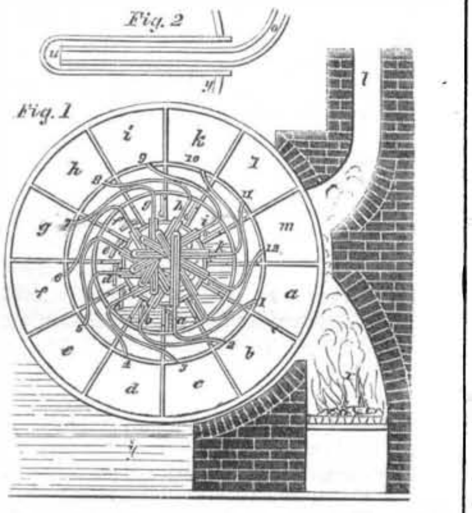
ROMANCE OF THE STEAM ENGINE.

Article VIII.

AMONTONS—FIRE WHEEL.

After Savery, the next inventor who produced a peculiar caloric motor was Guillaume Amontons, of Paris, who was so deaf that he was thereby deprived of the sweets of social intercourse except with his own family. He early exhibited a taste for mechanics and, as is mostly the case with young enthusiasts in this line, his first efforts were directed to invent a perpetual motion. His experience soon taught him that he was in search of an impossibility, and he then devoted his attention to other projects, among the rest a hot air engine entirely different from any that had preceded him. This machine was called a fire wheel by Amontons, and is described as being operated by the action of heated air forcing a quantity of water up one side of a wheel and producing a rotary motion by its differing weight from the other side. Amontons appears to have been partial to expansive air as the motive agent of his engine, represented in section by the annexed Figs. 1 and 2. This fire wheel, as described by its inventor, consists of two concentric rings connected and communicating with small pipes, 1, 2, 3, 4, &c. The outer ring of the wheel is divided into several compartments, *a*, *b*, *c*, *d*, *e*, *f*, &c. These were closed so as to have no connection with one another. The inner ring is divided into the same number of compartments, *a*, *b*, *c*, *d*, *e*, *f*, &c.; each of these communicates with the adjoining chamber by a hinged valve opening only in one direction—upwards. Although the two rings and their series of compartments are placed at a distance, each compartment of the one communicates with a corresponding division of the other by small pipes, 1, 2, 3, 4, &c. The wheel is so placed as to have one side of its periphery exposed to the action of a fire, and the other side is immersed in a cistern, *y*, of cold water. Four or five of the lower chambers of the inner series are filled with water. A fire is made in the furnace, *x;* this heats the air in the chamber, *a*, of the outer series, the air of which, becoming rarefied, flows through the pipe, 1, into the chamber, *a*, of the inner series, and presses upon the water which it contains and forces it upwards into the divisions on the side of the wheel nearest the furnace, which gives it a preponderance and causes it to descend. The cell, *a*, is now in the position at first occupied by *b*, and *c* is in that where it begins to enter the cistern; the air which is contained in the divisions which had been heated now being brought into contact with the water, it is condensed, and continues so until, by the revolution of the wheel, it is again brought, in its turn, into contact with the fire of the furnace.



Nothing can be simpler than the hypothetical action of this mechanism; its effect was, as usual, not underrated. The wheel was 12 feet in diameter, and the cells were calculated to contain 750 cubic feet of water, and an entire revolution to be made in about thirty-five seconds. This great weight, applied tangentially to one side of the wheel, was to give it a continuous preponderance, which was calculated, very minutely, to equal in effect the power of thirty-four horses, or two hundred and thirty-four men.

Throwing the practical merit of this mechanism totally out of the question, the combination is exceedingly meritorious; and looking to the time of its invention, and the perfect novelty of the idea, it has many claims to a more favorable consideration as a first thought, than has usually been awarded to it. That it presents glaring defects cannot be denied; but had length of years been alloted by Providence to its amiable projector, the same ingenuity which first traced the outline might have effectively supplied its deficiences. A negative proof of its merit is, that it has been the type of several attempts at the construction of steam wheels among later mechanics.

While Amontons, in France, was engaged in his steam wheel, and Savery, in England, had achieved so brilliant a triumph, Papin was again exerting himself at Marpurg, in Germany, to bend the same powerful agent to the use of man; "as if the three nations of Europe, which had made," says Belidor, "the greatest advances in science, were each anxious to furnish a learned man to participate in the glory of so fine a discovery."

ELECTRICITY AND SOME OF ITS PRACTICAL APPLICATIONS.

Article V.

When two electrodes of carbon are brought into contact with each other, or an electrode of carbon is lowered upon mercury, there is produced the well-known electric light. This light, which, for power and beauty, excels all other artificial luminaries, and is equalled only by the sun, is produced by a stream of small particles of carbon, which are transported from the positive to the negative electrode, where a portion of them is found piled in an irregular heap, and sometimes crystallized. These particles are kept at a white heat by the battery, and while in that state give an intense light.

Some idea may be formed of the brilliancy of this light, from the fact that two chemists, while experimenting with it, brought it too near their organs of vision, and, as a consequence, were confined to a dark room for several days, and barely escaped with their eyesight. Any such occurrence may be avoided by wearing green spectacles, which, although they prevent injury to the eyes, allow all the motions of the light to be studied, as well as its general characteristics. The flame takes the form of an arc when the electrodes are separated, which separation may be effected in a greater or less degree, according to the power of the battery. When the electrodes are separated nearly to their farthest limit, more light is given off than in almost any other position; and to effect and maintain this separation continuously is a subject to which much attention has been and is being given in Europe, although it has attracted but little attention in this country. The positive electrode wastes away with a rapidity controlled by various circumstances, the worst varying from one-third of an inch and upward per hour. If the exact waste can be obtained, one of the electrodes can be fed forward by means of clockwork, and the interval between the two kept of an uniform length. Another device is to have the current itself regulate the motion of the positive electrode; and such an arrangement is, if well constructed, much the best, as it will accommodate itself to a current of any power, while, if simple clockwork is used, a new adjustment must be made for every important change in the battery. One device is like the old fashioned steam engine, opening a port of the same size for each stroke; the other like the modern engine with its self-adjusting cut-off, varying the use of its port according to the pressure and the amount of work to be done. The current required for the production of the electric light may be either one of great quantity or of great intensity. A current of quantity will produce a wide and short arc of flame, E E, while a current of intensity will produce a long and narrow arc. From this, it is evident that the battery best suited for the production of this light is one which gives a current both of intensity and quantity, and such a current is produced by a number of alternations of large cells. One of the best batteries for experimenting with this light is Daniells', twenty cells of which (the zinc being seven inches in hight and two in diameter) give a current sufficiently powerful to exhibit the light upon a small scale; but with from 50 to 100 cells, a magnificent light will be produced. Bunsen's battery is chiefly used for this purpose, and when well managed it is, for the same number of cells, far superior to Daniells', although very expensive and troublesome in its working, and liable to the objections before given. A series of 40 cells of this battery, recently exhibited in Paris, produced a light equal in power to 3,500 wax tapers! The battery, though very convenient for producing the light, has been superseded, to some extent, by a machine in which no acids or liquids of any kind are used, the current being induced by permanent magnetism.

Fig. 6

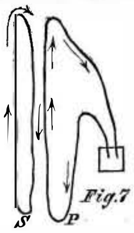
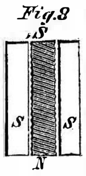


Fig. 7

Before proceeding to a description of this important piece of apparatus, it will be necessary to mention a few of the principles of induction. The subject of induction should properly be considered by itself, but it is so intimately connected with that of the electric light that we shall consider it in this place.

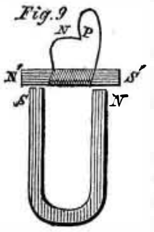
A number of years since, it was observed that if a current of electricity was made to traverse one of two parallel wires, a wave of electricity was produced in the secondary wire, and in the opposite direction to that in the primary wire; and that when the current was broken, another current was produced in the same direction that the primary current had flowed. In the cut, S represents the secondary wire, and P the primary.

Fig. 8



In 1831, it was observed by Faraday that an electro-magnet possessed the same power. The cut represents a sectional elevation of such an arrangement. N S is a bar of soft iron, around which is wound the primary or battery wire; S S is the secondary coil. In this case, both the primary and secondary currents flow in the same direction, because the secondary current is induced, not by the primary one but by the electro-magnet. The moment that the current ceases, there is induced another current, opposite in direction to the first.

Fig. 9



About the same time that he made this discovery, Faraday also found that permanent magnets possessed the same power of induction. The cut represents a device by which a spark may be obtained by the use of a common horseshoe magnet, of moderate power. S N represent the poles of the magnet, and N' S' the extremities of its armature. Around this, several feet of insulated wire are coiled, and its two ends brought as near as possible to each other without their touching. This being done, a faint spark will be seen whenever the armature is separated from, or brought in contact with the magnet.

Salt and its Offices.

Some modern agricultural writers have doubted the necessity of giving animals salt. The following remarks as to the effect of salt upon health, by Professor Johnston, may be relished by those who still put salt in their own puddings, and allow their cattle a little now and then:—

> The wild buffalo frequents the salt licks of Northwestern America; the wild animals in the central parts of South Africa are a sure prey to the hunter who conceals himself behind a salt spring; and our domestic cattle run peacefully to the hand that offers them a taste of this delicious luxury. From time immemorial, it has been known that, without salt, man would miserably perish; and among horrible punishments, entailing certain death, that of feeding culprits on saltless food is said to have prevailed in barbarous times. Maggots and corruption are spoken of by ancient writers as the distressing symptoms which saltless food engenders; but no ancient or unchemical modern could explain how such sufferings arose. Now we know why the animal craves salt—why it suffers discomfort, and why it ultimately falls into disease if salt is for a time withheld. Upward of half the saline matter of the blood (57 per cent) consists of common salt, and as this is partially discharged every day through the skin and the kidneys, the necessity of continued supplies of it to the healthy body becomes sufficiently obvious. The bile also contains soda as a special and indispensable constituent, and so do all the cartilages of the body. Stint the supply of salt, therefore, and neither will the bile be able properly to assist the digestion, nor allow the cartilages to be built up again as fast as they naturally waste.

◆

Diminished Slaughter.—The number of hogs slaughtered this season at Louisville, Ky., and in its vicinity is 194,797, or about 40,000 less than at this time last year. The receipts of hogs at Cincinnati, Ohio, thus far this season, are 263,363, a decrease of 111,000, as compared with last year to this time.