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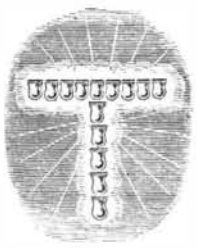
A VISIT TO THE MANHATTAN GAS-WORKS.



THE manufacture of illuminating gas is a very simple operation; and as this substance is now in daily, or rather nightly, use by a very large portion of the community, we suppose our readers would like to understand how it is made. Having recently gone over one of the two large establishments of the Manhattan Company, in this city, we are able to give a reliable description of the process, which we shall do with the utmost brevity possible.

Illuminating gas is made by subjecting bituminous coal to a red heat in a tight retort for the space of five hours, during which time the coal is decomposed and the gas is driven off through a pipe which communicates with the retort. When the hot gas is first driven off, it is mingled with three other compounds (tar, ammonia and carbonic acid), either of which would injure its illuminating properties, and which have to be separated by three different processes. The tar is condensed by cooling the gas; the ammonia, being readily absorbed by water, is removed by exposing the gas to a shower bath; and the carbonic acid is separated by passing the gas through successive layers of dry lime.

The apparatus by which the several processes are performed is, though extensive, very simple, and we can, in a few words, give a clear idea of it. The retorts are made of iron or clay, 7½ feet long, of semi-cylindrical or D shape, with the straight side at the bottom. Five of them are set over one furnace, in one bench as it is called, though the benches are joined together, forming one long pile of masonry, with the retorts facing outward on both sides. The inner end of the retort is cast solid and tight, but the outer end is made open, and is closed by a movable door or plate. The retort is kept at a cherry red heat, and when the time arrives to change the coke in it for fresh coal, the workman removes the door and hauls out the red-hot coke with an iron hoe into an iron wheelbarrow, when it is wheeled away and extinguished with cold water. A long iron shovel, shaped somewhat like a grocer's scoop, is filled with fresh coal, two men place a crooked iron bar beneath it, while a third takes hold of the long handle which extends directly from the end; the scoop is lifted and entered into the retort and pushed home to the end, when it is turned over and withdrawn. Each retort is charged with 150 lbs. of coal, and when it is charged the door is taken up from an iron wheelbarrow, by which it has been brought, readily prepared with a channel full of moistened clay or loam around its edge, and is screwed against the end of the retort by a clamp which takes hold of a flange on the the end of the retort. The heat immediately begins to expel the gas, which continues to pass off for five hours. It passes up a pipe which communicates with the retort, and is bent over into a long cylinder, passing down under the surface of the water with which the cylinder is partly filled. The object of this arrangement is to prevent the gas from flowing back from the main reservoirs and escaping through any one of the retorts while it is opened. The gas bubbles up through the water in the cylinder last mentioned, and flows on through a large pipe to the condenser.

The condenser consists simply of a series of large long pipes standing vertically over a vessel of water, and so divided that the gas must pass through them in succession. The tar is condensed and runs down into the water, and is drawn off through a stop cock. About 10 gallons of tar are produced from a tun of coal. To remove the ammonia, the gas is carried to the shower-bath or scrubber. This consists of a large upright cylinder, filled with successive layers of coke supported on horizontal lattices, with a jet of water coming in in spray at the top. The gas is admitted at the bottom, and as it struggles up through the wet coke the ammonia is brought into contact with the water and is absorbed by it. The purifier for removing the carbonic acid is a series of three large low boxes, some two feet high and eight or ten feet square, with a tight cover which can be lifted off by means of a pulley, block and tackle. The burnt lime is spread about three inches thick on a series of iron plates, which are perforated with numerous holes. The gas being admitted below passes up through the lime with which the carbonic acid combines, forming carbonate of lime, the same substance as the limestone before it was burned. This is sold to farmers as a fertilizer. From the purifier the gas passes into the great receivers, and is ready for distribution to the elegant parlors, the dirty workshops, the sad sick chambers, and the noisy drinking cellars of the great city.

In the large and elegant laboratory connected with these great works is a perfect gas-work in miniature, for making gas in small quantities from different kinds of coal, in order to test the coal. This test gas is then conducted into a dark room and its light is accurately measured by means of a photometer. The photometer in use at this establishment is the invention of a gas engineer of Liverpool, and is a beautiful device. It consists simply of a disk of paper, one portion of which is oiled and rendered translucent, while the remainder is left unoiled and opaque. The disk slides on a long graduated bar, which has the standard spermaceti candle (burning 120 grains an hour) at one end, and the standard gas-burner (a five-feet Argand burner, 15 holes, 1-23 inch diameter, 7-inch chimney) at the other. If the paper is placed very near the candle, on looking at the side next the candle, we see the opaque portion of the disk much brighter than the oiled portion, the quantity of light from the candle which is reflected being greater than the quantity from the gas which is transmitted. On looking at the other side of the paper, the oiled portion presents the brighter appearance. The paper is slipped along until the distinction between the oiled and opaque parts disappears, and all portions present a uniform brightness which is seen on both sides, when the comparative distances between the paper and the candle, and the gas and paper, being measured by the graduated bar on which the paper slides, a simple calculation gives the quantity of light emitted by the gas as compared with the candle.

The manufacture of coal-gas is one of the many arts which have grown up within the present century. It was first made at Redruth, in Cornwall, England, by William Murdoch, a Scotch engineer, who lighted his house and offices with it in 1792. Improvements continue to be made in the manufacture, the latest important one being the use of clay instead of iron for retorts. English coal has heretofore been almost exclusively used in this city for gas, but American coal is now being gradually substituted.

DEATH OF BRUNEL.

Lately the news came bounding gladly over the waters of the Atlantic, detailing the success of the *Great Eastern* on her first trip, but swiftly on the heels of this came other intelligence of a sad character, having a close connection with this event. When shouts of joy were reverberating along old Albion's chalky cliffs as the mighty steamship moved majestically down the classic Thames, tears were falling fast for her projector, Mr. Isambard K. Brunel, C. E., who at that period was sinking in the arms of death from paralysis. He departed life on the 16th ult., like a general struck down with the shouts of victory ringing in his ears. He was the son of M. I. Brunel, a French royalist and a man of wonderful inventive powers, who had to flee from his native country, in 1793, and found refuge in this city (New York), where he was engaged for several years as a surveyor, engineer and architect. Having invented a machine for turning irregular forms, and specially adapted for making ships' blocks, he went to England, and the British government at once employed him to put up his machinery at Portsmouth, and from that moment he became a justly conspicuous character. His distinguished son, now deceased, was born in Portsmouth in 1806, and received a collegiate education in France, where his father sent him. Having a taste for engineering, he devoted himself to this profession, and was first employed as assistant to his father in the Thames Tunnel. He also was of an inventive turn of mind, and in 1826 became a patentee for an engine to be driven by carbonic acid gas. This was shortly after the gas had been liquified by Sir Humphrey Davy, and when there was a most intense excitement regarding it superseding steam, because it was so sensitive to heat; but it was a failure in practice. He was a man of great ideas, and seemed to delight in mighty projects. He designed the Great Western (7-foot broad gage) Railroad, the most magnificent line in the world; also the steamship *Great Britain*, the largest known when built; and now his life concludes with the completion of the greatest naval wonder the world has ever seen. Mr. Brunel was also the engineer of the Tuscan portion of the Sardinian railroad, and he built the Hungerford Suspension Bridge over the Thames, at London, which is said to be the largest span in England, and is a model of elegance. He was a man who had great self-confidence, and this was manifested in his controversy with George Stephenson in regard to the comparative merits of the broad and narrow gage railroads, called "The Battle of Gages," which agitated Parliament and the whole country for several years; but experience has proved that Stephenson was correct. Being very enthusiastic as well as ingenious, he committed many mechanical and scientific errors by overlooking some important feature which ought to have been taken into calculation. Thus, when the steamship *Great Britain* was built, lo! and behold, the dock had to be dismantled before it could be launched; and he was also unfortunate at the first launching of the *Great Eastern*. At one period, atmospheric railroads were taken up by Brunel, Dr. Lardner, and several other great men, and it was argued they would soon supersede locomotives and steam. Two lines of such railroads were actually built and opened in England in 1845, and General Pasley, the government engineer, reported in favor of this mode of transit. In three years the atmospheric railroads were abandoned, their air tubes were pulled up, and among the rest, the huge one by Brunel on the South Devon Railroad. But there never lived a great man—engineer, inventor or statesman—who did not commit many errors; and although Brunel had his faults, still he was a great engineer and inventor, and he has left behind him many works which will endure for centuries, as a testimony to his skill and genius; and it is to be hoped that his great ship will long plow the waters of the ocean, in safety and with success, as the noblest monument of them all.

THE AMERICAN SCIENTIFIC ASSOCIATION.

Under this title a correspondent (S) of the *Railway Review*, of the 15th ult., makes an attack upon all the papers which presumed to criticise unfavorably some of the proceedings of the above association at its late convention. Of us he says, "One paper of large circulation and considerable influence, and moreover, calling itself *scientific*, is pleased to say: 'In reading the proceedings of the Scientific Association we are driven to the conclusion that it is directing itself in a great measure to useless scientific objects. It is a waste of mental power, and a misdirection of learning to enter upon long disquisitions on the tails of comets, or whether the curious tracks on the Connecticut red sand-stone are those of an extinct kangaroo, or of a goose.'"

These quotations are taken from page 137, Vol. 1, New Series, SCIENTIFIC AMERICAN, and they seem to have shocked the moral sensibilities of this writer, as he says respecting them: "To my mind this approaches very nearly to blasphemy." How our language should thus have affected him he gives no good reason; indeed he does not seem to comprehend its very plain meaning. In the "middle ages" the school-men held many long and grave discussions as to the possibility of two spirits occupying the same place at the same instant of time, and to have questioned the utility of such intellectual absurdities, as we have done of some of the speculations at Springfield, would, no doubt, have been called blasphemy by persons entertaining just such views as the correspondent of the *Railway Review*. It is very plain to any candid and careful man that our remarks only reflected upon the waste of time and learning exhibited by members of the association in speculative and curious philosophy, to the exclusion of experiment and strict induction,