Gas-lighting.—Article II.

In this country, from causes which would occupy too much space to review, gas-lighting has been confined to comparatively large cities; but at the present time, we are happy to say, that efforts are being made to introduce it into every locality. In the SCIENTIFIC AMERICAN of March 7, 1857, we devoted considerable space to the illustration and description of gas-works adapted to small towns and villages, taken from an English publication; and public interest seems now to be awakened to the want of such works in every community. But more of this anon. Let us continue our history.

The greatest objection to the use of coal gas, at this period of its history, was the large proportion of sulphureted hydrogen which it contained—a very noxious gaseous compound, which by burning is transformed into acrid vapors, eminently detrimental to life, furniture, plate, silk hangings, paintings, &c. Clegg introduced the purifying process, by passing the gas through lime-water, and subsequently through dry powdered lime. Nevertheless, it required a long time before the purifying was sufficiently perfected or attended to by companies to overcome the objections to the use of coal gas. Indeed, to the present time, many wealthy owners of costly picture galleries in England, many silk manufacturers and silversmiths, cannot be persuaded to introduce it into their houses or factories. In consequence, the efforts of gas engineers in Europe have been lately almost entirely confined to the improvement of the purifying process. The difficulty is, in that branch of manufacture, as in most others, to combine efficiency with economy and simplicity.

The simplest test by which consumers can ascertain the comparative purity of their gas in this respect, is by holding above a gas-burner, a piece of paper dipped in a solution of acetate of lead (sugar of lead). If the gas is not pure, the paper will turn to a greyish, and even a black tint; whilst pure gas will leave it white. The bad quality of coal gas at its origin induced the formation of rival companies, who used oils, fats, rosin, and other materials free from sulphur. Though the price of oil gas was four times higher than that of coal gas, many preferred it on account of its purity. But the rudeness of the processes employed in the distillation of oil or rosin, and the varying cost of these articles in England, as compared with that of bituminous coals, combined with the improvements in the manufacture of coal gas, soon put an end to all competition, and coal is now the article most generally used there. In several parts of Europe other materials are yet distilled for illumination. In some cities, the fat withdrawn from the washings of *wool*, in the manufacture of cloth, is used to make gas; in others, rosin gas is yet manufactured. In some parts of Germany, the wood gas process has been sufficiently perfected to make it preferable there to coal gas; and we have no doubt that the discoveries of Dr. Pettenkoffer, of Munich, will make the use of wood gas much more general than it has hitherto been.

The most important device, however, in gas-lighting (due also to Mr. Clegg's ingenuity) is the meter, by which gas is measured to consumers. That instrument has been the means of decreasing the price of gas, by making every one pay for what he burns. Before its introduction, gas was sold by approximation, based on the number of burners used in each house. This, of course, gave rise to great frauds, which weighed heavily on the honest customers. When well constructed, the meter is a fair reckoner, though frequent differences arise on this subject between gas companies and their customers. The fact is, that the discrepancies occurring between one period of consumption and another, which are always attributed to the meter, come more likely from differences in the quality of the gas furnished; for it is a fact not sufficiently known, that the poorer the gas, the faster it will flow through the burners; and, though the meter has registered correctly the volume of gas delivered, it does not follow that the consumer has received an equivalent amount of light. A desirable improvement in this direction would be a meter registering the time or duration of light, rather than the *volume* of gas. Until that is accomplished, gas companies have no inducement to furnish good gas. The worst article with which consumers can be satisfied will be more likely to be manufactured, since it is the cheapest to *produce*, and the dearest to *sell*.

A complete review of the different improvements introduced in the manufacture of gas would occupy too much space, and more properly belongs to special works on the subject. As the process is now generally practiced, it consists in placing from 1 to 3, 5 and even 12 retorts in an oven heated by a fire fed with a portion of the coke left from the distillation of gas coal. These retorts are long cast iron or clay tubes, usually of the sectional shape of a ⌓, open at one end, and closed by means of a plate luted with soft clay. It is furnished with a pipe, through which the gas, as it is generated, passes off to the condensers, purifiers, and gas-holder. The retorts are kept at a cherry red heat; a charge of coal is shoveled in, and the retort closed. The gas and vapors contained in the coal soon begin to be evolved, and continue to distill until nothing but dry coke remains in the retorts. The richest gas is generated in the first three hours; and it requires from four to eight hours to exhaust the coal. In the best managed gas-works the charges are renewed every four hours, the quantity and quality of gas varying with almost every kind of coal used. Cannel coal gives the richest gas, and in larger quantities; but as it leaves but little coke, it would not be economical to use it alone. A mixture of Cannel with caking coal, in certain proportions, afford the best results; but the reduction of the quantity of Cannel coal below a certain standard is soon perceivable, by a diminution in the illuminating power of the gas flame, and an increase in the bills of the customers. On an average, a tun of mixed good gas coals produces 8,000 to 10,000 cubic feet of gas, (or from four to five feet per pound,) 1,200 pounds of coke, 200 to 300 pounds of tar, and 200 to 300 pounds of ammoniacal water. One pound of rosin gives, in the old rosin apparatus, from six to nine feet of gas, the illuminating power of which is greater than that of ordinary coal gas as 5 to 3, and sometimes as 6 to 3. One gallon of fish oil gives from 70 to 90 feet of gas, of double the value of coal gas. But, on account of its cost everywhere, oil is now but little used.

Some wood gas-works have been tried in this country, but from some unknown causes, have not been so extensively built as we think that their merit deserves, although the original introducers (Messrs. Breisach) have still a patent on the process. The objection stated is, that the difficulty of obtaining the right kind of wood sufficiently dry, and of purifying the gas of a large proportion of carbonic acid, renders the process too uncertain and costly for large practical operations. These difficulties have been overcome, and there are many places where wood gas would be cheaper than coal. The best results seem to have been obtained at Philadelphia, Pa., where a cellular retort is employed, in which the volatile matters evolved from the wood are made to circulate in heated chambers placed under the retort, and by which they are mostly decomposed into permanent gas, which is afterwards passed through lime obtained from oyster shells. The wood is previously baked for that purpose. It is stated that 12,000 to 15,000 feet are obtained from a cord of south yellow pine or dry oak.

In a report of the analysis of the Philadelphia wood gas by Professor Gibbs, it is stated that its illuminating power is superior to coal gas. However, at the present prices of the other material, and in the actual state of the manufacturing process, it does not seem advisable to use wood where coal is cheap and obtainable.

Within a few late years, a number of small gas-works have been erected in or near gentlemens' private houses in the country, in which gas is generated from rosin oil, poured in small streams into retorts placed in a stove. They answer very good purposes where convenience is of greater import than economy; but the cost of rosin oil prevents its competing on a large scale with coal or wood. Several patents on portable rosin oil works have been taken out of late in this country.

A question very often raised here is, why gas costs so much more in this country than in England. Several causes can be assigned for it. First, gas coals cost more here than there, and the cheapness of anthracite coal renders coke of less relative value than it is in Europe; wages, and the value of capital, are higher; the residuary products are more easily disposed of there than here; tar is distilled for its naphtha and pitch; ammonia is made into sulphate and muriate of ammonia. The first is sold as manure; the last is used in the arts; the lime is also readily disposed of for more than its original cost. In America, gas companies have to rely more particularly upon the sale of gas for their income; as for the other products there is not so great a demand. Our cities cover a much greater area than those of the same population in Europe, therefore the outlay for main is much greater. However cheaply gas can be made from coal, when the cost of materials alone is taken into account, many difficulties yet prevent its adoption in our small communities. The first establishment of the apparatus is complicated and costly. The distillation of coal must be continuous, as it sometimes takes several days to heat the retorts to the required temperature; therefore two laborers at least are required, with an engineer to conduct operations and attend to repairs, which are somewhat expensive, since the renewing of the retorts necessitates the rebuilding of benches, which costs nearly $100 per retort. It will be understood how the summer consumption of many localities would not justify such expense. Indeed, we have heard of places where gas sold at five dollars, yet left a loss of one dollar per every thousand feet made in summer.

From what precedes, we think that all improvements which tend to remove those difficulties deserve attention. We have been furnished with drawings, plans and views of gas-works, constructed under Mr. Aubin's patents, adapted to small towns, villages, and factories. They have been tested at Palmyra, Cohoes, Murphreesborough, Rondout, San Francisco, and other places; and the statements which accompany them seem to confirm the claims of the inventor, who offers them as calculated to generate gas from any material, thus enabling each locality to adopt the cheapest, whether coal, rosin, oily seeds, sawdust, asphaltum, or mixtures of the same, and which can be operated one hour, one day, or constantly, as required. In an early number we shall publish illustrations of the Palmyra Gas-works, erected on this plan; and from them our readers will be able to form a sufficient idea of their merits. We will add that patents have been obtained in France and England, through the Scientific American Agency, on Mr. Aubin's improvements.

French and English Railways.

Joseph Locke, M.P., President of the Institution of Civil Engineers, of England, in an address on this subject a short time ago, gave some highly interesting information, the pith of which we present to our readers.

In England, when a company are desirous of forming a railroad, an act of Parliament has to be obtained, and this costs a vast sum of money. The line is then constructed, and when in working order, it would seem to be the aim of each company to spend as much as possible in legal contention. From a return published in 1854 we learn that no less than $20,000,000 were expended by 99 railways in legal and parliamentary expenses, exclusive of the London and Northwestern, Great Western, and several other of the largest companies. Taking all lines into account, it is supposed that not less than $50,000,000 has been thus extravagantly thrown away. The parliamentary and legal expenses of English railways have varied from $5,000 to $12,000 per mile. In like manner exorbitant prices have been paid for land. There are instances on record where property worth $25,000 has, by favor, been obtained at the *slight* advance of $600,000, and of land fetching from $10,000 to $50,000 per acre which was not worth one-tenth as much. In this style the shareholders have been swindled; consequently the stock of English railways has depreciated in value, for want of proper and vigorous legislation on the subject. The system of opposition there so largely practiced, brought about the railway mania of 1845, and subsequent panic.

In France, how different! There the government gives a fostering care to this species of investment and national wealth, and will allow of no railway being constructed where none is necessary; neither will it permit two companies to run to and from the same places. The government decides broadly on the route, and the authorities of each town through which it passes give all the assistance in their power. The preliminary survey is exhibited in each town, where it remains for eight days, and the mayor communicates the objections of the persons through whose land it passes, to a board consisting of the mayors of all places interested, the members of the Council of the Department, and the engineer of the road, when all the objections are discussed, and receive proper attention. Much more business has then to be arranged, and when everything is decided so that there can be no disputes, the line is commenced. There are now in France about 7,000 miles of railway, which have been conceded to companies, the average cost of which is $123,000 a mile; $98,000 of this amount has to be provided by the shareholders, and the remaining $25,000 is furnished by the government. In return for this, the government has the free transmission of the mails, and lays a tax of ten per cent on passengers and first class goods.

As a comparison as to how these two systems have worked, it is stated that the estimated average cost of French railways has been about $123,000 per mile, while the English roads have cost about $158,000 per mile. This at once tells which system is best for the community and most profitable to the shareholders.

We are happy to state that facts such as we present above have awakened the British capitalists, who are now seeking for such legislation on the subject as may place their railways on a safe basis; and we have no doubt the House of Commons will be unable to resist the appeal, but must form some protective measures for the public and holders of railway stock.

Steam Fire Engine at Chicago.

The citizens of Chicago have introduced a new steam fire engine, built by Messrs. Silsby, Mynderse & Co., of Seneca Falls, N. Y., like the one illustrated on page 73, Vol. XII, SCIENTIFIC AMERICAN. It is named in honor of Hon. "Long John" Wentworth. The Chicago press has favorable notices of its performance. With forty pounds of steam pressure, four streams were thrown through 100 feet of hose, with six-eighth inch nozzles, 150 feet horizontally; with sixty pounds, through the same length hose, with one-and-a-half inch nozzles, two streams 160 feet horizontally. No attempt was made to change the hose or nozzles after the playing commenced, as a pause of even a few minutes would have rendered the hose useless, by freezing. The full capacity of the machine was thus not called out, but was effectually indicated. The weight of the machine is about five tons, and the cost was $5,000.

Much reading makes a full man; much speaking, a ready man; much writing, an exact man.—*Bacon.*