

light, by "atmospheric air" laid on in pipes, with peculiar appliances of heat.

The Author's proposal may be considered as supplemental to each and all of these, and may be described as a method of charging common air, or non-luminiferous gas, with a highly-volatile naphtha, so as to consume it for the purposes of light, without the aid of heat, or of curious lamps for burning it.

The Author cannot conclude, without instancing a confirmation of the law of simultaneous invention, which is in natural connection with the subject, nor without, at the same time, doing homage to the ingenuity of the gentleman whose name he has here again occasion to quote. As the Author was writing the last paragraphs of this communication, a Paper, lately published by Mr. Donovan, was, for the first time, pointed out to him. In it are described some contrivances for burning naphthalized air, which have evidently flowed from a line of thought and of experiment, nearly parallel to that of the Author. Many of the later processes and results seem, indeed, to have been almost identical; but Mr. Donovan appears, for want of benzole, to have stopped just short of a scheme for the general distribution of luminiferous air. The account alluded to was read, February 28th, 1848, before the Royal Irish Academy, and is printed in vol. iv. p. 75, of their 'Proceedings.'

Mr. LOWE said, that in following the train of experiment first taken up by Mr. Faraday, Mr. Mansfield had obtained some highly interesting results; he had introduced to the Meeting the practical uses of a new class of highly-volatile hydrocarbons, and he hoped their introduction would prove as useful practically, as it was, theoretically, simple and good. A somewhat similar idea had occurred to himself; he had a light supplied on the naphthalizing principle, burning in his own house in 1822, before Mr. Donovan had made any experiments in that direction. He had, at first, used small meters charged with naphtha, the fluid being maintained at the same level, by means of a bird-fountain; these trials led to the general use of naphtha, for improving the quality of the flame of the common gas, as he had explained in 1824-25, in his evidence on the London and Westminster Gas Bill, where he fully stated the effect of the process of naphthalizing: and there could be no doubt, that the richness of gas, and those of its qualities which rendered it suitable for illumination, were chiefly derived from naphtha, naph-

thaline, and other hydrocarbons. His patent for naphthalizing coal-gas was taken out in 1832.

He thought Mr. Mansfield was entitled to great praise, not only for the valuable results of his researches, but for the immense labour he had bestowed on the subject; it was understood, that many hundreds of well-recorded experiments had been made by Mr. Mansfield, before this application of these new volatile oils had been matured; one, only, of a considerable series of these substances had been prominently brought forward on this occasion, but it might be expected, that equally practical uses would be found for nearly all the others.

MR. MANSFIELD apologized for having, in this historical sketch, apparently omitted the facts relative to the period of Mr. Lowe's experiments, which, it appeared, had preceded those by Mr. Donovan. They did not appear in the specifications at the Patent Office, which were the only records to which Mr. Mansfield had access.

In answer to questions, he stated that a gallon of crude benzole would cost about two shillings and sixpence, and that it would be equivalent to 1,000 cubic feet of gas; that conclusion he came to by the quantity of light obtained, as stated in the Paper. The benzole-vapour might possibly crystallize, but not until the pipes were exposed to a very low temperature, below the freezing point, which, practically, was scarcely probable.

Coal gas was a mixture of several hydrocarbons; naphthaline was one of those which crystallized at the ordinary temperature of the air, and it was that substance which did crystallize in the gas-pipes; not a trace of that substance was to be found in the benzole. The crystallization could not be said to arise from any excess of carbon in the composition, but from a physical property of the substance, of which, as yet, nothing was known, except that it was so; other substances containing an equal amount of carbon did not exhibit that tendency.

MR. LOWE said, it had been often urged against naphthalizing coal gas, that the naphtha would be deposited in its transit through the pipes: to set the matter at rest, he naphthalized all the gas in a gasometer at the Brick-lane Station, and conducted it for a distance of one mile, into another gasometer at the Curtain-road Station, without there being any perceptible difference; it had not lost any of its luminiferous properties, in passing from one station to the other. If its temperature was greatly reduced by passing through a colder medium, after having been naphthalized at a temperature of 70° , or 80° , a portion of it would be deposited; but from that, the gas, or air, should be well saturated at that high temperature. Now it was never requisite to saturate coal gas, when it was wished

to double its illuminating power, in fact, it only received, practically, one-fifth part of saturation; it was found, that if 1,000 cubic feet of coal gas took up one gallon of naphtha, it obtained considerably more than double its former illuminating power. It had been tried for a time at the engineering department of the South Western Railway, with and without the naphtha, and the result had been, that with the naphtha the gas gave a superior light at, he believed, not more than half the ordinary cost. Mr. Lowe had never found any deposit of naphtha in the pipes, or fittings. Such a deposit had been stated to have occurred in the House of Commons, but the fluid found in the pipes arose from the water-meter placed in the heated roof, where the water was soon evaporated by the heat, and was condensed in the first favourable spot. He doubted whether the naphtha could be obtained at one shilling per gallon; that which he used cost two shillings and sixpence per gallon, and it was a question how much benzole could be obtained from that quantity. The best naphtha now in use, was procured from Dundee, and was made from cannel coal.

Mr. MANSFIELD replied, that the crude naphtha from which he made benzole, had only cost one shilling per gallon, when purchased in small quantities; in the Paper, he had quoted two shillings and sixpence per gallon for the rectified naphtha, which was that to which Mr. Lowe referred.

In answer to a question from Mr. Lowe, Mr. Mansfield stated he had procured a proportion of one-fourth from the best crude naphtha, which was that from Scotland and the north of England; he thought the London naphtha would not yield more than one-sixth; there would, after the extraction of the benzole, be still the sale of the residuum product, which he thought would bear nearly the same price as before, those of its properties from which its value for many purposes arose, not being appreciably diminished, and some of them being actually enhanced by the abstraction of the benzole.

Mr. Lowe thought there would be little advantage to the coal gas, in using naphtha from which the benzole had been extracted; that had formerly been the impediment to the first invention. The naphtha sold in London was of so bad a quality, that little more than one-third could be volatilized, and it was so loaded with sulphurous compounds, that the gas, after being naphthalized, could not be burned in sitting-rooms.

Mr. MANSFIELD explained, that the uses of naphtha, to which he alluded, were not those in connection with illuminating gas, but various others, which occurred in the arts; he believed, however, that one of the oils, constituting the residual naphtha, of which there

was fully as much as there was of benzole, in the crude material, would answer quite as well as the finest naphtha of commerce, for the purpose of improving the illuminating power of gas.

Mr. RETTIE said, the value of this, as of every other invention, must be tested by its utility, safety, cheapness, and cleanliness. It was important to ascertain, whether the proposed light could be used in the same simple way as the lights in present use, without fear of accident. He admitted, that the light exhibited was beautiful, but, he submitted, that unless it was free from the objections to camphine and all spirit-lamps, there was little chance of its coming into general use. Camphine, if it had been less dangerous, would have been more generally used, notwithstanding the annoyance of its producing, at times, such volumes of smoke and soot. The new system had much to contend with, and would have still more, if the quality of the London gas, and the workmanship of the fittings and burners was improved; he also thought the gain in point of economy was not clearly demonstrated.

Mr. WYNDHAM HARDING begged, in the absence of Mr. Gooch, to confirm what had been stated, with respect to the experiments at the South Western Railway, the general results of which were, that by the use of naphthalized gas, there was a clear saving of 30 per cent. The plan had been tried for two, or three months, on a small scale, and not any disadvantages had been discovered; it was, therefore, intended to try it on a larger scale.

Dr. HOFMANN stated, that the very accurate and lucid descriptions which Mr. Mansfield had given of his system of illumination, precluded the possibility of his offering any remarks which could be of value, or interest to the Meeting. He had had the pleasure of witnessing the progress of Mr. Mansfield's experiments upon coal-tar, and was highly gratified with the results which his perseverance had obtained. As to the brilliancy of the light afforded by the apparatus, which had been exhibited, there could be no doubt; and as to the danger, apprehended by the gentleman who had just spoken, he could not see it; he thought that this method would not present any more danger than the use of ordinary gas. The question of economy he would leave untouched, but he was confident, that Mr. Mansfield had made his calculations with great care and circumspection. He hoped, that an opportunity would soon be offered to Mr. Mansfield, of removing, by experiments on a sufficiently large scale, any doubts which might be still entertained, respecting the practical value of his invention. He could only add, that the scientific combination of chemical principles by which Mr. Mansfield had perfected his contrivance, was exquisitely beautiful.

Mr. WHISHAW said, he had used camphine-lamps since they were first invented: with moderate care there could be no danger, and certainly, the lamps gave the most beautiful light that could be introduced into a house. With regard to economy, his three camphine lights cost him fourpence a night.

Mr. R. STEPHENSON, M.P., V.P., said, he thought there was no chance of danger in the proposed system, as the pipes were intended to convey the common air, or other gas from the air-holder through a metallic vessel containing the benzole, which would be placed in the cellar, or in an outbuilding.

He mentioned the gazogène-lamps now commonly used in Paris, which were simply composed of a vase containing, he believed, alcohol and oil of turpentine, the spirit of which ignited without any wick, at the upper extremity of a tube, which plunged into the liquid. This system of illumination was simple, and the light was pure and white; but in England it would be too expensive, in consequence of the cost of the alcohol.

Mr. APSLEY PELLATT thought if Mr. Mansfield could manufacture the benzole from the mere residue, there would be a probability of his making a cheaper article than if it were produced directly from the raw coal, although as a general rule, it was the proper system to manufacture from the raw material. With respect to the London gas, most of the Companies were in active competition with each other, as to which of them should introduce the purest article, and Mr. Lowe could corroborate the assertion, that the London gas was as much as possible cleared of sulphur, and nearly of ammonia. There was, however, one great mistake, which he thought all gas manufacturers fell into, looking more to the cost of the material than to the expense of conveying it; there was still too great leakage from the pipes, and then there were heavy expenses of inspection and of general establishment, and many bad debts, all of which diminished the dividend of the proprietors, and caused the high price of gas when sold, as compared with its actual prime cost. Great pains were taken, not only to render the gas pure, but to give it all the carboniferous matter it ought to possess, and constant improvements were introduced, with a view not only to the amelioration of its quality, but also to the processes of manufacture. Exhausters had been recently used for the purpose of taking the pressure from the retorts, and facilitating the subsequent stages of purification: this recent introduction was expected to be of considerable importance in the manufacture.
