

1888.

VICTORIA.

VENTILATION AND LIGHTING OF THE
LEGISLATIVE ASSEMBLY CHAMBER.

FIRST AND SECOND PROGRESS REPORTS

FROM THE

ROYAL COMMISSION APPOINTED TO INQUIRE INTO AND REPORT
UPON THE BEST MEANS OF VENTILATING AND LIGHTING
THE LEGISLATIVE ASSEMBLY CHAMBER;

TOGETHER WITH THE

PROCEEDINGS OF THE COMMISSION, MINUTES OF EVIDENCE,
AND APPENDICES.

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

By Authority:

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Victoria, by the Grace of God of the United Kingdom of Great Britain
and Ireland QUEEN, Defender of the Faith:

To our trusty and well-beloved the Honorable MATTHEW HENRY DAVIES, Speaker of the Legislative Assembly of our Colony of Victoria; The Honorable WILLIAM MCLELLAN, The Honorable JAMES MUNRO, The Honorable JOHN WOODS, The Honorable JOHN GAVAN DUFFY, The Honorable THOMAS BENT, The Honorable LOUIS L. SMITH, The Honorable CHARLES YOUNG, The Honorable WALTER MADDEN, The Honorable JOHN NIMMO, JOSEPH BOSISTO, Esquire, Companion of the Most Distinguished Order of Saint Michael and Saint George, ROBERT HARPER, Esquire, and EPHRAIM LAMEN ZOX, Esquire, Members of the Legislative Assembly of our said Colony,

GREETING :

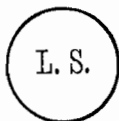
Whereas it has been deemed expedient that a Commission should forthwith issue to inquire into and report upon the best means of Ventilating and Lighting the Legislative Assembly Chamber: Now know ye that we, reposing great trust and confidence in your zeal, integrity, knowledge, and ability, have constituted and appointed and by these presents do constitute and appoint you the said MATTHEW HENRY DAVIES, WILLIAM MCLELLAN, JAMES MUNRO, JOHN WOODS, JOHN GAVAN DUFFY, THOMAS BENT, LOUIS L. SMITH, CHARLES YOUNG, WALTER MADDEN, JOHN NIMMO, JOSEPH BOSISTO, ROBERT HARPER, and EPHRAIM LAMEN ZOX, to be our Commissioners for the purpose aforesaid: And for the better effecting the purposes of this our Commission we do by these presents give and grant unto you, or any five or more of you, in case you shall think fit so to do, full power and authority to call before you such persons as you shall judge likely to afford you any information on the subject of this our Commission: And we do by these presents will and ordain that this our Commission shall continue in full force and virtue, and that you our said Commissioners, or any five or more of you, may proceed in the execution thereof and of every matter or thing therein contained, although your proceedings be not continued from time to time by adjournment: And our further will and pleasure is that you do, with as little delay as possible, report to us under your hands and seals your opinion on the matter herein submitted for your consideration: And we appoint you the said MATTHEW HENRY DAVIES to be the President of this our Commission, with authority to give a second or casting vote at any meeting at which the votes (including that of the President) on any question pertaining thereto shall be equal: In testimony whereof we have caused these our letters to be made patent and the seal of our Colony of Victoria to be hereunto affixed.

Witness our trusty and well-beloved Sir HENRY BROUGHAM LOCH, Knight Commander of the Most Honorable Order of the Bath, Governor and Commander-in-Chief in and over the Colony of Victoria and its Dependencies, &c., &c., &c., at Melbourne, this fifth day of January, One thousand eight hundred and eighty-eight, and in the fifty-first year of our reign.

HENRY B. LOCH.

By His Excellency's Command,

ALFRED DEAKIN





FIRST PROGRESS REPORT.

To His Excellency SIR HENRY BROUGHAM LOCH, *Knight Commander of the Most Honorable Order of the Bath, Governor and Commander-in-Chief in and over the Colony of Victoria and its Dependencies, &c., &c., &c.*

MAY IT PLEASE YOUR EXCELLENCY :

We, your Commissioners appointed on the 5th January, 1888, to inquire into and report upon the best means of ventilating and lighting the Legislative Assembly Chamber, beg to submit the following Progress Report.

1. That, in the opinion of the Commission, the whole of the Parliament House should be lighted with the electric light as soon as possible.
2. That the permanent installation should be under the control of Parliament, and that the necessary works should be proceeded with at once under competent supervision.
3. That the site for the works should be in the Treasury Gardens, at the angle formed by the junction of Gipps and Gisborne streets, so that the light could also be supplied, if desired, to the Government Printing Office, the Public Offices, and the Chief Secretary's Offices.
4. That the engines and plant at present in the possession of the Government should, if suitable, be utilized.

(Signed)	M. H. DAVIES, President,	(L.S.)
	WILLIAM McLELLAN,	(L.S.)
	JAMES MUNRO,	(L.S.)
	JOHN WOODS,	(L.S.)
	JOHN NIMMO,	(L.S.)
	LOUIS L. SMITH,	(L.S.)
	JOHN GAVAN DUFFY,	(L.S.)
	E. L. ZOZ,	(L.S.)
	JOSEPH BOSISTO,	(L.S.)
	WALTER MADDEN,	(L.S.)
	THOS. BENT,	(L.S.)

THOS. G. WATSON,
Secretary to the Commission.

Parliament House,
26th March, 1888.

SECOND PROGRESS REPORT.

To His Excellency SIR HENRY BROUGHAM LOCH, *Knight Commander of the Most Honorable Order of the Bath, Governor and Commander in Chief in and over the Colony of Victoria and its Dependencies, &c., &c., &c.*

MAY IT PLEASE YOUR EXCELLENCY :

We, your Commissioners appointed on the 5th January, 1888, to inquire into and report upon the best means of ventilating and lighting the Legislative Assembly Chamber, beg to submit the following further Progress Report.

1. That in the opinion of the Commission, in order to effectually ventilate the Chamber, it is necessary to have a completely artificial system of ventilation—that is, one that will provide for the forcing in of pure and the removal of vitiated air, and that sufficient motive power should be used to force in 300,000 cubic feet in an hour, either near the ceiling or at such place above the heads of Members as may be found most convenient, by which means the air in the Chamber will be thrice renewed within the hour.

2. That the air forced into the Chamber should be heated in winter, and cooled in summer, so as to maintain a temperature of about 65° F., and that, in order to obtain it as pure as possible, care be taken to draw it from a point in the gardens at a suitable height from the ground.

3. That the corridors, the rooms communicating with the Assembly Chamber, and, if practicable, the Queen's Hall, should be included in the plan of ventilation.

4. That the occasional ingress and egress of air through the entrances should be regulated, as the natural difficulty of ventilating is largely increased by the great number of doors that open into the Chamber.

5. That an officer of the House should be specially charged, under the direction of Mr. Speaker, with the management of the ventilation of the Chamber and be responsible therefor.

6. The Commission have read, with interest, Professor Ewing's reports on the best means of ventilating and lighting the Assembly Chamber, and recommend that his report on ventilation (a copy of which is attached) be carried out, subject to necessary modifications.

7. The Commission desire to strongly urge that steps be at once taken to carry out their recommendations, as Parliament will shortly be in session.

8. The Commission are specially indebted to one of their number, Mr. Robert Harper, M.P., for the practical interest he took in their work while in Europe, and for the valuable information he obtained for them.

(Signed)	M. H. DAVIES, President,	(L.S.)
	WILLIAM McLELLAN,	(L.S.)
	JOHN NIMMO,	(L.S.)
	LOUIS L. SMITH,	(L.S.)
	ROBERT HARPER,	(L.S.)
	JOSEPH BOSISTO,	(L.S.)
	JOHN GAVAN DUFFY,	(L.S.)
	EPHRAIM L. ZOX,	(L.S.)
	WALTER MADDEN,	(L.S.)
	T. BENT,	(L.S.)
	JOHN WOODS,	(L.S.)
	JAMES MUNRO.	(L.S.)

C. GAVAN DUFFY, JUNR.,
Acting Secretary to the Commission.

Parliament House,
25th April, 1888.

PROFESSOR EWING'S REPORT ON THE VENTILATION OF THE
LEGISLATIVE ASSEMBLY CHAMBER, MELBOURNE.

Having been instructed by Mr. Robert Harper to prepare a scheme for the Ventilation of the Legislative Assembly Chamber, and for lighting it by electricity, I have the honour to submit the following Report regarding the Ventilation. The Lighting of the Chamber will be considered in a separate report.

In any scheme of ventilation there are three essential features—inlets, outlets, and a means of driving the air. With regard to the last, an important distinction is to be made between methods which draw air out and methods which force air in. In the former, which are called *vacuum* methods, the fan, furnace, or other source of motive power, acts directly on the outlet flues; the air is exhausted there, and is merely allowed to enter at the inlets. The consequence is that the atmosphere within the Chamber has a pressure somewhat less than the pressure outside, and hence whenever a door or window is opened there is an inrush of cold air. In *plenum* methods, on the other hand, the motive power is applied to the air before it enters the Chamber; it is pressed in through the inlets, and is merely allowed to escape through the outlets. The pressure within the Chamber is then somewhat greater than the pressure outside. The opening of a door or window lets a portion of the air in the Chamber escape there, but gives rise to no disagreeable draught. The *plenum* method is especially to be preferred when, as in case of the Melbourne Chamber, access is given by a number of doors which are liable to be frequently opened. It would, of course, be possible to use a combination of *plenum* and *vacuum* methods, drawing air out as well as pressing it in; but this, apart from the consideration of its greater complexity, would not be so good as a simple *plenum* method; it is positively desirable to maintain within the Chamber a pressure greater than the pressure outside. In the following plan a simple *plenum* method is employed.

The inlets are arranged on what is known as Tobin's principle. They consist of wide shallow tubes, or rather boxes, set vertically against the walls, which deliver the air into the Chamber in thin but wide streams moving in a vertical direction up the faces of the walls. These rise to a considerable distance, and gradually become merged in the nearly still atmosphere of the Chamber. The open tops of these inlet tubes stand at a height of about 5 feet from the floor, so that the streams of air which enter by and rise from them are not felt by the persons standing or sitting in the room.

As regards outlets, it is in general best to allow the used air to escape at or near the floor level; but in certain conditions it is desirable to have supplementary or alternative outlets near the ceiling. These last are specially necessary when gas is burnt within the Chamber, and although in this case I propose to advise the disuse of gas within the Chamber, it will still be desirable to have them, especially for use in summer and on any occasions when the Chamber becomes overheated. I propose to modify the existing ceiling outlets so that they will serve for this purpose; and to provide in addition outlets at the floor, by allowing the used air to escape into the space between the raised sides and back of the Chamber and the floor below, and thence into the open air.

Briefly, the plan set forth in detail below is this:—To have a fan in the basement of the Chamber, driven by a gas-engine, drawing a supply of fresh air from a tower in the gardens and forcing it into a chamber in the basement, where it will be first washed to remove dust and then heated by passing through a second chamber containing hot-water pipes. It will then pass into two main delivery flues, one in each side corridor of the basement, and pass from them into "Tobin" inlet tubes in the Chamber, the corridors, and the rooms to the north side of the Chamber. In the Chamber proper these tubes will be set in each of the five recesses in each side wall, between the pilasters, space being made for them by drawing forward, through a distance of about 4 inches, the seats which at present are set with their backs in these

recesses. Each tube will be of the full width of the recess in which it stands, namely, 8 feet. This arrangement of the inlets will in no way affect the architectural features of the hall; the tops of the tubes may be made level with the lower moulding of the panel in each recess, the height of which appears from the plan to be very nearly 5 feet from the floor.

It appears from the plan that the capacity of the Chamber proper is about 90,000 cubic feet, and that when the side rooms, to which this scheme of ventilation is extended, are included, the capacity is about 120,000 cubic feet. I have considered it desirable to make provision for a minimum ventilation, in the coldest weather, of at least 300,000 cubic feet per hour, and, by an increase in the speed of the fan, for which provision is made, the delivery of air will easily be increased to 400,000 cubic feet per hour, or even more in mild weather.

Provision is also made for introducing the whole or any portion of the air into the distributing flues without causing it to pass through the heating chamber. This gives an easy and rapid control over the temperature at which air is allowed to enter the Chamber.

The appliances which are provided for washing the air will also serve, in hot weather, as a means of cooling it by the use of ice.

I shall now describe the proposals in detail, and with reference to the accompanying plan, where the flues, &c., are shown by red lines.

Motive power is supplied by an "Otto" gas-engine (Messrs. Crossley Bros. Limited, Manchester) of two-horse power nominal. This is to be set, as shown on the basement plan, in a chamber formed by enclosing (with window and door) the eastmost portion of the north basement corridor. The belt from this engine is carried through the wall to drive a countershaft, from which another belt is taken to drive the fan. The engine and countershaft are provided with stepped pulleys, giving two speeds, the ratio of which should be about 3:4. A further variation of speed is given by having several weights for the governor of the engine, which will be supplied by Messrs. Crossley if they are asked for.

The fan is a "Blackman propeller," 48 inches in diameter, made by the Blackman Ventilating Co. Limited, 63 Fore-street, London. It works in a partition which is to be formed between the chambers A and B in the basement. To give a steady support to the fan, and prevent any vibration from being felt in the Chamber above, the fan should be fixed between two stone columns, say 2 feet by 2 feet square and about $5\frac{1}{2}$ feet high, connected across the top by a heavy stone yoke; a light construction will serve for the rest of the partition, and a small air-tight door should be built in it. Fresh air is to be supplied to the chamber A from a tower in the garden. As I have no information as to the environs of the building, I am unable to say where the tower should be placed; it should, of course, be placed no further from the chamber A than can be helped. Its internal section should be such as to present a clear air way of at least 25 square feet. At the top it should be fitted, on all four sides if possible, with louvre boarding, through which the air will enter. The louvres should present an aggregate clear surface of at least 40 square feet. A brick built tunnel or passage from the foot of the tower is to lead into the chamber A. Care must be taken to place the tower where the air is not likely to be fouled by smoke from neighbouring chimneys. The lowest part of the louvred entrances need not be more than about 12 feet from the ground.

The countershaft, which may conveniently be carried between two wall plumper blocks at its ends, is boxed in round the pulley on to which the engine drives. This box is to be made air-tight, to prevent air from the engine room from being drawn into the chamber A. The box should have a movable cover to allow the bearing of the shaft to be oiled.

From A the air is forced by the fan into a second chamber B, and it passes thence through the washing apparatus. This consists of a stack of planks over which water is allowed to trickle in sufficient quantity to keep the whole surface of the planks wet. A brick partition C is to be built as shown in the plan, extending partly across the chamber B, and rising to within about 3 feet of the vaulted roof. Light bars, or tubes of brass, are fixed between this and the west wall of the chamber, and on these are laid smooth planks with chinks between them to allow the water to drip down, care being taken to break joint so that the drops from planks above may not pass clear between planks below, but may fall on them. The planks should be laid in horizontal layers with a 6-inch vertical pitch. Water is continuously allowed to

run over the topmost planks and to drip down through the stack, and is drained off by a trapped gully in a sloping cement floor at the bottom. The object of the whole arrangement is to bring the air into close contact with an extensive wet surface.

The air next passes into the compartment D, through the lower part of the arch between B and D, the upper part of which is to be blocked up. The compartment D is to be divided by a horizontal floor (see sectional elevation) into two air-tight chambers, the upper one of which is to form the heating chamber. In this there are to be placed 1,000 feet of 4-inch hot-water piping, or an equivalent heating surface if another diameter is preferred. This coil or nest of pipes should be grouped in two portions, one of, say, 400 feet and the other of 600 feet, with a separate furnace and boiler for each. One or other or both can then be used according to the coldness of the weather. The pipes now used under the floor of the Chamber may be transferred to the heating chamber, and form part of the 1,000 feet specified. The air passes from the lower part of D up into the heating chamber through trap doors in the floor between the two. These doors are ranged in a row across the chamber, and the centre of the row is set about 1 foot to the south of the centre line to equalize the heating effect, in view of the fact that the volume of air which goes to the north is greater than that which goes to the south, since the former has to supply the side rooms as well as one side of the Legislative Chamber. The doors are made in sections, so that one or more may be closed at pleasure. From the north and south ends of the heating chamber the air passes into the main distributing flues at E and F.

An alternative passage into these flues is provided by doors at G and H in the space below the heating chamber. When these are opened and the trap doors in floor of the heating chamber are closed, the air will go into the flues without being heated. The doors at G and H are also to be capable of being set more or less open, so that by partially opening them, and partially opening the trap doors, the temperature of the mixed air in the distributing flues may easily be regulated.

The doors at G and H should be vertical sliding doors, each consisting of a single board balanced by means of pulleys and counterweights, so that when they are pushed up to open G and H they will form partitions boxing in the ends of the heating chamber, and so preventing the hot air in it from escaping into the distributing flues.

The arch at the west end of D is to be blocked up, except for a small air-tight door. The pipes in the heating chamber must be grouped in a way that will leave narrow passages such as will allow the pipes to be cleaned of dust. All the distributing flues should be, as far as possible, accessible for the same purpose.

The figures marked on the plan give suitable *inside* dimensions for the distributing flues. These flues will be best constructed of wood, planed on the inside, and hung by rectangular frames from the vaulted ceiling of the basement, the frames serving also as straps to hold the planks composing the flue tightly together. It would be practicable to employ the existing air ducts as main distributing flues, their sectional area being indeed more than sufficient. But I think it will be preferable to remove them (except the end portions, which I propose to utilize as outlets), and build wooden flues of the dimensions shown on the plan. One advantage of this will be that the heated air will lose less of its heat on its way to the Chamber.

From the main flues branches are carried, first up through the vaulted ceiling, and then along above the main floor and beneath the raised side floor of the Chamber, to supply the "Tobin" inlets in the recesses of the side walls. The branches are shown by blue lines in the basement plan, and the figures give the *inside* dimensions they should have. From the eastmost and westmost ones on each side small flues are led off through the partition separating the Chamber from the corridors that run north and south, to supply small "Tobin" tubes in the corners of the corridors at I, J, K, and L.

On the north side, three of the branch flues are carried through the north wall of the Chamber, to supply the rooms marked "Cabinet" and "Committee" rooms on the plan, and also the room or rooms above. These lead into vertical ducts placed against the south wall of these rooms; each duct discharges partly into the room below, while a part of it is continued up the wall and through the cornice of the ceiling into the room above, forming a "Tobin" tube in each. (See plan and section.) The figures marked on the plan give the clear inside dimensions of these tubes. The tubes are best formed by thin wood lining ($\frac{1}{2}$ " or $\frac{5}{8}$ " thick), fixed on light rectangular frames within. Their tops, which form the outlets, are to be 5 feet from the floor. Over the top of each tube, a piece of wire netting of $\frac{1}{2}$ -inch mesh or thereabouts

should be fixed, to prevent things from falling down. Otherwise, the tubes are to be perfectly clear for the passage of air. For the sake of appearance, they should be finished at the top by a light cornice or moulding round the outside. The same construction applies to the inlet tubes in the Legislative Chamber itself.

The tubes in the Chamber are to be set, as has been said already, in the ten recesses between the pilasters, along the side walls. Each tube must have a clear air-way of $2\frac{1}{3}$ square feet. As each recess is 8 feet wide, the tubes are to have a clear inside width from front to back of $3\frac{1}{2}$ inches. The backs of the seats now against the wall may be set close up against the wooden lining forming the front of the tubes. The height of the inlets from the floor should be as nearly 5 feet as it can be made without prejudicing the appearance of the panelled walls. A fan-shaped connection should be made between each tube and its horizontal air duct, to allow the air to spread uniformly over the whole breadth of 8 feet.

The tubes in the corridors at I, J, K, and L should, like the others, be 5 feet high, and should be made as wide sideways as their position will admit of. Each of them is to present a clear air-way of $\frac{1}{2}$ square foot.

It is scarcely necessary to add that the holes which at present exist in the floor of the Chamber are to be blocked up; there are to be no other air inlets than those specified above. No valves need be fixed in any of the inlet tubes.

Outlets.—With regard to *roof outlets*, it appears from the plan that there are at present five openings in the ceiling leading by converging flues into a central shaft or chimney which extends to a considerable height above the roof of the Chamber. I propose to leave four of these outlets operative, closing up the middle one only. At M and N, where these communicate with the central shaft, automatic valves should be placed, to ensure that air may only pass outwards and to guard against “blow-downs.” These valves are made by fixing numerous little flaps of oiled silk or of waterproof cloth about 4 inches square side by side on frames, or rather gratings of light wooden rods, so that the flaps may open to allow air to pass out, but will be closed against the gratings whenever a current of air tries to force its way past them into the Chamber. The gratings should be fixed in the flues at an angle of about 10° to the vertical, in such a manner that when no air current is passing the flaps will hang clear of the frames and slightly open. These valves should fill the whole section of the present flues, presenting as much clear airway as the present flues will admit of.

Above the valves in the central vertical shaft at some such place as O, a wooden flap or throttle valve is to be set, which may be opened and closed by means of a cord from an easily accessible part of the building, for the purpose of checking or entirely preventing the exit of air through the roof outlets.

The large chimney which forms the present terminal of the roof outlets is unnecessary so far as this scheme of ventilation is concerned. It will do no harm if allowed to remain, but for the sake of appearance it might be cut off where it extends above the roof, and a neat louvre-boarded turret substituted for it. The louvres should have an aggregate area of section equal to twice that of the central shaft.

For *floor outlets* I propose to utilize the space between the raised side and back parts of the floor of the Chamber and the main floor as a discharge flue. Numerous gratings are to be fixed in the risers of the steps, distributed as generally as may be throughout the sides and back (*i.e.* west) part of the Chamber, and presenting an aggregate clear airway through the holes of the gratings, amounting to about 25 square feet. Through these the air will pass into the space beneath the steps. To allow it to escape to the open air the endmost portions of the two existing large air ducts in the basement are to be used. A hole about 10 square feet in size is to be cut in the main (lower) floor at each of the four corners of the Chamber, through which the air will pass from the space beneath the rising steps into the air ducts below; it will then be discharged into the basement areas into which these ducts at present debouch. The open ends of the ducts should be protected by louvre boarding, and inside each duct an automatic valve is to be placed, of the same kind as that already described in connection with the roof outlets, to prevent air from ever being blown in through these outlet flues. Thus, if a strong wind is blowing from the west, the valves on that side will be closed by it, and the discharge of air from the Chamber will then go on through the two ducts on the east side, and *vice versa*. The automatic flap valves are an essential feature; it is only by using them that one can prevent the wind from occasionally converting what ought to be outlets into inlets. If it be preferred to make new outlet ducts under the four corners of the Chamber rather than utilize the existing ducts, each should have a clear sectional area of at least 10 square feet.

It will not be necessary to provide any special outlets for air from the corridors. With regard to the rooms on the north side, outlet will take place partly through the fire-place chimneys, but it will be desirable to provide supplementary outlets near the ceiling. These should consist of gratings in the north wall of each room, opening directly out through holes in the wall, in each of which, however, a small automatic flap-valve frame of the kind already described should be fixed. The area of these openings should be about equal to that of the inlets in each room.

The speed at which the Blackman fan should be driven will have to be ascertained by trial : it is desirable that the speed should be such that air enters from the top of the Tobin tubes with an average velocity of about 5 linear feet per second, or in summer as much as 6 feet per second. The engine and countershaft pulleys should be such as to give velocities of about 480, and 360 turns per minute to the fan; it should then be easy to adjust the speed to a suitable value by varying the governor weights.

I have considered the possibility of using a refrigerating machine to cool the air in hot weather, but believe it will be more economical to secure as much cooling as is really desirable by the use of ice, or, in extreme cases, by using ice mixed with salt. The appliance described above for washing the air will form a convenient rack for the ice, which should be placed on the upper portions of the boarding chiefly, so that the cold water dripping from it may be completely utilized.

The cost of a Blackman 48-inch fan is £25. The 2-horse nominal Otto engine costs in Manchester £123. With regard to the constructive details of the above plan, a local architect will be able to give a much better estimate than I can possibly do.

If a scheme of electric lighting is not adopted, and the Chamber continues to be lighted by gas, it will be exceedingly desirable to burn the gas above an air-tight glass ceiling, and keep the air required for combustion and the products of combustion distinct from the atmosphere of the Chamber.

None of the doors leading into the Chamber should be allowed to stand open. If they are not already swing-doors, provision should be made for closing them automatically by means of springs.

J. A. EWING.

Dundee, February 18th, 1888.

PROCEEDINGS OF THE COMMISSION.

FRIDAY, 24TH FEBRUARY, 1888.

Members present :

The Hon. the SPEAKER, in the Chair;

The Hon. John Nimmo,
The Hon. J. Gavan Duffy,

E. L. Zox, Esq.,
The Hon. W. McLellan.

J. Bosisto, Esq., C.M.G.

His Excellency the Governor's Commission was read.

Mr. Zox moved—That Mr. T. Watson be appointed Secretary to the Commission.

Question—put and resolved in the affirmative.

Mr. Bosisto moved—That the press be admitted to the meetings of the Commission.

Question—put and resolved in the affirmative.

The Report of the Select Committee of the Legislative Assembly appointed last Session to inquire into and report upon the question of the ventilation of the Legislative Assembly Chamber, together with the proceedings of the Committee, Minutes of Evidence, and Appendices, was laid before the Commission.

Mr. Gavan Duffy, who was Chairman of the said Committee, moved—That the report and evidence, &c., be received.

Question—put and resolved in the affirmative.

Mr. Bosisto handed in an extract from the London *Times* of the 18th November, 1887, with reference to a system of ventilation invented by Mr. D. C. Green, of New York, and moved that it be received.

Question—put and resolved in the affirmative.

The extract is as follows:—

GREEN'S VENTILATING SYSTEM.—A few years since we noticed a very promising system of ventilation by means of induced air currents invented by Mr. D. C. Green, of New York, who was then introducing it in this country. His death, however, took place in 1884, before anything of practical value had been accomplished. His son then took up the work, and somewhat modified and improved the system, which is very simple, and is applicable to either buildings or ships. An air compressor, driven by a small gas or other engine, is placed in any convenient position, and supplies air from 3 lb. to 5 lb. pressure per square inch. The compressed air is conveyed by means of small gas pipes to automatic multiplying air nozzles, which are fixed wherever ventilation is required. From these nozzles the air issues into conduits through which a constant current of air is induced and delivered into the apartments of houses or cabins of ships. The induced current can be drawn from any distance, so that the nozzles may be fixed in remote parts of the building or ship, and be made to draw fresh air from the most convenient positions. By simply removing the direction of the nozzles, the air current will flow in the opposite direction, so that foul air can be drawn out and ejected. The ventilation of any building is effected and controlled from one central point—namely, the air compressor. Great economy is claimed for this system, the only power required being that for the primary current, which forms but a very small percentage of the body of air moved. An installation has been fitted up at the offices of the D. C. Green Ventilating Company, 91 Queen Victoria-street, London, which demonstrates the merits of the system. It has been fitted up in five of the Courts at the Royal Courts of Justice, and in eight of the North German Lloyd Company's steamships, as well as in vessels belonging to the Orient Line and to the P. and O. Company.—*Times (Weekly)*, Nov. 18, 1887.

The President read a telegram from London, which appeared in the *Argus* of the 21st February, stating that Professor Ewing had prepared a report on the question of the ventilation of the Victorian Houses of Parliament, which would be forwarded to Melbourne by the next mail.

The Commission deliberated.

Ordered—That the consideration of the question of "ventilation" be postponed until Professor Ewing's report is received from England.

The Commission then proceeded to consider the question of *lighting* the Legislative Assembly Chamber.

A *précis* (*vide* Appendix A), prepared by Mr. P. Kerr, the architect for the Parliament Houses, showing the previous steps taken with reference to lighting the Houses with the electric light, was laid before the Commission.

Ordered—That a copy of the *précis* be sent to each member of the Commission.

Ordered—That the following gentlemen be requested to attend and give evidence before the next meeting:—Mr. W. H. Masters, of Messrs. W. H. Masters and Co.; Mr. R. E. Joseph, of the Australian Electric Company; Mr. G. H. Jenkins, Clerk of the Legislative Assembly; Mr. Peter Kerr, architect for the Parliament Houses; Thomas Jeffery, engineer, Parliament House.

The Commission adjourned to Friday the 2nd March, at 11.30.

FRIDAY, 2ND MARCH, 1888.

Members present:

The Hon. the SPEAKER, in the Chair;

The Hon. Wm. McLellan,
The Hon. L. L. Smith,
The Hon. John Nimmo,

The Hon. J. Gavan Duffy,
E. L. Zox, Esquire,
J. Bosisto, Esq., C.M.G.

The minutes of the previous meeting were read and confirmed.

Mr. Zox moved—That there be laid before the Commission a return showing the amount paid per annum for gas, the rate per 1,000 feet, and the quantity consumed in the whole of the Parliament Buildings during the five years ending 31st December, 1887.

Question—put and resolved in the affirmative.—(*Vide* Appendix E.)

Mr. G. H. Jenkins, Clerk of the Legislative Assembly, called and examined.

Mr. R. E. Joseph, electrical engineer, and manager of the Australian Electric Company, called and examined.

Mr. W. H. Masters, electrician, of the firm of W. H. Masters and Co. called and examined.

Mr. Peter Kerr, architect for the Parliament Houses, called and examined.

A report from Mr. Kerr as to the site to be chosen for an engine-house for the electric lighting plant was laid before the Commission.—(*Vide* Appendix B).

Thomas Jeffery, engineer, Parliament House, called and examined.

Mr. Gavan Duffy moved—That there be laid before the Commission a return showing the amount per annum paid for gas, the rate per 1,000 feet, and the quantity consumed during the five years ending the 31st December 1887, in the new Government Offices, the old Treasury buildings, and the Government Printing Office, including all outside lamps.

Question—put and resolved in the affirmative.

Ordered—That Messrs. R. E. Joseph and W. H. Masters be requested to supply the following information :—

- (1.) Estimate of cost for supplying the electric light to the Legislative Assembly Chamber, and the time within which the light could be in use.
- (2.) A similar estimate for the whole of the Parliament House.
- (3.) Estimate of cost of lighting the Parliament House with the electric light, the Government to use their own plant, and the time within which the light could be in use.

Ordered—That the Postal Department, the Public Library, and the Manager of the Princess Theatre, be requested to depute some person best qualified to afford information as to the cost, convenience, and general advantages of the electric light as compared with gas, to give evidence to the Commission at its next meeting.

The Commission adjourned to Friday the 9th March, at 11.30.

FRIDAY, 9TH MARCH, 1888.

Members present:

The Hon. the SPEAKER, in the Chair;

The Hon. Wm. McLellan,
The Hon. J. Gavan Duffy,
The Hon. John Woods,

The Hon. John Nimmo,
J. Bosisto, Esquire, C.M.G.,
E. L. Zox, Esquire.

The minutes of the previous meeting were read and confirmed.

The estimates as to the cost, &c., of lighting the Parliament Houses by electricity, which Mr. R. E. Josephs and Mr. W. H. Masters had been requested to prepare, were laid before the Commission.—(*Vide* Appendix C.)

The returns ordered at the last meeting as to the cost of gas consumed at Parliament House and the Government offices, for the five years ending 31st December, 1887, were laid before the Commission.—(*Vide* Appendices D and E.)

A letter was received from Messrs. Booth, Ellson, and Co., electrical engineers, offering their services to carry out any scheme of lighting agreed upon.

A letter was received from Messrs. Williamson, Garner, and Musgrove, of the Princess Theatre, stating that, owing to pressure of business, they were unable that day to depute any one qualified to give evidence as to the advantages of the electric light as compared with gas, but if another day were fixed, they would be happy to do so.

Mr. George Smibert, Inspector Post and Telegraphs, called and examined.

Dr. T. F. Bride, Librarian of the Public Library, called and examined.

Mr. G. Walker, manager of the Victoria and Grand Hotel Coffee Palaces, called and examined.

Mr. Wm. Briggs, of the *Age* staff, called and examined.

Mr. John Samuel Jones, of the *Argus* staff, called and examined.

Ordered—That Dr. Bowen and Dr. Gray be called to give evidence at the next meeting as to the effect of the electric light on the eye.

The Commission adjourned to Friday the 16th March, at 11.30.

FRIDAY, 16TH MARCH, 1888.

Members present:

The Hon. the SPEAKER, in the Chair;

The Hon. John Nimmo,	|	The Hon. L. L. Smith,
The Hon. Wm. McLellan,	|	J. Bosisto, Esquire, C.M.G.
The Hon. John Woods,	|	

The minutes of the previous meeting were read and confirmed.
 Dr. A. Gray, oculist, called and examined.
 Dr. Aubrey Bowen, oculist, called and examined.
 Colonel Cracknell, of Sydney, called and examined.
 Mr. James Farrell, Parliamentary Librarian, called and examined.
 Mr. Richard Church, clerk in the Library, called and examined.
 The Commission adjourned to Friday, 23rd March, at 11.30 o'clock.

FRIDAY, 23RD MARCH, 1888.

Members present:

The Hon. the SPEAKER, in the Chair;

The Hon. J. Gavan Duffy,	|	The Hon. Wm. McLellan.
The Hon. John Nimmo,	|	

No quorum.

The Commission adjourned to Monday the 26th March, at 4 o'clock.

MONDAY, 26TH MARCH, 1888.

Members present:

The Hon. the SPEAKER, in the Chair;

The Hon. Wm. McLellan,	|	The Hon. John Woods,
The Hon. J. Munro,	|	J. Bosisto, Esquire, C.M.G.,
The Hon. J. Gavan Duffy,	|	E. L. Zox, Esquire.
The Hon. J. Nimmo,	|	

The minutes of the meeting held on the 16th March last were read and confirmed.

The following draft resolutions were considered:—

- “1. That, in the opinion of the Commission, the whole of the Parliament House should be lighted with the electric light.
- “2. That it is desirable that the Legislative Assembly Chamber should be lighted as soon as possible with the electric light, and that tenders should be called for at once to supply the light from a central station until the permanent installation can be completed.
- “3. That the permanent installation should be under the entire control of Government, and that the erection of a suitable engine-house should be proceeded with at once.
- “4. That the site for the engine-house should be in the Treasury gardens, at the angle formed by the junction of Gipps and Gisborne streets, so that the light could also be supplied, if desired, to the Government Printing Office, the Public Offices, and the Chief Secretary's Offices.
- “5. That the engines and plant at present in the possession of the Government should be utilized as far as possible, and that accumulators for storing the electric power should be provided.”

Mr. Munro moved—That draft resolution No. 1 be agreed to with the following amendment:—
 After “light” add “as soon as possible.”

Question—put and resolved in the affirmative.

Mr. McLellan moved—That draft resolution No. 2 be omitted.

Question—put and resolved in the affirmative.

Mr. Munro moved—That draft resolution No. 3 be amended by omitting therefrom the word
 “entire.”

Question—put and resolved in the affirmative.

Mr. Munro moved—That draft resolution No. 3 be further amended by omitting therefrom the word
 “Government” and inserting the word “Parliament” in place thereof.

Question—put and resolved in the affirmative.

Mr. Gavan Duffy moved—That draft resolution No. 3 be further amended by omitting therefrom
 the words “erection of a suitable engine-house should be proceeded with at once,” and inserting in place
 thereof the words “necessary works should be proceeded with at once under competent supervision.”

Question—put and resolved in the affirmative.

Mr. Munro moved—That draft resolution No. 3 as amended be agreed to.

Question—put and resolved in the affirmative.

Mr. Woods moved—That draft resolution No. 4 be amended by omitting therefrom the words “engine-house” and inserting in place thereof the word “works.”

Question—put and resolved in the affirmative.

Mr. Munro moved—That draft resolution No. 4 as amended be agreed to.

Question—put and resolved in the affirmative.

Mr. McLellan moved—That draft resolution No. 5 be amended by inserting the words “if suitable” before the words “be utilized,” and omitting the words “as far as possible, and that accumulators for storing the electric power should be provided.”

Question—put and resolved in the affirmative.

Mr. Munro moved—That draft resolution No. 5 as amended be agreed to.

Question—put and resolved in the affirmative.

Mr. McLellan moved—That the resolutions as agreed to be embodied in a Progress Report to His Excellency the Governor.

Question—put and resolved in the affirmative.

The Commission adjourned *sine die*.

THURSDAY, 12TH APRIL, 1888.

Members present:

The Hon. the SPEAKER, in the Chair:

The Hon. John Woods,
The Hon. J. Gavan Duffy,

The Hon. W. McLellan,
J. Bosisto, Esq., C.M.G.

The minutes of the previous meeting were read and confirmed.

Professor Ewing's reports on the ventilation and lighting of the Legislative Assembly Chamber were laid before the Commission.

The Commission took into consideration the report on ventilation.

The Commission deliberated.

Mr. Gavan Duffy moved—That, to effectually ventilate the Chamber, it is necessary to have a completely artificial system of ventilation—that is, one that will provide for the forcing in of pure and the removal of vitiated air by mechanical means.

Question—put and resolved in the affirmative.

The Commission adjourned.

WEDNESDAY, 18TH APRIL, 1888.

Members present:

The Hon. J. Gavan Duffy,
The Hon. J. Nimmo,
The Hon. Wm. McLellan,

The Hon. J. Woods,
J. Bosisto, Esquire, C.M.G.

In the absence of Mr. Speaker, Mr. Gavan Duffy was called to the Chair.

The minutes of the previous meeting were read and confirmed.

The Commission deliberated.

Mr. Nimmo moved—That the Commission recommend that the air forced into the Chamber be heated in winter and cooled in summer, so as to maintain a temperature of about 65° F., and that, in order to obtain it as pure as possible, care be taken to draw it from a point in the gardens at a suitable height from the ground.

The Commission deliberated.

Question—put and resolved in the affirmative.

Mr. Woods moved—That the Commission recommend that the Queen's Hall, the corridors, and the rooms communicating with the Assembly Chamber, be included in the plan of ventilation.

Question—put and resolved in the affirmative.

The Commission deliberated.

Mr. Woods moved—That the occasional ingress and egress of air through the entrances be regulated on principles to be determined on by the Commission on further investigation and inquiry.

Question—put and resolved in the affirmative.

Mr. Woods moved—That the Commission recommend that an officer of the House be specially charged, under the direction of Mr. Speaker, with the management of the ventilation of the Chamber, and be responsible therefor.

Question—put and resolved in the affirmative.

Mr. Woods moved—That, in the opinion of the Commission, the Chamber should be ventilated by forcing in pure air and drawing out the vitiated atmosphere, and that sufficient motive power should be used to force in 300,000 cubic feet in an hour, by which means the air in the Chamber will be thrice renewed in that time.

Question—put and resolved in the affirmative.

A letter from Mr. Guyon Purchas, offering the Commission his professional services while in Europe, was laid before the Commission.

Ordered—That Mr. Purchas be informed that the Commission do not consider it to be within their functions to accept such a proposal.

The Commission adjourned to Wednesday next, at 11 o'clock.

WEDNESDAY, 25TH APRIL, 1888.

Members present :

The Hon. the SPEAKER, in the Chair ;

The Hon. J. Munro,	|	J. Bosisto, Esquire, C.M.G.,
The Hon. J. Gavan Duffy,	|	R. Harper, Esquire.

The minutes of the previous meeting were read and confirmed.

The Commission proceeded to consider the following Draft Report :—

“ To His Excellency SIR HENRY BROUGHAM LOCH, Knight Commander of the Most Honorable Order of the Bath, Governor and Commander in Chief in and over the Colony of Victoria and its Dependencies, &c., &c., &c.

“ MAY IT PLEASE YOUR EXCELLENCY—

“ We, your Commissioners appointed on the 5th January, 1888, to inquire into and report upon the best means of ventilating and lighting the Legislative Assembly Chamber, beg to submit the following further Progress Report.

“ 1. That, in the opinion of the Commission, in order to effectually ventilate the Chamber, it is necessary to have a completely artificial system of ventilation—that is, one that will provide for the forcing in of pure and the removal of vitiated air, and that sufficient motive power should be used to force in 300,000 cubic feet in an hour, by which means the air in the Chamber will be thrice renewed in that time.

“ 2. That the air forced into the Chamber should be heated in winter and cooled in summer, so as to maintain a temperature of about 65° F., and that, in order to obtain it as pure as possible, care be taken to draw it from a point in the gardens at a suitable height from the ground.

“ 3. That the Queen’s Hall, the corridors, and the rooms communicating with the Assembly Chamber, should be included in the plan of ventilation.

“ 4. That the occasional ingress and egress of air through the entrances should be regulated, as the natural difficulty of ventilating is largely increased by the great number of doors that open into the Chamber.

“ 5. That an officer of the House should be specially charged, under the direction of Mr. Speaker, with the management of the ventilation of the Chamber and the responsibility therefor.

“ 6. The Commission have read with interest Professor Ewing’s reports on the best means of ventilating and lighting the Assembly Chamber.”

Paragraph 1, agreed to with the following amendment :—After the word “hour,” insert “either near the ceiling or at such place above the heads of Members as may be found most convenient.”

(Note.—In Mr. Harper’s opinion, Professor Ewing’s plan should be carried out in its entirety, without any variation.)

Paragraph 2, agreed to.

Paragraph 3, verbally amended and agreed to.

Paragraph 4, agreed to.

Paragraph 5, verbally amended and agreed to.

Paragraph 6, agreed to with the addition of the following words :—“ And recommend that his report on ventilation (a copy of which is attached) be carried out, subject to necessary modifications.”

Resolved—That the Government be asked to carry out the recommendations at once, as Parliament will shortly be in Session.

Resolved—That the Commission are specially indebted to Mr. Harper for the practical interest he took in their work while in Europe, and for the valuable information he obtained.

Ordered—That the above resolutions be added to the Report.

A letter from the Australian Electric Company, respecting their patent rights, was laid before the Commission and read, and ordered to be sent to the Public Works Department.

The Commission adjourned *sine die*.

MINUTES OF EVIDENCE.

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MINUTES OF EVIDENCE

TAKEN BEFORE THE ROYAL COMMISSION ON VENTILATION AND LIGHTING OF THE LEGISLATIVE ASSEMBLY CHAMBER.

FRIDAY, 2ND MARCH, 1888.

Present:

The Hon. THE SPEAKER, in the Chair;

The Hon. J. Gavan Duffy, M.L.A.,	J. Bosisto, Esq., C.M.G., M.L.A.,
The Hon. W. McLellan, M.L.A.,	E. L. Zox, Esq., M.L.A.,
The Hon. J. Nimmo, M.L.A.	

G. H. Jenkins, Clerk of the Legislative Assembly, examined.

1. *Mr. Jenkins.*—The position of the electric lighting now, as regards this chamber, in fact the whole of Parliament House, is this—that the installation is complete; but it was found that the engines had been placed in what Honorable Members thought a most unsuitable place—that was, in the basement. They were taken away, and now they are over by the Government Printing Office, and all that it will be necessary to do, if the Commission decide to go back to the electric light, is to order an engine-house to be built in some suitable and convenient place, and the engines that we had before will be perfect, and will be put there. That is really the position of the electric lighting now; the only thing is, that if you want the electric light by June or July next, then not later than to-day or next week the Commission should decide as to the site, and order the erection of the machinery at once. I may state it is a thing I took the greatest interest in, and I am sure the electric light the session before last, gave universal satisfaction. It was a magnificent light, and worked exceedingly well. I do not think throughout the whole session it went out one night, and it was under very great disadvantages that it was worked, because where the engines were it was pitch darkness, unless the gas was lit. It was always like night, so I am quite certain that if a suitable engine-house be built, and the same machinery used, that each member will be entirely satisfied with the light; the whole of the wires are here ready, and the installation can be completed, from the time the engines are ready, in about a fortnight.

G. H. Jenkins.
2nd March 1888.

2. *By the Commission.*—Is it sufficient to have the light from above, or do not you think it would be of great assistance for members if you had just those projecting small lamps here, round this room. We are all getting up in years. I have got up and have tried to read a paper with the light from above at this table, and have found the light very bad, and in old times we used to have a candle. Would it not be as well if you had a few lamps along the wall, and say four lamps at this table in front there, so that a person could come and read at?—That would be entirely for honorable members to settle for themselves; but I may state this, that I am quite certain the electric light that we had here two years ago was more than efficient for any writing or reading purposes—that no member in the House ever complained of the want of light when we had the electric light the last time. It is nearly double the present lighting capacity of the gas.

3. Had we that more than one session?—Yes; on the first occasion it was a failure.

4. Was its going out through the defects of the machinery, or through carelessness of management?—The time we had the electric light first it was experimental; there was a temporary engine put up to supply the Assembly, and another for the Council. It was entirely experimental, and it was a very crude experiment, and it frequently went out through the defects of the machinery, not through any carelessness. When we had our own machinery, the session before last, it gave every satisfaction. It was worked entirely under my control.

5. You have all the lamps left?—Yes.

6. It would be necessary to lay hold, at once, of the chance of getting the lamps, because the demand would be so great at the time of the Exhibition?—We have everything complete, as we had it when it was taken down.

7. I understand the electric lighting was a great success, but it was put an end to on account of the place where the engine was situated?—Yes.

8. Can you tell anything about the comparative cost of the two—gas and electricity?—The electric light is two and a half to three times the cost of gas. The gas for the whole of Parliament House would be about £1,000 a year, and the electric light would be, at least, £3,000.

9. What do you base that on?—On the last occasion there was a complete installation of the electric light in the whole building; that was under the control of the officers here, and I had to pass the accounts.

G. H. Jenkins,
continued,
2nd March 1888.

10. Is it not cheaper now than then?—No; and I might point out to the Commission that for working the electric light, we require almost a separate staff. There are two engineers, in addition to what we have now, and there is a very large outlay in connexion with it; it is very expensive, but a very beautiful light.

11. In your experience, do you think the advantage reaped from the electric light would compensate for the heavy cost?—Without a doubt, I think so.

12. Have you made any estimate of the cost of the building, and the erection of the machinery—can you give any idea of it?—It is in the printed report handed to the Commission.

13. The annual cost and maintenance?—I should think it would mean at least £3,000 a year.

14. That includes attendance and everything?—Yes.

15. In 1883?—Messrs. Ellery, Murray, and myself were members of the Electric Lighting Board. We estimated the first outlay for engines and generating power at £1,500.

16. And the cost of maintenance £800?—Yes. We took it from evidence—that was the result of the evidence. Our estimate of £1,500 for the generating machinery rose to £7,000, and the maintenance for the year, at least, must have been £3,000. We went into the matter very carefully with experts, and those were the accounts we got; and the thing was tendered for, and that was the result.

17. The Opera House is well lighted up?—Yes.

18. Do you know the cost?—I can tell how it is done, but if you wished to find out about it you could get the engineer over.

19. Have you fixed on a site for the engine-house?—Yes. Some years ago, when I was a member of the Board, with Messrs. Ellery and Murray, we recommended that the engine-house should be placed on the north part of Parliament Reserve, up by Albert-street, where it would be no annoyance to Members, and where the engine-house could be planted out of sight.

20. Everybody has this idea now—that it would be a mistake if we were now to have any place that looked unsightly during the Exhibition?—It would not be—we would put up a good-looking engine-house, an ornamental one, and plant it thoroughly round.

21. Why was that not done?—It was abandoned.

22. Your idea is that unless we order that at once it will not be in time?—I am sure of that. There is an alternative site suggested, outside the Parliament gates, leading into Gisborne-street across the road; there is the Treasury reserve, which comes to a point. Mr. Kerr and myself are of opinion that that would be a suitable site, and in addition to supplying the Parliament House, that engine-house would be useful for supplying the Printing Office and Government offices and the Chief Secretary's offices. I would strongly recommend to the Commission the site in Gisborne-street for two reasons—first, I think it is the most convenient to Parliament House, and arrangements have been already made for conducting the electric wires under the tram lines. There are pipes laid for laying the wires. The other is, it will be also convenient for lighting the Government Printing Office and the other Government offices; and Mr. Kerr's estimate for the cost of erecting a suitable engine-house on the spot, built of brick and cement, of ornamental design, so as to correspond with the surrounding buildings, is £2,500.

23. What would it cost here, on the other site; any difference?—No, about the same; and our reserve is quite small enough now, and if we take an engine-house and its surroundings out of it, it will take the best part of a quarter of an acre.

24. You have no plan of the site?—No, but I could get one; but the best plan will be for the Commission to go and see it.

25. Had you it brought before your Board with reference to gas engines in comparison to the engines worked by boilers?—No, I think not.

26. Because it strikes me we have advanced so since then, that gas might be used?—Experts could tell you that.

The witness withdrew.

Captain R. E. Joseph examined.

Captain R. E.
Joseph,
2nd March 1888.

27. *By the Commission.*—What are you?—Electrical engineer.

28. Have you had long experience?—Yes, from the commencement of electric lighting—the first era.

29. Have you given any consideration to the question of lighting the Parliament Houses by electricity?—Not lately. I thought the matter had been thoroughly discussed before—that is, some time back.

30. Have you any recommendation you could make as to that?—In what form?

31. As to whether you recommend electricity, or gas, or any other means of lighting?—Of course I would naturally recommend electricity; but apart from that, the advantages electricity presents over any other known method of illumination is apparent to everybody now, I think.

32. Can you give any idea of the relative cost—we have the plant?—The cost of maintenance?

33. Yes?—The maintenance, with the price of gas in Melbourne, should be somewhere about the same—that is, if supplied by yourselves; if supplied by an outside source, in which they would naturally make a profit, it would mean about 50 per. cent of excess of gas at the present time—that is, assuming it was supplied outside from the local company, it would cost about 50 per cent. more than gas for maintenance.

34. Apart from that, you think the cost would not be more?—Merely paying wages and coal.
35. Has the cost of supplying light by electricity been reduced lately?—No; it has simply been reduced because they have supplied it on a very large scale.

36. To what extent has it been reduced under those circumstances?—Within the last few years 50 per cent., by supplying it from a very large station.

37. Such a scale as would be required by us for the Parliament building?—No, larger than that. I should call that a small scale—a thousand lights perhaps. I should think if a gas company were started with only 1,000 lights it would be a very expensive arrangement.

38. I want this—we had some time ago the electric light here, the session before last. Has there been any reduction in the cost since then. Could we supply ourselves now cheaper than then?—No.

39. And your company could not supply it cheaper?—That I would not like to say. Our company are at present engaged in fitting up a very large central station. When the station is finished I should think they could supply it at a lower rate.

40. Where is the central station you refer to?—In Bourke-street.

41. Are you engaged in supplying this light to large buildings?—We have been lately.

42. Any you could mention?—The present building we are preparing to light is the Grand Hotel, 650 to 700 lights.

43. Is that the only building?—Oh, no. We supply all the theatres, Bijou, Princess's, Opera House, and the Public Library.

44. Could you give an estimate of your lighting by electricity and the previous lighting by gas?—Just about 50 per cent. more than gas; the theatres are all paying us. I should say we are doing the whole of the lighting in Victoria.

45. You say a "central station"—what do you mean by that?—We call it the central station, I do not know why, except that when the electric lighting was first started each building had its separate machinery, and now it is all in one place, in Bourke-street, next to the Bijou Theatre.

46. As you can supply those theatres, could not you supply Parliament House as well?—Decidedly so.

47. Would not that get rid of our having all the trouble of engineers and so forth?—Yes.

48. Would it not save machinery and so forth?—Yes.

49. Could you do it a very great deal cheaper than if we did it ourselves on an isolated scheme?—No; because there is the question arising there, that we should have a limited amount of machinery there, and supposing we had machinery to supply 2,000 lights, and you require 500 in this building, you require them three nights a week half the year; then we must keep that plant available for you, and it would be lying idle three-fourths of the year.

50. But it would be the extra amount of machinery and having higher power engines?—Yes. The interest on that. The interest on the outlay.

51. Do you think that is anything equal to our employing two engineers and buying the engines ourselves, keeping it going and so forth. Could you not do it cheaper than we could?—I think so, taking everything into consideration.

52. And then the means by which you would be able to do that. I have read that you can do it by meter. Would you do it in that way?—Either by meter or by contract. The meter system has not been found to be satisfactory, even the very latest.

53. How could you do it by contract?—In the same way the present buildings are supplied, say the Victoria Coffee Palace and the new Grand Hotel, with lights in every bed-room. There we average the annual consumption and divide it into monthly payments. We made a careful calculation of several weeks running.

54. Could you give us any average idea of what you could light this up for for the six months we sit?—No, I could not, because it would involve a lot of calculation to find out what we could reserve for you.

55. Could you prepare that for us?—Yes.

56. When can you get that?—In two or three days' time.

57. Will you do that?—Yes; it will be simply an approximate estimate, not in the form of an offer at all.

58. You have mentioned that you have lighted one or two theatres, and the Grand Hotel is being fitted up; is there any other building?—The Library and Victoria Coffee Palace, and a few shops; and it will be extended with the new plant that is being laid down for 2,000 lights—the whole is being taken up by customers.

59. Would there be anything lost in the strength, in the transmission from Bourke-street to here?—No loss as regards the light, there is slight loss in the pipes; that is provided for.

60. The power of the light is the same?—Yes, just the same a mile off.

61. Are there any other companies engaging in lighting?—Not any doing lighting. We are the only lighting company; the Australian Lighting Company, the local company, the manufacturing company.

62. If your company were asked to undertake the lighting of all these buildings, how long would it take?—Some months.

63. The installation is here already; how long would it require to do the whole thing; library, refreshment rooms, Upper House, the committee-rooms, and everything. How long would it take to complete the whole thing, suppose it were to be undertaken?—I should say between five and six months, but if a small number of lights were wanted, two or three hundred——

Captain R. E. Joseph,
continued,
2nd March 1888.

64. How long would it take to do this chamber alone?—That, I suppose, could be ready about the end of May or June next. The plant is to arrive at the end of March. It is due here the 11th and would take about six weeks to fit. This is for the new and extended lines.

65. In working the dynamos, do you recommend gas engines?—I would never recommend gas. We have had a lot of experience with it. They always stop just at an unfortunate time.

66. Through a want of pressure of the gas?—Yes, some little thing in the engine. It has proved a great annoyance.

67. And yet they work well in working machinery?—In small amounts, such as five or six horse-power.

68. What would you require here?—There were two twenty horse-power engines originally, and they work up to 100 here.

69. Do you find any interruptions occurring in the lighting of those buildings?—Not any.

70. When we had it first, there was a sputtering and then a going out?—There is no fear now. We lighted the Opera House for twelve months, the whole of the house, stage as well as the front, and the gas fittings were removed.

71. So that in those sputterings and the whole thing going out, there was mismanagement?—It was in the early days. After the amount of experience there is no danger to be apprehended now of that sort. In the Grand Hotel the rooms are being fitted up exclusively with electric light, the gas not being laid on at all. That is from the two years' experience in the other place. I would like to say that with regard to the plant originally furnished to the House of Parliament, commencing with the motive power, you had two twenty horse-power engines, and to show you they were of the best character the Tramway Company have adopted the same pattern; in fact they have taken the design from those. They tried the English engine first, but adopted those.

72. Suppose that Parliament were to undertake its own lighting, are there plenty of experts to engage?—Yes, no difficulty in finding men to run it. You do not require an expert. An ordinary intelligent engineer could be trained in a few weeks.

73. This flickering has been got over?—Yes.

74. Did you give evidence in 1883 before Messrs. Ellery, Murray, and Jenkins?—No.

75. I see it says here in 1883, the Board estimated the first outlay for engines, &c., £1,500, and it really came to over £7,000. What was the cause of that?—I was not examined by that Board.

The witness withdrawn.

W. H. Masters, examined.

W. H. Masters,
2nd March 1888.

76. *By the Commission.*—What are you?—Merchant.

77. Of the firm of Masters and Draper?—Yes.

78. You have a knowledge of electric lighting?—I have had the knowledge for the last eight years, and have seen some of the largest installations in the world. I went through every place that I could get into when I was at home the last time, to get as much knowledge as I could in reference to it.

79. Do you supply electricity for lighting purposes?—Yes.

80. You heard the evidence of the last witness?—A portion of it.

81. Is there any information you could give us as to the question of lighting the Parliament Houses by electricity?—We are quite prepared to tender for anything like that. We would like to tender for the whole, ventilation and all, and give any guarantee you like to name that it shall be carried out to your satisfaction.

82. Will you give us the relative cost of electricity and gas?—I could not give that.

83. Are you a member of the same company as Mr. Joseph?—No; we represent the Thompson Houssen Company.

84. How many electric companies are there in Melbourne now?—Three companies—Gantz, and Thompson Houssen, and the Australian.

85. Have they all central stations?—No; there is only the one company that has a central station.

86. So that the other two are not prepared to supply the light at the present time?—I will guarantee to supply the light to this House in less than four months.

87. From what station?—Do you want it supplied from a central station?

88. We do not care where it comes from. Are you going to have your own separate installation—we should like to get an estimate of the cost of both?—We can do it.

89. Would you be prepared to give an estimate, the same as the last witness, by next Monday?—We would give an estimate of the ventilation and lighting.

90. We prefer them separate?—I will do that.

91. Have you a prospectus of your company?—Yes, I will send it.

92. You represent the Telephone Company?—Yes.

93. Will you give an estimate by next Monday?—Yes.

94. Which would you be prepared to recommend; that we should be supplied from your works, or that we should build ourselves?—I should say that it would be much cheaper to supply it from your own station—have your own installation.

95. Do you contemplate establishing a station of your own in the city?—That is what we intend to do.

96. At an early date?—We are going to start a factory here.

97. I ask that, because it would seem we are in the hands of one company at present?—
Yes. W. H. Masters,
continued,
2nd March 1888.

98. You are aware that all the wires are here?—Yes, and you have the engines and boilers and everything.

The witness withdrew.

Peter Kerr, architect to the House, examined.

99. *By the Commission.*—You have heard the evidence of the previous witnesses?—Yes.

Peter Kerr,
2nd March 1888.

100. Will you give us any information which you desire to, with reference to the question of lighting the Parliament House by electricity, apart from the documents?—I do not think I can assist you in any way in the matter, because it is not a business of mine at all. I do not understand the lighting, the minutiae, and how it can be done.

101. Had you any control over it before?—No.

102. There is no statement you wish to make to the Commission?—No.

103. As to the sites, have you any site to recommend?—I forwarded the paper there—I recommend the Gisborne-street site.

104. You still adhere to that?—Yes, I do, for the simple reason that if that station was required to light up the whole of the Government offices, it could be done from that point much easier than if you took it up to Albert-street and Evelyn-street.

105. You say the old printing office site—you know that is built on?—Yes, but it states in that in the Treasury Gardens.

106. What proportion of lights are used in the Government offices?—When the House is sitting the Government offices are up all night—that is, the printing office; the others are not much used, except the Education Office—they are always working there.

107. You have no control over the gas supply for Parliament and the Government offices?—No.

108. About the ventilation subject—is it your opinion, if we light up this place with the electric light, that it would be advantageous for the purposes of ventilation—that it would improve the ventilation—whatever system we might adopt?—No, I do not think so, because it would be the incandescent system, and the gasaliers act as ventilators.

109. Suppose the gasaliers were shut off altogether, then it would be an advantage to have the electric light?—Yes.

110. It would be in cool weather, the gas is beneficial in heating the Chamber; but in intensely warm weather the electric light would not affect it at all—it would not heat it?—You must understand that ventilation and heating is one and the same thing; it must be done all the same, either hot or cold; the proper ventilation will give you that without gas or anything else.

The witness withdrew.

T. Jeffery examined.

111. *By the Commission.*—You were the engineer for the Parliament House when we had the electric light?—Yes. T. Jeffery,
2nd March 1888

112. Did you take the management of that?—I had the management inside, and there was an enginedriver and a fireman down below, working the machines.

113. Who bossed the whole machine?—They looked to me for orders.

114. Do you understand it?—Pretty fairly.

115. Are you capable of taking charge again?—Yes, the inside work.

116. Have you any information to give us?—If the old lights are used, there are one or two alterations to be made to strengthen them.

117. Merely matters of detail?—Yes.

118. Have you had long experience of the gas here?—Yes, I have been here nineteen years—my father was here before me.

119. Do you understand about the lighting of the gas?—Yes.

120. Can you give any information as to the difference between the two—would you think the electric light an improvement?—Yes.

121. Why?—There would be less complaints in summer about the heat, for one thing.

122. Did you find, during the time of the electric light, that the heat was not so bad in the summer time?—Yes, there was a great improvement.

123. Was the light much stronger?—Yes, some complained it was rather strong; but with the system we have here we could shut off.

124. No complaints were made that it was not strong enough?—No, I did not hear complaints about that.

125. Did you hear some one complain that they were going to lose their eyesight from it?—There is such a vast difference between the gas and the electric light.

126. Their eyes were rather weak before?—It was a very brilliant light.

127. What was the cause of our being left in total darkness the first time?—One of the bearings got heated—it was owing to the machinery being new, and the belting slipped.

128. No defect in the lighting system?—No. One of the machines gave a little trouble for a time. I have a list of the number of gas lights, and of electric lights in the chambers, &c.—
[handing in the same.]

T. Jeffery,
continued,
2nd March 1888.

		No. OF ELECTRIC LIGHTS.							
Council Chamber	58
Council passages	12
Council gallery	5
									<hr/> 75
Front vestibule	16
Queen's hall	144
Loggia	5
									<hr/> 165
Assembly Chamber	120
Assembly gallery	14
Assembly passages	9
									<hr/> 143
Library corridor	7
Library centre	19
Lavatories	6
Balcony	8
Dome	32
North and South wings	44
									<hr/> 116

Total, 499.

		No. GAS LIGHTS.							
Council Chamber	49
Front vestibule	16
Queen's hall	144
Loggia	4
									<hr/> 213
Assembly Chamber	210
Gallery	14
Passages	4
									<hr/> 228
Library corridor	7
Library centre	19
Lavatories	4
Balcony	6
Dome	20
North and South wings	26
									<hr/> 82

Total, 523.

Twenty-four more gas jets than electric lamps.

The witness withdrew.

Adjourned to half-past Eleven on Friday next.

FRIDAY, 9TH MARCH, 1888.

Present:

The Hon. The SPEAKER, in the Chair;

The Hon. J. Woods, M.L.A.,	|	The Hon. W. McLellan, M.L.A.,
The Hon. J. Gavan Duffy, M.L.A.,	|	J. Bosisto, Esq., C.M.G., M.L.A.,
The Hon. J. Nimmo, M.L.A.,	|	E. L. Zox, Esq., M.L.A.

George Smibert examined.

George Smibert,
9th March 1888.

129. *By the Commission.*—What is your occupation?—Inspector of post and telegraph service.

130. Have you had any experience in connexion with the lighting of the Post Office by electricity?—I have had the personal control of the electric lighting plant since it has been established.

131. Will you give the Commission the benefit of the experience you have gained so far as regards the usefulness of it in comparison with gas?—I have put together roughly some figures here; the total cost of the plant in the Post Office has been £6,627.

132. How many lights?—One thousand three hundred incandescent lights, and four arc lamps.

133. How long has it been in use there?—Since 1885—three years. It has been added to from time to time.

134. What is the horse-power?—There are two sixteen horse-power engines working up to about 66 horse-power.

135. What is the cost of those per annum to your department?—As to the engines, I may add there is an auxiliary engine which we keep working during the day to light the many dark spots in the building. We run about 120 lights in the day.

136. What was the cost per annum?—The cost for last year—1887—was £3,339 8s. 6d.

137. That is the working cost?—Yes.

138. What do you mean by that?—That includes engine drivers, stokers, coals, everything connected with the engines, lamps, and repairs to lamps, and fittings and carbons.

139. Does it include the cost of the electric light?—Yes, the whole cost.
140. What do you reckon gas would cost?—The last year in which we used gas—that is in 1884—we had only 730 lights, and the cost was £1,192.
141. For half the quantity?—Yes.
142. Did that number of lights light up your building sufficiently?—No, not sufficiently; there were always complaints.
143. Why did not you have more?—That I am not prepared to say.
144. If you were to take double, would it be about a fair comparison?—I may state at that time the number of hours the buildings were lit were not so great as now; that we have commenced mail work from twelve o'clock at night instead of four in the morning as then; and the night work in the electric telegraph office has been much increased.
145. What would it cost to light up the building now, satisfactorily, with gas?—The way I have calculated it is this:—The number of lamp hours we burn during the year, taking 1,300 lamps, the number of hours they have burned, that gives 3,983,000 lamp hours; that is a single lamp. Gas, to give the same illumination at 5s. 6d. a thousand—the present price of gas—would cost, reckoning five feet an hour, £5,726, and at four feet per hour—it is not quite decided whether four or five feet is the amount—it gives £4,631.
146. Are we to understand that it would cost the Post Office £4,631 to light the building with gas to answer the same purpose which you now get by electricity for £3,339?—Yes.
147. Had you any agreement with the Gas Company as to your gas, when you were lighted up before by them, or did you take it like an ordinary consumer at the current rate per foot in the ordinary way?—Yes.
148. Is that a fair way to calculate?—That is the only calculation you can make.
149. Could you give a calculation of what the electric light costs now and what the gas would cost, you see; the smallest variation would throw out your whole calculation; do you consider it a fair basis, and could the results be approximately correct?—I think so; I think it is a fair basis.
150. In your opinion, what would it cost to light up a building with gas in a manner which would be sufficient for the requirements of the Post Office?—I may state in explanation that the calculation is based upon the gas lamps being of sixteen candle power which is the recognized power for each burner; the electric lamp is calculated also at sixteen candle power, they are nearly twenty candle power; but we burn them lower than that for a reason which I will explain.
151. You mean the incandescent light?—The incandescent light; the illumination of the mail-room and the telegraph office has been added to since we established the electric light, consequently we may take the present light as that which is sufficient for our work; and to give the required illumination in gas, I say, would cost from £4,631 to £5,726, according to the amount of gas per jet it may be calculated each burner would burn.
152. What did the gas cost before?—Eight shillings.
153. The amount per year?—£1,192.
154. You say it has increased four fold, although gas is cheaper?—There were fewer lights then.
155. Has the expense of gas increased four times, although gas is cheaper?—Yes.
156. Is not that a very large increase?—Yes, but we have added many buildings since.
157. Not four times?—But we have increased the amount of gas burned.
158. Not four times?—We have increased it very nearly that, but you must see we have increased the number of lights to nearly double at the time they were burnt.
159. Is the Commission to understand that there are twice the number of lamps illuminated now?—Yes, and they increase in the illumination.
160. That is, the rooms before not illuminated are now illuminated?—Yes, new buildings, and a greater number of lights have been added to make up the deficiency in light which was always complained of.
161. How much would it cost to make gas give you the same light as you have now?—I have no direct figures to give that.
162. With electricity now, you get a stronger light than you would get if you had gas?—No, we want an equal light, the same number of burners, of sixteen candle burners that we had in gas, I say, would cost for gas alone, that I have estimated.
163. Do you need all the strength that you have at present?—Yes, we need it.
164. I do not see that those figures can be taken as the basis of any calculation—the nearest is the 730 lights you had under the gas; now you have 1,300 instead of 730?—Yes.
165. And each one of the 1,300 is supposed to be equal to one of the 730?—Yes.
166. If we now doubled the 730, that is 1,460 instead of 1,300; and, if you double 1,192, it comes to 2,384, as compared with 4,000 in electricity?—But we are now burning much more, and in places where we did not before.
167. Unless you have a standard of comparison, it is no use attempting to compare?—There is no other.
168. In your opinion, is it cheaper to have the Post Office lit up with gas or electric light; and, if so, will you tell us the comparison in price between each?—The comparison that I work out is just what I have told you.
169. But there is £6,600, with interest at 10 per cent., that is a contingency you have to face; when you purchase gas you have done when you pay for your thousand feet; but you never know when this electric plant is going to smash—in your estimate, do you include everything?—I was asked the cost of maintenance. I have, in the figures, put down 10 per cent. for deterioration.

George Smibert,
continued,
9th March 1888.

170. That will never cover keeping the dynamos in repair at that high speed?—The repairs are included in the £3,339 8s. 6d.
171. As to the eye-sight, have you noticed it affects the eye-sight at all?—I have not. I use it every day all day long.
172. Is it preferable to gas?—Much better.
173. You use it nearly all day long—for how many days?—Since the hoarding has been put up. When the light is used bare it is very distressing, from the fact that the eye retains the impression of the filament of the carbon; and, when you look away, you see the image of the carbon filament, and it has to be used with a shade when used close, as in the use of a table lamp, such as I use continually; but when used in clusters of light above the head, as in the main room at the Post Office, this effect is not seen.
174. You have no special knowledge of the peculiar construction of the eye as to whether there is any chemical effect on the eye?—I only speak from my own experience of it.
175. You have no special knowledge of that subject?—No. I know the opinion expressed by the sorters, employés in the mail-room, when we have to resort to gas now is that there are great complaints.
176. Does it break down sometimes?—Sometimes.
177. How often?—Not a thorough break down, not once in six months.
178. You have the gas laid on?—We keep the gas fittings there.
179. The boilers never burst?—No.
180. You run about 80 pounds to the square inch?—Yes.
181. How often have you used the gas?—I do not suppose we used the gas more than a dozen times.
182. What was the matter?—Some break down with the engines.
183. Was it a belt slipping?—In one case one of the driving pulleys broke.
184. How long did it take before the repairs were effected?—It took a couple of days. We had to get a pulley put on.
185. Do you find many of your men wearing shades, complaining of the electric light, or the gas either?—No.
186. Is there any statement you would like to make to the Commission as to this question?—I may say the electric light is run very economically, which is because the supervision is undertaken by officers in the department. There is the electric foreman of the telegraph shop, and there are my own services in connexion with it, and many of the minor repairs are made in the workshop.
187. Suppose that your services were not utilized in the way you describe, and also the other men in your department, and those repairs were to be carried on; would they not considerably augment the expenditure, and naturally lessen the value of your calculation?—Possibly they might to the extent of £500 a year, if we had to employ special men.
188. Would it not be necessary to do so if you had none in the department?—Yes.
189. Do you calculate that if this skilled labour had to be brought into operation the expenditure would be not more than £500 a year more than your calculation?—Not more.
190. You do the repairs, and the small repairs are the expensive ones in electricity?—Only the small repairs are done in the fitting shop. I think £500 a year would cover all the extras.
191. You know exactly what the electric light costs; now can you give an estimate of what it would cost to supply the same light with gas; it is a simple question?—I have already stated £4,600.
192. I understood that you based your calculation on an illuminating power equal to sixteen sperm candles, and that the cost at four feet per hour, with the gas, was £4,631?—Yes.
193. And that the cost for giving the same light—the electric light—was £3,339?—This is not the actual cost of the gas; this is a calculation of the probable cost—we have no experience of the gas since we abandoned the gas three or four years ago.
194. Then what is this £4,631 based on?—The same amount of light, or the same number of burners, burning four feet per hour.
195. About the apparatus, do you know whose the dynamos are or who are the makers?—The Victoria Brush is the name of the firm, and they were supplied by the Electric Company, Mr. Josephs.
196. Have you had many errors found with reference to the insulation of the wires in the dynamos?—On three occasions we have had to take the armature out, and renew a portion of it, on account of the insulation breaking down, and the heat burning away the insulation, and making a short circuit.
197. Have you discovered any offensive smell, or is there any chemical change in the atmosphere?—None whatever, because it is burnt in vacuo.

The witness withdrew.

Dr. Thomas F. Bride examined.

Dr. T. F. Bride,
9th March 1888.

198. *By the Commission.*—What are you?—Librarian at the Public Library.
199. Is the Public Library supplied with the electric light?—Yes. The library portions of the building only.
200. How long has it been so?—The first lighting took place in April, 1883: that was only the Queen's reading room and the galleries belonging to it.
201. You have had experience with it during that time?—Yes.
202. Will you tell what the result of that experience is as to the cost of it after comparison

with gas?—First, as to its cost, it is very difficult to arrive at anything like a definite estimate. Different portions of the building have been lighted at different times, and we have required a different light at different times, and we can hardly compare the two definitely; but the result of the comparison has been this, that the electric light has cost a little more than twice as much as the gas. The figures were these when the comparison was made: the electric light cost about £1,100 per annum, and the gas was a little over £500; but that refers to the time in which we lighted only the Queen's reading room and those galleries. The Barry Hall was not in existence.

Dr. T. F. Bride,
continued,
9th March 1888.

203. What period would that extend over?—A couple of years. I have tested it otherwise, and in round numbers my experience is that electric light costs twice as much as the gas. The whole cost.

204. You do not make the electricity?—No. The place is lighted by contract. We have simply to pay the £1,300; the men, the plant, and everything are supplied by the Electric Lighting Company.

205. What light does that give in comparison with the light of gas?—The light is decidedly better right through, but it has many special effects on the library; for instance, in the temperature in the Queen's reading room there is an improvement of six to eight degrees. The galleries were exceedingly bad. The ventilation is very bad there. And there is another point, the risk from fire has been diminished very much. In a large building like the Library there was a great risk in the large halls. There is almost none now.

206. Any other advantage?—There is a saving. The bindings are injured by the gas. The electric light is not known to have any effect on those. I understand that, in the Parliamentary library, the leather of the bindings of the books on the upper shelves is crumbling. It is known at home that the gas injures pretty well all libraries.

207. Have any accidents occurred with the electric light in the Library?—Nothing beyond the light suddenly disappearing.

208. The reason I ask that, is it liable to any accident?—It is so long since we have been without the electric light through any accident that I cannot remember it.

209. For instance, an accident occurred here; it was said the wires were fused, and that if something had fallen it would have killed somebody. Has anything like that occurred with you?—No.

210. It would have been carelessness that caused it?—I suppose so.

211. It shows that, if carefully handled, there is no risk?—No.

212. Do the readers say anything as to increased comfort or increased discomfort?—I have not heard a single complaint that the temperature is increased.

213. I allude to eyesight?—Not a single complaint.

214. Do you read there yourself?—No; but I have enquired continually, and have watched it particularly, and there is no complaint about the effect on the eyesight. It also has no effect on the upper books. There is scarcely any heat from it.

215. There must be some chemical action in connexion with it?—I could not say anything about that. The gas had a bad effect.

216. I think those galleries used to be simply horrible upstairs?—There is a vast improvement.

217. Who are you supplied by?—The Australian Electric Light Company.

218. And your opinion is decidedly in favour of electricity?—For a building like the Library, it is a decided improvement. We are protected many ways. There is the difference of temperature. The galleries and the Queen's reading room used to be like a Turkish bath, and I have heard no complaints latterly. Then again it is a very unsafe thing to have attendants going round and lighting some hundreds of lamps.

219. You say it materially diminishes the risk of fire. Has it made any perceptible difference in the premiums paid for insurance?—I cannot answer that satisfactorily, because the insurance rates have gone up; but I know that is from other reasons. As to the fusing of the wire, I think if there is a proper safety-valve that cannot occur. It simply means working the engines at over pressure. I may mention one point that may interest you, that although the expense as compared with gas is what I have stated, that I think that can be diminished. We have two men on the premises paid by the company. Those two men might as well light half a dozen other buildings. The working expenses are somewhat increased by our having the plant on the premises. We had apprehensions as to the boilers and other matters, and now we have arranged that the whole place is to be lighted outside, the Library grounds, the trustees decided, and within two or three months that is to be done.

220. Will that lessen the cost of expenditure?—It ought to, but I do not know whether it would; but those two men might light ten other buildings for the company. Then there is another point; there will be better machinery and everything will be better managed if everything is centralised.

The witness withdrew.

George Walker examined.

221. *By the Commission.*—What are you?—Manager of the Victoria Coffee Palace and Grand Hotel.

George Walker,
9th March 1888.

222. Are those lighted with electricity?—The Victoria is; the other is going to be.

223. How long has the Victoria Coffee Palace been?—Five years.

224. You have had experience during that time?—Yes. It has been very much superior to gas all the time.

George Walker,
continued,
9th March 1888.

225. What is your opinion as to the relative cost?—When we first took it we took the average cost of the gas at £2 a burner per annum, and then the Electric Light Company took it at the same price at first, and then they found they could not supply it, and then they charged £3 a burner, so it is practically half as much again as the gas.

226. At the present price?—Yes. It costs about £2 11s. actually. The idea was we were the first to undertake it, and they offered it first at the same price as the gas, and they afterwards found it would not pay.

227. What advantages do you get?—The increased light and the absence of heat. It is very important in our business to keep it as cool as possible. A good many people would not come because of the heat in summer.

228. You do get increased light?—It is a more brilliant light, and shows up better. Gas is a dead light, and the heat comes down on to the head.

229. Any other advantages besides those two?—The great advantage of turning off all the light at once. You have not a man going about with a light all over the place. The men used to strike matches against the paint.

230. Is there any difference in the insurance?—Yes. We have had the insurance decreased sixpence per hundred since we had the electric light.

231. Who supplies you with it?—The Australian Company.

232. From their works?—Yes.

233. Are you following the same plan at the Grand Hotel?—Yes.

234. Not works of your own?—No; to be supplied by them. We shall be supplied by meter, and they will charge so much.

235. Will they reduce the cost in the Grand on account of taking such a large quantity?—No, I think not.

236. As to safety; do you consider the one is safer than the other?—I do. I consider the effect of having the electric light in the Grand Hotel will be a great inducement to people to come as a protection against fire.

237. Have any accidents occurred with it in your experience?—No; it went out one night in the whole five years. We have never had above two or three cessations for a minute or two.

238. Have you a supply of gas there too?—Yes.

239. At the Grand Hotel are you having the gas put on too?—In the principal rooms we are having that done.

240. In the small bedrooms?—We have no gas in the bedrooms, only the combination with gas in the passages and big rooms. We had them in what was called the old club, in the bedrooms; but in the new rooms we merely use candles.

241. Those bedrooms are much better lighted with one electric light than formerly with one gas jet?—Yes. A good many complain it is too much light.

242. Cannot you regulate it?—No, it must be either on or off.

243. Does it injure the eyes?—No.

244. What is the cause of complaint?—I think it keeps the children awake.

245. How many hours a night do you use it?—From dark until dawn the next morning.

246. I was going to Sydney in the *Lusitania* and I certainly turned on the electric light any height I liked. In every cabin there is a little handle, and you can graduate it from full on to altogether out?—I have never seen that.

247. You were home lately in the Home country?—Yes.

248. Did you see any large institutions lighted there with electric light?—Yes; I stayed at one of the nicest hotels there, the Hotel Metropole, which is lighted with the electric light.

249. Did you inquire as to how the thing is worked there?—No.

250. Nor the relative cost of gas?—No.

251. Is the light a steady light?—Yes.

252. When we had it here it sputtered and then went out. Does anything of that sort occur?—No.

253. What would be the cause of that?—Defective running in the engine, irregularity in the strap where it goes round.

254. Do you think, then, all things considered, as to the difference between £2 11s. and the £2, that the extra sum is well laid out?—Certainly, there is no comparison.

255. You have had a reduction in the insurance?—Sixpence per cent. And I got the reduction on the Grand on renewing our policy, on stating that we were lighted by electric light. That was one of the points we urged.

256. Is there any statement you would like to make to the Commission with reference to this?—No, I think not.

257. Your directors and shareholders are perfectly satisfied with the increased expenditure?—They were always grumbling about the gas.

258. They prefer having the electric light though it cost more?—I think they do. I was just going to remark as to the effect on the eyes. I have had the electric light on in my office table the last three or four years, and I find I cannot see with the ordinary gas anything like as well as I can with the electric light; and I have always a shade.

259. You cannot tell whether it has a detrimental effect on the delicate structure of the eye?—I think not.

260. Injury may be going on without your knowing it?—It might be, but I do not think there is any injury. I have never found any. I think it is a relief rather to the eye.

261. You were abroad lately; did you make any inquiries as to the ventilation of that and other public buildings?—Not there, I did not; but I did in New York and Chicago. I only saw

they were ventilated. I went down in the basement. They have their own dynamos and make their own electricity. They have their own ventilating machinery, and they have a large fan which drives the air into any room you like to open. There was a tap you could turn on to any room.

262. Whereabouts did the air come in, at the ceiling or below?—I did not notice that.

263. After being in the electric light for a considerable time, when you go into a dark passage or street, have you not a great difficulty in seeing for a short time?—No, it does not have that effect at all.

The witness withdrew.

William Briggs examined.

264. *By the Commission.*—What are you?—A journalist employed on the *Age*.

265. Have you been attending Parliament reporting the proceedings?—Yes.

266. How long?—About five years.

267. Will you tell any results you have experienced by the gas-light?—The House is sitting generally in the hotter months, and the gas was very trying. The heat was most extraordinary. Frequently men after half-an-hour's turn would be completely prostrated with the heat from the gas. Generally the heat comes straight up from the wall, comes in a regular hot blast sometimes. When the electric light was put on we saw much better, and the temperature of the Chamber was reduced to a considerable degree.

268. Did you find that affect your eyes at all?—Oh, no, excepting in the Legislative Council. They did not shade the incandescent lamp that was placed over our desks. It was about eighteen inches from the desk, and as you sat writing it used to strike just level with the eye; but here it was above our heads about seven feet, so that we had no difficulty at all in seeing.

269. And you found the light softer?—Much softer. When we went into our rooms we had to use gas, and the transition from the electric light to the gas was certainly very trying; you could see the comparison at once. We complained very much when the electric light was here that we did not have it in our rooms, because the temperature in the small rooms was very high.

270. You found no difference in regard to the eyes?—No; less heat and better light, and no injury to the eyes, provided it is shaded.

271. That is, if it is close to you?—That is, if it is close to you.

272. Is it not possible that the glare of the electric light might be injurious to weak-eyed people?—You noticed sometimes some of the members of the staff have been using shades. You never see them using shades when the electric light is on.

The witness withdrew.

John Samuel Jones examined.

273. *By the Commission.*—What are you?—Reporter on the *Argus* staff.

274. You have reported parliamentary proceedings in the gallery?—Yes, for the last three years.

275. Have you heard the evidence of the last witness?—Yes.

276. Do you agree with it?—In every particular with the exception that instead of the effect of the electric light and gas being the same on the eyes, I think the electric light is very much better for the eyes. I know our men prefer the electric light very much, and we all hope the Commission will be able to bring it back to Parliament House; and especially if they could carry it on to our rooms, where we find they are very badly ventilated, and the gas being so hot makes it very bad indeed in the summer months.

The witness withdrew.

Adjourned to Friday next, at half-past Eleven o'clock.

FRIDAY, 16TH MARCH, 1888.

Present:

The Hon. the SPEAKER, in the Chair;

The Hon. J. Nimmo, M.L.A.,

The Hon. J. Woods, M.L.A.,

The Hon. W. McLellan, M.L.A.,

J. Bosisto, Esq., C.M.G., M.L.A.,

The Hon. L. L. Smith, M.L.A.

Dr. Andrew S. Gray examined.

277. *By the Commission.*—What are you?—Surgeon.

278. You have specially studied the eye in its various branches?—Yes, I am an oculist.

279. We are desirous of obtaining the benefit of your experience, so far as relates to the effect which the electric light would have on the eye, if you can give it from practical observation or otherwise?—With respect to the electric light, I think we are quite ignorant of it, at least as far as our profession; we have not considered the thing fully, at least I have not. Just after I got your communication I commenced to examine for myself the different places where the electric light is situated. For instance, I examined that light in the market, in Bourke-street, and I found that was a very objectionable light, because it flickers and partly goes out, and lights again; I found I could not stand that well. Then I went to the different theatres, and I found they had a modification of this light in the theatres, which was exceedingly pleasing to my vision; it did not

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Dr. A. S. Gray, *continued*,
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280. Are you prepared to say which would be least hurtful to the eyes—the electric light or gas?—I do not see any objection to the electric light; I think bad gas is equally as bad as bad electric light. In the House here, with gas, I have seen you frequently have candles on the tables to get sufficient light.

281. You have not used the electric light in your own study?—No.

282. You have had no patients who have suffered from the electric light?—No. I was asking a person from home, and he tells me there all the Parliament Houses are lighted with the electric light, and in Leadenhall-street all the places are lighted with the electric light. There are lots of Irishmen in the Houses at home who would soon kick up a row if the electric light were unpleasant to them.

283. From your own experience you cannot say?—No.

284. Speaking theoretically, which would you prefer?—I would sooner have the electric light.

285. As against gas?—Yes, you are not liable to explosions, and I think the temperature is not increased by the electric light.

286. What effect has a very brilliant light on the eye?—It would cause a good deal of congestion, and cause the pupil to act very quickly and contract.

287. Have you been caught in a thunderstorm?—No, I hope I never will.

288. What is the cause of blinding by lightning?—Congestion of the retina.

289. Would that be caused by the electric light?—I do not think you would have a bad electric light—one that would be very severe—a flash of lightning would kill a man.

290. The eye is affected by a very strong light—why is that?—Because a lot of light gets on the retina and on the nerve, the contraction and dilatation of the pupil is very injurious.

291. If you go out of a room that is brilliantly lighted, the effect on the eye is that it seems dark when you go out of that room?—It acts on the optic nerve, because the retina is acted upon by the expansion of the optic nerve.

292. Does not a brilliant light contract or expand the eye?—No, it only expands and contracts the pupil, it does not expand the globe of the eye.

293. So that the eye accommodates itself to any light?—It always does and must do so.

294. After all, I suppose there has not been sufficient experience of this electric light to give any opinion, either on the one side or the other?—I would be very sorry if you put me down as an expert at that, because I undoubtedly say I have not had sufficient experience.

295. In your experience in dealing with other causes—not of light—you have found that injury to the optic nerve has been going on for some time, but only coming to a climax at the last?—Yes, you may have incipient atrophe going on for two years, or you may have incipient cataract.

296. This may go on for years, without a patient knowing?—Slightly going on, but in this House the light would be modified, so that you would not be blurred on coming in here, you would have some stained glasses.

297. We want the effect of the electric light, generally, on the eye?—If you have a modified light, I would have no objection to it.

298. It is the same as sun-light modified?—Yes, and some men are not satisfied with the sun itself.

299. I understand you have not made this a portion of your study from a scientific point of view—whether the electric light has a bad effect on the eye or not?—If there is a very severe light, such as in a lighthouse, or a light that you would have to see by when an enemy is coming in the Heads, it would have a very serious effect, but not with a modified light.

300. It is not what we might have in this House, or anywhere else, it is the abstract question—whether a brilliant light has a bad effect on the eye or not from a scientific point of view?—You mean a very brilliant light?

301. You think we may safely risk the electric lighting here without risk to the members?—If you modify the light with globes.

302. There are a large number of members with weak eyes, and they used to wear shades because of a pain in the eyes—might there be ground for that?—Yes, they say you may get headaches from a very bright electric light.

303. Is there anything in the composition of the electric light—any fumes, or anything that may be emitted from it that may be injurious to the health or eyes?—I do not think so. I would have no objection to have my house lit with it; there is not the danger there is with gas, and you have an even temperature, and I think if you have a good light in this House, modified with good globes, there will be no danger.

304. Is not the globe outside the light warm?—It is only for a moment. I do not think there is much heat.

305. The electric light is white?—Yes.

306. And gas yellow?—Yes.

307. Have you had experience as to the yellow rays falling on the retina—do you think it is different from a white light?—I could not give an opinion on that.

The witness withdrawn.

Dr. T. Aubrey Bowen examined.

308. *By the Commission.*—What are you?—Surgeon and oculist.

309. We are anxious to get the benefit of your opinion with regard to the effect of the electric light on the eye-sight?—I have been making a number of inquiries since I got the summons from you; but, in the first place, I should like to say a few words as to what I consider is generally considered as a proper artificial light. In the first place, it should be a white light, bountifully supplied, that is to say, that in a chamber such as this manuscript or print ought to be read as easily as it is in the open sunlight, because if the light is not sufficient to enable anybody to read as well by artificial light as by the ordinary daylight there is a strain on the eyes, and if it is continuous it is apt to produce short-sight, as well as irritation of the retina—that is one. In the second place, there should be no heat—that is a most important matter in connexion with artificial light—because, suppose there is a candle or any artificial light which evolves heat, the natural moisture of the eye is, to a certain extent, dried up, and irritation of the surface of the eye is produced, and in addition to that there are constant draughts passing across the eye produced by the heat which is very injurious to the eyes; that is another essential for the highest quality of an artificial light. Then there is another point, that it should burn steadily; that is a most material point. In almost all gas, candles, and kerosene there is a certain amount of flicker, and this flicker means an intermittent supply of light; first, very little, then less, and then a little more. The retina is exceedingly sensitive to all intermittent supplies of light of that description, everybody has noticed that. Suppose you are walking along an open fence and the sun is low down on the other side, everybody has noticed the painful sensation to the eyes in passing across light then intercepted by each panel of the fence. Then another point is that the light should not exhaust the oxygen of the atmosphere. Now these four points are the main essentials for an artificial light. Of course we must make a distinction between the arc light and an incandescent one; no doubt the arc light does not in any shape or form supply those wants, because the arc is a very unsteady light, from whatever causes it may be; but I consider that the strong light, as used in the open places—the railways, the markets, and so on—is very injurious to the eyes, besides the intense unprotected glare; it is also intermittent, but I think the incandescent lights really attain very nearly to whatever perfection is likely to be obtained in artificial lighting. Almost all the elements that I have been mentioning that are required are present in the present incandescent lamps, and all of which are most important. It is a pure beautiful white light; there are no coloured rays which irritate the retina; there is no heat evolved to signify; you have a perfectly steady light; there is no intermittence in the light, and you do not exhaust the atmosphere in burning, because it is in vacuo, so that altogether I consider it supplies almost every want of an artificial light, and I consider if it is properly tempered by globes, and so on, that it is almost equal to, at any rate, it is the nearest approach we have to daylight.

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310. For all these reasons, you would strongly recommend it over gas?—It is infinitely better; I think there is no question.

311. Have you had experience in the use of it?—The subject in connexion with the eyes has been investigated by Professor Breslau, and he has detailed a few cases in which the arc light has produced an effect similar to snow blindness, irritation to the retina and front of the eye; but those were all cases of people experimenting with the arc light, and trimmers of the arc lamp, who had therefore to look right at the light; but, as regards the incandescent light, I cannot find any record of any cases that have been in the hands of any oculist anywhere. I have looked through all the journals I could find, and personally, myself, I have never come across a single case in connexion with electric light at all, or never heard of one, in my experience, any injurious effects from it. I asked Mr. James, of the Telegraph Department, the question, and he sent me the opinions from all the departments where they use the light, and they are all detailed here, one after the other.

312. I gather from what you say that you would have no hesitation in recommending Parliament to adopt the electric light for the lighting up of the Houses?—Indeed I would not, I should strongly recommend it in preference to gas.

313. Still the fact remains, the more brilliant the light the greater strain on the eye?—Undoubtedly the greater strain on the eye, but I look upon it in this way, that to get a certain amount of light by artificial means, you must have the same brilliancy, no matter what you use, to get a good light, so it is only a question of concentrating the brilliancy on one spot or distributing it round; if you distribute it round, you do not get the intense brilliancy.

314. I notice after reading for hours the eyes get fatigued, and the gas is turned down to ease the eyesight; was that a fallacy?—It is perfectly right, but then you must give up reading.

315. We want to know the effect of a brilliant light on the eyesight?—I think for equal brilliance between the yellow of gas and the clear bright light of electricity, when you want to see a certain manuscript you must have the same volume; and of the two, the same volume of the electric light is far less injurious to the eyes.

316. I have noticed here while the electric light was over our heads, that some gentlemen were wearing shades—was there any just reason for their doing so?—I certainly think that the electric light, which is a very powerful light, ought to be protected. I think it would be a risk to expose the eyes to such a brilliant light as either gas, kerosene, or the electric light, unless it is protected by smoke-tinted or other globes.

317. One gentleman said he had a headache from it?—I cannot understand that.

318. How would you shade the light?—By globes; a neutral tint would be the best, or those opalescent globes, which are very much more expensive.

319. That would diminish the rays?—Then you must put more strength in, it is only a question of expense.

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320. What is the chemical composition of this light?—It is unknown; you cannot call it chemical, it is caused by atomic action by the movement of particles which is, at present, a mystery to the world.

321. Then your opinion as to the gas and electric light is simply this, that it is the different colours of the rays?—The white light is undoubtedly better than any coloured light.

322. Have you read certain articles lately, by the Society of Arts, in London, where one gentleman has been lecturing on the electric light and its action on the eyes; he gives it that it is far less injurious on the eyes than gas?—Undoubtedly.

323. Then, speaking as a medical man, you really think it would be far preferable for the members of Parliament if they had the electric light, there would not be half this fighting going on, they are exhausted through the bad atmosphere after five or six hours?—Undoubtedly.

324. Then, as a non-competent, you think the electric light would be the better of the two?—Yes.

325. Is there any danger likely to arise from this electric lighting—say from a thunder-storm outside?—Oh, no; if the globe is broken, the light goes out—it is simply destroyed.

326. Is there any danger when there is a very heavy thunderstorm, with vivid lightning, of its coming down and cracking on our heads?—I am not sufficiently an expert to answer that.

327. Suppose that the illuminating power of gas be equal to twelve sperm candles, and that of the electric light equal to twelve sperm candles, which would you prefer?—I should prefer the white light—the electric light, undoubtedly.

328. The white light is not so injurious as the yellow?—No.

329. And it does not consume any oxygen?—No.

330. Then it follows, from your evidence, that the electric light is preferable?—I think so, in every aspect of it.

331. As to the danger referred to by electricity—have you thought of that?—I do not think the danger is one iota to be compared with bad gas-pipes and the danger from gas in many ways.

332. I want to have it recorded—the impression that it is your opinion that the white light, no matter where it comes from, is less injurious to the human eye than any coloured light?—Yes.

333. Why the electric light is not so injurious is because it is so diffused that the rays permeate, and with the gas it comes in direct rays—could it be that?—I do not think there is much difference in it. I think, if there is sufficient light, and with globes, the diffusion would be about equal in each case.

334. But the gas would not give as much diffused light?—No, there is more diffused light from the electric light with one powerful centre than if subdivided.

335. It struck me from a medical point of view, is it not perhaps that because it is a diffused light, the rays not coming direct upon the retina, by that means preventing the aching and over-sensitive condition of the retina?—It is possible, but a light ought always to be over the head; then I think you need not look at it. You do not look at the sun if it is very bright, and you would not look at the electric light.

336. It strikes me that where the rays are not direct upon a person they would not be so injurious. Suppose you have, for instance, the gas playing upon this point, it would strike here and deflect over to the Chairman, and, coming on his eye, it would be injurious to it, and cause it to ache; but a diffused electric light is the same as the daylight, and really approximates more to the natural light of day than the artificial light of gas, so I ask the question—do not you think that it might be in consequence of its being a diffused light that it is not so injurious to the eyes of those who are exposed to the two different lights?—No doubt the diffused light is the proper one, because it is the nearest approach to daylight.

The witness withdrew.

Colonel E. C. Cracknell examined.

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337. *By the Commission.*—What are you?—Superintendent of electric telegraph for New South Wales.

338. Have you had any experience with electric light?—Yes.

339. Will you tell the Commission the nature of that experience?—I have several installations of the Government under my control, such as the lighting of the Legislative Chambers in Sydney, some are lighting for street work, such as Circular Quay, and Cowper's wharf, and the Redfern railway station.

340. How long have you been engaged in attending to those?—For the last five or six years, off and on.

341. We are anxious to get the benefit of your experience with regard to electric lighting, particularly in connexion with the Legislative Chambers there. Would you give that. Have you had experience elsewhere?—I have had the opportunity of being home in 1885, and visited all the principal installations in London and other cities on the continent.

342. What is the result of your experience, briefly, as comparing electricity with gas?—For lighting the Legislative Chambers, my idea is, it would be very much better because you get a much better light, and more steady. If you use the accumulators in connexion with the dynamos the dynamo could be worked with a very much less powerful engine in that case, and the accumulators would give you a steady light that could be turned on at any moment without having the engines near the building working during the time you are sitting, which would be an advantage. I may say that is not the case in Sydney. We are working with four Edison's machines with 70 lamps each, but the engines are far enough removed not to be a nuisance.

343. As to cost, what is the difference?—I think the better plan will be to give the experience of the cost per lamp; the cost per lamp, with fittings.

344. What lamp?—Incandescent, sixteen-power lamp.

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345. What particular lamp?—You would have to take the Swan Edison lamp, which is protected now with royalties. But there is another lamp in America which might be got to overcome the patents and royalties; and I am informed there is another lamp likely to come from Berlin, by Mr. Zacharias, who can produce a lamp at much less cost, about two and sixpence each; for the Edison Swan you would have to pay five shillings to six shillings each, present price, but we are using the Swan and Edison for our Chambers.

346. Can you say what the cost is?—The cost per lamp without brackets or fittings (because it depends entirely on what is required in the way of decorations) is about £3 10s. per incandescent lamp; I mean for the first cost.

347. What per annum?—Per annum for maintenance would be a very small matter, because those lamps would run nearly 2,000 hours with the subdued light you would require for the Chambers.

348. What is the cost of lighting Parliament Houses in Sydney?—I think it costs £600 or £700 a year.

349. The whole House?—Yes, and the library and refreshment room.

350. What was the cost of fitting up?—I cannot give that exactly, but I should think £3,500 to fit up.

351. What used it to cost in gas?—More than £700 a year.

352. Then they are much about the same?—Yes. The gas certainly is not cheaper than the electric light. There is a trifle in favour of the electric light.

353. What has been the experience of members with regard to the working of the electric light?—They are perfectly satisfied now. At first the fittings were not quite convenient. The Speaker used to complain about too much glare. That was altered, and we have no complaint now about the effects on the eyes.

354. Have you heard it commended as being much better?—Yes, much better. They would never return to gas.

355. How do you work it?—A 30 horse-power engine working in the domain at the rear of the Legislative buildings. This works the four Edison dynamos.

356. Has any fear been expressed with regard to the effect of lightning?—No, there is not much danger of that, and that is so easily dealt with. There is not the slightest difficulty about that.

357. Any danger of accidents with the wires getting wrong?—Oh, no. If you work your dynamos at 110 volts there is not much danger to life or property.

358. You say that the accumulators you use along with dynamos?—No; I recommend it for these Chambers. We have not it there, but it is used in Sydney for other purposes.

359. Do you wish the Commission to understand that by the use of accumulators you can store the light in the accumulators in the day time and give it out again at night?—Exactly.

360. Without using the engines at all at night?—Exactly.

361. What is the percentage of loss?—I think we can work up to 75 per cent.

362. You can realize 75 per cent.?—Yes. Reckenzall says he can get to 80 per cent. of the power used, but we get from 70 to 75 per cent.

363. In this case with the use of accumulators, and say you get 75 per cent. of the power, you can have with your accumulators a perfectly steady light?—Perfectly steady, no flicker at all.

364. Is the Commission to understand that the flickering that is complained of in the electric light is due to variable speed of the engine?—Exactly; bad driving or the belting getting wrong.

365. We understand then that it is the variable speed of the dynamo, arising from the irregular speed of the engine, that is instantly felt by the light, and flicker ensues?—Yes, every revolution.

366. In the use of those accumulators, all this is got rid of?—Entirely.

367. And you use from a steady, still light?—The same as the gasometers.

368. Is there much difference in the cost?—Very little; a little more in cost. The accumulators cost £4 10s. per set of 24 plates—that is each accumulator costs that amount.

369. Can you get those prepared cells?—You have to import them. There are two principal makers.

370. And you have to import the storage plates?—They are complete. They are sent out as a cell containing 24 plates.

371. What power?—We use a 30 horse-power.

372. That supplies how many lights?—270 lights.

373. And how far can you be away from the scene of the operation in using the accumulators?—It does not matter if you have sufficient leads.

374. You can charge your accumulators half-a-mile away and bring them here?—Yes.

375. And have no engine about the premises?—No.

376. If we could make an arrangement with the Tram Company to charge our accumulators during the day we could bring them from there at night and light the place?—You would leave them here and have two leads. That is all you would want.

377. And let them be filled from that engine?—From the nearest engine. That would make it very simple.

378. Do you think a 30 horse-power would answer the purpose as far as these Houses are concerned?—It would be quite superfluous. You would not want anything like that.

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379. And there is no flicker?—No.
380. And you take so many hours' storage of electricity in the accumulators?—Yes.
381. Is there any danger in the accumulators?—They are perfectly harmless.
382. How many lights will one accumulator supply?—That all depends on the volt power.
383. Do you know the full power?—The Elwood Parker would run about two incandescent lights.
384. That is one cell?—Yes. But I am not speaking definitely about that. I should think about 100 cells ought to run about 200 lamps.
385. That is about two lamps to a cell. It is as well to have some surplus power?—Yes.
386. In point of fact you would recommend there should be a duplicate plant to turn on?—No, only a few additional cells.
387. So that while some are out of repair you can attach the others?—Yes.
388. Have you seen a building that has been lit up with the accumulators?—Yes; we have them at the Sydney Post Office.
389. And it is very regular there?—Very. We are not just now using the accumulators continuously. But there is a hotel fitted up in Sydney lately, and they have 80 accumulators to run about 150 lamps there, and they have been very successful.
390. Where do they get the power?—A very small gas engine in the cellar, and so far it has been very successful.
391. What is the relative loss of power; in other words, of electricity between using it direct, as produced through the dynamo, and through cable, direct on to the lamps and electricity, as stored in the accumulators?—I put it down about 25 per cent.
392. You lose that amount by the accumulators?—Yes.
393. Do you mean to say you get the full percentage by taking it direct?—There must be loss, of course, but we calculate it by so many volts.
394. As to the danger; you think there is no danger about the lightning combining with the wires?—With proper arrangements that is out of the question.
395. Have you heard of lightning rods being fused and a building destroyed?—Certainly. If they are not properly constructed.
396. It was a defect in the construction of the rod?—Yes.
397. In the Upper House the wire became fused, and fell very nearly on the heads of some members?—That is the fusing of the safety plug.
398. Is it liable to do that sort of thing?—Not if it is properly made. But no man who understands his business would allow the safety plug to be in such a place.
399. It can be guarded against?—Yes. Working the volt power at 110 volts, there is no danger except the safety plug becoming fused, and that would be rather awkward coming on any one's head; but there is no necessity for that.
400. The best test of that would be the insurance companies. Would they not insure as well with electric light?—That is provided for in our bill. You must have certain appliances, and not run beyond certain volt power; but if you run a very high tension machine, and put up faulty wires, there is danger. Lightning conductors would prevent danger from outside lightning.
401. I have read of a cathedral being destroyed by lightning, though it had lightning conductors?—It is very probable, because they omit the very essentials of a true lightning conductor. The lightning comes down, and where it cuts the earth, the conductor has got eaten away, and it cannot get down to the lightning plate.
402. It is people's own fault?—Yes. But now there is a very easy way to test the rods.
403. What is the limit of safety—the number of volts?—One hundred and ten.
404. Beyond that?—You may run beyond that with impunity, but I would not advise it, and electricians would not.
405. Can we get the accumulators direct?—Yes.
406. In three month's time for the session of Parliament?—Yes, they can be got out in six weeks. They are already made. They are articles of commerce. The accumulator I would recommend is the Elwell Parker.
407. What loss would there be. It has been spoken of that we possibly might have an engine and so forth across the road there. Have you seen the distance?—That would matter very little. That would depend entirely upon the size of the leads, and with good conductors there is very little loss.
408. I suppose it would be more convenient to have the control of the lighting within ourselves?—If you have people connected with the service to look after it; but all those things require attention. You have to see what power you are using, and see that you are not wasting it.
409. If you were lighting this Chamber, and you could employ power within say 20 chains from where we sit, to charge your accumulators with, would you do that, or would you erect your separate plant for charging the accumulators?—If I could get accumulators at that distance I would get the power there. You could get the power that you could always rely on.
410. At a certain time those accumulators must be charged?—Yes, and then you want some one to look after that. By a very simple apparatus you can have where they are charged, and you only need a little hydrometer in each cell, and that is marked with a red mark, and when that cuts the fluid you can tell that the cells are charged. There is one matter that perhaps would be interesting to the Commission. The two doctors here were asked on one or two occasions how they accounted for the difference in gas and electricity. I may mention that electricity gives you the entire rays of the rainbow. You get all the light from electricity that you get from the sun, so that is the reason. They did not seem to bring that out quite.

411. The rays of light run horizontally, and the direct ray of the sun goes across that, and produces the white light?—Yes.

412. It just occurred to me, as to the accumulators, that where they have got the great engine power of the Tram Company, arrangements might be made with them to supply the power. If you were doing these Houses, do you think, if you could get suitable arrangements with them or any other within that radius, you would rather take that than erect machinery and look after it yourself?—I would rather do it that way, certainly.

413. I asked the witness about the relative cost; I asked which would be better for us to have our own machinery here, or, as the company are employed in lighting up the different theatres—the Princess's and others—would it not be more economical for them to do it, because it would require extra machinery. Now, with your accumulators, where they could do it during the day, do not you think, under those circumstances, it would be more economical, instead of our employing men and engineers, if we were to have it from this company?—I think it would; but it is suggested that there is the motive power so close at hand.

414. Would it be cheaper that way?—I think it is entirely a question for your engineers to see to.

415. Would it or not be cheaper for us to employ an outside company, or to do it ourselves, having in view that we should require engineers here, men to look after it, and should have to buy engines, and so forth; which, in your opinion, founded on experience, would be the cheaper; we have all the plant and engines here?—It entirely depends on the advice from your own people as to that point. May I say one word as to setting fire to buildings?

416. I meant could the thing come down about the ears of members?—There is not the slightest danger. Colonel Roberts and myself have lit up the powder magazines in Sydney with the electric light, so there is no danger in it, otherwise we should not put it in the powder magazines.

The witness withdrew.

James Farrell examined.

417. *By the Commission.*—You are the librarian of the Parliament House?—Yes.

418. What is your experience as to the effect of gas on the binding of books in the Library?—I saw the statement in the paper of last Saturday made by Dr. Bride. He said “He understood, owing to the use of gas in the Parliamentary Library, the binding of the books on the upper shelves, where the atmosphere was most heated, had crumbled away.” My attention has also been called to that report, and I desire to say it is quite incorrect. I never noticed any injury to the bindings of the books up to the present time; but since the statement was made I examined the books on the upper shelves, and they do not show the slightest signs of decay, much less of crumbling to pieces.

419. However, as far as your experience goes, it has not had that effect on the Parliamentary Library?—No. Dr. Bride did not speak from his own knowledge; he spoke from information given by some one else, and the information was quite incorrect.

420. He says—[*reading the official record of the evidence*]—“I understand that, in the Parliamentary Library, the leather of the bindings of the books on the upper shelves is crumbling”—your impression is that that is quite incorrect?—Yes; I do not think that statement should go forth to be repeated here and elsewhere.

421. Has the electric light any injurious effect on your eyes?—No.

The witness withdrew.

Richard Church examined.

422. *By the Commission.*—What are you?—Clerk in the Library.

423. Have you found the electric light affect your eyes at all?—Yes.

424. In what way?—I never wore glasses before. I had to take to them immediately after the electric light, and when I went into the street it was just the same as if there was a halo round my feet.

425. Was the light shaded?—Yes, the light was under a shade.

426. Can you say whether it was an arc light or an incandescent?—An incandescent.

427. Has this occurred every time after you have gone out in the dark?—Yes.

428. About wearing glasses—did you find any failing of your sight coming on before that?—No.

429. How old are you?—Fifty.

430. And do you see without glasses?—I see a long way, but not near.

431. Do you attribute that to the electric light?—I never felt it before the electric light was in the Library.

432. You have no other reason?—No.

433. Did any other officer complain of it?—No.

434. Have you noticed any effect of the gas on the books?—The gas has not injured them at all.

The witness withdrew.

Adjourned to Friday next, at half-past Eleven o'clock.

Colonel E. C.
Cracknell,
continued,
16th March 1888.

James Farrell,
16th March 1888.

Richard Church,
16th March 1888.

APPENDICES.

LIST OF APPENDICES.

- A. *Précis*, prepared by Mr. P. Kerr, showing the previous steps taken in connexion with the lighting of the Parliament House with the electric light.
- B. Report from Mr. P. Kerr as to the best site for the electric lighting works.
- C. Estimates of the probable cost of lighting the Parliament Houses, wholly and partially, with the electric light, prepared by the Australian Electric Company and W. H. Masters and Company.
- D. Return as to cost of gas consumed at the Government Offices and Parliament House during the five years ending 31st December, 1887.
- E. Similar return for Parliament House only.
- F. Professor Ewing's report on the electric lighting of the Legislative Assembly Chamber. (*For Professor Ewing's Report on Ventilation, see the Second Progress Report of the Commission.*)

APPENDIX A.

HOUSES OF PARLIAMENT, MELBOURNE.

ELECTRIC LIGHTING.

85-6/ $\frac{506}{4693}$ Department of Public Works,
Melbourne, April 17th, 1886.*Précis.*

In October, 1882, Messrs. W. H. Masters and Co. and the Australian Electric Company Limited both wrote offering to light "the Chamber" by electricity; the latter offering to do it "at the same price as you are now paying for gas."

Accordingly, Mr. P. Kerr, the architect in charge of the Houses of Parliament, drew up particulars and obtained tenders from these two firms; that of the Australian Electric Company was £2,960, and that of Messrs. Masters £4,965, but they differed very much as to what they included. The Australian Electric Company also offered to supply the necessary lamps, &c., for £490, and to maintain the installation by a current from their own station for £920 per 1,000 hours; Mr. Kerr recommended the adoption of this proposal. No tender, however, was accepted, it being deemed desirable, in order that some idea might be formed of the effect of electric lighting, that the two Chambers should be temporarily lighted by the rival companies. This was done.

An Electric Lighting Board, consisting of Messrs. Ellery, Murray, and Jenkins, was subsequently appointed by the Parliament Buildings Committee, and they, in their report of the 30th October, 1883, recommended that a complete installation should be provided, worked by the Parliament House employés. The Board estimated the first outlay for engines and generating machine at £1,500, and the annual cost of maintenance at £800.

In accordance with the recommendations of the Electric Lighting Board, competitive designs and tenders for lighting the whole of the Houses of Parliament were invited, and were opened on the 27th March 1884. Two tenders only were received, one from the Australian Electric Company, amounting to £7,273 6s. 8d., and the other from Messrs. W. H. Masters and Co., amounting to £4,473 15s. These tenders were not deemed satisfactory, and amended tenders, giving alternative prices for a "complete" and for a "smaller" installation, were asked for from these two firms. These were accordingly supplied. The amounts of the Australian Electric Company's tenders were, for the "complete" installation £7,273 6s. 8d., and for the "smaller" installation £5,062 19s.; and the amounts of Messrs. W. H. Masters and Co.'s tenders were, for the "complete" installation £4,473 15s., and for the "smaller" installation £2,341.

The Parliament Buildings Committee recommended the acceptance of the Australian Electric Company's tender for the "smaller" installation, amounting to £5,062 19s., on the understanding that the company would complete the "complete" installation, if desired, for the amount of the difference between the two tenders. It was afterwards decided to include in the contract for the "smaller" installation the engine-power and shafting that would be required eventually for the "complete" installation; this raised the amount of the tender eventually accepted to £5,577 6s. The contract was signed on the 16th June, 1884. This contract was satisfactorily completed by January 15th, 1886.

With regard to the position of the generating plant and its proposed removal, the following facts may be noted:—

The particulars prepared by Mr. Kerr for the first tenders, received in 1882, placed the generating plant under the steps to the west front; Messrs. W. H. Masters and Co. did not consider this position suitable, and proposed a distinct engine-house somewhere near the Houses of Parliament, and suggested the site of the old Government Printing Office. The Electric Lighting Board, in October, 1883, recommended that the engine-house should be erected in the north-east part of the Parliament Gardens, and be covered in by planting, but subsequently, after conferring with Mr. Kerr, altered their opinion, and concurred in the selection of the position under the steps; the generating plant was accordingly placed there.

On the 25th February, 1885, Mr. Cooper, M.L.A., objected to the position of the boilers as dangerous. Mr. Kerr furnished a report, on the 28th February, answering this and other objections.

On the 4th August, 1885, the Parliament Buildings Committee decided to have the engines, &c., removed to a site to be approved of; but, by direction of the Honorable the Commissioner of Public Works, any action in the matter was stayed, pending the receipt of communications from the Honorable the President and the Honorable the Speaker with regard to Mr. Kerr's report; meanwhile arrangements were made for the official examination and periodical inspection of the boilers and engines.

On January 15th, 1886, Mr. Kerr recommended the old Printing Office site, which suggestion was subsequently adopted by the Parliament Buildings Committee. Provision was at once made for carrying the conductors under the cable-tramway then being constructed in Gisborne-street, and the engines were taken to pieces and the boilers dismantled, and the latter have since been removed to the old Government Printing Office site.

On the 4th March, 1886, tenders were received from the Australian Electric Company for effecting the required alterations and the removal. Four tenders were submitted, namely, *A*, £3,040; *B*, £522 10s.; *C*, £1,696 0s. 8d.; and *D*, £4,858 10s. 8d. These tenders were forwarded to the Government Astronomer for report, and he recommended the acceptance of tender *D*, £4,858 10s. 8d., which includes completing the "complete" installation.

On the 5th April, 1886, the Parliament Buildings Committee decided that no further action should be taken until Parliament had expressed its opinion.

P. KERR, Architect.

APPENDIX B.

HOUSES OF PARLIAMENT, MELBOURNE—VENTILATION AND LIGHTING OF
ASSEMBLY CHAMBER.Department of Public Works,
Melbourne, 27th February, 1888.

MEMORANDUM.

At the meeting of the Royal Commission on the ventilation and lighting of the Legislative Assembly Chamber held on the 24th instant, I was requested to furnish a report, pointing out the most favorable positions in the vicinity of the Houses for the erection of an engine-house, &c., for the electric lighting plant.

After careful examination and consideration, I am enabled to point out two very suitable sites.

The first is at the angle formed by the junction of Gipps and Gisborne streets, and forms portion of the Treasury Gardens; this is close to the Houses, and also to the Government Printing-office, the Public Offices, and the Chief Secretary's Offices, so that from it electricity could be eventually radiated to all these buildings as required.

The second is at the junction of Evelyn and Albert streets, and forms portion of the Parliament Gardens. This site is further from the Houses, and is so situated that there are no buildings near that can suffer damage from it.

On the whole, however, I would recommend the adoption of the first site mentioned, principally on account of its central situation with regard to other Government buildings.

I estimate the cost of erecting a suitable engine-house, &c., built of brick and cemented, and of a moderately ornamental design, so as to correspond with the surrounding buildings, at £2,500, and, in estimating the cost of completing the electric lighting of the Houses, this amount must be added to the £4,858 10s. 8d. forming the amount of tender "D" of the Australian Electric Company, making a total of £7,358 10s. 8d.

The site recommended it is to be noted, however, is a good deal nearer the Houses than the Printing-office site, on which tender "D," above quoted, was based; a corresponding reduction would therefore be effected in the cost of the "main" conductors (a very heavy item), so that tender "D" no doubt could be considerably reduced, as I believe that for the shorter distance, not only a shorter length would be requisite, but "main" conductors of a smaller sectional area would be sufficient.

This report should be forwarded to Mr. T. Watson, the secretary to the Commission, for their consideration at their next meeting.

P. KERR,
Architect.

APPENDIX C.

THE AUSTRALIAN ELECTRIC COMPANY LIMITED.

Offices and Works: Prince's-bridge, Sandridge-road.

Melbourne, 5th March, 1888.

The Chairman Royal Commission on Ventilation and Lighting, Parliament Houses.

SIR,

Following the evidence given before you on Friday last, and in accordance with a promise to submit an estimate which was not to be considered as an offer, I have now the honor to supply you with the additional information contained in the attached memos.

No. 1 is an estimate of the cost of lighting the same number of lights, for same number of hours, by (a) gas, (b) electricity supplied from a central station, (c) electricity, working your own plant.

The price charged for from a central station is at the rate this company are now being paid by consumers who use the light constantly during the year, and is, as I stated in my evidence, about 50 per cent. dearer than gas at its present price. The company do not attempt to compete in price with gas, but rely upon obtaining a price that pays them to supply a better illuminant; and that it is better, and is appreciated by the consumers, is evident from the fact that in no instance has a consumer of electric light returned to gas, but, on the contrary, has in most cases increased their electric lighting.

No. 2 is a return showing the actual cost of lighting the Houses by electricity during a Session in 1885, by which you will see that it is slightly over the estimate given you (C in No. 1). This is accounted for by—in accordance with an arrangement made—this company charging 5 per cent. commission on the wages of engine-driver and fireman, and they also charged for supervision. Both these amounts can be saved. It will be seen by these estimates that by supplying your own current this amount is less for 500 lights than gas, whilst, as the lighting is increased, the cost will decrease proportionately.

No. 3 is a return of the plant originally fitted up and now available, and the actual amount paid for the same.

No. 4 is a scheme for refitting the plant in a new engine-house, to be built at a spot pointed out to me by Mr. Kerr.

With respect to this plant, I have no hesitation in saying that, if new plant were required at the present time, you could not obtain any of a better description. The boilers are of a type approved and recommended by Mr. Wilson. The engines are of the best make for electric lighting, and are so excellent and economical of steam that the Tramway Company's engines are now being constructed from drawings made from similar engines in our central station. The dynamos also are of the most efficient type—"The Victoria Brush"—and the last two steamers of the P. and O. Company, the "*Britannia*" and the "*Victoria*," have the same type machines, but of larger size, in use. Three dynamos identical with those of Parliament House have been at work at the Post Office here for over three years, working constantly from dusk to sunrise every day in the year, and an additional one is being fitted up this week. These dynamos are made entirely in the company's factory, and the Post Office authorities can doubtless testify to their efficiency.

In my evidence before you on Friday, I stated that this company is the only one supplying electric light from stations, and it has done this successfully for the last six years—operating sometimes over 2,000 lights.

In addition to this, it has fitted up every incandescent plant, and wired, and made fittings for every building using the electric light in the colony, and it is now engaged in further extensions on a large scale.

It also possesses the patent rights and licenses for the exclusive use of incandescence lamps in the colony of Victoria, and for the construction of self-regulating dynamos, on which principle the Victoria Brush is constructed.

If the new engine-house can be constructed in time, there would be no difficulty, providing the order was given at once, to prepare the machinery, &c., in time for use by June next, and, if the building was not ready, arrangements could be made for temporary lighting from the company's stations.

I shall, if you desire, be glad to afford you information on any other points,

And have the honor to be,

Your obedient servant,

ROBERT E. JOSEPH.

PARLIAMENT HOUSES.

(No. I.)

Estimated Cost for Maintenance of 500 Lights of Twenty-candle power each, for six months, burning for three nights per week, and an average of seven hours per night.

(a) By Gas.—Using burners consuming 5 feet of gas per hour, at 5s. 6d. per 1,000 feet	£375	7	6
(b) By Electricity.—Supplied from a central station, at ½d. per lamp per hour	568	15	0
(c) By Electricity—Working own plant—			
Wages—Engine-driver and fireman, at £5 8s. per week	£140	8	0
Coal, oil, &c.	168	0	0
Sundries, lamp renewals	20	0	0
Supervision to be undertaken by present gas engineer	—		
	£328	8	0

NOTE.—In working own plant, the same outlay for wages would suffice for over 1,000 lights, but coal and lamps would be in proportion to lamps used.

(No. II.)

Return of Expenditure for Maintenance of Electric Light at Parliament Houses from July to December, 1885.

Number of lamps in use, 500 ; amounts paid to the Australian Electric Company for—

* (a) Services of engine-driver and fireman from July 1st, 1885, to January 8th, 1886	... ..	£162	0	0
(b) Services of electrician and for supervision from July to December, 1885	... ..	36	0	0
(c) Sundry stores and lamp renewals	... ..	10	5	5
** (d) Coal and oil from July 7th to August 27th	... ..	55	19	7
Add say same proportion for coal and oil for remaining four months	... ..	111	19	2
Total cost of maintenance...	... ..	£376	4	2

*The engine-driver and fireman were kept on from 18th December to 8th January for the purpose of cleaning up and preserving the plant whilst not in use.

**After August 27th the Public Works supplied coal and oil.

(No. III.)

Return of Original Outlay and Details of Plant supplied for Lighting the Parliament Houses, 1884-1885.

Plant, as fitted up, provided :—

- (1.) Boiler and engine power for 1,200 to 1,500 incandescent lamps and 10 arc lamps.
- (2.) Dynamo machines for 825 lamps of 20-candle power each.
- (3.) Wires, fittings, lamps, switches, &c., for 500 lamps, distributed in Council Chamber, Assembly Chamber, Library, main hall, entrances, and corridors.

Total amount paid for above, including foundations, erection, and maintenance for 100 hours, £5,577 6s.

NOTE.—The whole of this plant is still available if erected in position for working.

(No. IV.)

Refitting Plant now in possession of Government.

An estimate for refitting the plant was submitted some time back.

The plant was then to be fitted up at the Government Printing Offices, a distance of 280 yards from the point of lighting. This made the cost of providing mains large enough to carry the current, without too great a loss, very expensive; although the cost of a new building would have been saved. If it is proposed to build an engine-house at the site suggested by Mr. Kerr, it will altogether alter the cost of the electrical portion of the work.

The dynamos are constructed to work at a pressure of 53 volts, a suitable pressure when the dynamo is located in the building to be lighted, but not suitable for working economically at a distance. There will be no difficulty in converting the three dynamos now in possession of the Government from 53 volts to 110 volts, the machines being of the type made by the company, and who have the necessary material and skilled labour to effect it. Altering the pressure of the dynamos will necessitate new lamps being used of 100 volts, and slight alterations to the fittings; but the cost of this would be more than saved if the whole of the building is at any time electrically lighted, as the present insulated conducting wires, which are laid throughout the buildings, would be large enough to carry all the increased number of lamps required, whereas, if the present pressure is retained, fresh wires would have to be laid.

In building a new engine-house, the setting of the boilers, providing foundations for engines, dynamos, and shafting, should be included in the building contract, and this would effect a considerable saving.

There would then remain fitting up engines, shafting, steam pipes, &c., and this could be done either by contract with an engineering firm, or by this company; but an actual estimate of cost could not be made until plans of building were arranged.

A rough estimate, however, of the cost of fitting engines, dynamos, new mains from engine-house to the Parliament House, new lamps and fittings for the present 500 lights, at from £800 to £900.

To provide increased lighting as originally proposed—that is, 306 additional incandescent lamps and three arc lamps—would involve extra fittings and one arc dynamo, and one spare incandescent dynamo, and this would be an additional cost of £1,300.

As, however, the whole of the building cannot properly be lighted whilst the building operations are going on, I would advise that only the light at present fitted up be used, but that foundations in the engine-house should be prepared for extra machines, and that an extra cable should be laid in the same trench from engine-house to the building, so as to provide for the increased lighting when ready. This would only involve an additional amount of about £200, and would then provide for another 500 lights.

W. H. MASTERS & CO.,

104 Elizabeth street, Melbourne,
March 5th, 1888.

SIR,

In answer to your communication of the 2nd inst., asking for information on the lighting of the Parliament Buildings by means of the electric light, we beg to submit the following answers:—

1st. "At what cost can we supply electric light to the Legislative Assembly Chamber?"

We can supply the electric light from our central station at a rate not exceeding one half-penny per hour per light. The light to be available within four months.

2nd. "For a similar estimate for the whole House."

We can supply the electric light from our central station at a rate not exceeding one half-penny per hour per light. The light to be available within four months.

3rd. "Estimate of cost of lighting the Parliament House with electric light, the Government to use their own plant."

The Government to provide a building with chimney stack on a part of the old Printing House reserve, as previously proposed by us. We will remove the electric plant engines and boilers to that building and install the same in complete running order. We will also provide and lay in the most approved method copper leads with best insulation, enclosed in piping. We will make the necessary changes in leads where required, and provide double pole safety-catches at each end of leads crossing the road (the present being inadequate). We will make such repairs as are necessary for the lights to be used, providing all the lamps required for the purpose.

This work we will undertake to complete for the sum of £2,450.

We may state that we do not consider the present wiring or disposal of the lights suitable for the position in which they are placed, and we are prepared to re-wire the whole of the building on the latest and most approved European and American method, finding all the necessary switches and safety-catches suitable, and new electroliers for the Council and Assembly Chambers, and also the Library will be provided. We will also fit up any other portion of the building with any surplus lights to a maximum of 600 lights, if the apparatus is capable of working the same.

We will complete the whole of this work for £1,050 extra to the previous price, or a total of £3,500 in all. We will complete the whole of the work in four months, or before if the building to receive the plant is ready in time.

We may mention that we have made as careful a survey of the plant and premises as the limited time at our command would allow, and we have come to the conclusion that the installation as it at present stands is unsatisfactory and unsafe. With a view, however, to have an unbiassed opinion, should you desire it, we would suggest that the same be obtained in this or the other colonies.

We are, Sir,

Yours faithfully,

W. H. MASTERS & CO.

T. Watson, Esq., Secretary to the Royal Commission on Electric Lighting.

APPENDIX D.

GAS.—GOVERNMENT OFFICES AND PARLIAMENT HOUSE.

RETURN showing the Amount per Annum paid for Gas, the Rate per 1,000 feet, and the Quantity Consumed at the New Government Offices, the Government Printing Office (at the Exhibition Buildings), the Old Treasury Buildings, and Parliament House, during the Five Years ending 31st December, 1887, including all outside lamps.

Year.	Name of Building.	Amount paid per Annum.	Rate per 1,000 feet.	Consumption.
		£ s. d.	s. d.	Feet.
1883 ...	New Government Offices	185 8 8	6 7	Not given.
	Government Printing Office (Exhibition Buildings)	336 2 5	6 7	1,020,900*
	Old Treasury Buildings	150 3 7	6 7	456,200
	Parliament House	717 3 3	6 7	1,909,530
	Total 1883	£1,388 17 11	...	3,386,630
1884 ...	New Government Offices	201 13 1	6 4½	Not given.
	Government Printing Office (Exhibition Buildings)	335 17 7	6 4½	1,053,700*
	Old Treasury Buildings	140 10 3	6 4½	441,000
	Parliament House	861 8 0	6 4½	2,378,270
	Total 1884	£1,539 8 11	...	3,872,970
1885 ...	New Government Offices	261 1 10	5 11½	Not given.
	Government Printing Office (Exhibition Buildings)	350 10 5	5 11½	1,176,500*
	Old Treasury Buildings	146 2 6	5 11½	490,800
	Parliament House	665 9 9	5 11½	1,841,913
	Total 1885	£1,423 4 6	...	3,509,213
1886 ...	New Government Offices	268 7 7	5 9	Not given.
	Government Printing Office (Exhibition Buildings)	394 10 11	5 9	1,362,300*
	Old Treasury Buildings	154 17 6	5 9	536,700
	Parliament House	948 16 9	5 9	2,963,860
	Total 1886	£1,766 12 9	...	4,865,860
1887 ...	New Government Offices	304 9 2	5 9	—
	Government Printing Office (Exhibition Buildings)	459 4 7	5 9	1,597,500*
	Old Treasury Buildings	200 12 2	5 9	697,800
	Parliament House	957 0 11	5 9	2,996,204
	Total 1887	£1,921 6 10	...	5,291,504

* Does not include the gas used for driving gas engines.

NOTE.—The above Return has been compiled from information supplied by the different Departments, and includes all outside lamps. The gas for the Government Printing Office includes that used for heating purposes; the same meter being used to register the gas used both for heating and lighting, it was found impossible to indicate the consumption for each purpose. It is stated that in the new building the consumption of gas for heating purposes will be very small.

THOS. G. WATSON,
Secretary to the Commission.

APPENDIX E.

GAS.—PARLIAMENT HOUSE.

RETURN showing the Amount per Annum paid for Gas, the Rate per 1,000 feet, and the Quantity Consumed at Parliament House during the Five Years ending 31st December, 1887, including all outside lamps.

Year.	Department.	Amount paid per annum.	Rate per 1,000 feet.	Consumption.	Remarks.
		£ s. d.	s. d.		
1883	Legislative Council ...	80 15 10	6 7	202,400 feet	Parliament met on 67 days.
	Legislative Assembly ...	380 5 0	6 7	971,600 ,,	
	Refreshment Rooms ...	156 14 6	6 7	476,100 ,,	
	Parliament Library ...	99 7 11	6 7	259,430 ,,	
	Total 1883 ...	£717 3 3	...	1,909,530 feet	
1884	Legislative Council ...	94 7 8	6 4 $\frac{1}{2}$	252,200 feet	Parliament met on 75 days.
	Legislative Assembly ...	474 9 8	6 4 $\frac{1}{2}$	1,252,500 ,,	
	Refreshment Rooms ...	195 9 4	6 4 $\frac{1}{2}$	613,100 ,,	
	Parliament Library ...	97 1 4	6 4 $\frac{1}{2}$	260,470 ,,	
	Total 1884 ...	£861 8 0	...	2,378,270 feet	
1885	Legislative Council ...	66 5 9	5 11 $\frac{1}{2}$	174,500 feet	Parliament met on 76 days. The Electric Light was in use during the Session of 1885.
	Legislative Assembly ...	352 7 0	5 11 $\frac{1}{2}$	923,100 ,,	
	Refreshment Rooms ...	192 0 8	5 11 $\frac{1}{2}$	607,300 ,,	
	Parliament Library ...	54 16 4	5 11 $\frac{1}{2}$	137,013 ,,	
	Total 1885 ...	£665 9 9	...	1,841,913 feet	
1886	Legislative Council ...	79 2 10	5 9	226,600 feet	Parliament met on 84 days.
	Legislative Assembly ...	569 12 11	5 9	1,741,800 ,,	
	Refreshment Rooms ...	209 18 6	5 9	730,200 ,,	
	Parliament Library ...	90 2 6	5 9	268,260 ,,	
	Total 1886 ...	£948 16 9	...	2,966,860 feet	
1887	Legislative Council ...	86 19 5	5 9	255,000 feet	Parliament met on 76 days.
	Legislative Assembly ...	550 18 7	5 9	1,674,100 ,,	
	Refreshment Rooms ...	232 3 5	5 9	807,800 ,,	
	Parliament Library ...	86 19 6	5 9	259,304 ,,	
	Total 1887 ...	£957 0 11	...	2,996,204 feet	

NOTE.—The above Return has been compiled from information supplied by the Departments named therein, and includes all outside lamps, the gas used for fuel in the Library, and the gas used for cooking in the Refreshment Rooms.

THOS. G. WATSON,
Secretary to the Commission.

APPENDIX F.

PROFESSOR EWING'S REPORT ON THE ELECTRIC LIGHTING OF THE
LEGISLATIVE ASSEMBLY CHAMBER, MELBOURNE.

The following proposals for electric lighting provide for the supply of the Chamber proper, and also of the vestibule, corridors, staircases, the Speaker's ante-room, and the refreshment room above it, the Cabinet and Committee rooms on the north side of the Chamber, and the room or rooms above them:—

To guard against all possibility of a breakdown in the supply of light to the Chamber proper, I consider that it is indispensable to have storage batteries with a capacity sufficient to supply the lights in it for a period of, say, nine hours. With regard to the lights in the corridors and other rooms, a temporary failure of the electric light would be less serious, as the existing gas fittings in them may be retained, and, therefore, it is less necessary to provide storage batteries for them. It would add about £300 or £350 to the cost of the installation to do so. There is no doubt that the installation would be improved by extending the storage batteries in this way, so that they would be capable of supplying all the lights; and if first cost is not a matter of principal moment, I recommend this addition to the proposals detailed below. The engine, dynamo, and other features of the plan will be the same whether these supplementary storage batteries are or are not provided. In any case I consider storage batteries for the supply of the Chamber proper to be essential.

For the lighting of the Chamber, large incandescent lamps of the new type known as "Sunbeam" lamps should be provided. These are manufactured by the Sunbeam Lamp Company Limited, of Gateshead-upon-Tyne, and have come into favour through their successful use at the Newcastle Exhibition. They serve the purpose of clusters of incandescent lamps of the ordinary small kind. Eight (8) "Sunbeam" lamps, each of 300 candle-power, should be suspended from the ceiling of the Chamber by flexible conductors, so that they will hang at a height of about 20 feet from the level of the central part of the floor of the Chamber. These lamps will be arranged in two rows, each row about 10 feet from the nearest side wall, and the lamps in each row may be spaced at a distance of 16 feet from one another and 12 feet from the end walls. As compared with clusters of small lamps giving an equal amount of light, these "Sunbeam" lamps have the advantage of less first cost for the lamps themselves and for the fittings, greater economy of electric power, and less cost for lamp renewals.

As a supplementary light in the Reporters' Gallery and the Strangers' Gallery, I recommend that six small Edison-Swan lamps, each of 16 candle-power, be fitted in single lamp or double lamp brackets on the east wall, and other six similar lamps on the west wall, at a height of about 6 feet from the gallery floors.

This completes the lighting of the Chamber proper, the equipment of which will, therefore, consist of eight 300-candle "Sunbeam" lamps, and twelve 16-candle Edison-Swan lamps. Storage batteries should be provided of sufficient power to maintain all these lamps in full incandescence for at least nine hours.

For lighting the corridors and other rooms, Edison-Swan lamps of 16-candle power will be most suitable. These may either be suspended from the ceilings by flexible conductors, or in rigid pendants resembling gasaliers, or be carried by brackets on the walls. In no case should an existing gas fitting be utilized for the support of the electric light; but the electric pendants, or brackets, may easily be chosen so that they will harmonize well with the gas fittings. The lamps should be distributed as follows:—

- 4 in the west corridor under the Strangers' Gallery.
- 4 in the east corridor under the Reporters' Gallery.
- 3 in the north-west staircase.
- 3 in the north-east staircase.
- 4 in the vestibule.
- 4 in the Speaker's ante-room.
- 4 in the refreshment room above.
- 8 in the Cabinet room.
- 12 in the Committee room.
- 16 in the room or rooms above these.
- 4 in the engine-house.

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With the twelve 16-candle lamps in the Chamber proper, this makes a total of 78 lamps of 16-candle power, in addition to the eight "Sunbeam" lamps of 300 candle-power.

These lamps should be grouped in circuits, which it will be convenient to extinguish or light at pleasure; and all the circuits should radiate from a single switch-board placed in a convenient central position in one of the lobbies, and fitted with switches by which the various groups may be put off or on at will

The lamps are to be supplied by a dynamo driven by a steam-engine, and working in connexion with storage batteries in such a manner that in case of a stoppage of the engine or dynamo, the batteries will go on supplying current in sufficient quantity at least to supply the lamps in the Chamber proper. It would be practicable to place the engine and dynamo in the basement beneath the Chamber, if a special ceiling were built to act as a deafener, and other precautions were taken to prevent the noise of the engine from being heard. But if it is at all practicable to build a small detached engine-room, I should much prefer this arrangement. The room should be about 30 feet long by 16 feet wide, divided by a glazed partition extending along its whole length at a distance of 6 feet from one side and 10 feet from the other. The part 10 feet wide will serve for the engine and dynamo, the dynamo being driven direct by a belt from the fly-wheel of the engine. The part 6 feet wide is to be fitted with stout benches about 30 inches high and 18 inches wide all round it, on which the storage batteries will stand. If additional storage batteries are used to supply all the lamps, the battery room should be made 10 feet wide instead of 6 feet, to make room for a central bench carrying two rows of cells.

For engine, I recommend a small high-pressure compound engine of the "underneath" type, combined with and standing below a boiler of the locomotive type, as made by Messrs. Marshall, Sons, and Co. Limited, of Gainsborough, with special automatic expansion gear fitted for electric light work, and with a special governor which will allow the speed to be varied between two limits—one to be used when the lamps are lighted, the other when the cells are being charged; in the latter case the dynamo must run 20 per cent. or 30 per cent. faster than in the former case. The engine should be of ten horse-power nominal; it will then be easily able to work at twenty actual horse-power or more. Engines of this class are adapted for working with steam at 140 lbs. per square inch pressure, and by using this high pressure along with compound expansion a considerable economy of fuel is insured.

For dynamo, I recommend an Edison-Hopkinson shunt-wound machine, by Messrs. Mather and Platt, of Manchester, giving a current of 126 ampères with a potential of 105 volts. The dynamo should be erected on a very steady foundation, and with carrying rails and screw-tightening gear, which will allow any slackness in the belt to be easily taken up. To guard against breakdown it will be well to have in reserve a spare armature for the dynamo.

The storage battery (if for the Chamber proper alone) should consist of 54 cells of the type and size known as "31 L," made by the Electrical Power Storage Company Limited, of Millwall, London, and capable of maintaining a discharge at the rate of 60 ampères for about ten hours. In general, current should be supplied to the lamps from the dynamo, with the battery in circuit as a shunt; and when the battery alone is supplying current, the attendant will have to switch off as many groups of lamps from the outlying rooms as will bring the rate of discharge well within that specified above. Measuring instruments—namely, an ampère-meter and a volt-meter—should be fixed in the engine-room, by reference to which the charging and discharging of the battery may be regulated. If storage is to be supplied for all the lamps, a second battery, also of 54 "31 L" cells, should be fitted up and connected in parallel with the first.

If the engine-room is situated at some distance from the Chamber overhead, leading wires will be most suitable for the out-of-doors portion of the circuit. All the indoor wires must be well insulated with india-rubber, and secured in their places by being encased throughout their whole length in wooden casings. The coverings of the casings may be finished and moulded in such a way that their appearance is not objectionable.

I append a formal specification for the supply and erection of the engine and the whole electric plant, exclusive, however, of the building of the engine-house.

The following is an approximate estimate of the cost of such an installation:—

Price of engine and boiler of 10 nom. h.p., compound, underneath locomotive boiler, with steam-jacketted cylinders, Hartnell's patent expansion gear, automatic sight-feed lubricator, complete, with all necessary fittings and mountings, including foundation bolts and plates (as per Messrs. Marshall, Sons, and Co.'s estimate)	...	...	£310
Packing for export, extra	...	...	8
Dynamo as above, by Messrs. Mather and Platt	...	...	145
Spare armature and brushes	...	...	45
Storage batteries for Chamber proper, namely, 54 glass cells, of "31 L" type, at £6 per cell	...	...	324
Lamps, 8,300 candle "Sunbeam" lamps, with holders	...	...	10
Eighty 16-candle Edison-Swan ditto	...	...	20
Spare lamps, say 8 "Sunbeam" and 40 Edison-Swan	...	...	20
Wiring, switches, cut-outs, and erection of fittings, say	...	...	100
Ampère-meter and volt-meter	...	...	10
Sundries and contingencies, say	...	...	50
Total	...	...	£1,042

This is exclusive of the erection of the engine and battery house. It is also exclusive of the cost of the brackets or chandeliers selected for the electric lamps. These last, if reasonably plain patterns are chosen, need not cost more than about £50. The estimate must be understood as applying to an installation of the kind specified, *in England*; the cost of transport of the plant to Melbourne being another additional item.

If the storage battery is extended to include all the lamps, the whole number of cells should be 108, and their cost will be £648, instead of £324 as above.

These figures will furnish some idea of the probable cost of the installation. An exact estimate will easily be arrived at by inviting local electric light contractors to tender in terms of the specification appended to this Report.

J. A. EWING.

Dundee, February 18th, 1888.

SPECIFICATION OF ELECTRIC LIGHTING AT THE HOUSES OF PARLIAMENT, MELBOURNE.

The Contract is to include the furnishing and erection, in working order, of complete electric plant and engine and boiler power for the electric lighting of the Legislative Assembly Chamber and adjoining lobbies, staircases, and apartments, according to the following specification:—

Engine and Boiler.—The engine to be a compound high-pressure engine of ten (10) nominal horse-power, of the “underneath” type, by Messrs. Marshall, Sons, & Co. Limited, of Gainsborough, in combination with a locomotive-type multitubular steel boiler, to work up to 140 lbs. per square inch. The engine to be steam-jacketted, and fitted with Hartnell’s patent automatic expansion gear, and with a governor specially arranged to maintain speed at one or other of two values, one about twenty per cent. greater than the other, and arranged so that the speed may readily be varied from one to the other limit while the engine is running. The engine and boiler to conform to the specification by Messrs. Marshall, Sons, & Co. Limited, which is appended hereto.

Dynamo.—The dynamo to be a shunt-wound Edison-Hopkinson dynamo, of the best and most recent construction, by Messrs. Mather and Platt, of Salford Ironworks, Manchester, to be capable of yielding, in continuous work a current of one hundred and twenty-six (126) ampères at a potential, at the normal speed of 105 volts, and at an increased speed of 130 volts for the purpose of charging accumulators, without undue heating or sparking. A spare duplicate armature is to be provided, and also four spare sets of brushes. The dynamo is to be erected on a massive stone foundation, and on carrying rails furnished with screw-tightening gear to take up the slack of the belt, and is to be fitted with sight-feed lubricators. The dynamo and engine are to be connected either directly or through a countershaft by suitable belting, and so that the speed of the dynamo will be such as to develop a potential of 105 volts for working the lamps direct, and about 130 volts for charging accumulators, when the engine is run at the lower and higher limit of speed already mentioned.

Accumulators.—A storage battery is to be fitted up, consisting of fifty-four (54) cells [*or, according to the alternative scheme, one hundred and eight (108) cells, in two parallel groups of 54 each*] of the type known as “31 L,” of the Electrical Power Storage Company’s most recent construction, in glass boxes, each cell to be capable of giving a discharge at the rate of sixty (60) ampères for ten hours without being re-charged. The battery to be erected on benches in an apartment separated from the engine-room by a glazed partition. Hydrometers are to be supplied for testing the state of charge of the cells.

Lamps.—The following lamps are to be supplied and fixed with holders, leading wires, and all necessary appurtenances:—

I. Eight (8) incandescent “Sunbeam” lamps, as manufactured by the Sunbeam Lamp Coy. Limited, of Gateshead-upon-Tyne. Each of these to be of three hundred (300) candle-power when worked at their normal potential of one hundred (100) volts. These lamps are to be fitted in suitable holders, and are to be hung from the ceiling of the Legislative Chamber at points to be arranged, after consultation with the architect, by means of flexible twin conductors, consisting of a pair of strands of copper wire, strongly insulated with india-rubber and braided silk. Each positive and negative conductor of each lamp to have an aggregate area of section of not less than one-one hundred and fiftieth ($\frac{1}{150}$) of one square inch.

II. Seventy-eight (78) Edison-Swan incandescent lamps, each to give a light of sixteen (16) candle-power at their normal potential of 100 volts. These lamps to be fitted with vitrite holders, with bayonet-joints, and to be carried by ornamental pendants or brackets of forms to be approved by the architect. It is intended to distribute these

lamps according to the following scheme, subject to the discretion of the architect, who will specify the exact locality in which each lamp is to be placed :—

Six (6) on the west wall of the Legislative Chamber, at the back of the Strangers' Gallery.

Six (6) on the east wall of the Legislative Chamber, at the back of the Reporters' Gallery.

Four (4) in the west corridor.

Four (4) in the east corridor.

Three (3) in the north-west staircase.

Three (3) in the north-east staircase.

Four (4) in the vestibule.

Four (4) in the Speaker's ante-room.

Four (4) in the Refreshment room.

Eight (8) in the Cabinet room.

Twelve (12) in the Committees' room.

Sixteen (16) in the room or rooms above these two last.

Four (4) in the engine-house and battery room.

In all, seventy-eight lamps.

Leading Wires.—All main and branch leading wires to be of copper of not less than 95 per cent. of the conductivity of pure copper, strongly insulated with india-rubber, and taped or braided. The sectional area of each conductor to be nowhere less than in the proportion of one-fifteenth hundredth ($\frac{1}{1500}$) of one square inch for every 16-candle Edison-Swan 100 volt lamp supplied by that conductor, and one-one hundred and fiftieth ($\frac{1}{150}$) of one square inch for every 300-candle 100 volt "Sunbeam" lamp. Bare overhead wires carried by strongly fixed porcelain insulator may be employed in the portion of the circuit out of doors between the engine-house and the Chamber.

All indoor wires are to be neatly and securely fixed and covered throughout their whole length in wooden casing, which shall be of a moulded ornamental character wherever that may be required by the architect. All joints in the conductors shall be soldered with resin and insulated in the most approved manner with india-rubber tape, and covered with tape and varnish.

Cut-outs.—Fusible cut-outs are to be inserted in the main and branch leading wires in such manner that the current in no main or branch wire may exceed a value double the normal value of the current in the said wire; but every cut-out must be able to stand without fusing under a current twenty-five (25) per cent. greater than the normal current in the conductor which it protects. A separate cut-out is to be provided for each of the "Sunbeam" lamps, to yield with not less than 8 ampères nor more than 12 ampères. Two spare fusible pieces are to be supplied for each cut-out.

Switches.—A switch-board is to be provided in the engine-house, with switches for (1) connecting the dynamo to the main circuit, (2) connecting the storage batteries to the main circuit, (3) connecting the storage batteries to the dynamo, (4) inserting an ampère-meter in the battery circuit to measuring the charging or discharging current, (5) applying a volt-meter to the dynamo or to the battery. The switch-board is to be fitted with an Ayrton and Perry direct-reading ammeter to read to 120 ampères, and an Ayrton and Perry direct-reading volt-meter to read to 150 volts.

The main wires from the engine-house are to be brought to a switch-board in a convenient position in one of the lobbies of the Chamber, from which separate circuits are to be led for the supply of the eight "Sunbeam" lamps and the groups of lamps in the various rooms and corridors. Each circuit is to be provided with a separate switch and cut-out on this board. The number of lamps which may be grouped on any one circuit shall be determined by the architect.

General.—All materials, fittings, and workmanship to be in every respect of the best quality. The work shall be done at the sight and to the satisfaction of the architect, who shall inspect it from time to time; but such inspection shall in no way relieve the contractor of responsibility for any defect that may afterwards be discovered. The work shall be completed within a period of weeks from the date of acceptance of tender, under a penalty of

Spare Lamps.—The following additional spare lamps shall be provided :—

Eight (8) "Sunbeam" lamps, of 300 candle-power and 100 volts.

Forty (40) Edison-Swan lamps, of 16 candle-power and 100 volts.

J. A. EWING.