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REPORT

OF THE

TWENTY-SIXTH MEETING

OF THE



BRITISH ASSOCIATION

FOR THE

ADVANCEMENT OF SCIENCE;

HELD AT CHELTENHAM IN AUGUST 1856.

LONDON:

JOHN MURRAY, ALBEMARLE STREET

1857.

k. It was resolved—

That the cordial thanks of the Council be tendered to the Lord Wrottesley and the Officers and Council of the Royal Society, for the promptitude with which they have responded to the request of the British Association, in granting the sum of £250 for the purpose of lighting the Kew Observatory with gas.

Report of the Kew Committee, presented to the Council of the British Association, August 6, 1856.

The Committee beg to submit the following Report of their proceedings since the meeting of the British Association at Glasgow:—

The instruments and apparatus sent by the Committee to the Paris Exhibition were returned to the Observatory in December last. The total expense incurred by the Committee in connexion with the Exhibition amounted to £202:7s. 11d., exceeding by £62:7s. 11d. the sum of £140 granted by the Board of Trade. This balance has since been repaid by the Board.

At the last Meeting of the Association, your Committee presented a Special Report relative to their application to Her Majesty's Government for the use of two acres of land contiguous to the Observatory, and the lighting of the building with gas,—such applications having been made in consequence of the recommendation of the General Committee at the Liverpool Meeting. The Association is still compelled to pay the high rent of ten guineas per acre for the land. The Committee fully expected that this year they should have been enabled to report that the expense of lighting the Observatory with gas would have been defrayed by the Government. The President of the Board of Works at first intimated to the Committee that the subject would receive consideration, and subsequently that he would consider the propriety of including the amount in the estimates for the present year. On further application, however, this has been refused. A copy of the correspondence is annexed to this Report.

Your Committee have, however, the gratification of reporting, that on a representation of the circumstances being submitted by the Council of the Association to the President and Council of the Royal Society, the sum of £250 from the Wollaston Fund was immediately placed at the disposal of the Committee, in order that no further delay from the want of funds should take place in effecting the long-desired object.

Much as the Committee may regret the refusal of the Board of Works to grant their request, they gladly avail themselves of this opportunity to express to Lord Wrottesley and the Council of the Royal Society their thanks for the prompt manner in which the intimation was made to them that the money had been voted. It affords another proof how ready the Royal Society has ever been to forward and assist scientific investigations.

Mr. De la Rue has made a preliminary examination of one of the Huygenian object-glasses, namely, that of 122 feet focal length, and, so far as he has hitherto been enabled to judge, it would appear that this object-glass defines with tolerable precision; but he is not yet able to say whether it will be desirable to go to the expense of erecting the tower for celestial observations.

A paper by Mr. Welsh, descriptive of the Kew Standard Barometer, and of the apparatus and processes employed in the verification of barometers, has been communicated to the Royal Society by the Chairman, and is now being printed in the Transactions of the Society.

The following statement shows the number of meteorological instruments which have been verified at Kew during the past year:—

	Thermo- meters.	Baro- meters.	Hydro- meters.
For the Admiralty and Board of Trade	360	90	100
For the Portuguese Government		12	
For Opticians and others	170	35	
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Total	530	137	100

On February 5, the Committee resolved,—“That, in consideration of the number of Barometers already verified at Kew having been sufficient to defray the preliminary expense of apparatus, the charge for verification shall in future be reduced to five shillings each instrument.”

Arrangements have been made with Messrs. Adie, Casella, and Negretti and Zambra, to have on hand a constant supply of verified marine meteorological instruments, and the Public may be supplied through any respectable Optician in London or the country at the following prices:—

For a Marine Barometer	£4	4	0
For a Set of Six Thermometers	2	2	0

Since the last Report, the Committee have disposed of 60 standard thermometers, graduated at the Observatory. Of these, 14 have been made for Mr. Hopkins, to be employed in his experiments on the effect of pressure upon the melting-points of solids. The charge on account of the graduation and distribution of these thermometers is arranged with the Government Grant Committee of the Royal Society, and consequently does not appear in the financial accounts of the Kew Committee.

A self-recording Anemometer, for measuring the velocity of the wind on the plan of Dr. Robinson, has been completed at the Observatory by Mr. Beckley: it is erected upon the dome, and has been in regular operation since the 1st of January. Its performance is most satisfactory, the delicacy of its indications being so great, that during the last six months the whole period of “calm,” as shown by the registrations, has been only *four hours*. It has not yet been possible to erect an apparatus for registering the direction of the wind, on account of difficulties arising from the anticipated use of the dome for the solar photographic telescope. The direction of the wind has, however, been observed five times daily from an ordinary vane.

Mr. Beckley has since submitted to the Committee a model of a new arrangement for a self-recording Anemometer, in which the registration of both the direction and velocity of the wind (and also the fall of rain if desired) is obtained upon a single sheet of paper. This arrangement is much more compact in its design and less costly in construction than any other with which the Committee are acquainted. Mr. Beckley's model will be exhibited, and a description of it communicated to this Meeting.

A series of monthly determinations of the absolute horizontal force and of the magnetic dip was commenced in January, with instruments provided by General Sabine from his department at Woolwich. Some difficulties have been experienced by Mr. Welsh in the observations of the absolute horizontal force, owing to imperfections in the usual mode of suspension of the magnets during the observations of vibration. These difficulties he hopes soon to overcome by employing reversible collimator magnets, and by an improved mode of suspension.

A convenient apparatus has been constructed at the Observatory for the determination of the effect of temperature on magnets: with this apparatus the temperature coefficients of the magnets employed at the Toronto Observatory have been obtained. The scale of the unifilar, and the dimensions and weights of the *inertia* rings employed at the same Observatory, have been determined with reference to the Kew standards of length and weight.

Two dip circles, one for M. Hansteen of Christiania, and the other for Dr. Pegado of the Meteorological Observatory of Lisbon, have been examined and compared with the Kew instrument before being sent to those gentlemen. A 30-inch transit instrument, lent by General Sabine's department, has been erected in the south window of the old transit room. A clock by Shelton, the property of the Royal Society, is used with it.

Owing to alterations required in the dome in order to adapt it to the use of the solar photographic telescope, it has been necessary to remove the large electrical apparatus of Mr. Ronalds. An apparatus of smaller size, but on the same plan, has been erected on the side of the dome, by which atmospheric electrical phenomena can be determined in the same manner as heretofore. A new vane has also been constructed, having an indicating dial within the dome.

Dr. Halleur, who had for about six months assisted Mr. Welsh in the Observatory, having been appointed to a professorship in the New College of Engineering at Calcutta, left the Observatory in September last.

In February, the Committee, on the recommendation of Professor J. D. Forbes, engaged Mr. Balfour Stewart of the Edinburgh University, as Assistant Observer, at a yearly salary of £80, with residence in the Observatory. Mr. Stewart commenced his duties on March 1. The Committee regret having to report that the Observatory will shortly lose the services of this gentleman, who has recently been appointed an assistant to Professor Forbes: he will leave the Observatory on October 1, previous to which the Committee hope to be able to appoint a successor.

The Committee refer with pleasure to an ingenious thermometer devised by Mr. Stewart, in which advantage has been taken of the difference of capillary force and friction in two tubes of different capacity connected with the same bulb, to measure the sum of the fluctuations of temperature. The instrument has been made at the expense of the Committee; a description of it has been communicated by Mr. Stewart to the Royal Society, and is printed in its "Proceedings."

Mr. Welsh reports most favourably as to the general attention evinced by Mr. Beckley and Mr. Macgrath in the discharge of their respective duties. Mr. Beckley's talent as a mechanical engineer renders his services of great value in an establishment where instances constantly occur of work requiring the highest skill being promptly and correctly executed: the assiduity of Mr. Macgrath has been such as to merit the entire approbation of Mr. Welsh.

Your Committee cannot close this Report without again recording their high opinion of the unremitting care and attention, as well as of the ability which has ever been displayed by Mr. Welsh, as the Superintendent of the Observatory; during the past year he was compelled for upwards of six weeks to be in Paris, in order to arrange the delivery of the valuable scientific apparatus forwarded at the request of Her Majesty's Government by the Committee to the Paris Exhibition; but his arrangements were such, that the general business of the Observatory was not in any way suspended during his absence.

Your Committee have finally to report, that the total expenses of the Observatory during the past year amount to £557 : 1s. 9d. In consequence of the Committee having received during the year the sum of £221 : 7s. 8d. for

the verification of meteorological instruments, they have in hand a balance amounting to £260 : 4s. 6d.; they do not consider it therefore necessary to apply to the Association for a larger sum than £350, to enable them to meet the expenses of the ensuing year.

By order of the Committee,

JOHN P. GASSIOT, *Chairman.*

22 July, 1856.

Correspondence.

“Clapham Common, December 18th, 1855.

“SIR,—In the interview with which you favoured the deputation from the British Association this day, you kindly explained that you had no power to order the Works such as we required to be executed for the Observatory in the Old Deer Park, Richmond, without the sanction of the Lords of the Treasury, and you suggested the advisability of my briefly explaining to you by letter the position in which the Association stands as regards the Building, as also of defining the exact object of our application previously to your submitting the same to their Lordships.

“The Building was placed at the disposition of the British Association by Her Majesty in 1842 for scientific purposes; it has ever since been used for those objects, the entire expense of the Establishment being paid by the Association, without receiving any assistance, pecuniary or otherwise, from Government.

“The Committee has obtained permission from the Hon. Charles Gore, Chief Commissioner of Woods and Forests and Land Revenues Department, to have gas-pipes laid along the pathway through the Park to the Observatory without any cost or indemnification being required by his department, provided the work is done in the winter months; and the more immediate object of the application of Colonel Sabine and myself was to request you would order at the present time the gas-pipes to be laid on to the Observatory in order that the Building may be properly lighted, such lighting being indispensable for the carrying out various scientific investigations, and thus enabling the Committee to fulfil with greater efficacy the purposes for which the Building was originally granted by Her Majesty to the Association.

“I may add, that the funds of the British Association consist of the contributions of its members; from these limited means the Council have most liberally expended of late years an annual sum of £500 for the Observatory, but it being unable to meet this increased expenditure, which would not exceed £250 (the estimate is £200), the Committee has been induced to make this application, which we hope will not be refused.

“In respect to the repairs alluded to by us, we merely desired to explain that some repairs were indispensable to preserve the Building, which, if promptly attended to, would probably save a much larger outlay at a future period.

“The Building could *perhaps* remain in its present state for a short period, but a trifling outlay, the extent of which could be easily ascertained by the Government Surveyor, would be all that at present is required. The Committee considered it their duty to point this out for your consideration.

“I have the honour to be, Sir,

“Your obedient Servant,

(Signed)

“J. P. GASSIOT,
*Chairman of the Kew Committee,
British Association.*”

“The Right Hon. Sir Benjamin Hall, Bart., M.P.,
Chief Commissioner of Works, Public Buildings, &c. &c.”
1856.

“ Office of Works, &c., Dec. 20, 1855.

“ SIR,—I am directed by the Chief Commissioner of Her Majesty's Works, &c., to acknowledge the receipt of your letter, dated the 18th inst., relative to certain works considered to be necessary by the British Association at the Observatory at Kew, and to inform you that the subject will receive consideration.

“ I am, Sir,

“ Your most obedient Servant,

(Signed)

“ ALFRED AUSTIN, *Secretary.*”

“ J. Gassiot, Esq.”

“ Office of Works, &c., Jan. 5, 1856.

“ SIR,—With reference to your letter dated the 18th December last, requesting on behalf of the Kew Committee of the British Association that gas-pipes may be laid on to the Observatory at Kew, and that certain repairs may be also done to that Building at the expense of this Department, I am directed by the Chief Commissioner of Her Majesty's Works, &c., to acquaint you that he has caused an estimate to be made of the cost of the Works required by the Society, which amounts to a large sum, and that there are not any funds voted by Parliament out of which such cost can be defrayed.

“ I am however directed to add, that the Chief Commissioner will consider the propriety of including the amount in the estimates of the ensuing year.

“ I am, Sir,

“ Your most obedient Servant,

(Signed)

“ ALFRED AUSTIN, *Secretary.*”

“ J. Gassiot, Esq.”

“ Clapham Common, May 19th, 1856.

“ SIR,—I duly received the communication from your office, of 5th of last January, stating that you had caused an estimate to be made of the cost of the Works required at the Observatory in the Old Deer Park, Richmond, and that you would consider the propriety of including the amount in the annual estimates.

“ I have been informed that the usual estimates have been voted by the House of Commons:—may I therefore beg the favour of your acquainting me, for the information of the Kew Committee of the British Association, whether it is arranged that the laying on of the gas to the Building, and effecting the necessary repairs should now be commenced?

“ Permit me also to explain that it would be very advisable, in order to prevent additional outlay, that no further time should elapse as to the repairs of the Building.

“ I have the honour to remain, Sir,

“ Your obedient Servant,

(Signed)

“ J. P. GASSIOT,
Chairman of the Kew Committee.”

“ The Right Hon. Sir Benjamin Hall, Bart., M.P.,
Chief Commissioner of Parks, Palaces, &c. &c.”

“ Office of Works, &c., May 27, 1856.

“ SIR,—I am directed by the First Commissioner of Her Majesty's Works, &c., to acknowledge the receipt of your letter, dated the 19th inst., requesting that you may be informed whether it is arranged that the works for laying on gas at the Observatory at Kew, and for the necessary repairs, should now be commenced.

“ In reply, I am directed to call your attention to a letter addressed to you by this Board on the 2nd of June last, to the effect that there would be no objection to the use of gas at the Observatory, but that the whole of the work

connected therewith must be done by, and at the expense of, the Kew Committee of the British Association, and to the satisfaction of this Board's Officer in charge of the district.

"I am to add, that this communication was made to you before the First Commissioner came to this Office, and that he was not made aware of it when he gave directions for the letter of the 5th January last to be written to you, in which he informed you that he would consider the propriety of including the cost attending the laying on gas and performing the repairs therein referred to, in the Estimates of the ensuing year. His attention having now been directed to that communication of the 2nd June last, he is of opinion that the decision of the Board thereby conveyed must be adhered to, and that he is unable consequently to undertake the laying on gas at the Observatory, or to incur any portion of the expense attending it.

"With regard to the repairs referred to in your letter, the First Commissioner desires me to state that he will shortly communicate with you upon the subject.

"I am, Sir,

"Your most obedient Servant,

"ALFRED AUSTIN, *Secretary.*"

"J. Gassiot, Esq."

"Clapham Common, June 3, 1856.

"MY LORD DUKE,—At the suggestion of Col. Sabine, I forward your Grace a copy of a correspondence I have recently had with the Board of Works relative to the lighting of Kew Observatory with gas.

"The letter alluded to of 2nd June 1855, and a copy of which I enclose, is printed in the Report of the Kew Committee. I may also state that in an interview with Sir B. Hall, on 18th last December, both Colonel Sabine and myself explained the particulars of my former correspondence with the Board of Works; this has possibly escaped Sir B. Hall's recollection, for we left him with the impression that he would grant our request; and this was further confirmed by a letter received from Mr. Austin, on January 5th, who in reference to our application says, 'the Chief Commissioner will consider the propriety of including the amount in the Estimates of the ensuing year.'

"I cannot therefore but feel much disappointed at the result, which, if confirmed, will prevent the Committee from carrying out those scientific researches they have in contemplation.

"Hoping your Grace may induce Sir B. Hall to reconsider the application,

"I have the honour to be, My Lord Duke,

"Your obedient Servant,

"J. P. GASSIOT,

Chairman of the Kew Committee."

"His Grace the Duke of Argyll,
President of the British Association."

"Clapham Common, July 17, 1856.

"SIR,—I duly received your reply to my last letter of 19th May, and having communicated to the President and Council of the British Association your final determination not to incur any portion of the expense of laying on gas to the Observatory, I have now the pleasure of informing you that the Royal Society has, from a small fund bequeathed for scientific purposes, most liberally placed the sum of £250 at the disposal of the Kew Committee, in order that the work may be no longer delayed.

"I have respectfully to request you will be pleased to give the necessary directions to the Officer in charge of the district, referred to in Mr. Austin's letter of 27th May (but whose name, designation, or address I have no

means of ascertaining), in order that the Committee may be informed by him in what manner the work must be done to his satisfaction.

“From what took place at the interview with which you favoured General Sabine, Mr. Welsh, and myself on 18th of last December, as well as from the tenor of the letter addressed to me by Mr. Austin on 5th last January, the Committee fully relied on the necessary amount for the proposed work being included in the Estimates; they regret that any circumstance should have arisen to prevent your carrying your intentions into effect, for although the amount may appear trifling, in comparison to many sums voted on such occasions, it is nevertheless a large item in the income of any scientific Society supported entirely by voluntary subscriptions; and considering that the British Association already devotes the large sum of £500 per annum for the support of the Observatory, the Committee could not anticipate that the cost of laying on gas to a building the property of the Crown, would have been refused by your Board.

“I have only to add, that, although nearly two months have elapsed since the date of Mr. Austin’s last letter, and upwards of sixteen months since the subject was first communicated to your Board, I have not received any communication relative to the repairs, some of which are absolutely necessary for the preservation of the building.

“Regretting that you should have been troubled with so long a correspondence on this subject,

“I have the honour to be, Sir,

“Your most obedient Servant,

“J. P. GASSIOT,

*Chairman of the Kew Committee,
British Association.*”

“The Right Hon. Sir Benjamin Hall, Bart., M.P.,
First Commissioner of Public Works, &c. &c.”

“Office of Works, &c., 25th July, 1856.

“SIR,—I am directed by the First Commissioner of Her Majesty’s Works, &c., to acknowledge the receipt of your letter of the 17th instant, stating that the British Association will, out of a grant of money made to them by the Royal Society, lay on gas to the Observatory at Kew, and requesting that the necessary orders may be given to the proper officer of this department on the subject, and also calling attention to the state of repair of the Building; and I am to inform you, in regard to the laying on of the gas, that the Board request that the Committee of the Association will, as soon as they shall be prepared to commence the works, communicate with Mr. Starie, the Officer of this Department, who has the charge of the Kew District, and who is instructed to attend from time to time to see that the works are performed to his satisfaction.

“With regard to the repairs I am directed to state that, upon further consideration, a question has arisen which renders it necessary for the First Commissioner to submit that subject to the Treasury, and that upon receiving their reply, the First Commissioner will communicate further with the Committee.

“I am, Sir,

“Your most obedient Servant,

“ALFRED AUSTIN, *Secretary.*”

“J. P. Gassiot, Esq.”

