1895, TO 30TH JUNE, 1896.

PRESENTED TO BOTH HOUSES OF PARLIAMENT BY HIS EXCELLENCY'S COMMAND.

By Authority:

ROBT. S. BRAIN, GOVERNMENT PRINTER, MELBOURNE.

THIRTIETH REPORT OF THE BOARD OF VISITORS TO THE
OBSERVATORY.

To HIS EXCELLENCY THE RIGHT HONORABLE THOMAS, BARON BRASSEY,
Knight Commander of the Most Honorable Order of the Bath, and
Governor and Commander-in-Chief of the Colony of Victoria and
its Dependencies, &c., &c., &c.

We have the honour to report to Your Excellency that, on 21st September, we made a visitation to the Observatory, received the report of the Acting Government Astronomer (Mr. P. Baracchi), and inspected the buildings and principal instruments. We found everything in excellent order, the instrumental equipment well cared for and generally in good working condition.

We append the Acting Government Astronomer's report, to which we beg to refer Your Excellency for a detailed account of the proceedings and work of the Observatory during the period under review. The large reduction of the staff which has taken place during the last two or three years has necessarily limited the operations, but we are pleased to find from Mr. Baracchi's report that he has been able to cope with the most important work of the institution and keep well up with the local requirements for meteorological statistics and other scientific matters. In the concluding paragraph of Mr. Baracchi's report, he calls our attention to the fact that the records of a large amount of valuable work are still unpublished. We beg to especially point out to Your Excellency the importance of rendering these results available to the scientific world as speedily as possible, not only on account of their intrinsic value, but also that the colony should not lose whatever reputation may be obtained by our Observatory from such valuable contributions to knowledge. Among them are over 30 years' records in terrestrial magnetism beside many important investigations bearing on the climate of the colony. There is also the very important work of measurement of the photographic plates of Southern Zone Stars, which constitute the Melbourne Observatory portion of the great international undertaking of a photographic chart of the heavens. It appears from our conference with Mr. Baracchi that these requirements may be best and most economically fulfilled by the temporary employment of quite young persons, who should be selected as physically and otherwise capable of quick training in this special but not intricate or very scientific work. The position of chief assistant has been vacant since the retirement of Mr. Ellery in July last year, and the appointment of Mr. Baracchi to the Acting Astronomership. Mr. Baracchi recommends that the position should be kept vacant until a man thoroughly qualified to take the responsibility of the full work and direction of the institution can be obtained, for he states that none of the members of the staff have at present sufficient qualifications for the position, but some of them may, by continuous effort and perseverance in the higher studies, eventually make themselves eligible. We have in former years referred to the importance of keeping in view the desirability of there being a junior in the staff with qualifications for training for the higher positions of the Observatory, where the requirements are so special and utterly distinct from other branches of the service, we, therefore, approve of Mr. Baracchi's suggestion.

R. L. J. ELLERY, Chairman.
W. C. KERNOT.
A. BLACK.
THOMAS R. LYLE.
H. J. WRIXON.
ALFRED DEAKIN.
G. V. SMITH, Hon. Secretary.

REPORT ON THE GENERAL STATE OF THE OBSERVATORY BUILDINGS,
INSTRUMENTS, AND APPLIANCES, AND ON THE WORK EXECUTED
DURING THE PERIOD MAY 31ST, 1895—JUNE 30TH, 1896.

Presented to the Board of Visitors.

During the first month of the period under consideration, the Institution was still under the control of my former chief (Mr. Ellery), whose retirement from the service did not take place until the 30th of June, 1895; but, as Mr. Ellery's last report goes only as far as the 30th of May, 1895, I thought it desirable to commence the present account from the earlier date, in order to preserve continuity in the information submitted to the Board.

GROUND AND BUILDINGS.

The grounds are in fairly good order, considering that no more than about £80 a year is allowed to be expended in the keeping of $4\frac{1}{2}$ acres of land. There is, however, much room for necessary work and improvements. The approach to the main gate, and the principal path within, are worn and in rather a bad state, and the fences require repainting. Provision has been made in the Estimates for these requirements, which, I hope, will be attended to during the current year. Certain repairs to the roof of the main building and to the Astronomer's quarters, besides others of minor importance, are now being executed.

INSTRUMENTS.

The facilities for instrumental alterations and additions are now to a great extent reduced, as, owing to retrenchment, no mechanic can be permanently employed, and the workshop is consequently kept closed.

The repairs and periodical attendance to the instruments are, therefore, intrusted to outside persons.

The principal repairs, &c., necessitated during the period under consideration, may be summarized as follows, viz. :—

Transit clock taken down and cleaned; electric contact springs repaired and re-adjusted; cleaning and repairing of four Observatory chronometers; tide-gauge at Williamstown repaired, wells cleaned out and put in order; photoheliograph altered to give sun pictures 4 inches in diameter instead of 10 inches as before.

Refitting of plate-holder and new appliances for regulating exposures in photographic operations with the great telescope.

The three principal clocks, viz., the transit clock (Frodsham, No. 991), the zone clock (Frodsham, No. 1062), and the Seth Thomas clock, No. 51 have kept very satisfactory rates. Indeed, so reliable is their general behaviour, that the time could always be determined and depended upon within two or three tenths of a second, in the absence of astronomical observations for a week or even longer.

In the 8-in. transit circle, the level error is giving some apprehension. For the first five years after the instrument was set up this error remained very small, and without exhibiting any distinctive or periodical feature in its variations; but, after 1890, it became gradually larger in one direction, moreover exhibiting in its changes the form of a curve, with a maximum ordinate in May or June, then gradually descending to a minimum in December or January, then again rising to a maximum on the following May, and so on with the same periodical phases till March, 1895, when the instrument was reversed for the first time. After reversal, and up to the present time, the character of the curve has been quite different, as it shows no maximum in the winter months, nor minimum in summer, but has continuously and steadily descended from $+ 57''$ to $- 66''$. Thus it would appear as if a marked relation to seasonal causes, hygrometric, or thermal existed between 1890 and March, 1895, and that a new condition was introduced after reversal, such as to modify the characteristics of former disturbances. This might be the gradual self-adjusting of the pivots to their new bearings, although this adjustment had been carefully effected to apparent perfection after the reversal. These matters are now under investigation.

The 5-in. transit circle has been maintained in working order in case of emergency or requirement, but it has not been used. The astrophotographic telescope gave no trouble and remained as in previous years very steady, and the periodical observations and tests showed no necessity for re-adjustments of any kind, mechanical or optical.

The great telescope, as already mentioned, has been provided with an arrangement by which exposures in photographic operations can be automatically effected for any desired interval from a very small fraction of a second to four or five seconds. This was chiefly done with a view to facilitate lunar photography. The primary mirror A, which was successfully polished and re-figured in 1890, has been, and is still in use, but now requires polishing again. The other primary B unfortunately is much over corrected, and I am afraid that its figure could not be made right without some fine regrinding. These operations could only be carried out by myself, but under present conditions it is impossible for me to devote the necessary time to this work, much as I desire to accomplish it.

It is, however, not expected that any systematic observations could be undertaken with this instrument for some time to come, and therefore the repolishing may not be regarded as a matter of immediate necessity, although it is extremely unsatisfactory not to have the instrument in fully efficient working order, knowing that in such circumstances rare opportunities may be lost, and that the possibility of honorably assisting in the efforts of modern astronomy is very greatly reduced. This instrument, in spite of adverse opinions, is undoubtedly capable of doing what only few other telescopes can do in

the class of work for which reflectors of great aperture are specially adapted, provided it be placed in charge of a skilful observer with an attendant, both solely devoted to this one instrument, and without any other care, duty, or responsibility. For, in order to do full justice to the great telescope, nothing less than the whole time of an observer and mechanical attendant throughout the year would suffice, and even then only a very moderate amount of first-class work could be produced, as owing to the nature of this, and probably other great reflectors, a multitude of obstacles to its best performance are encountered almost every time it is used.

Herein lies perhaps the only valid reason for giving so much preference to refracting telescopes as has been done of late years. I shall have occasion to make some further remarks on the great telescope later on. I have nothing in particular to say concerning the south 8-in. equatorial and the smaller 4½-in. equatorial, which are in excellent condition.

All meteorological and magnetic instruments, the seismograph, the various electric instruments and circuits for Observatory use and distribution of time signals, the tide-gauge and time-ball appliances at Williamstown have worked satisfactorily, and are in good order. I have reason to suspect that some of the instruments at up-country stations employed in connexion with the meteorological service of the colony do not give reliable results. No doubt a general inspection is wanted, and as no officers of the Observatory can at present be spared for this purpose, I am endeavouring to arrange with travelling officers of other Departments of the State to give us some assistance in the matter.

Early in the year the stock of meteorological instruments was almost exhausted, but I was allowed to spend £50 for the purpose of replenishing it, and an order was accordingly sent to England. The new instruments, however, have not yet reached the Observatory.

An unusual number of applications for rain-gauges and thermometers were received as a sequel, I believe, to the drought and excessive heat of last year, but only a very small part of these could be complied with.

The staff now consists of—

Mr. W. SWAN	...	...	...	...	Assistant
Mr. E. T. QUAYLE	...	...	...	...	"
Mr. F. KEMP	...	...	...	...	Photographic Assistant
Mr. W. WALLACE	...	...	...	...	Junior Assistant
Mr. D. HODGE	...	...	...	...	Weather Telegraph Clerk
Mr. J. BYRNE	...	...	...	...	Mechanical Attendant
Mr. J. MANNIX	...	...	...	...	Junior Messenger and Clerical Assistant
Mr. G. LONG	...	...	...	...	Junior Messenger
And MYSELF.					

A gardener and a charwoman are also temporarily employed.

There are besides, under the control of the Observatory, a paid attendant at Williamstown, in charge of the tide-gauge and time-ball; ten observers, at second-class meteorological stations along the coast and at other places in the country, who receive an annual bonus of £10; and some 530 honorary rainfall recorders, a portion of whom also register temperatures.

DISTRIBUTION OF THE WORK.

Mr. Swan makes transit observations on alternate nights on alternate weeks, deduces the daily clock, errors, and rates; attends on alternate days to the comparison of clocks and to the distribution of time signals; reduces star places in right ascension; keeps the right ascension-book and clock register; prepares the separate results in right ascension and the annual catalogues. Mr. Quayle also makes meridian observations on alternate nights on alternate weeks, assisting Mr. Swan in the determination of instrumental errors, &c.; performs the necessary computations for the reduction of all polar distance observations, from which he prepares the separate results for the year; keeps the polar distance-book; attends on alternate days to the comparison of clocks and to the distribution of time signals; completes the daily weather chart in conjunction with the weather telegraph clerk (from which he deduces and submits to me the mid-day forecast); reads off the daily curves of the tides recorded at Williamstown; completing the necessary reductions and entering results in the tide register.

Mr. Kemp has charge of the meteorological instruments and of the observations in connexion therewith. Attends to the photographic registration of the magnetic elements; reduces and enters in appropriate tables and ledgers the meteorological data furnished monthly by up-country observers; partly prepares the quarterly meteorological records for publication; has charge of stores; takes photographs of the sun on occasional days; and is the photographic operator in connexion with the astrophotographic work; also attends to the clock comparisons and distribution of time signals on every third Saturday.

Mr. Wallace's principal duties are in connexion with the astrophotographic work, excepting photographic operations. He makes the observations; performs all necessary computations relating thereto; examines the star plates from which he selects measures, and arranges in convenient working lists certain stars (five from each plate) intended for meridian observation; and keeps all records in connexion with the work; acts as librarian; attends to the rating of chronometers and testing of instruments for the public; shows visitors over the Observatory; relieves Mr. Kemp on alternate Sundays and holidays in reading off and resetting of meteorological instruments and magnetographs; keeps record of extraordinary phenomena, such as earthquakes, auroras, meteors, &c.; and assists generally in professional and clerical matters of occasional occurrence, preparation of urgent returns, &c.

Mr. Hodge is principally the weather telegraph clerk, and has charge of the telegraphic operations in connexion with the weather service, local and intercolonial. He goes every day to the central telegraph office at 10.30 a.m., where he collects and plots in a map all meteorological data required for the deduction of the forecast. This occupies him till 1 p.m. He assists in other work, chiefly in connexion with rainfall stations, preparation of weather synopses, information for the press, issue of our publications, keeping records of unusual meteorological phenomena, preparation of returns, &c.

James Mannix, who was formerly junior messenger, has, since May, 1895, acted as clerical assistant, but without promotion or increase of salary. His general duties during the period under review have been as follows, viz.:—The registration of inward correspondence; copying outward letters; receiving, checking, and entering monthly returns from some 540 up-country observers; preparing rainfall manuscript for quarterly publications; and assisting in other occasional clerical work, such as preparation of returns, &c.

James Byrne is the caretaker of the Observatory and mechanical attendant. Attends to the cleaning of instruments and the keeping of the offices in order, &c., distributes the weather synopses at various places in town every afternoon, takes the readings of meteorological instruments at 9 p.m., attends to great telescope during observations and to general messenger's duties, in all of which he is assisted by the junior messenger, Long.

Besides the supervision and administration of the Department, extra meridional work, absolute measurements of the elements of terrestrial magnetism with their reduction, and all correspondence are solely under my care.

THE WORK.—MERIDIAN OBSERVATIONS.

Observations in R.A.—Clock stars	781	Observations for Flexure	... 11
Azimuth do.	264	Runs ...	... 42
List do.	1282	Collimation	... 122
Observations in N.P.D. List do.	1263	Level ...	... 131
		Nadir ...	... 121

The state of the reductions is as follows, viz.:—

In R.A. all observed stars reduced to correct meridian passage.

Clock and Azimuth stars completely reduced to the 2nd April.

List stars reduced to apparent place to the 2nd April.

Clock register made up to 30th June.

Observations in N.P.D.—Reduced to observed place to 30th June.

 Completely reduced to 17th April.

Annual catalogue for 1894 and separate results and catalogue for 1895 completed.

The List stars are stars selected from the plates of the astrophotographic catalogue, with the exception of a batch of 54, which were observed for the Adelaide Observatory at the request of Sir Charles Todd.

ASTROPHOTOGRAPHIC.

Catalogue plates.—Exposed, 218; rejected, 4.

Chart do.—Exposed, 49; rejected, 9.

Plates on the South Pole, 41; Oxford type charts, 11; plates for trails, 21.

Plates for adjustment of centre, 11.

Total number of exposed plates, 351; rejected, 13.

Three successive exposures of 5 minutes, 2½ minutes, and 20 seconds were invariably adopted for all catalogue plates, Oxford type charts, and plates on South Pole. Each plate was examined, in order to ascertain whether the setting and orientation were accurate, and whether the sensitiveness of the plate and the atmospheric transparency had been sufficient to allow stars of the 11th magnitude to give images of the required density. Negatives were accepted as satisfactory when the setting was found to be correct within 10' (this error is generally within 5'), and when the image of a 9th magnitude star on Argelander scale, obtained with twenty seconds' exposure, was such as to be accurately measurable.

The Oxford type regions were photographed on an average once a month for the purpose of controlling the scale of photographic magnitudes, in its relation to diameter of image and time of exposure, and the plates on the South Pole, which were secured on every observing night, are intended to assist in the reduction of this scale to an equal standard of transparency of the atmosphere. The chart plates were obtained with a single exposure of one hour, and represent regions whose centres correspond to even degrees of declination. This is in accordance with the decisions formulated at the International Conference of 1891. "Ilford" plates were generally used, with the exception of a few Elliott "Rocket" plates. For each batch of twelve dozen, the quantity usually comprised in each separate order, tests were made on a few plates for relative sensitiveness and for determining the best time for development; the results so obtained being accepted as applicable to all the rest in the batch. The quality of these plates is usually so constant that there has not been any reason for varying the time of exposure nor the time of development; this latter being six minutes.

The plates for trails of stars north and south of the zenith serve for the periodical examination and adjustment of the zero reading of the position circle or the orientation of the reseau lines, and the plates for adjustment of centre are used for testing the parallelism of the collimation axes of the guide and photographic telescopes. The adjustment of the polar axis of the instrument was also periodically observed by the method proposed by Dr. Scheiner.

There remain now 81 plates to be taken in order to complete the photographic operations of that part of the astrophotographic catalogue allotted to this Observatory. These operations would have been finally accomplished by now were it not for the circumstance that the regions not yet dealt with can only be photographed in those periods of the year when the weather is most unfavorable.

From each of 210 catalogue plates five stars were selected, measured, and reduced, thus forming a list of 1,050 stars suitably arranged in working lists for observation with the transit circle; two of these lists, containing some 277 stars, were supplied to Charles Todd, who, since 1894, has assisted us by observing stars of this class with the meridian circle of the Adelaide Observatory. He has already sent me the places of 196 such stars; but to this subject, as well as to the systematic measurement of the catalogue plates, I shall be obliged to draw the attention of the Board further on.

The work with the great telescope and with the smaller equatorials has been of a very occasional character, consisting of some experiments in lunar photography, scattered spectroscopic and planetary observations, the search for announced comets, and evenings of star-gazing allotted to special visitors.

PHOTOHELIOGRAPH.

Forty pictures of the sun were taken. In former years this work was carried on systematically, but was reduced by my predecessor to the photographing of the solar surface on days of conspicuous spots only, and it has been found impracticable to alter that arrangement in the direction of an increase in the amount of this work.

TIME SERVICE.

The time-ball at Williamstown was dropped on 318 days, with eight failures, caused chiefly by defects on the line; time signals were communicated daily at 1 p.m. throughout the colony, in addition to the daily comparison of the Melbourne Post Office clock, the control of the synchronous clock at the central telegraph office for distribution of signals to subscribing firms, &c., special hourly signals, and signals transmitted to the Railways.

In former years, the time service was not carried on on holidays, but on account of some complaints which reached me at Easter, I decided that the time should be distributed on every day in the year except Sundays, and this course has since been followed.

TERRESTRIAL MAGNETISM.

The photographic traces representing variations in the magnetic declination, horizontal, and vertical components have been obtained almost uninterruptedly, excepting a few cases in which the records were lost, owing to accidental failures of the gaslight, repairs, cleaning, or adjusting. The aggregate loss of records for the whole period amounts to five days.

I re-determined the scale values of the magnetographs and the value of ordiuates in March last.

Absolute measurements were made on ten days.

In February and March last, eye observations of the variation instruments were made at the request of Professor Bezold, of the Berlin Meteorological Observatory. These consisted in noting the scale readings of the declination instrument and of the bifilar at accurate intervals of five seconds for periods of one hour at specified times. These observations were made simultaneously at all the principal magnetic Observatories. It is recognised that the magnetic curves as usually obtained by the photographic process are not sufficiently delicate for deducting the times of magnetic pulsations or disturbances more or less minute with the necessary precision, when corresponding phenomena at different parts of the earth are to be compared, and Professor Bezold, in order to secure better data, proposed the eye observations above mentioned, and intends to further develop this scheme at the conference to be held in Paris in September, 1896.

Under the auspices of the "Bureau des Longitudes," expeditions have been organized for magnetic work all over the world, to extend over three years, with the object of making new and more complete magnetic charts. One of these parties visited Australia in January last, and at the request of Lieutenant Monague, the officer in charge of the expedition, certain records of simultaneous observations were prepared and forwarded to Paris.

A journal on "Terrestrial Magnetism," edited by Dr. L. A. Bauer, was started in America at the commencement of the year, under the auspices of the Ryerson Physical Laboratory. This is the only journal of the kind existing, and promises to be of great value to this branch of terrestrial physics, owing to the facilities it affords for the appropriate publications of what is being done in regard to magnetic work by investigators of every nation. A warm appeal was made to Australia for co-operation and support in these matters.

The interest in terrestrial magnetism is greatly increasing, and it seems that a revival of the Gaussian epoch is near at hand.

When retrenchment came, the desirability of stopping the magnetic work was repeatedly considered, but the fact that this is the only institution in Australia where such work is performed always weighed in favour of its being continued; and now the circumstances mentioned above, in addition to my personal interest in the work, make it all the more imperative that it should be not only continued, but also that the uninterrupted records of the last 30 years, which have not yet been systematically reduced and discussed, should be now finally dealt with.

METEOROLOGICAL SERVICE.

The usual observations of pressure and temperature of air, temperature of evaporation, cloud, wind, and weather were made three times daily. Rainfall, spontaneous evaporation, maximum and minimum temperature of air, solar and terrestrial radiation, and temperature of the soil at various depths were observed once a day. The various instruments for continuous registration of the principal meteorological elements, including rainfall and sunshine, have been kept at work uninterruptedly. The daily weather synopsis of the colony, and two weather forecasts issued at 1 p.m. and 6 p.m., were prepared for every day in the year except Sundays, and communicated to all telegraph stations in Victoria, to the other Australian Colonies, Tasmania and New Zealand, and to the local press.

The meteorological records taken at all the stations under the control of the Observatory were collected monthly, examined, tabulated, and discussed, and the results arranged for publication in quarterly pamphlets. The part of the meteorological service which, in my opinion, is first in importance, as it appears to be of some more immediate usefulness or interest to the public, is that concerning the rainfall. I have, therefore, given whatever attention I could afford to this matter, and made certain new arrangements, in order to secure sufficient daily returns by which timely information could be prepared for the benefit of agriculturists.

Accordingly, with the assistance and good-will of the postal authorities, the number of stations sending rainfall records to the Observatory by telegraph has been increased, with due care as to selection, from 20 to about 74. It is found that with this larger but still limited data, the results may be provisionally considered as equivalent to those based on the whole 540 stations, without serious discrepancy, and we are thus enabled to follow the general distribution of rainfall over the colony from day to day, in anticipation of the more complete monthly returns, which cannot be fully dealt with until several weeks later.

In other directions, the meteorological work has been curtailed, as, for instance, the supply of weather charts to several public places in town, which, I had reason to believe, were not of much real use, and the stoppage of the weather forecast for Tasmania, when it was found that similar information was already received by that colony from other sources.

The publications of meteorological records for 1895 have been issued, and those for the half-year ending 30th June, 1896, are ready for the Government Printer. It is intended to publish an extra number in addition to the usual matter, dealing solely with rainfall distribution with maps and diagrams. This is now in course of preparation.

MISCELLANEOUS WORK.

A scheme for concerted cloud observations having for its object the improvement of present knowledge of upper atmospheric currents was proposed by the Meteorological International Committee. The work was to extend over a period of twelve months (date of commencement, 1st May, afterwards postponed to 1st July), and all the civilized countries were urged to co-operate simultaneously. It was required to secure, in each country, a large number of workers to take observations at many different localities, without instruments or with simple nephoscopes or contrivances, and also to establish pairs of principal stations situated at a distance of about a mile, intended for the determination of absolute height and velocity of clouds by accurate methods, preferably photographic. The Melbourne Observatory was invited to assist in the scheme, and after some reluctance and consultation with other Australian Observatories, I was induced to take up our share of the work in Victoria. Accordingly a circular was issued setting forth the aims of the scheme, with an appeal to persons interested in these matters to join as volunteer observers at scattered up-country places. About 55 names were enlisted, out of which a selection was made, and after giving the necessary instructions and advice, and completing all detail of organization, some 40 observers commenced work on 1st May. Several had to withdraw after the trial of the first month; but a good many were successful from the first, while others improved rapidly; so that at present we have about 30 of them doing reliable work.

With regard to the paired stations, the roof of Parliament House, which presented the best conditions for the purpose, and a point on the grounds of the Melbourne Observatory were selected for concerted observations.

The authorities very readily gave the necessary permission and concessions, and the arrangements for carrying out operations being now nearly completed, a start will be made shortly. We have adopted the Kew method, which consists in simultaneously photographing the same cloud with two cameras permanently fixed at the extremes of the base line, having their optical axes truly vertical. The photographic lenses for this work have only just arrived from England, after a long delay of several months, and this has unduly retarded the progress of the undertaking.

The station at Parliament House will be placed in charge of expert photographers and observers, who are officers of Government Departments, whose Ministers (Public Works and Chief Secretary) have given them the necessary permission to act.

The Honorable the Chief Secretary, who approved of all these arrangements, conceded a sum of £50 for photographic material and other expenses. The Observatory has undertaken the direction of the work and the publication of observations and results.

TESTING OF INSTRUMENTS AND RATING OF SHIP CHRONOMETERS AND WATCHES FOR THE PUBLIC.

This class of work was done at the Observatory in previous years free of charge; but I found that we were subjected to a good deal of imposition, and that much time was expended for the benefit of private individuals, who had no scruples in making a convenience of the institution, consequently I decided to charge fees according to a fixed scale. The proposal having been approved by the authorities, due notice was given in the *Government Gazette* of 20th September, and the new rule commenced from that date.

It was not expected that the State revenue would largely increase on this account; but the hope that an efficient check would be exercised on the demands of the public was realized. The instruments tested and adjusted from 1st June, 1895, to 30th June, 1896, were as follows:—

Chronometers	...	...	...	...	...	28
Aneroids	...	...	...	...	...	7
Anemometers	...	...	...	...	...	2
Thermometers	...	...	...	...	...	2
Standard chain	...	...	...	...	...	1

The chain standard was very carefully remeasured and compared with the original 10-ft. bars formerly employed in the geodetic survey. Other instruments were tested and adjusted free of charge for other Departments and institutions and for our own meteorological observers.

PENDULUM OBSERVATIONS.

It was mentioned in last year's report that our three half-second pendulums had been brought back to Melbourne by Mr. Love after swinging them at Greenwich, Kew, and Cambridge early last year. I subsequently made a series of observations for determining whether any variation in their length had occurred during the voyage, and, from a preliminary reduction of the observations, found that the all-important condition of invariability had been maintained. Mr. Love has now completed all the necessary observations relating to instrumental constants and corrections, and we hope soon to publish the final results of the whole work.

VISITORS.

Notwithstanding the notices given to the public that no visitors could be regularly admitted at night as in former years, the persistency of applicants was so considerable that 80 of them had to be given the opportunity of viewing the moon through the great telescope. It is much against my wish to deprive the public of a privilege which they had been accustomed to, but I find it absolutely impossible to carry on the old rule of three or four nights a month being set apart for that purpose, although special cases must necessarily be given due consideration. Two hundred and ninety visitors were shown over the Observatory on Wednesday afternoons as usual.

LIBRARY.

Three hundred and forty-four books, memoirs, and papers on scientific subjects were presented to the Observatory, and five new books, besides copies of *Nautical Almanac*, *Connaissance des Temps*, and *Jahrbuch*, were purchased. We have been regularly presented with 39 periodicals, and have subscribed to ten.

This shows that the library is very rapidly increasing, and, as regards recent and current scientific literature, may be considered fairly complete; but there are many standard works yet wanted, which, under the circumstances, cannot be bought all at once; but advantage will be taken of every opportunity for gradually filling the deficiencies.

Forty volumes, chiefly periodicals, were bound at the Government Printer's Department. A large number still remain unbound, but will, I hope, receive attention gradually.

GENERAL REMARKS.

The International Permanent Committee for the execution of the photographic chart of the heavens held its third meeting at Paris in May last, and an official invitation to attend was sent to me, which, however, had necessarily to be declined. Certain resolutions (as I gather from the July number of the *Observatory*) were passed by the conference, which clearly determine the conditions under which it is expected that the work should be completed, and as I entertain some fear that we may not be able to fulfil those conditions with due promptitude, I shall here lay bare the position of the Observatory, in its relations to this undertaking, for the information and consideration of the Board.

The essence of the resolutions in question is as follows, viz.:—

That the catalogue plates are to be measured by ourselves, the rectilinear co-ordinates are to be published as soon as possible, and their probable error should never be above 0^o.2 seconds.

That for computing the constants of a plate, a minimum of ten fundamental stars, if possible, should be employed, and the adopted positions of these fundamental stars are to be published. That the second series of chart plates, viz., those whose centres correspond to odd degrees of declination, shall be made with three exposures of 30 minutes each (with sensitiveness of plates attainable at present).

And that the Observatories shall make by contact two positives on glass, of which one shall be deposited with the Bureau International des poids et Mesures, Paris.

It thus appears with regard to the catalogue plates that the accuracy demanded in their measurement is about three times greater than that ordinarily attained in meridian observations, and that the number of fundamental stars to be employed for their reduction is double of that which I had contemplated. Our star list for observation with the transit circle is therefore increased by some 3,500 stars.

The amount of work, which the two present transit observers seem to be willing to produce, is limited to the determination of some 500 star places a year, hence, at this rate, it will take some twelve years to complete the meridian observations required for the reduction of the catalogue plates.

The measurement and reduction of these plates is by far a more perplexing question. The astrophotographic observer only, and only partly, could be employed in these operations, under present conditions; but this would be quite inadequate to requirements. It is clear, in fact, that the work cannot be undertaken without extra means. I consider that three very young assistants should be temporarily appointed for this purpose alone. They should possess some fitness and aptitude for the position, but no special scientific qualifications would be necessary. They should be taken on probation, and gradually trained. I may mention that this class of work is efficiently executed by ladies at Greenwich and Paris, and the same course might be adopted here, if it be found to offer any facilities or advantages.

With regard to the chart plates we are at present covering the zones of even degrees of declination with single exposure of one hour. It will be advisable, I think, to take the odd degrees with three exposures of 30 minutes *pari passu*; but I have not decided as yet pending the arrival of complete accounts of the Paris Conference.

The catalogue plates will soon be completed, and increased energy will be devoted to the chart plates in the future, so that the actual photographic work will not, it is hoped, remain conspicuously behind that of other Observatories, and if my demands be favorably considered, the measurements and reductions may be expected to progress satisfactorily.

Provision has been made in the Estimates for the addition of an assistant to the staff, at a maximum salary of £160 a year; but the new officer will be urgently required for other than astrophotographic work.

It has already been stated that 30 years' continuous records of the variations in the magnetic elements await to be systematically examined for the preparation and publication of results, now eagerly asked for by all who are interested in the subject. I have to add in connexion with this matter that the Honorable the Chief Secretary has promised to consider my request for a temporary computer to be employed solely in this work.

Of the work done with the great telescope from its very commencement, including a great mass of finished drawings of nebulae, sketches, notes, and micrometric measurements, only a minute portion has been published. The great bulk remains yet to be properly arranged and prepared for publication, which will require more time and leisure than we can at present afford.

The Melbourne zones, and the annual catalogues of stars observed with the meridian circle since 1884 all fully reduced, are still unpublished. Mr. Ellery, in his last report, expressed the opinion that, under the circumstances then existing, the best course was to stop the publication of yearly catalogues, and to combine the whole into one general catalogue for 1900, which we might wait some years longer to complete. It would not, however, seem desirable to delay much longer the placing in the hands of astronomers these results of eleven years' observations; and as a third ten-year catalogue which would satisfy the symmetry of the Melbourne meridian publications cannot at present be finally prepared owing to the still unaccomplished investigation of the division error of the transit circle, the annual catalogues with separate results should perhaps be published; but as the circumstances referred to by Mr. Ellery are now even more aggravated, I have been obliged to defer taking any definite resolution in the matter.

It will be seen from the foregoing statements that I have been unable to deal with many matters of importance, and have merely struggled through current duties of a routine and official order, largely for the direct service of the Victorian public, which naturally claims first recognition.

It must be remembered that the Institution since 1892 lost its two oldest members, a junior assistant, a mechanician, and its director, and that no new appointments have been made since.

The demands made upon it are now, at the least, the same as they were in past years, and as no overgrowth existed at any time, it cannot be expected that the same efficiency could be maintained. Consequently, I feel that we cannot keep pace with the astronomical world, that observations with the great telescope and other equatorials must for the present be abandoned, and that even if the extra assistance asked for be granted, we shall only be able to barely fulfil already accepted obligations.

P. BARACCHI,
Acting Government Astronomer.

Observatory, 21st September, 1896.