WAVE POWER MACHINE.

GAUCHEZ'S PROJECT FOR UTILIZING THE OSCILLATIONS OF THE OCEAN.

As well known, the ocean forms an immense reservoir of motive power, perhaps the greatest in nature, and one whose energy is expended to no purpose. The incessant agitation of its waves and the oscillation of its tides are absorbed without profit in polishing the rounded pebbles on the beach, or in merely modifying the contour and relief of the coasts against which they continually beat. There is here an enormous power, which, so to speak, offers itself of its own accord, and entirely gratuitously; for it is derived from the sun, as are all the forces that we employ on earth. Nor is there any danger of the supply giving out, as some persons have begun to fear with regard to coal, which is merely the heat of the sun that has accumulated for ages, and which has remained up to the present time the daily bread of the industries. For this reason there has for a long time been sought a method of collecting this power by motors adapted for making it serve a useful purpose to the needs of man, as has been successfully done with water courses. Yet the numerous experiments made in this direction have never as yet yielded apparatus that were really practical; and, moreover, the success obtained in one day with the steam engine has completely turned attention away from this question of the utilization of natural forces. Nevertheless, the steam engine is far from being an economical and advantageous apparatus from the stand point of rational mechanics; and, without going so far as to say with M. Le Bon (*Revue Scientifique*, Oct. 8, 1881), that "the last specimen of this rude apparatus must, before the end of twenty years, go to join the stone axes of our primitive ancestors in the museums," we cannot forget the fact that it does cause a true waste of motive power, since its effective work scarcely exceeds ten per cent of the stress exerted; nor is it even to be hoped that any important progress can be effected, notwithstanding all the improvements of which it is the object, since the maximum and theoretic performance determined by the physical properties of steam, is limited to about 20 per cent.

The recent progress made in electrical machines is at present attracting attention to the subject of the cheap production of power; and now that an intermedium is being arranged which is capable of transforming and utilizing at a distance the motion produced, for all sorts of applications, electric motors will finally dethrone the steam engine, when they shall no longer be obliged to call upon it for their motive power.

The utilization of natural forces is, then, called on to perform a decisive role in the mechanics of the future; and there is reason to hope that this question, now definitely proposed, will receive its solution in a not very distant future. Such being the case, our readers will read, not without interest, a few details that we shall here give regarding some recent experiments, especially regarding Mr. Victor Gauchez's apparatus, which figured at the Brussels Exhibition of 1880. M. de Coligny had succeeded, before M. Gauchez, in utilizing the oscillating motion of the waters of the sea for raising water to a certain height, and his apparatus has been applied successfully in drying lakes in the vicinity of the coast. M. de Coligny is likewise the inventor of a most ingenious apparatus, founded on an analogous principle, which permits of collecting in the locks of canals a portion of the volume of water that is uselessly given out when a boat passes from one level to another, by carrying it back to the upper level again. He utilizes only the elevation of level that the waters assume when they are undergoing the effect of an oscillating motion, or what is called the ram stroke, resulting from a suddenly interrupted current. Properly maneuvered, it appears that his apparatus is capable of economizing a volume of water reaching 70 per cent. of the unprofitable outflow from an ordinary lock, and sometimes even 90 per cent., according to an experiment made with it on a lock near Fourchambault.

Some experiments have also been undertaken to directly utilize the motion itself of ebb and flood, by collecting the water at high tide in large basins, from which it afterwards flows out to furnish the motive power at low tide. In the Department of Finistère it has been found possible to actuate a mill by this process, which has been applied likewise, under a different form, at Alexandria, in Egypt. The trial has also been made, but without much success, to compress air into large submerged bells which became filled with sea water at high tide.

Besides the tides, the motion of the waves themselves on the surface of the sea may be utilized. In this case it becomes necessary to set up the apparatus at a certain distance from the coast, so that it may not be interfered with by the tide; and, on another hand, the power that it is desired to store up becomes much more capricious, and very accidental and variable in its effects, from the simple swell that gently ripples the surface to the furious wave that sometimes reaches several meters in height, and occasionally capsizes boats. But this undulating motion of the wave is very easy to seize; for it is propagated, in fact, under the same conditions as sound and light, that is to say, the molecules of water, like those of air or ether, are alternately raised or depressed without there ever a longitudinal motion occurring. It is easily ascertained, moreover, [illegible] light body floating on the surface of the sea does not change place, and for this reason there may be installed without difficulty a simple oscillating float, located at the extremity of a lever, whose axle may thus be given a rotary motion. Such an idea as this, put forth some time ago by Mr. Roche, of Nimes, who has made some experiments with regard to this subject on the Mediterranean, has been taken up in a more general way by Mr. Victor Gauchez, in the apparatus shown in Figs. 1 and 2, and by employing the intermedium of compressed air, which is stored up in reservoirs to be afterward distributed as wanted. Such an arrangement presents the advantage that the power is stored up, and dangers of a stand still are prevented. Mr. Gauchez's apparatus consists of a float weighing anywhere between 40,000 and 100,000 kilogrammes, according to its dimensions; of an iron compressing bell, connected with the float by cords passing over pulleys, as shown in Fig. 1; and of air reservoirs, withstanding a pressure of twenty-five kilogrammes, located on the coast and connected with the compressor by special conduits (Fig. 2).

The float rises or descends with the wave, and, in its descending motion, raises the bell through the intermedium of the two cords wound in opposite directions on the pulleys. In this motion the belt sucks in air through apertures in the upper part, and when the cords slacken while the float is rising, it falls back by its own weight and forces the air into the reservoirs. The bell is closed at the lower part by a rubber membrane attached to the masonry which supports it. The length of the chains is limited in such a way as to follow the tide only, from the half-swell at ebb-tide to that at flood-tide, supposing the highest bar does not exceed three meters. In this way the slightest swells are utilized, and those irregularities are avoided which are frequently occasioned by abnormal tides.

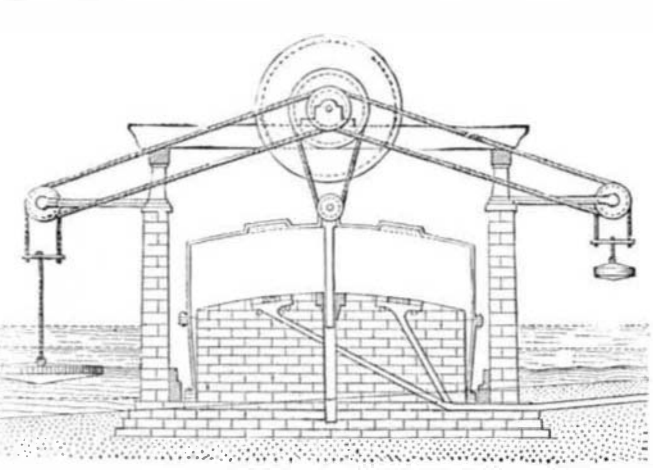


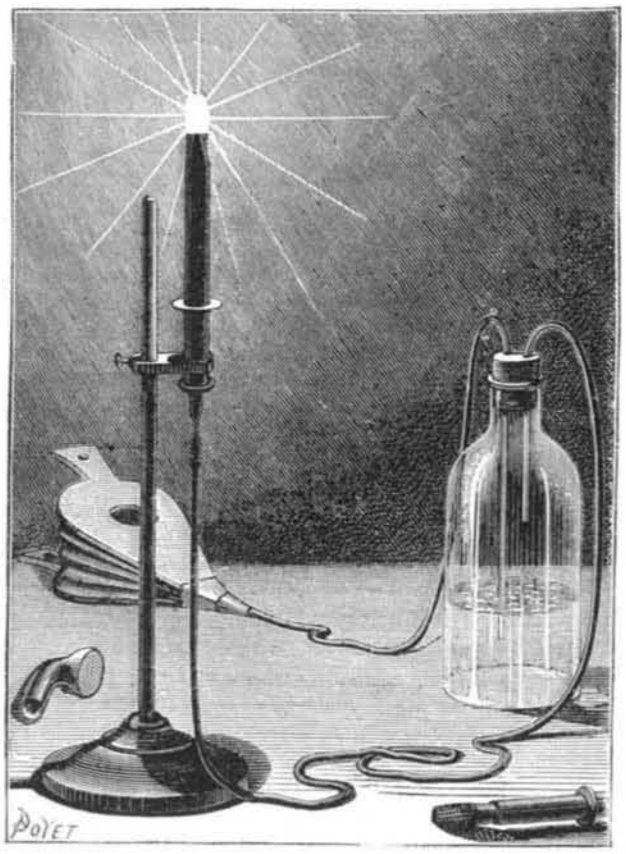
Fig. 1.—Float and Iron Compressing Bell.

Fig. 2.—General Arrangement of the System, Showing the Air Reservoir on the Coast.

The great difficulty that this arrangement, otherwise so simple, will present, will be that of preventing the exaggerated heating of the air, and especially that of insuring a rapid flow of it into the reservoirs; for the waves succeed each other, in fact, every nine or ten seconds on an average, and it is necessary in this so short an interval of time to fill and completely empty the bell. The inventor foresees that the latter may have a diameter of about 25 meters with a total height of seven meters, and weigh, with all its appurtenances, 600,000 kilogrammes. Its travel might be limited to two meters, so as to suck in only a volume of 800 or 900 cubic meters of air. It would be necessary to reduce the dimensions of the orifices in order to limit the entrance of air, and, on another hand, to provide the bell with strong safety-valves in order to insure of a flow of a portion of the air into the atmosphere, when the pressure, having become somewhat high in the reservoir, would prevent the introduction of the whole volume.

We shall not dwell on these grave difficulties of execution; for, in a question of such a nature, they can scarcely be decided by a simple calculation, and the model, a very careful one, by the way, constructed by Mr. Gauchez on a scale of one-tenth, can give only an approximate idea of what the apparatus will in reality become. However, there is reason to think that there is nothing insurmountable in these difficulties, especially in the presence of the progress already realized in the great works of Mont Cenis and St. Gothard, where compressed air was employed under pressures that were likewise very great. And probably we shall one day be permitted to see, at least in a preliminary application, the most powerful, perhaps, of natural forces put at the service of the industries by means of Mr. Gauchez's apparatus, which will, if necessary, be improved without doubt.—*La Nature.*

REGNARD'S INCANDESCENT LAMP.



DR. REGNARD'S INCANDESCENT LAMP.

There has for a long time been sought a process for obtaining a bright light which should permit of projections being easily made. In places where electric lights exist the thing is very simple; and it is also easy in places where there is gas, but then oxygen being necessary the apparatus became quite difficult to arrange and move about. But in all localities where even gas does not exist it becomes absolutely necessary to dispense with a method of teaching, which, it is generally agreed, is an excellent one.

Quite recently the Minister of Public Instruction requested a special commission to design for him an apparatus that might be readily used in primary schools for making projections. The result of this commission's examination is that even if simple apparatus for projecting be not wanting, we are very far from having luminous foci sufficiently intense for obtaining somewhat enlarged images.

Dr. Regnard has conceived the idea of obtaining a very brilliant light by burning a mixture of air and vapor of petroleum on a platinum gauze. There results from this an intense heat, which raises the platinum wires to a white heat, and thus produces a light about half as bright as that of the oxyhydrogen light. The apparatus is very simple, consisting of an ordinary Bunsen burner terminating in a little cage of platinum wire. Instead of supplying this burner with gas, there is forced into it a mixture of air and petroleum vapor, according to a process known for a long time, and utilized recently by the numerous inventors of thermo-cauters. A simple kitchen bellows or a syringe bulb is quite sufficient to set up the necessary current of air. In order to throw all the light in one direction the Bunsen burner may be covered with a tube having a flaring orifice, like the bell of a trumpet, covered very accurately with a network of platinum wire. In order to obtain an extremely brilliant light whenever the blowing is done, it is only necessary to regulate the flow of the gaseous mixture by the ring of the burner. If, instead of using a bellows, the current of air be forced by a pneumatic machine or tromp, quite a number of lamps may be supplied and made to give a light having the aspect and power of incandescent electric lamps for rooms, factories, etc., in places where no gas exists.

Dr. Regnard's lamp is based on the Bourbouze burner, but is superior to that in not requiring the use of illuminating gas. It has another very great advantage, and that is that it costs almost nothing, and even when operating at a maximum the expense is only a few cents per hour. It will prove of service to physicians for making laryngoscopic and otoscopic examinations.

If it be desired to give the apparatus greater constancy and make it serviceable for regular lighting, we suppose it would be necessary to go to a little more expense and increase the size of the carbureter in order that the impoverishment of the petroleum may not make itself too quickly felt. This may be accomplished by causing the air to bubble through one of those large flasks found in all drug stores, and into which there will be put nine or ten pints, of the liquid. Such a flask may be placed under the table holding the apparatus, or even further off.

If it be not desirable to perform the blowing with the hands, there may be disposed under the table a large blowing apparatus that any one can construct by loading with a weight a bag filled with air. If the bag is tolerably large the lamp will be enabled to operate for several hours without any attention being paid to it. The petroleum product to be put into the carbureter is the ordinary benzine of commerce.—*La Nature.*