

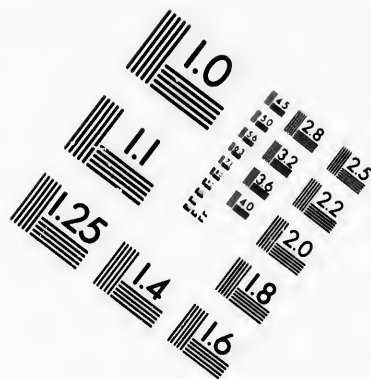
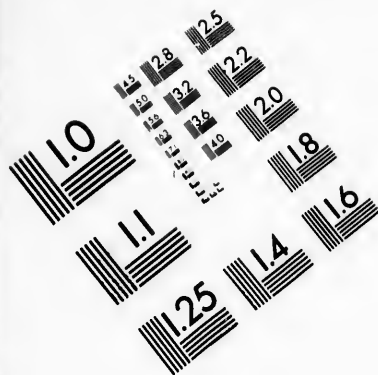
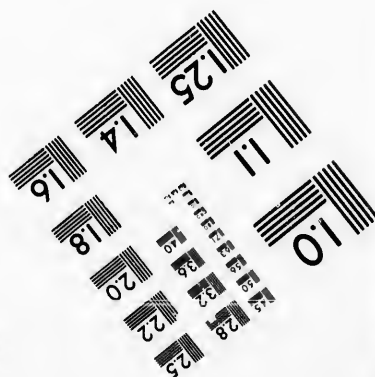
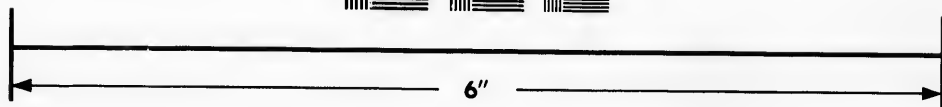
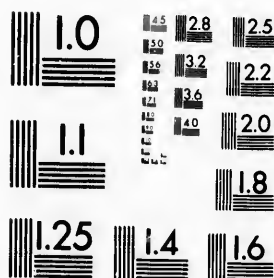


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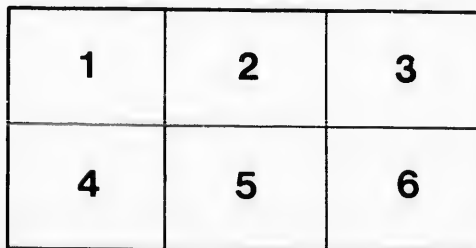
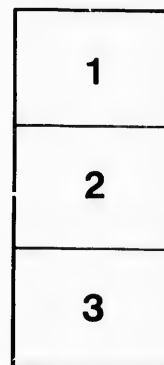
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A LETTER
TO THE
CORPORATION OF THE CITY OF TORONTO,
ON
THE GAS SUPPLY,
FROM
W. H. PEARSON,
Secretary of the Consumers' Gas Company of Toronto.

CONSUMERS' GAS COMPANY,

TORONTO, *December 28th, 1880.*

ROBT. RODDY, Esq.,

City Clerk, Toronto.

SIR,

I beg to acknowledge the receipt of your letter of the 20th inst., with a communication from Mr. Littlehales, and a draft of a "Report" prepared by the Chairman of the Special Committee appointed to confer with this Company regarding the quality of the gas, sent to me for the purpose of my replying thereto.

As most of the matters referred to are considered both in Mr. Littlehales' letter and the "Report," instead of replying to each separately I shall answer them collectively, mentioning, however, as occasion may require, when I reply to a statement contained in one which is not in the other.

In Mr. Littlehales' introductory remarks, giving a short history of Water Gas, he states that it has been before the gas world for a number of years, "under ever varying forms, but on the unvarying principle of decomposing steam with red hot carbon."

With this statement I have no disposition to find fault. Nor do I dispute his statement that efforts made to introduce Water Gas in England failed.

That this should have been the case is not to be wondered at. Few inventions of any importance have been successfully introduced without at first meeting with failure, and it is often only after other men have improved upon the original ideas of inventors that success is accomplished. Coal Gas was quite as long in winning its way into public favor as Water Gas has been. Many improvements were made in the various apparatus required for its manufacture, and many obstacles and much opposition and prejudice had to be overcome before it was generally adopted. As an instance of this, I saw the other day a copy of a petition from a large number of influential inhabitants of the City of Philadelphia, dated 1830, setting forth a great number of evils and calamities that would in-

evitably follow its introduction there, owing to its poisonous, explosive and destructive nature, and praying the Government to prohibit it. They evidently for a long time succeeded, as that city was not lighted with gas until five years afterwards.

A brief statement, showing the slow rate of progress Coal Gas made for a long time, may not here be out of place.

The first proposals to light a town with Coal Gas were made in England as early as 1765. It was not practically applied for lighting until 1792, when William Murdoch lighted his own house with it in Redruth, Cornwall. It was not introduced into London until 1807, when a private individual lighted Pall Mall with it, and a gas company was not formed there until 1810. Paris was not lighted with gas until 1820, New York until 1834, and Philadelphia until 1835.

The idea of lighting by electricity was entertained over thirty years ago, and attempts were then made to introduce it, but it is only recently that to any extent this idea has been practically carried out.

Apart, however—from any other consideration, there were powerful economic reasons, such as the high price of Anthracite Coal and Oil, to prevent the successful introduction of Water Gas in England, and on this account it is doubtful if it will ever make much headway there.

Whatever want of success it may have met with in England, Water Gas is making rapid progress in America—about sixty companies having adopted it within about five years, four of them being in Canada, whilst a number of new works are contracted for or are in course of construction.

One of the processes referred to as having failed in England—the Tessie du Motay—was introduced, with modifications and improvements, in New York, about five years ago, and has been in successful operation ever since. About four years since, in consequence of the great demand for their gas, the Company working the process erected new works capable of producing three million cubic feet per diem. Other works have since been erected elsewhere, and are working successfully.

The Lowe Process, which Mr. Littlehales says is almost a precise copy of Kirkham's plan, differs from it in some material points, as can be easily shown, and is a great improvement upon it.

In both the "Report" and Mr. Littlehales' letter exception is taken to the gas now supplied by this Company, principally upon two grounds, namely, its *quality* and *safety*.

The question of the *quality* of the gas is almost altogether taken up by Mr. Littlehales.

In discussing this, he very properly refers both to its illuminating power and freedom from ordinary impurities found in gas. As exception is not taken to it upon the latter ground, either by Mr. Littlehales or in the chairman's "Report," it may only be necessary for me to state that the Government tests invariably show, that since gas has been supplied here by the Lowe Process alone, the amount of impurities found therein *has never in any case exceeded the legal standard*, while, according to the published reports, *it has been frequently exceeded by all the Coal Gas Companies in the Dominion*, where tests had been made for any length of time. In a great many instances these impurities have been found *very largely in excess*, and in the case of one large company, on several occasions *as much as fifty times over the allowance*. Indeed, two large companies have not during some years complied with the Act as far as one of the impurities is concerned, and one of these companies has almost invariably exceeded the standard with regard to another. Had Mr. Littlehales desired to do so, he could as easily have tested the gas here for two impurities as have observed its illuminating power.

With reference to the illuminating power of the gas, he speaks from *general personal observations alone*, and from these he condemns the gas, and says that he has "seen greater variations in its quality" here than "in any other place;" that he has seen it when, according to his "best judgment, it was at least twenty candles," and "at other times when it was not more than ten or eleven." He also says: "My knowledge of the principles involved and of the details of the manufacture, convinces me that it is, from the very nature of the case, next thing to an impossibility to maintain anything like uniformity in the illuminating power of the gas."

Knowing very well that the frequent tests made here by the Government Inspector showed no such variations as he states, and knowing that he could not ignore those tests, Mr. Littlehales attempts to explain the discrepancy between them and his "observations" by stating that, as a rule, the tests did not occupy more than half an hour.

Let us now consider whether Mr. Littlehales' occasional "observations" or the Government tests are the most reliable, and whether his assertion is a correct one. In doing this I shall have to refer to a matter which Mr. Littlehales' disparage-

ment of the gas renders it necessary for me to speak of in order to show his unreliability and apparent determination to misrepresent facts.—(See Appendix "A.")

In the tests made here—72 in number—taken at different periods between February 1st and September 30th last, when we were making Water Gas exclusively, *only a difference of 2.75 candles was shown between the highest and lowest of the whole record*, and no Government tests made since then show any greater difference. The correctness of the Government tests is confirmed by the tests made three times a day, at least, by this Company, which have not shown in a long time a variation of two candles. Surely if there was any such variation as is claimed, it would have manifested itself during some of the tests spread over so long a period. I assert, notwithstanding Mr. Littlehales' knowledge of "the principles involved and the details of manufacture," that it *is* quite possible to maintain a very uniform quality of illuminating power with Water Gas and that the tests made here show this. In further proof, thereof I give the testimony of the managers of three Lowe Process Works; and others could be given if necessary.—(See Appendix "B.")

Let us see what the record says of the *Coal Gas made at Mr. Littlehales' Works in Hamilton*. In the Government Report for the year ending June 30th, 1879, the last I have received, I find that 49 tests were made of Hamilton gas, the highest illuminating power shown being 17.20, and the lowest 12.96, *a difference of 4.24 candles*. Taking Mr. Littlehales on his own ground, that the tests fail to show truly the variation in illumination, *how great then must have been the variation in the Coal Gas in Hamilton, the photometer itself showing, with the comparatively few tests made, over fifty per cent. more than Toronto*. Nor do the records of the previous year say anything more in favor of the gas made there; in this respect, indeed, the difference is greater. *In fact, quite as great a difference is shown in the gas made by all the Coal Gas companies in the Dominion*. In further proof of the incorrectness of Mr. Littlehales' conclusions, it will only be necessary for me to say that the records of 1878 *show a variation in the gas made by the St. John, N. B., Company, of from 19.79 to 10.24 candles, or a difference of 9.55 candles*; and great variations are shown in three of the eight months in which the tests were taken.

The statement is made in the "Report," that the manager of this Company acknowledges the imperfections of the gas by

advertising to change the burners free of expense. In doing this no such acknowledgment was made; the object, as stated, was merely in some instances to supply burners suitable to the somewhat higher gravity of the gas, in others to replace worn out burners. The objection to lava burners was solely on account of their liability in some localities, to close up from carbonization, as they had done in other places where Lowe Gas is supplied, owing to the richness of the gas, and probably to the fact of the Hydrogen being less in quantity than in Coal Gas; and Mr. Littlehales informed me that the same difficulty occurred with some of his lava burners at Cobourg, the works of which he is the lessee. The statement that the Company are asking consumers to use 5 feet burners instead of 3 feet, is unwarranted. The object of the Company in supplying burners to consumers free of charge, is solely for the convenience of the latter.

The charge of the gas being of poor illuminating power is proved to be unwarranted by the tests made by the Government Inspector and by the Company, the former of which show an average for 8 months, ending Sept. 30th last, of 15.91 candles, which is *higher than the best average of that of the Coal Gas previously supplied, and higher than the average shown in any of the reports of that of the neighboring city of Hamilton.* Objection has been made, that although the gas as tested by a bar photometer may show a higher illuminating power than that of Coal Gas, yet after all it does not have the same radiating power. In answer to a question as to whether or not both gases tested in this manner had the same radiating power, the celebrated gas analyst and chemist, Dr. H. Wurtz, says: "A person acquainted with this process and appreciating the principle it is founded upon, could no more hesitate to answer the question in the affirmative than he could hesitate in agreeing to the truth of the mathematical axiom, that 'things which are equal to the same thing are equal to one another.' The notion which I am told is propagated among your consumers, of some peculiar want of illuminating power in the gas, can be nothing but sheer fantasy."

Whenever any defect has been noticed in the gas it must therefore have been local, and have been caused, either by some stoppage in the pipes or defects in the burners.

If anything more were needed to prove this, we have it in the written testimony of a number of the largest consumers, who speak strongly of their satisfaction with gas generally.

The statement that the present gas carries with it tar or other heavy substances, which necessitates the blowing out of the pipes, etc., is incorrect, the fact being that there is much less tarry deposit and condensation in the pipes from this gas than Coal Gas. The stoppages complained of have been caused by the deposition of Naphthaline, which it is well known is a very old and serious trouble with Coal Gas works, and is not peculiar to Water Gas; and in the past, when making Coal Gas, this Company has had relatively greater difficulty from this cause than it has had recently.

This difficulty has been completely overcome, and I am satisfied no more stoppages from it need be apprehended. Naphthaline is not an impurity.

And now as to the charge of the *danger* incurred from the use of the gas.

This charge is made on the ground of there being a large amount of Carbonic Oxide in the gas, and in corroboration of this claim it is asserted that more accidents result from its use than from Coal Gas, which contains a smaller amount of Carbonic Oxide. Mr. Littlehales very properly says that this question "is really one to be decided by chemists," and a number of authorities are quoted, both by him and in the "Report," testifying to the dangerous nature of *Carbonic Oxide*, but *not one is quoted in condemnation of what is called Water Gas.*

But I would submit, that the question is not whether or not *Carbonic Oxide* is a poisonous and dangerous gas, but whether the so-called Water Gas, containing say 22% of Carbonic Oxide, and less of other deleterious gases, is on the whole more dangerous than Coal Gas containing say 7% of Carbonic Oxide, and a larger proportion of other deleterious gases; and in estimating the relatively injurious nature of these gases, two elements of danger must be taken into consideration—their *poisonous and suffocating character and their explosiveness*; and hitherto more accidents have taken place from the latter than from the former.

As it is stated in the "Report" that Water Gas was prohibited in Paris because of its dangerous character, I give, in addition to explanations given for its not having been adopted there by Prof. Adolphe Wurtz in Appendix C, the following one by Gideon E. Moore, Ph.D., of Jersey City, N.J.:

"The objections to Water Gas in general on account of its contents in Carbonic Oxide, are based on an entire misconception of the meaning of the reports of the eminent scientific men who were called to pronounce upon its safety in France.

The French report was unfavorable for the following reasons:—"The gas was not saturated with illuminating hydrocarbons, and was consequently *inodorous*; it was not of itself luminous, but was employed to heat to intense whiteness small cages of platinum, which were suspended in the flame, and furnished the luminous body. Being inodorous, the escape of the gas could not have been detected, hence the dangers arising from accidental leakage were excessive."

I shall now give a few quotations from the opinion of some chemists of eminence—and of others who, although not so noted, are possessed of very high qualifications—regarding the safety of Water Gas.—(See *Appendix "C."*)

It may be proper to remark, that the analyses of Water Gas, given both in Mr. Littlehales' letter and the "Report," are not analyses of gas made by the Lowe Process, but of that made by another one, which contains a larger amount of Carbonic Oxide than what has been found in the gas made here by the former process, which has averaged about 21%. The analyses of Coal Gas given, are about the usual averages; as the Carbonic Oxide and other gases present usually vary, according to circumstances, as they do in Water Gas; and Carbonic Oxide may be present in Coal Gas to as great an extent as 12%, or even higher.

It is worthy of note that Mr. Littlehales, in his analyses of *Coal Gas*, has called the "Marsh Gas" (the destructive fire damp of coal mines) by another of its appellations, "Light Carburetted Hydrogen," while in the analyses of the *Water Gas* he calls it "Marsh Gas."

As the dangerous character of the gas is further attempted to be shown by the number of deaths which it is claimed have taken place in New York and here from its use, it will be well for me to consider the accuracy of the statements made, and the correctness of the deductions drawn therefrom.

Mr. Littlehales says: "In the last two years there have been recorded in the public press of the City of New York no less than eleven deaths from suffocation, every one of which was caused by Water Gas, and which I venture to say is a greater number than can be traced to Coal Gas in the whole of Europe in the same time." Of course, he means it to be understood that these deaths took place in New York. With reference to the reported deaths in New York, I would say that I got a friend *there*, to make particular inquiries as to the correctness of this statement, and the following is his reply —

"The following I get from the 'Coroner's Office,' and by inquiry at the places where the deaths occurred:

"There have been *eleven* deaths from illuminating gas in the City of New York in the past two years.

"*Three* of which were caused by explosions at gas works.

"*Three* were suicides, by the persons deliberately stopping key-holes in door and putting rugs at bottom of same, and closing fan-light, unscrewing gas bracket. Neither of these should be mentioned, I think, in yours or any other report.

"*Three* by accidental suffocation with 'Water Gas.'

"*Two* by accidental suffocation with 'Coal Gas.'"

Whether the three deaths from suicide were from Water or Coal Gas is not stated, but it would be manifestly unfair to blame either, for them, and such a quantity of gas was allowed to escape as would be far more than sufficient with either gas to cause death.*

This leaves *three* cases of suffocation which can be properly charged to Water Gas, and *three* from *explosions*, the kind of gas which caused them not being stated. Now, suppose we allow Mr. Littlehales these cases for the sake of argument, and include in the list of deaths in Great Britain, during the time referred to, those which took place from a similar cause, and see how far this claim is borne out.

In venturing to say that there were a greater number than could be traced to Coal Gas *in the whole of Europe* in the same time, Mr. Littlehales ventures a statement that it would be somewhat difficult to controvert, as far as the *Continent* of Europe is concerned, owing to lack of information on the point. As far as *Great Britain alone* is concerned, I find the following accidents recorded in the *American Gas Light Journal* as having resulted from Coal Gas. *How many took place that are not recorded it is hard to say:*

1878:—Explosions, 14; deaths, 1; fatal suffocations, 11.

1879:—Explosions, 20; deaths, 4; fatal suffocations, 6.

1880, to December 7th:—Explosions, 6; deaths, 2; fatal suffocations, including 2 from carbonic acid gas, 5.

Total:—Explosions, 40; deaths, 7; fatal suffocations, 22.

Besides the deaths from explosions, a number of persons were seriously injured.

In estimating the relative danger of the two gases, as I before said, the danger from *explosions* must be taken into consideration.

* Since this was written I have received information of two more deaths having taken place in New York from Coal Gas.—W. H. P.

It will thus be seen that Mr. Littlehales has again shown some want of accuracy in his statements, and he is perhaps not aware that in making such an assertion, he is paying a high tribute to the safety of gas containing very much more Carbonic Oxide than that made in Toronto; as, according to Dr. Wurtz, Wood Gas, containing from 27 to 32 per cent. of Carbonic Oxide, is used largely in many European cities. The gas made from Lignite or Brown Coal in Berlin, contains 40 per cent., and according to Prof. Chandler, in Johnson's Encyclopædia, the Wood Gas of the City of Munich, Bavaria, contains 40.5 per cent. of Carbonic Oxide.

Mr. Littlehales says further: "Since Water Gas has been introduced in Toronto, I believe six fatal cases have occurred." Here again, as usual, Mr. Littlehales is wrong. Four cases, it is supposed, have taken place, but one of those I dispute—that of a feeble woman who arrived at a hotel late at night, apparently very ill and almost utterly exhausted, and who after being in a room for about six hours, where the gas was found escaping from a small burner, was found lying on the floor not only dead but *cold*. No particular examination took place, and no Coroner's inquest was held. Her friends from the country, who came for her body, expressed no surprise at her death. The other three cases all apparently resulted from carelessness, either from blowing out the gas or leaving it turned on. Two of these persons inhaled the gas for many hours, and yet lived some days afterwards; and a relative of one of them said that he had been previously insane; which would make it harder for him to recover from the effects of the gas. It is worthy of remark, that none of the deaths recorded as having taken place in Great Britain resulted from carelessness on the part of the parties who suffered; and it is evident that so much ignorance regarding the use of the gas does not prevail there as here. Mr. Littlehales has again shown a want of knowledge of facts, in asserting that more deaths took place in Toronto than in England since Water Gas was in use here, as *seven* deaths from suffocation and *six* from explosions are recorded in the *Journal of Gas Lighting* as having taken place there during that time; beside two others from carbonic acid gas in the ammonia works of a gas company. The terrible explosion in the Tottenham Court Road, London, England, last July, damaging to a greater or less extent over 400 houses, causing great destruction of property, injuring more or less over thirty persons, and causing the death of two others, will be fresh in the memory of every one.

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The number of deaths which have taken place here since the introduction of Water Gas in January, 1879, has given color to the charge, that Water Gas is more dangerous than Coal Gas; but a reference to the past may tend to disabuse the minds of any who may hold that opinion. It is certainly a fact, that accidents of a similar character do often occur very soon after each other, and then again for a long period none occur whatever.

The past history of this Company fully bears this out. Late in 1853, a man was suffocated at the works. Early in 1857, a house was completely demolished and all of the inmates more or less injured from an explosion caused by the gas having entered the cellar through a sewer. About the same time, two girls were suffocated in a hotel, from an escape from a burner. In 1860, a young lady was suffocated from gas escaping into a house through a sewer, and two other persons were asphyxiated at the same time, and recovered with great difficulty. In 1861, a woman was found dead in a room in the morning, from the effects of gas escaping from a burner during the night.

Here there were five deaths from suffocation in Toronto in less than eight years; two occurring in one year, and two more within two years, besides another serious accident.

Taking into consideration the difference in the amount of the consumption, which averaged during these years only about one-fifth of what it has been here recently, relatively a much larger number of deaths from Coal Gas suffocation took place then, than since this Company commenced making Water Gas.

The number of accidents which have taken place within a very short time recently from gas escaping from coal stoves is another illustration in point.

Experience here has not proved that Water Gas causes death more rapidly than Coal Gas. While in some of the above mentioned cases, the parties were found dead in the morning from the escape of Coal Gas from an ordinary burner during the night, persons have recovered here after inhaling the Water Gas for a much longer period—one after having inhaled it thirteen and a half hours, and another after inhaling it eighteen hours; all the apertures in both of the rooms being closed up tight, and in the latter case the room being a very small one.

It remains to be seen whether or not Mr. Littlehales' predictions will be verified; but if his prophecies are not more correct than his statements of fact, there is not much danger of them being fulfilled; and it is worthy of note that Mr. Lit-

Littlehales did not commence to prophesy until after accidents had taken place. In October, 1879, in a discussion on a paper read by me on Water Gas, in which he took considerable part, he never once referred to the danger connected with its use; but on the contrary, in alluding to its commercial advantages, said, "It is the most important consideration to us in the whole thing." I may also add as a significant fact, that at the two meetings of the American Gas Light Association, at which this subject was discussed, out of the considerably over one hundred gas managers, engineers, &c., present, only two persons besides Mr. Littlehales referred to its poisonous nature—one to ask some questions regarding it, and the other to claim that it was not more dangerous than Coal Gas.

In conversation with a number of gas engineers after the last meeting, every one of them said that the question was simply and purely a *commercial* one.

Although the matter is not referred to either by Mr. Littlehales or in the "Report," yet as it has gained currency that Water Gas is specially dangerous because of its high gravity, it may be as well to say, that such an idea is perfectly groundless. The gas made here is not much more than half the weight of air, very little heavier than *good* Coal Gas, not nearly so heavy as many kinds of Cannel Coal Gas, and it is impossible to have gas of high illuminating power without its being of high gravity. The gas will raise a balloon, and any one who will open a gas jet in the lower flat of a house will very soon find that the gas will ascend to the upper ones.

The fact of a law having been passed recently in Massachusetts which practically prohibits Water Gas, is presented as an argument why a similar law should be passed here. I am informed on credible authority, that that law was passed in the interests of Coal Gas Companies. Coal Gas Companies very naturally do not want competition, and most Coal Gas managers do not care to have the trouble of making the changes necessitated by the introduction of a new process. Moreover, many of them have already committed themselves against Water Gas, and it would be a considerable "coming down" in having to acknowledge their mistake by adopting it. The easiest way to get rid of the difficulty and shut out opposition, of course, would be to obtain legislation against it, and I am quite satisfied that Coal Gas Companies in other places, would be very glad to obtain the same legislation. The legislation obtained has given plenty of margin to Coal Gas Companies, but has

limited the only dangerous ingredient in the gas, which is found in Water Gas to a greater extent than in Coal Gas. If it is so very dangerous, why not legislate it all out; and why not obtain legislation limiting the quantity of the dangerous *Marsh Gas*, of which there is a very large quantity in the Coal Gas? Simply because Coal Gas Companies could not comply with such conditions.

The law passed in New Jersey, referred to, *practically prohibits the manufacture and sale of any illuminating gas*, as it enacts that no gas can be sold which contains more than *two* per cent. of Carbonic Oxide or *ten* per cent. of Hydrogen. Any one who understands the composition of gas, must be aware that no illuminating gas can be made to comply with those conditions. The fact that there are a number of gas companies in this State, none of which do or can comply with the Act, is sufficient evidence that the law is a dead letter.

This Company is blamed for not substituting five feet burners for those used in the street lamps.

The Company will be very glad to do so if the Corporation will pay the difference for the gas. I am quite confident, however, that on testing the burners it will be found that instead of consuming three feet per hour—the quantity contracted for—they are on the average consuming considerably more. I would take the liberty of reminding the Committee of some other facts connected with the street lamps, which are worthy of consideration. The Company have recently erected over 500 iron posts, at a cost of several thousand dollars, and on the principal streets, are putting on handsome globe lamps at a very considerable cost. I think I may also say, that there is not a place on the Continent where the lamps are kept in a better or cleaner condition.

While speaking of the street lamps, it may also be as well for me to correct an opinion which is apparently entertained by some of the members of the Council, viz., that the city is paying more for the gas than private consumers are. A member of your Committee is reported in the papers to have said that the Company, though reducing their rate to private consumers, continued to charge the city at the rate of \$3.00 per thousand feet for the gas supplied to the street lamps, while ordinary consumers got it for \$2.00 per thousand. The fact is, ordinary consumers only pay \$1.50 and \$1.75 per thousand; and after paying for the expense of lighting, cleaning and repairing, and interest on outlay for the street lamps, the Com-

pany do not receive from the Corporation more for the gas than the lowest price mentioned, and the Corporation was only paying at that rate, when the citizens were paying \$2.50 per thousand.

It may now be well for me to repeat what I said in a circular addressed to the members of the Corporation; that the limitation of the Carbonic Oxide in the gas now supplied by this Company and several others in the Dominion to the quantity allowed by the Massachusetts legislation, would be tantamount to its prohibition; for no means have yet been discovered for its profitable elimination. "It would cause a loss to the Company of the large amount expended for the erection of works for the purpose. It would render it necessary for them to increase the price of the gas without being able to supply as good an article as that now furnished. It would stop the expenditure in our own Province by this Company alone, of from \$25,000 to \$30,000 annually for petroleum, and cause them to spend in the United States instead, between \$50,500 and \$60,000 for coal to take the place of petroleum."

It is stated in the "Report" sent that as "the consumers were not consulted about the expense incurred in changing the mode of manufacture," that therefore the Gas Company "should pay for their own experiments themselves."

In reply to this, I beg to say that this new process was introduced after the most careful investigation *principally in the interests of gas consumers*, and *mainly* as a result of its introduction the price of gas was reduced 25 cents per thousand feet, and had not this process been introduced, no reduction would have been made. Now, this being the case, should the Company be forced to return to the manufacture of Coal Gas, no one would have the right to blame them for returning to the old prices, especially with coal so much higher than it was before the price was lowered. There is no doubt that the consumers would be much dissatisfied at this, but the responsibility of making the change would not rest upon the Company, but upon those who might force them to take such a course.

All of which is respectfully submitted.

W. H. PEARSON, *Secretary.*

APPENDIX "A."

At the meeting of the American Gas Light Association last October, at Chicago, in a discussion upon a paper read by me there on the Lowe Process, Mr. Littlehales made a similar charge regarding the gas, but first took care to furnish himself

with a statement, which he read for the purpose of showing that its illuminating power was sometimes as low as that which he then claimed it had been—under ten candles. This statement I disputed, and then the following discussion, as recorded in the *American Gas Light Journal* of the 16th inst., took place.

"Mr. Littlehales.—Mr. Pearson challenges my statement about the quality of the gas. I read a paragraph from a Toronto paper: 'Alderman Boustead presented four reports by the Government Inspector in reference to the Gas supplied to the City by the Toronto Gas Company. They showed the illuminating power of the gas (12 candles being the standard) to have been on October 5th, 12.08 candles; on October 9th, 10.62; on October 28th, 14.67; on October 11th, 11.54.'

"Mr. Pearson.—That is manifestly incorrect.

"Mr. Littlehales.—This was last October.

"Mr. Pearson.—We were making Coal Gas then, gentlemen.

"Mr. Littlehales.—Last October?

"Mr. Pearson.—We were unable to use the Lowe Process exclusively, because we had not the means of properly purifying the gas. That is a very different statement. (Laughter.)"

Will it be believed, that the paragraph which Mr. Littlehales read, *was taken from a Toronto paper, not of October, 1879, but of November, 1876, and contained a report of the illuminating power of the Coal Gas made by this Company in October of the same year—years before this Company commenced making gas by the Lowe Process?*

In corroboration of this, it is only necessary to call the Committee's attention to what they are probably well aware of—that Alderman Boustead, who presented these reports, has not been a member of the City Council since 1878, and was not Chairman of the Fire, Water and Gas Committee after 1876.

APPENDIX "B."

Mr. John Kerr, manager of the Kingston Gas Works, where the Lowe Process has been in successful operation for about four years, writes me as follows, in a letter dated the 20th inst.:—"I do not find any difficulty in maintaining our gas at a uniform standard, nor need there be any, if the same quality and quantity of oil is used, and the same degree of heat maintained in the generator and superheater. During the past month *my gas has not varied more than two candles in any one day, and very seldom that*; and I feel perfectly satisfied that *this much and even more variation will take place in any Coal Gas works in a given space of time.*"

Mr. Kerr was a manager of Coal Gas works for about thirty years.

Mr. F. H. Hambleton, the engineer of the large Lowe Works of the Consolidated Gas Company of Baltimore, Md., in connection with which there are two Coal Gas works, writes as follows, under date of the 24th inst.:—"I have to say that we are not troubled about our candle power, and that the city inspector reports us as making a variation from the average of *less than one candle for months; in fact, ever since we started.*"

"We are satisfied, and have fewer complaints by long odds from our consumers of Oil Gas than from those using Coal Gas."

The manager of the Lancaster, Pa., Works writes:

"The candle power is not variable after it leaves the holder, as I have frequently tested. We take the candle power at the works, and from tests at my house, one and a quarter miles distant, there is no perceptible difference. I am now running besides our works *the Coal Gas Works* of the old Company, and with the best skill *I cannot prevent that gas from varying, and will abandon gas making at these works soon after January next, and make all by the Lowe Process.*"

APPENDIX "C."

DR. E. FRANKLAND, of the Royal College of Chemistry, South Kensington Museum, London, writes regarding the Water Gas manufactured by the Municipal Gas-Light Company of New York:—"In compliance with your request, I have read the reports of DR. HENRY WURTZ, dated January 1st, 1878, and March 4th, 1878, on the composition and properties of the gas of the Municipal Gas-Light Company of New York, and also the articles published by Professor H. MORTON, in the *American Gas Light Journal* of March 2nd and 16th, 1878, and having been called on to express my opinion as to the adaptability of this gas for lighting and heating purposes, I have no hesitation in saying that it may be used with safety both in public buildings and private houses. I should be delighted to substitute this *pure and powerful illuminating agent* for the gas with which my house in London is at present supplied, although it is used in all the bedrooms."

DR. ADOLPHE WURTZ, member of the Institute, Professor at the School of Medicine and the School of Sciences, Paris, writes regarding the same gas:

"I have been struck with the correctness of the remarks which terminate the Report of Dr. H. Wurtz, and which in my opinion answer the objections formulated by Dr. Henry Morton, inserted in two articles in the *American Gas Light Journal*, published in New York. No doubt the danger of poisoning exists with all gases containing Carbonic Oxide, and Coal Gas is not exempt from the latter, as it can contain as much as twelve per cent. of its volume. But I think the danger—which could only have sad consequences in exceptional cases and through a sort of fatality—has been exaggerated, and should not be taken into account, considering that gas is used without hesitation for lighting our houses, notwithstanding the very real danger of explosion and fire, no matter what kind of gas and its composition.

"Further, the use of Water Gas has never been prohibited in France; and if the numerous processes which have been indicated for its production have been abandoned, or have received only a restricted application, the cause is principally due to the circumstance that the technical and economical conditions of the production have up to the present been very unfavorable."

In reply to inquiries made by me regarding the relative danger of Coal and Water Gas, PROF. T. STERRY HUNT, of Montreal, writes:

"I must say, however, that the notion of any important difference as to the safety or fitness for use of two such gases seems to me to be absurd. The only questions to be raised are the relative cheapness and illuminating power."

The following are answers to questions addressed to DR. HENRY WURTZ, of New York, regarding the Lowe Gas:

"Question 5.—Are the products of combustion of this gas, when in use, more or less deleterious to health than those of gas from gas-coal?

"The answer to this question must be qualified by assuming it to apply to gases of like candle-powers. In this case it is matter of chemical demonstration that the amount of carbonic acid formed by the Lowe Gas when burning, the amount of aqueous vapor formed, and the amount of atmospheric oxygen consumed or destroyed, are all three very considerably less than in the case of gas from gas-coal. The effects upon the atmospheres of rooms (equally lighted with the two gases) tell, therefore, considerably in favor of the Lowe Gas.

"Question 6.—Whether, in the event of leakage in dwellings,

the new gas is more dangerous or less dangerous to life and property than ordinary gas-coal gas?

"The dangers from leakage of gas are two in kind: 1. From suffocation by inhalation. 2. From explosion and fire. Of these, the last is much the most common and the most serious, involving injury to both property and life. Indeed, suffocation rarely or almost never arises from ordinary (accidental) leakage; but mostly from inexcusably culpable negligence or ignorance. Facts on record support strongly the belief that variation in composition of illuminating gases has little or no appreciable influence in its suffocating quality. The most narcotic agents present are the illuminating hydrocarbons, and a small percentage of these in air is always dangerous to life, by reason of the rapid anaesthesia which follows their inhalation; and Carbonic Oxide is also a powerful anaesthetic, but not more so than these heavy hydrocarbons, on which the illuminating value of all gases depends. As to the explosiveness of the two gases, however, and the danger arising therefrom, the new gas has a decided advantage."

Carbonic Oxide is a gas whose explosive power for equal volumes is far smaller than that of Marsh Gas, a main constituent of ordinary gas-coal gas. This is because in exploding Marsh Gas consumes four times as much Oxygen as Carbonic Oxide. The introduction of the Lowe Gas must therefore be attended with diminution of risks to life and property.

(Signed), HENRY WURTZ, Ph.D.

12 HUDSON TERRACE,
HOBOKEN, May 13, 1878.

Regarding Dr. Henry Wurtz, Prof. T. Sterry Hunt, of Montreal, writes:

"He has for many years past paid special attention to the various questions connected with gases for illumination and heating, and has by original processes much improved the method of gas analyses. I do not hesitate to say that his ability and his conscientiousness would make his judgment in all cases where such cases are involved of the greatest weight."

The following are extracts from a Report prepared at the request of this company, by Professor H. H. Croft, late Professor of Chemistry, University College, Toronto:

"The explosions caused by gas arise from its becoming mixed with Oxygen, or what comes to the same thing, atmospheric air, containing one-fifth of Oxygen."

"Olefiant Gas, with 3 parts of Oxygen (15 of air), forms a fearfully explosive mixture."

"Marsh Gas, with 2 parts of Oxygen (10 of air), forms an equally explosive mixture.

"Hydrogen, with $\frac{1}{2}$ its bulk of Oxygen ($2\frac{1}{2}$ air), forms a strongly explosive mixture.

"*Carbonic Oxide, with Oxygen or air, forms a mixture which, as far as I know, does not produce any violent explosion.*

"Hence, the greater the quantity of these hydrocarbons, Olefiant and Marsh Gas in the gas, the more explosive it would probably be when mixed with air.

"In conclusion, I may say that the gas made by the Lowe Process, or from coal, may be used indifferently, with proper precautions and common sense, and that the one is not on the whole more dangerous than the other, nor nearly so much so as the oil employed in our lamps."

The following is an extract from a report on the gas, made for this Company by DR. PIKE, Professor of Chemistry, University College, Toronto:

"The City gas as at present supplied is, if used with the ordinary precautions necessary in the case of Coal Gas, free from all practical danger, which is, as far as I remember, what Prof. Croft says in the report which I saw. I find it more difficult than I anticipated to come to a certain conclusion as to the comparative danger to life of an open tap or leak in a bedroom in the case of Coal Gas and Lowe Gas, but I think that the following considerations will prove to you that there can be no great difference."

Some years since, PROF. H. MORTON, of the Stevens Institute, Hoboken, N. J., objected to the gas because of its dangerous character, and he is the only chemist of note in America, that I am aware of, who has done so; but even *he* has changed his views upon the point, and in a letter in the *Plumber and Sanitary Engineer* of January 15th, 1880, says:—"I am quite ready to admit that when the subject first came to my notice, my impression was very much of that nature;" that is to say, "that Water Gas was so practically dangerous (on account of the large amount of Carbonic Oxide in it), that it should not be admitted into general use;" "but *further consideration* modified this view," and that "it would be a *question of economy and efficiency simply*, whether Water Gas did or did not become the gas of the future."

It is worthy of note that Professor Morton, in an article upon *Carbonic Oxide*, in the *American Gas Light Journal* of March 2nd, 1878, quotes many more authorities than those mentioned by Mr. Littlehales and in the "Report," in proof of its poisonous nature.

