41st Congress, 3d Session. } HOUSE OF REPRESENTATIVES. { Report No. 48.

VENTILATION OF SENATE CHAMBER AND HALL OF HOUSE OF REPRESENTATIVES.

March 3, 1871.—Ordered to be printed and recommitted.

Mr. Jenckes, from the Joint Committee on Ventilation, made the following

REPORT.

The Committee on Lighting, Heating, and Ventilating the halls of the Capitol, to whom was referred the petition of F. C. Clark, agent, for the substitution of Wilson's electrical lighter for the one now in use over the Hall of the House of Representatives and in the dome and rotunda of the Capitol, submit the following report:

The committee gave notice of the pendency of said petition to Samuel Gardiner, the present electrician of the Capitol, and heard the parties at length upon the comparative merits of the apparatus. The committee have also examined the Gardiner apparatus, now in use in the Capitol, and have visited Corcoran's Art Gallery in this city and witnessed the operation of the Wilson lighter. Each apparatus is operated by electricity, but upon a different principle, and by substantially different means.

The Gardiner apparatus requires the use of the galvanic electricity, generated in such quantity as to heat a platinum wire over the lip of the burner to redness, and thus ignite the gas when it begins to flow. The battery required for this purpose is very large and powerful, and occupies one entire room in the central building of the Capitol. The Wilson lighter operates by an electric spark passed through the gas at the moment it is turned on. For this purpose a small battery only is required, with a coil and a connection, by means of a wire, with the burner, where the circuit is broken, and the spark made to pass between the disconnected points of the wire, whenever the electricity is permitted to act. The cost and the advantages and disadvantages of each are fully set forth in the papers hereto annexed.

As this business of lighting the Capitol is in charge of the Superintendent of Public Buildings and Grounds, the committee addressed a series of questions to him, framed so as to obtain information upon some questions of fact in dispute, and also to obtain his opinion upon the relative merits of the apparatus. A similar communication was addressed to the Architect of the Capitol. The questions and the answers of the two officers to whom they were addressed are hereto annexed.

The committee have looked at this proposition for a change in the mode of lighting the gas in the Capitol as a question of economy, under certain conditions. These conditions are that each apparatus should be certain and reliable in its operation, and not liable to accidents arising from its construction and mode of operation; and that there should be no liability for the use of any patented invention. It should require no

greater amount of skill to operate one than the other, or to keep the parts of the apparatus in repair and in working order.

Supposing those conditions to be equal, the Wilson apparatus is so much simpler in its construction and operation than the other, that the expense required to keep it in constant use appears to be but little more than the salary of the electrician. The saving in the use of the Wilson apparatus over the expense of keeping up and operating the Gardiner apparatus would pay for the cost of the change in four or five years at the furthest, even if nothing were realized from the sale of the apparatus now in use. On the question of economy the advantage is greatly in favor of the Wilson lighter.

The architect, however, does not seem to think that the Wilson apparatus has been in use for a sufficient length of time, or under circumstances testing its qualities and capacities, to justify its being placed in the dome of the Capitol, where any slight accident or failure to operate might be attended with dangerous consequences. As it has been already ordered to be applied to the lighting of the gas in the Senate chamber, it may be well to wait until its operation is there tested, before introducing it into the other parts of the building. If it be found equally reliable and certain as the Gardiner apparatus, and no more liable to derangement or accident, the committee are of opinion that the change ought to be made as a matter of economy. But they recommend that the subject be referred to the Superintendent of Public Buildings and Grounds, and the Architect of the Capitol, and that action be deferred until the results of the experiments they may make or require shall be known; and that, if any appropriation is made, it shall be expended or not according to their decision.

The committee append to this report the report made in the Fortieth Congress by the Committee of Accounts on the lighting of the gas by electricity.

HOUSE OF REPRESENTATIVES,
Washington, D. C., February 25, 1871.

DEAR SIR: The Committee on Ventilation, &c., request answers from you to the following questions:

1. What has been the approximate cost of apparatus for lighting the gas in the dome of the Capitol and the hall of the House of Representatives?
2. What has been the cost of operating the apparatus since its introduction?
3. What are the elements of loss or waste in its use, if any, and what proportion do they bear to the whole expense?
4. Are you acquainted with what is known as the Wilson apparatus for lighting gas-burners?
5. How does the first cost of the same compare with the cost of the Gardiner apparatus?
6. How does the cost of operating the Wilson apparatus compare with that of Gardiner's?
7. What is the comparative expense of repairs upon the two?
8. Suppose the expense of a new apparatus, according to the Wilson method, should cost not exceeding $15,000 for the rotunda and the hall of the House, and the expense of its operation should be reduced to the salary of a single electrician and almost a nominal expense for chemicals and battery, would it, in your opinion, be advisable to substitute such an apparatus for that now in use?

Please answer as soon as convenient.

Respectfully, yours,

T. A. JENCKES,
Chairman of Committee on Ventilation, &c., on part of the House.

General N. MICHLER,
Superintendent of Public Buildings, &c.

OFFICE OF PUBLIC BUILDINGS, GROUNDS, AND WORKS,
Washington, March 1, 1871.

SIR: I have the honor to acknowledge your letter of the 25th ultimo, respecting the apparatus for lighting the gas in the dome of the Capitol and halls of the House of Representatives, and requesting certain information in connection therewith. Presuming that you have retained a copy of the letter, I propose to answer your questions in the order in which they are asked, viz:

1. Original cost of apparatus for lighting the dome of the Capitol and hall of House of Representatives has been $35,718 37.

2. Cost of operating the apparatus since its introduction, $15,240 56.

3. Of the foregoing amount of $15,240 56 for operating, $9,976 76 was for salaries and $5,263 80 for chemicals and materials.

4. I am not well acquainted with the Wilson apparatus for lighting burners, but have seen the gas jets lighted in the halls of the Corcoran Art Building by this apparatus, and, in my opinion, it worked remarkably well.

5. The first cost of the Gardiner apparatus is given in the first answer at $35,718 37, and I have never seen an estimate for placing the Wilson apparatus in the localities referred to.

6. I am not acquainted with the cost of operating the Wilson apparatus, excepting so far as the agent informs me. It will be seen by the second answer that the cost of operating the Gardiner apparatus, which has been up about five years, averages about $3,048 11 per year for material and operating.

7. There are no data in my possession to enable me to answer this question. The repairs, if any, have been made by the Architect of the Capitol.

8. It will be seen by the figures already given in regard to the Gardiner apparatus, that, for the five years it has been in operation, the sum total, including the original cost of apparatus, maintenance, and labor, is $50,958 93. Presuming the cost of the Wilson apparatus not to exceed $15,000, as stated in this question, and for operating and material not to exceed what the agent states, the cost for the same length of time will be $21,250. There is, therefore, a difference of $29,708 93 in favor of the Wilson apparatus. In regard to substituting the Wilson for the Gardiner apparatus, I think before making the change it would be advisable to appoint a commission with a view of testing the relative merits of each.

It may be proper to state that the information relative to the cost of the Gardiner apparatus has been furnished by the First Comptroller of the Treasury up to March 1, 1867, and since the latter date to February 28, 1871, it has been taken from the books of this office.

Very respectfully,

N. MICHLER,
Major of Engineers U. S. A.

Hon. T. A. JENCKES,
Chairman of Committee on Ventilation
on the part of the House of Representatives.

ARCHITECT'S OFFICE, UNITED STATES CAPITOL EXTENSION,
Washington, D. C., February 27, 1871.

SIR: In reply to yours of the 25th instant, requesting a statement as to the cost of Gardiner's electric lighting apparatus, now in the dome and hall of Representatives, I have the honor to state that the apparatus for the dome cost about $26,000; that for the hall of Representatives, including the recent extension of the same, $11,000. In the foregoing amounts the sum of $2,000 is included for gas-pipe and services of gas-fitters.

I am not able to state the cost of operating this apparatus, or the element of loss, as these expenditures are under the control of General N. Michler, whom I have written, requesting the information desired.

I have some knowledge of the Wilson apparatus, but have not had any experience in its working. While I believe it is less costly to put in and to operate than the one now in use, yet I do not believe it would be wise to make any change, particularly in the dome, where there is no ventilation. The Gardiner apparatus has proved successful after years of trial. Owing to the platinum coils being red-hot for some time, there is a certainty of all the jets being ignited; while the other being lighted by a spark, if there should be many burners not lighted, there would be danger (in the dome) of the explosive mixture being formed, and serious consequences might ensue.

Very respectfully, your obedient servant,

EDWARD CLARK,
Architect.

Hon. THOMAS A. JENCKES,
Chairman Committee on Ventilation
on part of House of Representatives.

Memorial of F. C. Clark, agent, praying the substitution of Wilson's electrical lighter for the one now in use over the hall of Representatives and in the rotunda and dome of the Capitol.

To the honorable House of Representatives of the United States:

Your memorialist, fully believing that he is in possession of the most practical, durable, economical, and only instantaneous method in use for lighting gas by electricity, viz, Wilson's electric gas-lighter, the only plan in which the *electric spark* is applied to such a purpose, and in view of the fact that during the previous session of this Congress said Wilson's lighter was adopted for lighting the burners over the Senate Chamber, after a thorough comparison of its merits with those of the apparatus now employed over the hall of Representatives and in the dome and rotunda, viz, Gardiner's apparatus, your memorialist, therefore, as agent for said invention, being desirous of at once introducing the same in lieu of the Gardiner lighter, would respectfully ask your attention to a concise description of the two methods, and the comparative relation they bear to the following principles involved, viz, economy, durability, rapidity, and safety.

ECONOMY.—The Gardiner method consists of a Smee battery of one hundred and sixty cells, containing each six gallons of diluted acid, and two plates of amalgamated zinc, each 9 by 10 inches, and a plate of platinized carbon of the same dimensions. The igniting of the gas is done by applying the current of electricity generated by this immense battery to a coil of fine platinum wire, which is heated to a white heat. In no case are there more than thirty burners lighted at one time. This battery is in constant consumption during the sessions of Congress. The following tabular statement, compiled from the records on file in the Treasury Department, exhibits the annual cost for maintenance of the Gardiner apparatus for the fiscal years ending June 30, 1867, 1868, and 1869. There is also considered in the statement the number of times the hall of Representatives and dome were lighted, the number of burners to which the apparatus was applied, and average cost for lighting each:

	No. of burners.	No. of times lighted.	Annual cost.
Fiscal year ending June 30, 1867	1,075	33	$2,652 72
Fiscal year ending June 30, 1868	1,243	24	3,321 99
Fiscal year ending June 30, 1869	2,193	47	3,959 80

Average cost per night in 1867	$80 38
Average cost per night in 1868	138 41
Average cost per night in 1869	84 25
Average cost for each burner, each time lighted, in 1867	07.5
Average cost for each burner, each time lighted, in 1868	11.1
Average cost for each burner, each time lighted, in 1869	03.8
Total cost for three years	9,934 51
Average cost for one year	3,311 50
Average cost for lighting each burner, each time lighted, during three years.	05.9

In addition to the cost of the maintenance of this apparatus for the three years above specified, there is justly chargeable the cost of forty cells of battery, which were consumed within that time. The number of cells originally purchased by the Government, in 1866, was two hundred. There are now but one hundred and sixty. Their cost was $46 06 per cell; total cost for forty cells consumed, $1,842 40. Adding this amount to the $9,934 51 stated above, the total cost for the three years is $11,776 91
Average cost for one year 3,925 64
Average cost for lighting each burner 07

The Wilson method employs a battery of but twelve Smee cells, of much less dimensions than Gardiner's, in connection with the induction coil. The battery is so arranged as to be in consumption only for the few moments actually employed in lighting; the plates, by mechanical device, being immediately removed thereafter from the acid, thereby rendering the annual cost for maintenance merely nominal.

DURABILITY.—The items of expense for maintenance of Gardiner's apparatus disclose great lack of durability, requiring the services of an electrician and assistant, both experts, to operate and keep it in repair, whose pay amount jointly to $2,295 per annum.

The platinum coils, in order to perform their office, are located in the hottest portion of the flame, and also where the utmost chemical action takes place, consequent upon the peculiar heat-generating property belonging to that metal; thus decomposition rapidly ensues, requiring their frequent renewal to an extent not less than 10 per cent. during and after each session of Congress, and, being of about the same value as gold, entails a large item of expense. The coils are also liable to be destroyed by an overcharged battery, and from the want of uniformity in the length, thickness, and quality of the wire to be heated.

The Gardiner apparatus is not and cannot be a reliable lighter, for the reason that it depends upon a *continuous circuit*. The destruction of any one of these platinum coils comprising parts of the circuit renders it impossible to ignite any one of the burners; and almost invariably this defect is not discovered until it fails to perform its office. Then, too, the nicety of their adjustment renders them constantly unreliable, both from contraction and expansion, and from the dusting and cleaning always necessary.

Wilson's lighter, on the contrary, depends upon *breaks in the circuit*, the electric spark leaping from metallic points into the burner. Hence the extreme care which is required in the Gardiner method, to preserve an unbroken circuit, is avoided; the least possible break under that method rendering his battery powerless.

RAPIDITY.—The Gardiner lighter is a *slow* method of lighting, not only on account of the limited number of burners which can be ignited at one time, but also from the fact that it requires a full and uniform flow of gas; for while the air contained in the pipes is being expelled, the wires are kept cool, and until it all escapes they will not ignite, thus requiring considerable time for lighting.

The Wilson lighter is instantaneous; the spark can be transmitted from burner to burner, through the entire circuit, at least one hundred times per minute, igniting the gas the moment it is emitted from the burner, no matter how small the quantity.

SAFETY.—The Gardiner lighter entails great waste of gas, endangering both the health and safety of those wherein it may be operated. The gas is turned into a pipe containing several sections of burners, which must be lighted in turn, in consequence of which there must necessarily be a very great amount of gas emitted unburned, before the battery can be applied to all; a considerable quantity of gas being also lost during the expulsion of the air from the pipes, as the coils are then being cooled, and ignition is impossible until a full flow ensues, as hereinbefore shown. These facts demonstrate the necessity of lighting up a long time before required for use, in order that the escaped gas should work off; thereby a great and additional expense is incurred. A careful observation of the length of time required in the operation of lighting shows a waste of gas, in value not less than $4 80, which, properly, should be added to the annual cost, heretofore shown.

Probably not the worst feature of this waste is the vitiation of the atmosphere, which all therein engaged have to breathe, as there is in this method, under the most favorable circumstances, a great escape of gas, arising from so great a number of burners being so tardily lighted, and, as the lighting process is frequently performed during the sitting of the House, the possibility of explosion is a subject of the gravest importance, the disastrous result of which can only be estimated. Comparing the relative strength of ceiling and roof, in all probability the force of an explosion would precipitate the entire glass panneling into the hall below. It is a fact well known in chemistry that a highly explosive mixture is produced by a combination of 15 to 20 per cent. of coal gas with atmospheric air; therefore any plan necessitating an escape of gas for four or five minutes, from so many burners in so confined a space as that in which they are located, would make an explosion not only possible, but probable. This danger would be greatly increased, in fact, rendered almost inevitable, should there be a simultaneous destruction of coils in two or three of the sections of burners, in which event all on those sections would fail to ignite, and the gas flow until it be lighted by other means.

The Wilson lighter entails absolutely NO WASTE OF GAS. There being no circuits to break, nothing about its paraphernalia of a destructible character, the performance of its office is inevitable, the sparks of electricity being transmitted through the burners many times each second, ANTICIPATING the flow of gas. The ignition would be instantaneous, however, if the gas reached all the burners at the same instant.

Your memorialist would respectfully submit that all the difficulties which are, sooner or later, sure to arise in the use of the heated platinum wire, are overcome by adopting the electric spark generated by the induction coil used in connection with a few small cups of Smee's battery, which constitute Wilson's lighter. This arrangement will do the work of the 160 cells, as now applied by Gardiner. The only part that can wear out is the battery; and as 160 pairs of plates, other things being equal, wear out just as soon as 12 pairs, by such a reduction in the number of plates used, and in the time of their employment, the expense of keeping a battery in operation is almost annihilated.

Your memorialist would respectfully call the attention of your honorable body to the fact that, upon the request of the chairman of the Senate Committee on Public

Buildings and Grounds, Professor Joseph Henry made a report upon the relative merits of the two lighters, highly favorable in its terms to the Wilson method. He would also refer you to the following extracts, taken from a report of a commission, appointed 31st of October, 1865, by the Secretary of the Interior, composed of Professor Joseph Henry, Charles G. Page, and James H. Simpson, lieutenant colonel engineers United States Army, to examine and report upon the Gardiner apparatus, now used in the Capitol. Said report, dated 26th April, 1866, is now on file in the Interior Department; and also would beg leave to submit, as evidences of the stability and economy of the Wilson apparatus, the following testimonials, selected from many of like character, furnished him by the proprietors of buildings in which the lighter has been for years, and is now, in practical operation.

The lighter has been recently introduced into the Corcoran Art Building, of this city, to the entire satisfaction of the founder:

Extracts from the Henry, Page, and Simpson report.

"To heat to redness a single fine wire of platinum, such as is used to kindle a gas jet, requires but a very small quantity of electricity; but when the same current is used to heat, simultaneously, a large number of wires, the power required necessarily increases in a geometrical ratio—a consideration which, in the opinion of the commission, ought to have militated very much against the choice of this method.

"The electrical power which has been provided for kindling the gas in the dome, and operating the stop-cocks, consists of 200 large glass jars, each containing six gallons of diluted acid, and two plates of amalgamated zinc, each 9 by 10 inches, and a plate of platinized carbon of same dimensions. The power of this apparatus is derived from the combination of the zinc and of the acid, in which process both the zinc and the acid are continually consumed. Even the platinum wires, under the operation of an intense galvanic current, are dissipated in the form of a fine powder, and in time will also require renewal.

"The cost of supplying the materials constantly consumed in the batteries will, according to the prices which have been charged in the accounts submitted to the commission, amount at least to $2,500, and if to this is added the salary of an electrician, competent to repair and adjust the work, as estimated by Mr. Gardiner, at $2,500, the annual expense will be about $5,000.

"The commission have witnessed, on two occasions, the kindling of the gas by means of the electrical apparatus, and find, contrary to what they were led to suppose before examining the arrangements, that all the jets are not lighted at once, as it were, by a single flash, but in sections of about 30 at a time, so that from 10 to 15 minutes are required to complete the illumination of the dome, and in both cases several of the jets were not ignited upon the first application of the electric current, from which it is inferred that the platinum wires are liable to displacement, and it is evident that, from their present exposure, it will be difficult to guard against such a contingency.

"In this connection it is proper to state that, however interesting the exhibition may be of the instantaneous lighting all the jets by a single discharge of electricity, or in rapid succession by means of the flash tube, caution should be used, previous to definite experiments on this point, in opening at once all the stop-cocks, since an accumulation of gas in the tholus, or any portion of the dome, to the extent of from 15 to 20 per cent. of the volume of atmosphere, would form an explosive mixture, and endanger the whole structure."

TESTIMONIALS.

"HARTFORD, CONN., *February* 3, 1870.

"It is now eight years since Allyn's Hall has been lighted by Wilson's electric gas-lighter; it has been in constant use for at least four nights in each week during that period, and has given the most perfect satisfaction. The time saved by this method in lighting a large hall will essentially reduce the quantity of gas consumed, which would otherwise be suffered to escape during the time occupied in lighting up.

"It gives me great pleasure to assure you of the satisfactory results experienced from the continued use of your electric gas-lighter.

"JOHN ALLYN."

"NEW YORK, *January* 29, 1870.

"This may certify that the method of lighting gas by the electric spark, from an induction coil known as Wilson's patent, has been in use in the lecture-room of the Cooper Union for a number of years with the most complete success. Among its excellencies are the simplicity and comparative durability of its fixtures, the comparatively small battery power required to work the coil, and the certainty of its operation under ordinary care and attention. Its use for any time in any public hall or lecture-room will render it almost an indispensable necessity, as it is now regarded here.

"CHARLES S. STONE,

"*Professor Chemistry, &c., Cooper Union, New York.*"

"BOOTH'S THEATER, NEW YORK, *March* 31, 1870.

"The Wilson electric gas-lighter has been under my charge one year; it lights 900 burners in the auditorium, and has never failed once. The chandelier is turned off and relighted five times during the performance. It saves about $50 a week in gas. The expense for battery is $12 for one year. I consider it a perfect success.

"JOSEPH SCOLLEN, *Engineer.*"

"Wilson's method of lighting gas by the spark of electricity obtained from the induction coil of Rhumkorff is a most useful and ingenious application of electricity, and is now so generally known and highly appreciated as to require neither encomiums nor any description. I believe Mr. Wilson's method was original with himself, having been covered by a patent from the United States. I have mentioned Mr. Wilson's method, in connection with the induction coil, in my Physics, published in 1861.

"B. SILLIMAN,

"*Professor Chemistry, Yale College.*"

Your memorialist proposes to your honorable body to furnish for the hall of Representatives, dome, and rotunda, an apparatus of the most substantial character, and to apply it in the most workmanlike manner, for the sum of fifteen thousand dollars, ($15,000.)

Very respectfully, your obedient servant,

F. C. CLARK, *Agent.*

MR. GARDINER'S STATEMENT.

To the Hon. THOMAS A. JENCKES,
Chairman of Committee on Ventilation:

I would respectfully submit for your consideration the following statement as a partial answer to the memorial of F. C. Clark:

Mr. Clark asserts in his memorial that the Wilson lighter was adopted by the Senate to light the burners over the Senate chamber during the previous session of Congress, after a thorough comparison of its merits, as compared with my invention. I can positively assert that no such comparison ever took place, as no member of the committee who reported the bill ever called on me for any information concerning my apparatus.

Mr. Bogart, for whose benefit the bill was reported, claimed to be the sole agent for introducing the Wilson lighter, and although I am aware there was some trouble between Mr. Bogart and Mrs. Wilson, widow of the inventor of said lighter, I cannot assert that the agency has been transferred to F. C. Clark, but would most respectfully suggest some inquiries be made as to who really is the agent for said lighter.

Mr. Bogart, in pressing the lighter on the notice of the Senate, claimed in his memorial as a fact that he would light all the burners in the Senate chamber at one flash, the same as Mr. Clark seems to claim he would do in the House of Representatives. But Mr. Bogart, in closing the contract with the architect, Mr. E. Clark, distinctly states that he will light each panel separate, the same as I now do in the hall. Mr. Clark would no doubt have to do the same thing.

The Wilson lighter has been taken out of the picture gallery of August Belmont, esq., for two reasons: first, it was a nuisance on account of the offensive smell from the battery used; secondly, it would not do the work as claimed for it. It has also been taken out of Cooper Institute, and has been abandoned by the proprietors of Steinway Hall as a perfect and complete failure, after giving it a fair test for three months.

The lighter was put in the picture gallery of Belmont by Messrs. C. T. & J. N. Chester, a firm thoroughly competent to do the work, and men who have had a large experience in all kinds of work where electricity is employed. It was put in the Cooper Institute by the inventor himself; and when they could not make it work successfully, it does not seem possible that Mr. Clark, who has had no experience in the business, could make it a success, more especially when there is at least five times the number of burners in the hall of Representatives that there was in either of the places named.

Mr. Bogart placed the lighter in both Steinway Hall and Booth's Theater, New York. In the hall it proves a complete failure; in the theater it misses from ten to thirty burners every night. That is the record of the success of Mr. Bogart in placing the Wilson lighter in working order.

For a report of the only complete and impartial test, as between the merits of the Wilson lighter and my invention, I respectfully refer you to the report of the board of managers of the American Institute, and the decision of committee appointed by the said board to decide on the relative merits, both the board of managers and the committee awarding me the two first medals and diplomas, after a test of seven weeks, during which time the models stood side by side.

But allowing the Wilson lighter to be a perfect success in lighting, (which I deny,)

by what right does F. C. Clark assume to put magnetic engines in his estimates, as for the purpose of turning on and off gas by electricity, when I hold five patents on the magnetic engines as used for that purpose, the first of which was granted in 1858, and for improvements as follows: 1st of May, 1864; 9th of June, 1866; 4th of September, 1866; 19th of February, 1867? I also hold the exclusive right to use lava tips, or any other insulating tips, as applied to gas-burners where electricity is used to light the gas; and that fact must compel Mr. Clark to use metal burners, the natural consequence of which would be their corrosion, the same as was the case with the flash-tube when used in the hall of Representatives. I refer you to House Report 31, second session Fortieth Congress.

Mr. Clark seems to lay considerable stress on the report of Professor Henry. Henry's report was never accepted by the Secretary of the Interior, being considered irrelevant to the object for which that committee was formed, viz: an inspection of the work as done by me in fitting up the dome by my invention.

Allow me to give you two reasons why the carrier or flash-tube was not employed in the lighting the dome:

To light the dome by the tube would require eight lines of 2½-inch gas-pipe running from the flooring to the different tiers, each line with stop-cock attached, which would be a most unseemly looking affair on the inside wall of the dome, and the corrosion that would inevitably take place in the nipples would cause an expense of not less than $1,000 per annum to clean. True, the carrier tube could have been touched off at the different tiers, but that would compel the operator to descend a rope to the first cornice—a rather dangerous operation, especially at night.

As to the durability of the platina coils, I have no hesitation in asserting that where they are inaccessible they will remain for years without requiring any renewals whatever; for instance, the old hall, where there are fifty-six burners in exactly the same condition and with the same platina tips that were placed there three years ago, the House of Representatives has not had but eighty new platinas during the time my invention has been used there, and every one of them was broken by the workmen employed there last summer. I have no hesitation in asserting that from three-fourths to nine-tenths of all platinas renewed in the dome have been rendered necessary by breakages caused by the laborers during the annual cleaning of the dome.

As regards the expense attending my battery, Mr. Clark has no doubt shown a large array of figures; but it happens they are not all chargeable to my battery. For the three years he takes as his basis the actual amount of acid used by me was $250 85 as against $459, charged by him; he also charges me with $1,842 40 for forty cells of my battery, which he says have been consumed, but which I am happy to say are still in my charge, less a few of the jars broken. The only reason that I do not use the two hundred cells is, that I find one hundred and sixty quite enough to do the work. I do not think the salary of myself and assistant can be charged as material, which would make a considerable difference in the annual expense, as, no matter what method of electric gas-lighter is used, it is imperative to have an electrician to take charge of it.

All the material actually used in my battery amounts to $2,038, making an annual average of $509, as the material has actually lasted four years up to November, 1870, and will last from two to three years more. All of which I respectfully submit to your consideration.

SAMUEL GARDINER,
Electrician.

MR. GARDINER'S STATEMENT—No. 2.

Hon. THOMAS A. JENCKES, *Chairman of Committee on Light, &c.:*

DEAR SIR: I will only make a few remarks in addition to my statement already before you, and will make them as brief as possible. In the statement of F. C. Clark, that I placed my electric gas-lighting apparatus in the Broadway Theater and that it was a failure and abandoned, I will state to you that I placed it in the Broadway Theater, and that it worked every night with perfect success, never having made a failure, and the apparatus remained in said theater until the building was taken down to make room for a block of fine stores. I will refer you to C. S. Marshall's sworn statement as to its perfect success. (Certified copy from the Commissioner of Patents, marked A.)

Mr. C. S. Marshall was the proprietor of the Broadway Theater until the building was taken down. As for F. C. Clark's statement that Mr. Chester employed me to put the electric gas-lighting apparatus in August Belmont's picture gallery, and that I had operated the same, is not true. The Wilson electric-spark apparatus was placed in August Belmont's gallery in Fifth Avenue by the Messrs. Chesters. I had never been in Mr. Belmont's house until Mr. Chester invited me to go with him to see the workings of the Wilson apparatus. The Chesters lighted it up; a number of the burners missed to ignite; they were carefully adjusted and another trial was made, and

others again would fail to light. Mr. Chester then informed me that it had been in operation several weeks, and at times he would succeed to light all the burners, and then again a portion would not ignite. I informed Mr. Chester that Mr. Wilson, the inventor, had the same trouble, viz: the difficulty of insulation and the changes of the temperature would cause the spark to take various directions, and that the same adjustment would not answer in all temperatures. Mr. Chester informed me that he had more trouble with it than it was worth; that he had already expended more money than he was to get for it, and wished me to take it off his hands and introduce my apparatus. I declined to do so, and never put my electric gas-lighting apparatus in August Belmont's gallery, or ever worked the Wilson lighter in said gallery. It was a perfect failure in Belmont's gallery, and Mr. Belmont ordered it taken out, which the Mr. Chesters did, and did not receive one dollar for their trouble. I will refer you to Mr. August Belmont's letter of February 9, 1871, marked B.

In regard to Steinway Hall, the Wilson patent was placed in said hall two or three years since, and they had it in operation some three months; it failed so often to light the burners, and so much trouble to keep it in order, that it was abandoned after three months' use as a perfect failure. I will refer you to letter of Mr. Bartlett, dated New York, February 3, 1871, marked C.

Booth Theater: the Wilson spark-lighter has been introduced, and it fails every time it is lighted to ignite all the burners, and hand-lighting has to be resorted to. Refer you to letter marked C.

At the Cooper Institute, where it was placed by Mr. Wilson himself, it was used for a time, and it failing to light the large number of burners required, was taken out and a portion of the apparatus was placed in the lecture-room of Professor Stone, in same building, where, under the management of Mr. Stone, with a small number of burners required to be lighted, makes it answer his purpose. The Music Hall, New Haven, often fails to light all the gas-burners, and on several occasions some of the burners remain unlighted all the evening.

As regards my electric gas-lighting apparatus, it was placed in A. T. Stewart's house, New York, some three years since, and has always lighted the burners with perfect success, there being some three hundred and twenty-five gas-burners in his picture gallery alone, Mr. A. T. Stewart being so well satisfied with it that six months after he closed a contract with me to put my electric gas-lighting apparatus in his store, corner of Broadway, Tenth street and Fourth avenue, lighting over two thousand gas-burners. One year and a half after I had finished his store, and having a successful trial all that time in lighting the gas in his store, Mr. A. T. Stewart closed another contract with me to extend my gas-lighting apparatus to his new addition on Broadway and Ninth street, which I completed over one year since, and is now in successful operation every night. I will refer you to letter marked C, dated February 3, 1871; also to certificates marked Nos. 5 and 6.

In the Academy of Music, New York, it was placed only to the border light, to produce a sudden effect on some scenery in Ullman's opera. It worked with perfect success until the close of his engagement, some eight months. The building was closed for over a year, and soon after the building was burned.

* * * * * * *

As regards the perfect success of my electric gas-lighting apparatus for the past five years, it is well known to all the members of Congress. It has never made a failure in the whole five years, and is now at this time working with perfect success. As regards the expense which Mr. F. C. Clark states, I have admitted that the zinc, carbons, quicksilver, platina tips, chloride of platina, and the larger portion of the acid is correct, which amount, taken for the average of five years, will not amount to over $500 per annum. F. C. Clark attempted to swell up a bill of expenses which did not belong or chargeable to the battery. In one case, where Mr. Edward Clark, architect, made a change of running the whole line of wire belonging to the dome in another direction, and where an entirely different kind of wire was used, and a large quantity was required, is charged to battery account; also where a change had to be made in the dome indicator to accommodate the lighting of the rotunda, that was charged to battery account; also a large quantity of glass globes furnished for the old hall of Representatives was charged to battery account. Cockroach powders, boxes of soap, and other articles were charged to battery account, which I have had nothing to do with, as I have said before that the sum of $500 is about the average cost of maintaining the battery for the last five or six years. I am sorry that so much of your valuable time has been taken up with this personal quarrel of Clark and myself. I have been obliged to defend my rights. I would be most happy to have the committee visit my department and examine for themselves the battery and the gas-lighting apparatus, as they will have the opportunity to see the magnetic engines, indicators, the electric lava-tip burners, and everything pertaining to the lighting gas by electricity.

Most respectfully, your obedient servant,

SAMUEL GARDINER,
Electrician.

Hon. THOS. A. JENCKES,
Chairman on Lighting and Ventilating the Halls of the Capitol:

TURNING ON GAS, ETC., BY THE AID OF ELECTRICITY.—Patented December 22, 1857.

The object of this invention is to control and regulate the supply of gas to burners by a mechanism operated by electricity.

The object of my invention is to bring the service or supply cock by which the gas is supplied to a number of burners that are to be lighted by electricity, to be opened or closed or made to regulate the supply to the said burners, under the control of a person at a distant part of a building or other place; and to this end my invention consists in furnishing the service or supply cock with a ratchet wheel, or its equivalent, to be engaged by a pawl or dog, or the equivalent thereof, attached to one end of a lever whose opposite end has attached to it the armature of an electro-magnet.

Claim.—I do not confine myself to the particular method herein described of accomplishing my object, but having thus described the construction and operation of my invention, I claim broadly turning on or shutting off inflammable gas by degrees or gradually, through the agency of electricity, for such purposes as are hereinbefore alluded to.

(Refer to patent dated June 19, 1866, for turning on and off gas.)

DIVIDING THE CURRENT OF ELECTRICITY.—Patent dated November 29, 1864.

There is great difficulty in lighting a large number of gas-burners by passing one continuous current of electricity through a number of platina coils, the resistance being so great that the galvanic battery could not act or generate the electricity to its full extent. I have found by experiment that to divide the current by having several smaller wires leading from the main conducting wire to several sections of gas-burners to be lighted, that I could light a much larger number of gas-burners by the same current of electricity generated by a galvanic battery. By actual experiment I have found that where I could light but ten gas-burners by having only one continuous current, by dividing the current into ten sections I could light one hundred gas-burners by the same current passing over the main conducting wire from the galvanic battery. It makes no difference if the connection of the several smaller wires are brought in connection with the main wire at the switch, the result is the same.

I claim dividing the current of electricity generated by a galvanic battery into several circuits, as herein specified, for the purpose of lighting a large number of gas-burners by electricity.

GENTLEMEN OF THE COMMITTEE: You will see at a glance that my claim for turning on and off gas through the agency of electricity is broad. If, as has been suggested, that other power would be used to turn the gas-cock, you will see that the parties would have to infringe upon my patents, as they could not bring the other motive-power into action for the purpose of turning on or off the gas without the agency of electricity. You have my several patent papers before you, and any other information you may require please send for me, and I will be most happy to give it to you.

Respectfully, your obedient servant,

SAMUEL GARDINER,
Electrician.

Hon. THOS. A. JENCKES,
Chairman of the Joint Committee on Ventilation:

Mr. Gardiner's reply to my memorial seems directed, so far as the claims made for the superiority of the Wilson lighter are concerned, entirely to those alleged to have been put forward at some past time by Mr. Bogart, my predecessor in the agency for this apparatus. In doing so he said that Mr. Bogart had declared before the Senate Committee on Public Buildings and Grounds his ability to light *all* the burners by one flash, but that after the appropriation was made, and Mr. Bogart came to make his contract, he was unable to conform to his alleged declarations, and contracted to light but a square at a time, just as he, Mr. Gardiner, did now.

He also denies my statement that the Wilson lighter had been adopted by the Senate after an investigation of the merits of both methods. I would, as confirmation of my representations, and as a denial of Mr. Gardiner's statement, call the attention to a brief recital of the facts relating to this point.

During the first session of the Forty-first Congress, Mr. Gardiner caused a resolution to be offered in the Senate asking for an appropriation to enable him to extend his apparatus to the burners over the Senate chamber. This resolution was referred to the Committee on Public Buildings and Grounds. Soon thereafter Mr. Bogart memorialized the Senate, asking for an appropriation to put in the Wilson lighter, which was referred to the same committee. They were, in consequence, both before that committee. Mr. Gardiner and Mr. Bogart both appeared and urged their respective claims, and finally, on the 13th day of July, 1870, the following debate upon the report of that

committee upon the subject took place in the Senate, as taken from the Globe of that date.

"Mr. MORRILL, of Vermont. I am directed by the Committee of Public Buildings and Grounds to report the following amendment:

"'For materials and putting up the Wilson Electrical Gas-lighter in the Senate chamber, $4,500: *Provided*, The same can be done under the control of the Architect of the Capitol Extension during the recess, and at an expense not exceeding the amount herein appropriated.'

"I will state that the committee have fully examined this matter, and I think the operation here was exhibited to most Senators. There is no question about the rapidity of the lighting, or the saving of gas, or about its being less dangerous from explosion.

"Mr. NYE. I simply wish to say that I am informed by the electrician, who lights the other House, that the whole building can be lighted just as well from his apparatus, and at a very small expense. It seems to me it would be better to have the whole thing under one head instead of having it under two heads.

"Mr. MORRILL, of Vermont. It will not cost $5 to keep this in repair. For the other it requires a master workman and a journeyman. It has been tested recently in this city in Corcoran's Gallery, and I believe there is no sort of doubt as to its being an improvement on the process used by the House of Representatives.

"Mr. NYE. Will it cost any more to let the present electrician, who lights the other end, compete for this?

"Mr. MORRILL, of Vermont. Until competed with, he wanted more. He wanted $10,000 until this man offered it for less, and then he agreed to take something less.

"The amendment was agreed upon."

It is simply impossible that Mr. Gardiner's statement can be correct in the face of these proceedings, and furthermore, as the letter heretofore referred to by me as given to that committee by Professor Henry, now on file with that committee, treats of the two methods comparatively, thus showing that the committee considered both plans. Mr. Gardiner furthermore declared himself to me verbally, several weeks prior to the making of the appropriation, that he was confident of success.

Now, as to what Mr. Bogart's representations were before that committee, I know not, nor is it pertinent here. Mr. Gardiner's whole argument on this point appears to be devoted to tearing into tatters a person who is not before the committee nor any of the representations made by that person on behalf of the Wilson lighter; furthermore Mr. Gardiner, knowing that he is not here, or his representations, at least the only one alleged to have been made by Mr. Bogart, viz, "his ability to light *all* the burners by one flash," has endeavored to connect them to me by assuming he supposes that I propose to do the same thing. I will merely say to him that Mr. Clark has not proposed to do anything of the sort; that what he has proposed to do is to simply light all the jets so soon as the gas is emitted from them in sufficient quantity to ignite, and to do it in an economical manner. Whatever Mr. Bogart may have declared his ability to be on this point, I know not, but it seems he was able to demonstrate the superiority of the Wilson lighter to the satisfaction of the entire committee and the Senate.

I do not propose to occupy the time of the committee needlessly, but propose to briefly refer to a few statements made by Mr. Gardiner at issue with the facts.

He has declared that Wilson's lighter has been "put out" of August Belmont's picture gallery, Steinway's Hall, and Cooper Union, because of inefficiency and smell from the battery; so far as the smell of battery is concerned, Mr. Gardiner is well aware that the style of battery applied to Wilson's method is identically the same as used by him, only much smaller in size; and I would, in all conscience, ask what force there is in such an argument, even if it existed in fact, so far as it would operate in this building, where he has one hundred and sixty cells of six gallons where we would have but twelve of less number of gallons? But I will state to the committee that which Mr. Gardiner does *not* know, this battery can be, and is, under our process, rendered perfectly inodorous, as can be demonstrated at the Corcoran Art Gallery. The facts in regard to the Belmont picture gallery are these: Wilson's apparatus was put there by the Chesters, of New York; they put Mr. Gardiner there to arrange or work it; the result was, as might be foreseen; Wilson's apparatus went out, Gardiner's went in; neither are there to-day. Steinway had Wilson's apparatus, but it was not put out for any other cause, as explained to me by Mr. Steinway himself, but because, unknown to them, the janitor had neglected the battery, and owing to the battery having been put near the roof, where it was affected by the frost, and also immediately thereafter they raised their roof, and that the apparatus was not thereafter re-affixed to the burners; that they had proposed to re-attach it.

As to the Cooper Union, the Wilson lighter is still in that building; it was originally put in the large hall of that building in 1859; it continued there until 1862; was then taken down from the burners there, and attached to the burners of the chemical lecture-room, where it has operated ever since, and is now; the cause of the change was the desirability for use before the classes of the unusually fine induction coil belonging to it.

Mr. Gardiner carefully avoids every reference to the fact that his lighter has been in other places than in this Capitol and in A. T. Stewart's, New York; or that it has been abandoned for inefficiency. It was in Broadway Theater, New York; was not used after a short period; it was in the Academy of Music, New York; was taken out; it was in Belmont's gallery, the house of Captain West, of this city, in Chicago, Illinois, where it was abandoned, after great expenditure of time and money in endeavoring to obviate its faults of want of reliability, durability, and its excessive expense; besides in other places which I might mention; and the fact stands out, save only behind the General Government and the princely income of Mr. A. T. Stewart, does it exist to day, and I will add here that I expect by return mail an affidavit of John Kellum, architect, who has in charge all such matters belonging to the business of Mr. A. T. Stewart, (a testimonial from whom was read by Mr. Gardiner,) to the effect that he was only debarred from contracting with Mrs. Wilson's former agent for her lighter for Mr. A. T. Stewart's new store, in lieu of Gardiner's, now in use, because of the agent's exorbitant price. I will add, also, that upon Mr. Kellum's attention being called to the testimonial read by Mr. Gardiner, he expressed great surprise, and said he would much like to see the original before admitting that he had signed such a paper.

But Mr. Gardiner, in enumerating the two solitary instances in which the Wilson lighter is not operating, avoids any reference to the Boston Theater; Peck's Music Hall, New Haven; Allyn Hall, Hartford; Cooper Union chemical lecture-room; Corcoran Art Gallery, Washington; where it has operated covering a period from eleven years to six months; but he does declare, as regards its operation in Booth's Theater, New York, that forty burners fail at a time upon the chandelier, a statement unsustained by any attempt at evidence in the face of the declarations of Mr. Edwin Booth and his gas engineers.

Mr. Gardiner attacks the metal burner used by Wilson, because of alleged corrosion and expense. I will say that this burner, so far as regards the tip from which the gas exudes, is in no respects different from the common metal burner in general use in buildings of all kinds, both large and small. Scores are used where one lava-tipped is used, and have been, doubtless within the knowledge of your committee, without the evils attributed to them by Mr. Gardiner. He has offered as corroboration of his statement the report of the Committee on Accounts of House of Representatives. I will call the attention of the committee to that report. * * * It will be seen that the remarks therein refer solely to the small nipples of the traveler tube, then used for igniting the service burners, the capacity of which was, with three small orifices, only one cubic foot per hour, and in no way referring to the regular metal service burners used for illuminating.

Mr. Gardiner alleges that the Wilson spark is inoperative in a draught. In reply I would say that probably no severer test can be offered than that of the lights in a theater, the draughts caused by the rising of the curtain being greater, probably, than elsewhere. Wilson's lighter has triumphantly vindicated itself in this respect in the two largest theaters in this country. I would ask which would probably be the most likely to be affected by a draught, a fine, heated wire, or the irresistible spark produced by an induction coil?

As regards the expense for maintenance of his apparatus, Mr. Gardiner has utterly failed to meet my statements save by the bald assertion that all the material charged in the certified statement furnished were not all for the Capitol apparatus. I would ask him what apparatus were they for. Look at the items. Are there any objects in this building to be paid for out of appropriation for the support of this apparatus that require acids, quicksilver, platina coils, chloride of platinum, zinc plates, carbon plates, battery jars, insulated copper wire, insulators rubber and clay, binders? For these kind of materials the statement of expense I have submitted, certified by the signature of the Secretary of the Treasury and the seal of that Department as a true copy of the vouchers, shows that for the three years acid cost $588 38

Mr. Gardiner asserted but $250.

Quicksilver	235 33
Glass battery jars	268 35
Amalgamated zinc plates	705 30
Platinized carbon plates	355 45
Platinum coils	315 00
(Yet Mr. Gardiner said but eighty had been replaced; this $315 was for 315 tips.)	
Brass binders	30 00
Chloride of platinum	82 00
Insulators, rubber and clay	75 00
Insulated copper wire	491 35
Sundries, such as tools, freight, &c	90 61
Total	3,236 77

Yet Mr. Gardiner says the materials cost in the three years but $1,800. I challenge him to show an item of that certified statement that was not obtained upon his requisition. General Michler is not in the habit of getting material for one thing and charging it to another. In addition to the above, $217 15 has been paid during that period for cleaning the apparatus. I take it that there is no going behind the certified documents. I will conclude this point by saying that Mr. Gardiner has not attacked the Wilson method on this score, and that yet, in the face of these figures, readily obtained, the Committee on Accounts, in 1868, were made to say that the apparatus "had cost in the way of repairs but $60 per annum."

I shall trespass but a few moments longer on the patience of your committee, but beg leave to touch upon the subject of right to turn on gas by electricity, which Mr. Gardiner claims he has the sole right to do. I will not dilate upon this point, but be content to submit the papers and letters-patent to your honorable committee, feeling confident that you will correctly judge upon that point.

One other point and I am done; it is this: Mr. Gardiner has submitted as rebuttal of the Henry, Page, and Simpson report, a report made by Shaffner, Pike, and Knight, stating that the Henry report was ignored by the Secretary of the Interior, Mr. Harlan, because it went further than was intended. I do not doubt it did go further than Mr. Gardiner wished it, as the sequel proved. The facts are these: the Henry report was not ignored by Secretary Harlan, but was filed in the Interior Department; it caused a stoppage of Mr. Gardiner's claim; an investigation of certain matters connected therein, by Dr. Page, through the orders of the Secretary of the Interior; it eventuated in cutting down his vouchers some $6,000 or $7,000. I herewith offer to the committee certified copies of the correspondence on the subject. Now for the Shaffner report: It will be observed the Henry committee was appointed by the Secretary of the Interior; the Shaffner committee was appointed by Mr. B. B. French, then Commissioner of Public Buildings and Grounds, and was essentially a white-washing affair. Mr. Shaffner testified under oath, very unwillingly (a certified copy of which I have sent for to the court in New York, and will doubtless receive in the course of a couple of days, and propose to place in your hands) that Mr. Gardiner appealed to him to sign this report, because the Henry report had stopped his money; that he, Shaffner, did so after great importunity; that he had never met any committee to view the apparatus; that the report was drawn up by the third man on the report, Mr. Knight, who was Mr. Gardiner's attorney; the other man, Nicholas Pike, he did not know. As to the premium at the Institute fair, upon which Mr. Gardiner has laid so much stress, I will merely say that at a former exhibition of the two methods, during the life of the inventor, before the same Institute, Mr. Wilson took the prize, viz, a gold medal. I conclude by expressing my thanks on behalf of Mrs. Wilson, as well as myself, for the courtesy and kind attention of your honorable committee.

Very respectfully,

F. C. CLARK.

APRIL 4, 1868.—Mr. Broomall, from the Committee on Accounts, made the following report:

The Committee on Accounts, who were instructed by resolution of the House of February 22, 1868, to inquire into the expediency and the expense of causing the gas over the hall to be lighted by electricity, from the battery now used for lighting the rotunda and dome, make report.

The mode of lighting the gas over the hall now in use is this:

A pipe called a carrier tube, about one inch in diameter, in which are inserted at intervals of an inch small jets or burners passes the burners which light the hall, and when fire is communicated to the jets at one end, it passes from jet to jet and lights the burners.

The proposed mode is to put a wire in the place of the carrier tube and connect it with the galvanic battery used for lighting the dome, so that the electricity being communicated to the wire will immediately light the burners as soon as the gass is emitted. After careful investigation the committee are of opinion that the following advantages will result from the proposed change:

1. The expense of keeping the carrier tube and jets in order will be saved. This expense is shown to the satisfaction of the committee to be about $800 or $1,000 a year. There are 9,670 jets or small burners in the carrier tube. To prevent the extravagant use of gas, these jets are very small, eight of them emitting about a cubic foot of gas per hour. By the decrease of the size of these jets, their liability to become obstructed and out of order is increased. The obstruction of a single jet frequently stops the progress of the fire. Two jets together obstructed almost always stops the

communication. Hence, the jets require frequent cleaning and removing. This constitutes the great item of expense attending it.

The annual cost of the proposed substitute will be very little.

The entire expense of the similar apparatus for lighting the rotunda and dome in the way of repairs is about $60 a year.

2. The waste of gas during the time required to light by the carrier tube will be prevented and the amount used by the carrier tube saved.

The time occupied in lighting is about ten minutes. The amount of gas consumed by the 1,260 6-foot burners is about 6,000 feet *per hour*, and that used by the jets about 1,200 feet, making the amount used by both about 1,200 feet in ten minutes, costing, at the present rate, $4 20 per evening.

Assuming the number of evenings during which the hall is lighted to be thirty per annum, the number during the past year, and the expense saved on this account would be $136 annually.

3. Much of the gas discharged by both jets and burners during the time of lighting is not consumed, but, as every member of the House knows, is suffered to escape and pervade the atmosphere of the hall, rendering it for some time not only unpleasant to breathe, but very injurious to health.

4. By the present mode it is necessary for the person lighting the hall to remain in the place where the lights are during the time of lighting, to attend to the carrier tube, and prevent the flame from stopping by reason of obstructed jets.

This is not only pernicious to the individual so compelled to breathe the noxious atmosphere, but dangerous both to him and the occupants of the hall. The effect produced upon him is often that of partial insensibility, and the consequences of falling in such a place may be easily foreseen.

The recent accident by which a member and an ex-member of the House were injured by the falling of broken glass, was attributed to this cause.

These are the material advantages of the proposed change, and in the opinion of the committee they are sufficient to justify it.

If the proposed mode of lighting should be adopted, the committee would recommend other changes. The present burners are metallic, and hence liable to corrosion. Many of them are already so corroded as to require renewing; probably all of them will require it within the next year. The committee have examined the lava-tipped burners used in the dome, and are satisfied of their much greater durability than metallic ones, and of their entire freedom from corrosion. It is only while a metallic burner is new that its action is perfect—that the whole of the gas emitted is consumed, and consumed to the best advantage. The lava-tipped burners, on the other hand, remain the same.

From some experiments made by the direction of the committee, it has been shown that the horizontal direction of the present burners prevents, to some extent, the proper combustion of the gas, and hence fails to attain all the light of which the gas is capable.

These experiments have shown that twenty-two upright burners placed immediately over the large sash in each of the panels, will produce as much light as the twenty-eight horizontal burners placed as they now are.

By this change two hundred and forty-six burners may be saved, and counting six hours to the evening, and thirty evenings to the year, the amount saved would be about $137 per annum on this account.

Throwing aside the danger to health and life of the present mode, the committee are of the opinion that the actual saving of expense by all the proposed changes would be about $1,000 per annum.

The committee further report that the expense of changing the mode of lighting as proposed, and changing the burners and their position, will not exceed $6,600.

And they believe that this expense will be much more than compensated by the annual saving. On this account, and because the committee are satisfied that the proposed change will conduce to the health and safety of the occupants of the hall, they recommend the passage of the following resolution:

Resolved, That the Clerk of the House of Representatives be directed to cause the carrier-tube now used for lighting the burners of the hall to be removed, as well as the burners and the pipe in which they are inserted, and to cause a pipe furnished with lava-tipped burners to be placed in the most advantageous position over each panel, and to be so connected with the battery used for lighting the dome as be lighted therefrom.

Resolved, That the work be done under the direction of the Architect of the Capitol Extension, and that the expense be paid out of the contingent fund of the House: *Provided*, That the same shall not exceed $6,600.

OFFICE OF THE COMMISSIONER OF PUBLIC BUILDINGS,
CAPITOL OF THE UNITED STATES,
Washington City, October 17, 1866.

Mr. Samuel Gardiner, of the city of New York, electrician, was employed, by those having the authority to erect the dome of the Capitol, to light the same by applying his patent electrical apparatus thereto. He entered upon the work with all zeal and vigor, and completed it, so that, when the dome was so far finished as to require lighting, he was ready to light it. He did so, from base to tholus, to the admiration of all who witnessed it. His work was well, thoroughly, and elegantly done, and its operation was a complete, and, I may say truly, a wonderful success—the whole dome being lighted by the manipulation of keys, in a small passage on the floor of the rotunda, in not over three minutes.

Although entirely satisfied with the perfect result of Mr. Gardiner's work, I thought it best to have placed on file in this office the views and opinions of eminent electricians, and addressed notes on the 23d day of July, 1866, to Professor S. F. B. Morse, Colonel Tal. P. Shaffner, Professor Nicolas Pike, and Edward H. Knight, esq., well known to me as men eminent for their knowledge and study of the operations of electricity, and its practical application as a motive and illuminating power, asking them to examine carefully and thoroughly Mr. Gardiner's work, and make a report of their conclusions to me. They proceeded at once to make the examination, and concluded their labors in July, and have submitted a report, to a copy of which I attach this statement. Professor Morse, having left for Europe, has not signed the report, but I am assured, in the letter from Mr. Knight accompanying it, that he "has signified his acquiescence with the spirit of the report." He will probably add his signature on his return.

The report goes so fully into the details of Mr. Gardiner's work, and the manner of its operation, that I need add nothing more than my testimony to that of the committee, that "it deservedly attracts great attention from experts and intelligent casual visitors, from whom the effect of the manipulation of the keys elicits murmurs of applause."

B. B. FRENCH,
Commissioner of Public Buildings.

WASHINGTON, *July* 31, 1866.

SIR: In accordance with your request to report upon the character, efficiency, prospective durability, and cost of maintenance, of the apparatus for lighting the dome and tholus of the Capitol, we have to report that the work has been executed in a handsome and substantial manner, worthy of the people and the place, and is a credit to all concerned.

We take especial pleasure in commending the courage manifested by Mr. Gardiner in bringing his invention to the most crucial test which the country affords by lighting up an interior of the area and height of the Capitol rotunda, dome and tholus.

The gas-pipe connections consist of circles of burners at 45, 80, and 165 feet from the floor of the rotunda, and are furnished with 300, 325, and 425 burners respectively. In addition to these, a cluster of 90 burners is placed in the tholus, at a height of 264 feet from the floor, and, being 60 feet above the crown of the dome, is, of course, invisible from the interior, but is a beautiful object viewed from the Capitol Grounds, and visible at a distance of many miles.

The flow of gas at each tier and in the tholus is equalized by a regulator, and governed by a stop-cock, the latter being opened and closed by electro-magnetic engines in their immediate vicinity, worked from the battery, the central brain of the apparatus, from which ramifies the nervous fluid which vitalizes the motive agents and the illuminating coil of each of the 1,130 burners.

The battery occupies an elliptical room, 45 by 36 feet, and consists of 200 glass jars, of a depth and diameter of about 13 inches, containing two zinc plates, 9 by 10 inches, weighing 6 pounds each, and an interposed carbon plate, all supported by suitable insulators in the acid bath. It is disposed on benches in concentric series in the room, and arranged in sections of twenty jars each, to be brought into service as required.

The connections consist of five miles of No. 10 copper wire, doubly wrapped with linen yarn, and, when necessary, encased in India-rubber tubing. This is securely laid in protecting pipes or through passages drilled through the walls, the return circuit from the engines and the burners being made through the gas-pipes.

The burners used have an indestructible lava tip, which acts as an insulator, and each is provided with an insulated coil of platinum wire, placed on one side of the orifice, so as not to interfere with the free exit of the gas, which is lighted by exposure to the red-hot metal when the electric connection is made.

The tiers of burners are divided into sections of from thirty to fifty burners, each section having independent connection with the instrument; so that a tier being divided

into ten sections, it is lighted by a corresponding number of pulsations following the flow of the gas, which is turned on by the electro-magnetic engine belonging to and in the vicinity of the tier. The manipulation, which by successive pulsations operates the engines, makes the series of illuminating connections, and registers the work, is performed in a passage-way leading north from the floor of the rotunda, and perhaps 50 feet from the battery.

The electro-magnetic engines consist of a double helix with a sliding armature, on which is a latch-pawl, which operates a ratchet-wheel on the axis of the stop-cock. The operator, by a succession of electric connections, works the armature piston, and turns the plug of the stop-cock such a fraction of a revolution as is represented by the number of teeth on the ratchet-wheel.

The handsomely engraved dial-plate of silver has keys, eleven in number, and with a corresponding number of vernices.

The primary electric connection with the battery is made by a stud in the central key, which, by rotation, is made to bring such a portion of the battery into play as may be required, a vernice indicating the extent of battery connection, which takes place in successive sections of twenty jars.

The surrounding keys, ten in number, are equally divided between the duties of turning on the gas and lighting the same at the five levels for which the dial-plate and keys are adapted. But four of these are yet arranged, consisting of the tiers at the elevation of 45, 80, and 165 feet, respectively, and the tholus at 264 feet.

The fifth may be used for a proposed tier at the spring of the dome, or a circle to illuminate the picture, as you may desire.

Each gas-key has a dark and a light segment on its disk, which are exhibited at an opening in the dial-plate, in correspondence with the closed and open position of the stop-cock which governs the flow of gas at the tier represented by the said key.

Each lighting key has a pointer, which indicates on its vernice the extent to which the electric connection has been made in the sections of the tier to which it belongs.

The apparent column of light in the tholus is derived from 90 burners with reflectors and prisms, was designed by Mr. Gardiner, and has a beautiful effect.

The prospective cost of maintenance, so far as it consists in the waste of materials used in the 200-jar battery, may amount to 600 pounds of zinc, 80 pounds of mercury, and 50 gallons of sulphuric acid per annum.

So far as appears to us, the apparatus requires but proper ordinary care and attention to maintain it in effective condition, and the lighting of the burners can be more effectively and economically accomplished by the use of this apparatus than by any other appliance that has come under our notice.

The workmanship of the dial and appurtenances and the electro-magnetic engines is substantial and elegant, and deservedly attracts great attention from experts and intelligent casual visitors, from whom the effect of the manipulation of the keys elicits murmurs of applause.

Many doubts as to the ultimate success of the enterprise have arisen in the minds of persons quite familiar with the science, when the great amount and proximity of the metal in the iron dome was considered, and on account of other difficulties incident to the scale of the apparatus and connections; but these are happily set at rest, and the appropriateness of the exhibition of American enterprise in the nation's Capitol has given zest to the congratulations tendered to the inventor and contractor, Mr. Gardiner.

We have to report, in conclusion, that the work has been well done; its efficiency and practical performance leave nothing to be desired; its permanency may well be admitted, from the solid and honest character of the work; and the economy with which it performs its duty is beyond dispute.

Very respectfully,

S. F. B. MORSE.
TAL. P. SHAFFNER.
NICOLAS PIKE.
EDWARD H. KNIGHT.

Hon. B. B. FRENCH,
Commissioner of Public Buildings, Washington, D. C.

The United States Patent Office, to all persons to whom these presents shall come, greeting:

This is to certify that the annexed is a true copy from the files of this office.

In testimony whereof I, Samuel A. Duncan, Acting Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed this 8th day of February, in the year of our Lord 1871, and of the independence of the United States the ninety-fifth.

[SEAL.]

SAM'L A. DUNCAN,
Acting Commissioner.

CITY, COUNTY, AND STATE OF NEW YORK, *ss:*

C. S. Marshall, of Nos. 326, 328, and 330 Broadway, New York City, being duly sworn, says that he is by profession the manager of the Broadway Theater, New York; that he is generally acquainted with the various methods of practically employing galvanic electricity in the arts; that he has carefully examined a new method of lighting gas by means of electricity, invented by Samuel Gardiner, of New York City, which consists in an arrangement whereby on pressing a key the gas-cock is turned and a flow of gas admitted to the burner, while at the same time a current of electricity is made to pass through and heat a platinum coil located immediately above the aperture of the burner, and thus ignite the gas.

Deponent further says that he has adopted Samuel Gardiner's, jr., new invention of lighting gas by electricity in the Broadway Theater in the city of New York. It was put in successful operation in May last; the theater is lighted in thirty seconds instead of taking the time of two men one-half hour to do the same work; it is a saving of gas and time. Often in theaters and large public buildings the gas is turned off or blown out by a too strong current of air passing through the house; by pressing the key the whole is lighted again, without annoying the audience by sending out the gas-man with his torch to relight each burner.

Deponent further says that the general idea of lighting gas by electricity is not new; but, so far as his knowledge extends, the method employed by said Gardiner, viz, operating the gas-cocks by electricity and at the same time sending the current through a platinum coil above the burner, is new.

Deponent further says that by the common mode of lighting gas-burners in theaters and other public buildings there is always a large waste of gas, because many of the burners are so located that the gas must be caused to flow through a large number of them at once, while the attendant can only light them with his taper one by one. The air within the building is also rendered impure by the escape of gas while the attendant is passing around to light the burners.

Deponent further says that he regards said method of Gardiner's as a valuable, new, and useful improvement, and productive of highly important results; and, further, that this opinion is founded upon actual personal experiments with the invention of said Gardiner.

C. S. MARSHALL.

Sworn to before me this 5th day of December, 1857.

W. M. HOOPE,
Commissioner of Deeds.

CERTIFICATES.

WASHINGTON CITY, *March* 1, 1867.

This certifies that Samuel Gardiner's apparatus for lighting the dome of the Capitol with electricity has now been completed, and in successful operation for more than a year, and that the same has not failed when applied to the lighting in a single instance. The whole thing has worked to my entire satisfaction, and to the satisfaction of all in any way concerned in its use.

B. B. FRENCH,
Commissioner of Public Buildings.

WASHINGTON, *January* 9, 1869.

The electrical apparatus of Samuel Gardiner, esq., within mentioned, has worked with perfect success to my personal knowledge to this date. Since I gave the within certificate, the lighting has been extended to the rotunda and the hall of the House of Representatives, with equal success as the dome.

B. B. FRENCH.

ARCHITECT'S OFFICE, CAPITOL EXTENSION,
Washington, D. C., February 10, 1868.

SIR: It gives me pleasure to be able to state that your apparatus for lighting the gas-burners for illuminating the rotunda and dome of the United States Capitol, by means of galvanic electricity, has proved very successful, after a trial of nearly three years. Over thirteen hundred gas-burners are lighted in a few seconds, the operator being at the floor, while many of the burners are nearly two hundred feet from him.

The cost of maintaining the batteries, I must say, has been much less than I at first supposed it would be. I do recommend your method as being convenient and reliable, and admirably adapted to many purposes.

Very respectfully, your obedient servant,

EDWARD CLARK, *Architect.*

SAMUEL GARDINER, Esq., *New York City.*

HOUSE OF REPRESENTATIVES,
Washington, D. C., April 15, 1869.

SIR: I take pleasure in stating to you that your process of lighting the hall of the House of Representatives gives entire satisfaction to all, and I regard it as a great improvement.

Very respectfully, &c.,

JOHN BOYD,
First Assistant Doorkeeper, H. R.

Professor SAMUEL GARDINER, *Electrician, United States Capitol.*

NEW YORK, *February* 7, 1868.

This is to certify that Samuel Gardiner's electric gas-lighting apparatus has been applied to A. T. Stewart's house, corner of Fifth avenue and Thirty-fourth street, and it works with perfect success; the picture gallery alone containing no less than three hundred and twenty-five gas-burners.

JOHN KELLUM,
Architect, 811 *Broadway, New York.*

NEW YORK, *September* 18, 1869.

SIR: This is to certify that I have had charge of the electric gas-lighting apparatus placed by you in the store of A. T. Stewart, corner of Ninth and Tenth streets, Broadway and Fourth avenue, for one year, and that the same works with perfect success, lighting some two thousand five hundred gas-burners.

Yours, respectfully,

NATHANIEL H. ANDREWS,
Electrician at A. T. Stewart's.

Professor SAMUEL GARDINER.

CLERK'S OFFICE, HOUSE OF REPRESENTATIVES U. S.,
Washington, D. C., June 6, 1870.

DEAR SIR: It gives me pleasure to state that your method of lighting the hall of the House of Representatives, adopted some two years ago, has given entire satisfaction in all respects. It has cost the Government nothing whatever for repairs to gas-burners since the adoption of your improvement.

Very truly yours,

CLINTON LLOYD,
Chief Clerk House of Representatives United States.

SAMUEL GARDINER, Esq., *Electrician.*

WASHINGTON, *February* 3, 1871.

DEAR SIR: It gives me pleasure to be able to state that your electric gas-lighting apparatus, as applied to the lighting of the hall of the House of Representatives, has been in successful operation for over two years, and has not, in a single instance, failed to light all the gas-burners in a few seconds of time, preventing, as heretofore, a bad odor of the escape of gas, and I am happy to recommend your process to the lighting of large halls and public buildings.

O. S. BUXTON,
Doorkeeper House of Representatives.

SAMUEL GARDINER,
Electrician, United States Capitol.

70 UNION PLACE, *September* 1, 1868.

DEAR SIR: I have examined the insulated copper wires which Mr. Gardiner proposes to use in your stores for lighting the gas-jets. In my opinion, they are of sufficient diameter to carry the electric current he intends to employ. They are also well insulated, so that no spark or current can pass through the insulating materials to cause fire; in other words, I consider them perfectly safe and durable.

I am happy to state, also, that nine years ago I first had the pleasure of showing Mr. Gardiner's ingenious invention at a lecture (given for the benefit of the church for the deaf-mutes) in the Academy of Music.

Since that time Mr. Gardiner has been wholly occupied in the business of lighting gas-jets by electricity. I question if any one has as much experience in this matter as himself.

I have the honor to remain your obedient servant,

R. OGDEN DOREMUS.

Mr. A. T. STEWART.

THE NITRO-GLYCERINE COMPANY,
LESSEE OF THE UNITED STATES BLASTING OIL COMPANY'S PATENTS,
Office, Nos. 78 *and* 80 *Broadway, New York, August* 31, 1868.

DEAR SIR: In answer to your questions, I briefly state my opinions, viz: A current of electricity produced by a Voltaic battery cannot escape from the wires (No. 16 insulated) shown me in sufficient quantity to ignite any substance used in the construction of buildings.

The samples of wire shown me, one insulated with gutta-percha and the other whip-covered, are the usual and only kinds used in America as reliable for electric conductors in houses.

I have seen your process for lighting gas by electricity successfully during the last ten years, and I am surprised that there should be a necessity for asking me any questions upon the subject.

Yours, respectfully,

TAL. P. SHAFFNER, *Electrician, &c.*

SAMUEL GARDINER, Esq.

NEW YORK, *February* 9, 1871.

DEAR SIR: In reply to your letter of the 7th instant, I beg to state that some years ago I had my gallery lighted by electricity, (whether by "Wilson's lighter," or some other patent, I do not now recollect,) but found that the apparatus would frequently get out of order from atmospheric causes and changes in the temperature. I have now the gas in my gallery lighted by torches.

Yours, respectfully,

AUG. BELMONT.

D. SMALL, Esq.,
218 *B Street North, Washington, D. C.*

NEW YORK, *February* 3, 1871.

MY DEAR SIR: Mr. Wheeler only received your letter last evening, and to-day he has handed it to me. I have called on Mr. Steinway and inquired as to his use and experience of the Wilson electric spark lighter. He was indisposed to give much information about it, but briefly stated he tried the plan a few years ago and abandoned it, on account of its imperfect working; said the burners were not always reliably lighted. I closed the conversation by asking him if he would like his hall lighted by electricity, if it could be done satisfactorily; when he replied he should. The strongest evidence of the failure of the Wilson plan of lighting, as tried by him, was in this response, that he would like a reliable method introduced. At Booth's theater there seemed to be a disposition to give no information, as I judged there was some law-suit going on, in relation to the Wilson patent and its use at that place. So much as this, however, I learned from the gas-man of the house, that the burners did not always light, and hand-lighting had to be resorted to to some extent. In an interview I had two weeks since with A. T. Stewart, he spoke of your plan of lighting, as now used by him, as entirely

successful, and said he had examined the Wilson plan, but did not approve of it. All concur in one opinion, that the least imperfection in the insulation of the wire used in the Wilson spark process will permit the spark to escape and frustrate the successful lighting.

Yours, truly,

ABNER BARTLETT.

Professor SAMUEL GARDINER, *Washington, D. C.*

Final decision and confirmation of the report of the judges in awarding to Samuel Gardiner the first premiums for the best and most reliable and practicable mode for lighting gas by electricity; an appeal having been made from said decision by A. L. Bogart, proprietor of the Wilson patent, to the board of managers of the American Institute, New York.

[Extract from the report of the judges in Department 6, Group 4, at the fair of the American Institute, held in the city of New York, October, 1869.]

REPORT ON THE WILSON PATENT—BOGART, PROPRIETOR.

No. 436.—"ELECTRIC GAS-LIGHTING APPARATUS."

This consists of a galvanic battery, Ruhmkorff's induction coil, and conducting wires, which are broken near the gas-jets so that an electric spark is produced by a charge of electricity leaping to the "tips" of the burners, each burner being insulated, and forming a part of the circuit. The ends of the wires from which the spark proceeds are covered with platinum to prevent their corrosion.

The use of the spark obtained from electricity of high intensity, induced by "Ruhmkorff's induction coil," is not nor was not novel to this apparatus for lighting gas. It involves the necessity of great exactness in the adjustment of the points of the wires at the gas-jets, and also in the insulation of the wires. When these have once been regulated they are very liable to become disarranged. In cases of rapid currents of air passing over the burner at the moment of the occurrence of the spark, it is obvious, as experiments have proven, that the gas fails to ignite. The peculiarities herein stated are the more prominent, which have led us to regard it as not the best known to us, but as second in class.

REPORT ON SAMUEL GARDINER'S PATENT—FIRST PREMIUM.

No. 963.—"ELECTRIC APPARATUS FOR LIGHTING GAS."

This consists of a galvanic battery, insulated conducting wires leading near the gas-jet, and joined or connected so as to complete the circuit, by small spirals of platinum wire adjusted over and very near the gas-jets of the burners, the tips of which are lava, and a circuit connector and breaker.

By this apparatus a current of dynamic electricity is established, which, in passing over the platinum spirals, heats them to a dull red, and thus ignites the gas.

The lava tips insure insulation of the platinum spirals from the metallic portion of the gas-burners. The form of electricity employed by this apparatus is easily confined to the conductors, so that the adjustment of the insulation is attended by no difficulties. The platinum spirals are placed immediately over the gas jets, insuring ignition, while during the burning of the gas they are within the cooler and deoxidizing part of the flame, which insures their durability for a long time.

This plan possesses more features of invention, is more reliable in action, and less subject to accidents or disarrangement than any other known to us; we, therefore, recommend a first-class premium.

D. D. PARMELEE, M. D.,
JOHN PHIN,
P. H. VAN DERWEYDE, M. D.,
Judges.

I certify the foregoing to be a true copy from the report on file.

JOHN W. CHAMBERS,
Secretary Managers.

[It appeared from a copy of testimony given by T. P. Shaffner, in a case in one of the courts of New York, that he affixed his name to the report printed on pages 15 and 16, while at the Hoosac Tunnel, in Massachusetts; that it was drawn by Mr. Knight; that, although appointed

on the committee by the Commissioner of Public Buildings, he did not meet with them; that he was not in Washington when it was prepared; that he did not know and had never heard of Nicholas Pike; that he never acted with the other persons named in making an examination of Mr. Gardiner's apparatus, but was tolerably familiar with it, as far as he could see from a distance, but did not go through the examination of the platina or the arrangement of the wires; that he signed the report because he wanted to help Mr. Gardiner, deeming him a very meritorious man who ought to be encouraged; that he thought some points of the report were "considerably roseated, a little colored," but that Mr. Gardiner ought, in his opinion, to be paid the money that had been held back on his contract on account of a counter-report against him, signed by Professor Henry, and he wanted to do what he could to get him the money that was due him.]

The following certificates were also filed by the petitioner:

BOSTON THEATER,
Boston, Massachusetts, February 17, 1869.

We take pleasure in certifying that Wilson's Electrical Gas Lighter has been in use at the Boston Theater during the last three years, and has given perfect satisfaction. It has never failed to light the chandelier during the whole time, and continues to work in perfect order. During the whole time it has been in operation it has not required the expenditure of a dollar for repairs. By its use, besides other advantages, it has caused a great saving of time, labor, and gas.

F. O. PRINCE,
President of the Corporation, in behalf of the Directors.
S. B. BOOTH, *Manager.*

BOOTH'S THEATER,
New York, September 14, 1869.

Wilson's Patent Electric Gas-lighting Apparatus, constructed for and applied to the whole number of jets contained in my theater, is worthy of my unqualified commendation. Having had for several years a knowledge of its utility, economy, and certainty in lighting the Boston Theater, I had not the slightest hesitation or misgiving in placing the gas jets in the best position for effectiveness, especially where the torch could not be made available.

From the opening night to the present, it has not failed to perform its office satisfactorily. Having the facility of *instantaneously* lighting the auditorium as well as the border lights of the stage, it enables the perfecting of scenes that could not be otherwise produced. It prevents the escape of gas and consequent fouling of the atmosphere. It is also a great economizer of gas, as the general lighting is done preparatory to the opening of the house, or the borders lighted until a moment before the commencement of the performance, during which, not unfrequently, the greater number of burners in the auditorium may be turned entirely off to advantage, to be relighted by the apparatus the instant they are required. It is under the control and operation of the gas man of the theater, without the aid of an expert. The match and torch are dispensed with; it is therefore estimated as a fire insurance. Its practical convenience is bound sooner or later to insure its universal adoption in public buildings.

EDWIN BOOTH.

PECK'S MUSIC HALL,
New Haven, Connecticut, November 9, 1866.

Wilson's Electric Gas Lighter, which has been in constant use in my hall for the past six years, has during that time given the fullest satisfaction, and, when properly attended to, has never failed to do its work. I regard it as a most perfect and indispensable method of lighting gas, and would on no account do without it. I therefore cheerfully and earnestly recommend its adoption, and feel sure that all who use it will find, as I have done, that it is economical, reliable, safe, and in all respects satisfactory, being far superior to any other known method of igniting gas by means of electricity.

SAMUEL PECK,
Proprietor of Music Hall.

PECK'S MUSIC HALL,
New Haven, March 24, 1870.

MADAM: I now take pleasure in answering your inquiries about cost, &c., of using the Wilson Electric Lighter. Zinc plates have to be renewed once in about three years. Music Hall is used two hundred or more nights per year. Yearly expenses of keeping apparatus in order will not exceed $5.

Any other questions you may wish me to answer will be cheerfully complied with.

Very respectfully, yours,

CLARK PECK,
Agent of Music Hall.

Mrs. J. H. WILSON.