piece of lead immersed in some of the water for a week, and this water after evaporating to a fourth of its bulk, showed it was contaminated with lead to a sufficient extent, if it were constantly drunk, to produce the poisonous effects of this metal.

This circumstance, therefore, should be a caution to the public against using lead pipes, cisterns, &c., for poisoning by lead in this way is by no means an uncommon occurrence, and from being introduced into the system gradually, it becomes a most insidious poison, producing the most serious derangment of the health, which unfortunately is but slowly, if ever, restored, from the disease being often attributed to other causes.

XVI.

GAS AND GAS WORKS:

CONSIDERED

IN RELATION TO THE PRESENT CIRCUMSTANCES

AND REQUIREMENTS OF THE COLONY.

BY A. K. SMITH, ESQ., C.E., F.R.S., &c.

(*Continued.*)

READ JUNE 7, 1855.

FOURTHLY and lastly, the application of Gas to public and private uses.

The three great arguments at one time advanced against

the use of gas are now almost annihilated although we hear them quoted, either for one reason or another, as a mode of illumination more dangerous, more unhealthy, and more costly than the more common methods of obtaining heat and light.

It fortunately happens, however, that from the progress of collateral knowledge, that the first of these objections has long ago received a conclusive answer through the experience and practice of our insurance companies, who are now so perfectly convinced of the safety of gas, that they neither make any extra charge, nor require any notice or intimation whatever upon its adoption, as a luminiferous or calorific agent, in place of lamp, candles, or coals. Here then we have the best of tests, the money-test, the test of self-interest, a kind of evidence it is impossible to controvert, coming as it does from a class of the community not very liable to be deceived in such matters, and this test so powerfully demonstrated the entire safety of coal gas (here I quote from the admirable paper by Lewis Thompson, M. R. C. S.), that I will henceforth dismiss it without the ceremony of discussion. No man of common sense now-a-days believes that there is any real danger in the use of coal gas. But the question of unhealthiness or insalubrity is not so easily disposed of, for here we have unhappily no insurance evidence to assist us, and even the bills of mortality are inconclusive, nay although it is quite notorious that the workmen constantly employed about gas works enjoy excellent health, and live to a good old age, yet this only proves, we are told, that they are "used to it," or like Macbeth they bear a "charmed life." Perhaps it would be impossible to point out a more remarkable instance than the above of the effect of prejudice on the imagination; there are thousands who firmly believe that coal gas in burning gives off some highly deletereous compounds, from which wax, tallow, oil, and even coals themselves are free, and this belief is supposed to be corroborative testimony in the shape of facts displayed in the creation of disease, or in the misconceived

opinions of medical men; but the real truth of the matter is, that whether gas be burned under the name of gas or not, can make no difference whatever to the advocates of this strange prejudice, for under all the circumstances used in the ordinary burning of wax, tallow, oil, &c., &c., it is gas, and nothing but gas that is burned, the only difference being that, coal gas is always purified before it is consumed, whereas the extemporaneous gas of a candle or lamp is consumed without being purified at all, and hence, light for light, it must and does vitiate the air of an apartment vastly more than coal gas. If, therefore, it is true that gas is insalubrious, then wax and oil must be decidedly more so, from the simple fact that all the impurities they evolve pass into the atmosphere of the locality lighted; whereas the great bulk, at least, of these from coal gas remain at the gas works. The actual question consequently for the public to consider is, not whether the burning of gas be injurious to health, for, in one shape or another, gas must be burned to procure light, but the point is, whether is it better to consume for this purpose gas of a pure or impure quality.

In an earlier page of this paper, I mentioned that a wax or tallow candle was simply a gas work on a small scale, consuming the gas generated immediately on its production and without having its impurities removed; now those impurities arising from coal are conducted through instruments called condensers, scrubbers, and purifiers, where the impurities are arrested by various means, so that, in the end, pure gas only is sent to be consumed by the public. Thus, then it would appear, that the advocate for wax and tallow illumination is not only a manufacturer and consumer of gas, but, what is worse, a manufacturer and consumer of the most impure kind. It is well known that the red hot wick of a recently extinguished candle continues to give out a dense fetid vapour or smoke which readily kindles on the approach of a lighted match—this smoke is nothing but impure gas, the very gas constantly burned by the wax and

tallow advocate, and which, if properly condensed and purified, would resemble coal gas, the two differ only in respect to purity, and I (Lewis Thompson) have entered thus minutely into the question, for the purpose of showing the extraordinary power of prejudice, because, although it follows as a necessary consequence of the above comparison, and is moreover susceptible of positive proof, that all the ordinary agents employed to give light evolve more impurity and vitiate a larger amount of atmospheric air than coal, yet many tolerably well educated persons are to be found who have argued themselves into a belief the very opposite of that which is the correct one. With regard to the last argument, that gas is more costly than light from wax, sperm, &c. &c., but little need be said, as it is now universally admitted that gas is the cheapest where a considerable amount of light is required, yet, strangely enough, it would appear that where but little light is needed gas is not cheaper when consumed in the fittings or burners generally in use; this arises from those burners being fixtures, and hence an equally near position to them is not always attainable, as to that of a lamp or candle; it is true this can be remedied by having a flexible Indian rubber tube, or by the use of elbow-joints, &c., as in Scotland, where the light is brought into proper proximity with the object in view, but unless this is done, as before stated, gas is not cheaper where little light is required, for this reason, that the effect of light diminishes in proportion to the square of the distance, it is clear that a single candle placed at two feet from any object will illuminate that object as strongly as thirteen candles, or a gas light equal to thirteen candles, would do, if placed at a distance of little more than seven feet. Thus we see the advantage of position which the common candle possesses, and which compels the public to consume, as a general rule, thirteen times as much gas, and to generate thirteen times as much expense, heat, and inconvenience as would be incurred did

we possess facilities for bringing the gas we burn into the same advantageous proximity as the candle; and the above fact requires also to be kept in mind by those who would substitute a gas light in a fixed position for any other portable light in common use.

The relative quantities and cost of gas and sperm candles have been obtained by photometerical experiments, the results of which are, that 1,000 cubic feet of common gas was found to yield a light equal to that derived from 312,000 grains or 44 4-7 lbs. of sperm candles—assume the price of gas to be 25s. per 1,000 feet and the actual cost of sperm candles 2s. 6d. per lb. (the present selling price in Melbourne is 3s. 3d.), we would have for equal quantities of light:—

44 four-sevenths lbs. of Sperm Candles at 2s. 6d....	£5 11 6
1,000 feet of Gas, at 25s	1 5 0
Leaving a balance in favour of Gas	£4 6 6

or nearly four and half times cheaper than sperm candles.

From the preceding facts, I think it will be admitted by every candid inquirer, that in point of safety, salubriety and economy, coal gas not only rivals but greatly excels every other form of illumination yet within the reach of the public, and I know of no reason unless ignorance and prejudice may be dignified by the title, why gas should not be universally employed in all the cities and towns, in our public and private edifices, in our workshops, and in our parlours. Amongst many other useful purposes to which coal gas may be applied besides those of lighting our streets and houses, I may mention that its introduction into the hall, the kitchen, the bath room, the laundry, and the stable, has been attended with signal success. In the hall it can be used to warm and ventilate the house, in the kitchen to cook our victuals, in the laundry to heat iron for the preparation of our linens, in the bath room for the purpose of heating the water, in the stable for the singeing of horses, &c., &c.

In the colony of Victoria cooking and warming by gas has great claims to our attention for several reasons, that, though important here, are of less consequence at home and in other countries. I refer to the sudden change of temperature, often varying as much as thirty degrees Fahrenheit in a few hours, and also to the fact that in no part of the world does the saying of "time is money" admit of a broader or more truthful application than here.

The public of Great Britain have been much indebted to J. O. N. Rutter, Esq., for many excellent hints on the use and abuse of gas; and in a paper read before the Society of Arts, in 1853, he proceeds to say,—"It may not be immediately and not without its advantages in promoting the sale of gas, if its applicability to heating purposes be a little more attentively considered, the proper methods of using gas need only to be understood to become popular. The actual and relative cost of such is not of so much importance as may be imagined. In the every day business of life, out of doors and in-doors, we willingly pay something extra for comforts, conveniences, and luxuries; so it is with gas as fuel, the most simple, comfortable, and healthful means of adopting it ought to be the first consideration, if it cost more than a common fire as a matter of £ s. d., it possesses advantages of another kind which money will not easily purchase."

Mr. Chairman and Gentlemen, understanding that other papers will claim your attention this evening, I draw this paper somewhat abruptly to a conclusion, at its commencement I stated that I would refer to, and quote from, various authorities on the subject, I have done so; and lest I should be accused of plagiarism, I beg again to acknowledge the fact.

I have to thank you for your attention to a Light subject although it may have been rather Heavily treated.