



THE FUEL OF THE FUTURE.

The use of wood or coal in stoves and ranges for domestic purposes is essentially wasteful and expensive. Taking anthracite, as used in our cities, for cooking, the cost to the consumer includes the cost of the coal at the pit's mouth, the transportation, commissions on sale, storing in the house, the labor of putting on the fire, and the expense of removing the ash and waste. If the full thermal value of coal could be utilized in a cooking or heating stove these items would not be worth considering. When it is considered that an ordinary grate gives only 3 per cent. of the heating capacity of the coal consumed in it, the matter assumes another aspect and it may well be doubted if coal is the best domestic fuel.

Moreover, coal and wood as fuels are not sufficiently under control to be economical. To boil sufficient water to make a liter of tea often demands a bundle of wood and ten kilos of anthracite, because a less quantity of coal cannot be made to burn, and yet this amount of fuel has sufficient heating capacity, if fully developed and rightly applied, to raise over eight hundred kilos of water from 60° Fahr. to the boiling point, or 212° Fahr. The waste of domestic labor in building and tending fires, and removing the ashes, the waste of the fuel for hours after the work demanded of it is done, the waste of other materials, carpets and furniture, and the injury to health by reason of the dust and the excessive heat of the stove in warm weather, can only be roughly estimated. Every householder knows how grievous the burden. The cost of coal is, next to rent, the largest expense in domestic life, the cost of stoves and ranges is the largest single item in the expense of furnishing a house. It is a conventional form of expression to say that coal burns. Practically, it does not burn, it merely supplies gas, and the gas alone gives the flame, light and heat. In starting a coal fire, paper or other light material is burned (or its gas), and this heat compels the kindling wood to give up its gas, that escapes in singing jets, and this burning gas forces the coal to give up its gas in turn, and this burning coal-gas makes our fire. The process of breaking the gas out of the coal proceeds through each lump from the outside toward the interior, and the stony and useless matter that forms the bulk of the coal, and that makes the ashes waste the process and absorbs and wastes the heat of the burning gas. Besides this, the gas is accompanied by other non-burning gases, and these rob the flame of its heat, check the combustion and carry away unburned up the chimney much of the valuable gas.

These facts are well known. It has long been admitted that a stove is a most imperfect gas retort, or gas-making machine, but the abundance of coal and its apparently low price have made it a universal fuel. The abundance of coal is questionable. Its cheapness is only apparent and not real, and the question now raised is whether coal is either scientifically or commercially the best fuel. The question involves matters of the widest interest both in trade, manufactures and domestic life, and it is the most important question in the immediate future. Coal has been tried and has been found wanting. It is not a cheap fuel, and a cheap fuel is one essential factor in our civilization. The fuel of the future is gas, clean non-luminous, heating gas, delivered in pipes at every elbow and house.

Common illuminating or street gas is already extensively used as a domestic fuel during the warm weather, and many families use it all the time. There is a steady and constantly increasing demand for gas-stoves, and either in their present form or in some improved shape, they are the type of the future cooking-stove. The gas-stove gives the full intensity of its flame at the instant it is lighted, its flame intensity is uniform all the time, and the moment the work required of it is over, it may be extinguished. There is no waste of the heat before or after the actual work needed is accomplished, there is no dust or solid waste after the fire is out, and the light and invisible products of combustion are readily removed. Gaseous fuel requires only a match to give its full heating power, it is clean, safe, and does no harm to carpets or furniture. It saves all the cost and labor of handling a crude and rough material, it may be concentrated upon any desired spot, and by means of flexible pipes the stove in which it is used may be moved from place to place.

The advantages of a gas fuel are recognized in all our cities, as the general use of gas-stoves testifies, and it requires no further discussion. The important question in this matter is the quality, character, and price of this form of fuel. It must be cheap, it must have

a high heating capacity, and it need not be luminous. Of the different methods of making gas employed in this country, the most common is the retort system. Gas-works are a disagreeable adjunct of all our towns, and the process by the retort system is familiar and needs no special mention. The gas now used for fuel is almost wholly from this class of works. Among the other method of making gas that promise more in the way of a really cheap and high-class heating gas, is one that produces a water-gas. The manufacture of gas from steam, and thus indirectly from water has been under experiment for a great many years, and only within a short time has it been possible to make a water-gas upon a commercial scale. The plant needed to manufacture this gas differs widely from the huge structures used in making gas by the retort system and with the exception of the purifying apparatus and the gas-holder, only requires a few small constructions of insignificant proportions. The first of these is called a generator, and it resembles in appearance a small cupola furnace, or stack. It is built of brick, hollow within, and is of a circular shape, and covered on the outside with wrought-iron. This generator has a charging-door, or trap, at the top (on the level of the second floor of the building), a grate at the bottom, and inlet pipes below it for an air blast. Near the top is also an outlet pipe for the escape of the products of combustion. Near this generator is another brick stack, perhaps twice as high and of proportionate size, and lined on the inside with fire-brick. There is an open-work brick arch near the bottom, and above this the interior is entirely filled with loose fire-brick thrown in roughly, so as to be full of spaces and openings throughout the entire mass. Below the arch is an air-chamber, and above the mass of loose brick is a tall smoke-stack, or chimney, with a damper for closing it tight when it is necessary. Just below the top is an outlet with a large pipe for leading away the gas. A pipe extends from the top of the generator to the air space under the arch in this regenerator, or superheater as it is called, and opposite to this pipe is an inlet for another air-blast.

When the apparatus is to be used for making gas, the generator is filled about half full of anthracite coal through the charging-door, and this is fired in any convenient manner and the blast is applied. The blast quickly drives the fire up to a high temperature, and the products of combustion pass out through the pipe at the top and thence down to the bottom of the superheater and then rise through the mass of loose fire-brick and escape at the top. The outlet for the gas is kept closed, and in a few moments after the fire is started, the second air-blast is turned into the base of the superheater and fire is here applied and the whole mass of the superheater is instantly filled with flame.

By the time the coal is at a red heat, the brick-work of the superheater is at a white heat. At this point, when the loose brick-work is intensely hot, the smoke-stack is closed and the gas outlet is opened. At the same moment small jets of superheated steam (or a common dry steam), are turned directly into the mass of hot coals just above the grate-bars. The steam is decomposed and in a new form rises through the fire, goes over into the superheater and rises through the mass of white-hot bricks and appears at the outlet in the form of a water-gas. From the outlet the hot gas passes to the washer, scrubber, and other purifying appliances, such as are used in ordinary gas plants, and finally reaches the holder. In a short time the influx of steam checks the fire, and the process comes to an end. The steam is shut off more coal is charged on the fire, the air blasts are started, and the whole process begins again. In a few moments the fire is in condition to resume its work, and the gas-making goes on as before. To make the gas continuously, two sets of apparatus are used, and while one is making gas the other is being fired up. By this arrangement, one man can make gas at the rate of 945 meters (3,000 feet) in thirty minutes, and with only an expenditure of about fifty or sixty kilos of coal for the production of over 4,000 meters (15,000) of gas. By the addition of simple machinery, whereby hydrocarbons may be added to the water-gas during its manufacture, the same apparatus produces an illuminating gas of excellent quality.

None of the gas-works now in operation in this country and using this or similar processes make a simple, non-luminous, heating gas. It is only necessary to leave out the hydrocarbons to give up this enrichment for the sake of light and the apparatus will give the required gaseous fuel. It cannot be expected that gas plants for making a heating gas will be immediately erected, for the demand is yet to be developed. It certainly will be developed in time, for gaseous fuel presents so many advantages over the present system of domestic heating and cooking that this water-gas in some form is evidently to be the fuel of the future. The companies now making luminous water-gas will in time, no doubt, find it to their

advantage to lay two mains and to manufacture both luminous and heating gases, and to sell the non-luminous gas at a low rate that will make it commercially available. It is reported that such a gas can be sold at a profit at from 50 cent to \$1 per 315 meters (1,000 feet), and if this can be done, gas will ultimately replace coal as a domestic fuel.—*The Fuel of the Future, from Scribner's Monthly.*

POISONOUS SILK DRESSES.

In purchasing silk, many require that the material shall possess both weight and stiffness, these qualities adding to its rich appearance and allowing it to be draped more gracefully. Heavy silk is also commonly believed to be of better manufacture and to wear better, as the extra weight is supposed to be due to a thicker and closer fabric. While all heavy silks are not necessarily weighted, a large proportion of them are.

The weighting of black silks with a compound of tannic acid and oxide of iron, far exceeding in quantity what is really needed for the production of a black color, has now been known for a considerable time, and has been carried so far as to deprive the material of its non-conducting power for heat and electricity, greatly to impair its strength and durability, and even to render it liable to spontaneous combustion. Consumers, however, till lately "laid the flattering unction to their souls" that white and light-colored silks were genuine. Alas! the depraved ingenuity of the age has introduced sophistication in this department also, and it is possible to buy white silks which goods, rather—consisting of about one-third to one-half the genuine product of the silk-worm, the remainder being made up with oxide or carbonate of lead. This stratagem is not merely a fraud upon the purchaser who asks and pays for one thing, and receives another very inferior in its properties but it is a direct attack upon public health, and (we learn from the *Chemical Review*) in that capacity has already brought forth evil fruits. Persians who are continually handling such weighted silks are liable to lead poisoning. Still greater is the risk for milliners and dress-makers who sew with silk, and who are in the habit of biting off the end of the thread, or of putting it in the mouth to make it the better enter the eye of the needle. A minute quantity of lead is taken into the system each time; it remains and accumulates, and, at last, colic, palsy, and other alarming symptoms make their appearance. Those are trained to lead poisoning, but it is no medical man in a hundred will suspect how the lead is introduced into the patient's system. He will blame water, wine, vinegar, food cooked in leaden vessels, etc. In the last guess he may often be right, for the tin with which sauce-pans are lined is no longer tin, but an alloy containing a large proportion of lead. The so-called tins in which most butter, fruits, etc., are now imported and sold are also no longer "tins," save in a "Pickwickian sense," but "leads."

But, to return, so long as the silk is not recognized as the source of the lead, the patient will go on using it, and recovery will therefore be impossible. This, it must be understood, is no mere matter of conjecture or probability, but of actual fact. Poisoning cases of the kind described have already occurred, and will certainly become more and more frequent if the evil practice is allowed to continue.

The detection of lead is not difficult. If a piece of the silk, or a little of the thread or yarn suspected of being weighted with lead, is moistened with pure water and then exposed to sulphuretted hydrogen gas (as obtained by putting a little sulphuret of iron in a cup and pouring dilute sulphuric acid upon it), if lead is present, it will change color and rapidly thicken. Ladies applying this simple test are, however, cautioned that if they have been made artificially "beautiful forever" with powders and enamels, their faces may possibly change color as rapidly as the weighted silk.—*Scientific American.*

COMPRESSED TEA.

At a late tea conference in London provision was made for a critical examination of the merits of compression and other methods of treating tea, with a view of ascertaining definitely, by comparison, the amount, if any, by which the tea is strengthened by the process, and what are the advantages to be obtained from its general adoption. The "compression" of tea referred to is a process of treating tea which was patented in 1871, and first brought to notice at the South Kensington Exhibition in 1873.

The operation is very simple, and consists essentially in weighing out tea to quarter pounds, and placing these in moulds on a revolving iron table a piece of metal exactly fitting the mould being placed in the top. As the table revolves, each mould comes under the stroke of a hydraulic ram which exercises a pressure of

about eighty tons on each quarter of a pound, reducing it to one-third of its bulk, and consolidating it in a mass marked by depressions into divisions of exactly half an ounce in weight. As the table revolves, each cake is ejected from its mould, and the process, in which not a particle of moisture is used, is completed.

The effect of this enormous pressure is said to be so thoroughly to break the cells and smaller vessels of the tea leaves that the theine and aromatic oil are set perfectly free, and the mass of tea is more easily affected by boiling water, in which it at once falls to pieces.

The practical result is that the liquor produced from consolidated tea after ordinary infusion is considerably stronger than that produced from loose tea, varying according to the quality of the tea subjected to the process; the higher the grade, the more marked the difference. The separation of the fibres and particles of the tea would naturally appear to produce the effect named. It is also asserted that the half ounce of consolidated tea will in five minutes give the same strength of liquor as the same weight of ordinary tea in four or five hours.

That the ordinary infusion of tea does not remove all the virtues of the leaves is shown by the fact that if such leaves be dried and submitted again to the process of tea-making, a liquor of considerable strength will be produced.

Another advantage claimed for the consolidated tea is its much greater convenience of transportation and packing, fitting it especially for use on expeditions by land or sea. Sportsmen and travellers have used it to great advantage. It is also stated that the tea thus treated retains its strength a longer time.—*Bazar.*

—The extensive manufacture of soap from bone grease, now carried on, has led to investigation relative to the effect of such an article on the human skin. It appears that in the preparation of this material, bones of every description, and in every stage of putrefactive decomposition, are ground into a fine powder, and submitted to the action of water boiling under pressure in a Papin's digester; the resulting mixture is then cooled, when the undissolved bone earth settles to the bottom, while fats or oils rise to the top, and between these exists a solution of bone gelatine in water. Out of this gelatine solution, by suitable processes, a patent mangle is manufactured for the production of soaps and jellies, while the oil or grease is saponified and converted into soap. But in the soap thus produced there remain fine particles of bone-earth, which, when the soap is rubbed on the face, as in shaving, lacerate or scratch the skin, and the wounds caused in this way are, it is stated, poisoned by noxious matters originally existing in the bones, and which none of the processes have succeeded in destroying.

—It has been calculated by Dr. C. W. Siemens that Niagara Falls do as much work as 266,000,000 tons of coal could do in a year at the rate of four pounds per horse-power consumption of fuel in an hour. Dr Siemens objects to so much force being wasted, and proposes that the water be made to drive an electrical machine at the falls, the current from which would traverse a copper rod. He has calculated that a rod three inches in diameter would transmit 1,000 horse-power as far as thirty miles, and that at the end the electricity could be used to produce motion or light, the quantity of electricity being sufficient for about 250,000 candle power. This view of a catamaran is not quite new, but it is sufficiently rare to be interesting.

—Glass slippers have been produced by the cunning artificers of Vienna. The slippers are actually woven of fine flexible threads of glass. The novelty is quite as much in the effect as in the material. Not only do lines of colored light, in different hues and distinctly definable, traverse the body of the slipper, but with the motion of the foot of the wearer these hues so blend and intermingle as to produce a magical and beautiful effect, particularly when seen in the gas-light.

—Chapels may well be close, seeing how little they are ventilated, and how the air they contain is inevitably vitiated by morning and afternoon attendances. A fainting case or two of an evening can excite but little surprise. The day may come when doctors will realize that they are appointed to consider the creature comforts of the congregation as well as to push collection-boxes into pews.—*South London Press.*

—So many cases of skin disease were the result of heavy crapes falling over the face, that custom has at last pronounced the once indispensable widow's veil no longer a necessity. Of course this applies equally to other wearers of mourning. It is not considered unconventional among young people to dispense with a crape veil of any kind.