THE LONTIN MAGNETO-ELECTRIC MACHINE.

We extract from *Les Mondes* the annexed engravings of a new dynamo-electric machine, made by MM. Lontin & Co. of Paris. Two forms of the apparatus are manufactured, one giving direct and continuous currents, and hence adapted for galvano-plastic operations, the other affording alternating currents for the production of the electric light.

Fig. 1 represents the continuous current machine, which is composed of an ordinary electro-magnet, A A', before the poles of which turns the piece, P, called "induction wheel." This wheel is composed of an iron cylinder on which are formed iron teeth, or induction coils enveloped in copper wire, D. The wire which forms the coils is continuous, passing on from one tooth to another, so that a completely closed circuit is formed. The currents produced in each coil are united at a single point, C, on the axis of the cylinder, whence they pass to the immovable conductor wires, *a a*, placed perpendicular to the line, X X, of the magnetic poles.

The induction wheel, P, being rotated, the residual magnetism of the electro-magnet, A A', produces feeble currents in the coils, which currents are conducted by the wires, *a a*, to the electro-magnet, the energy of magnetization of which increases in ratio of the production of these particular currents. The line, X X, of the magnetic poles, divides the coils on the wheel into two equal series, five above and as many below. Now, if the electricity furnished by the upper coils is of contrary name to that furnished by the lower ones, then there will be on the line, X X, on one side a double pole of positive electricity, and on the other a double pole of negative electricity; and if contact be established on this line by means of two copper wires, there will be the two poles of one electrical source. This will be more clearly understood by imagining (as indicated in Fig. 2) two batteries, each of five elements, connected by their poles of the same name. This would evidently produce a battery of five elements in tension and two in quantity.

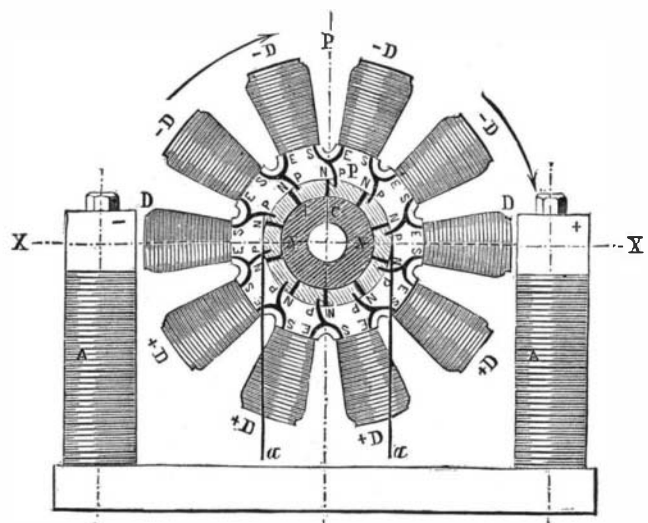
By using all the electricity produced to excite the magnetic energy of the electro-magnet, the radius acquires so high a resistance to rotation, that it is scarcely possible to move it without causing injury. But if, breaking the circuit, work to be done is interposed (a galvano-plastic bath for example), the machine operates excellently, and, according to *Les Mondes*, gives good results.

The alternating current machine, especially adapted for the production of the electric light, is represented in Fig. 3. It consists of 24 inducing electro-magnets, A, fixed on a shaft, and concentric with the same number of coils, B, attached within an iron ring, *b b*. The wires which envelope the inducing electro-magnets are connected so as to form but a single circuit, the extremities of which are attached at *f* to two friction rings, *a a*, attached on each side of the drum and completely isolated. The attachment of the wires is so disposed that, inverting the polarity of the cores from one bobbin to the other, the rotation of the drum presents successively a magnet of different pole before the cores of the induced coils, whence result, in the latter, polarizations alternately reversed.

The current which circulates in the inducing electro-magnets of the drum, is produced by a small auxiliary machine, similar to that above described. It enters by the rubbers, F, to which are attached the wires which form the circuit of the auxiliary machine. The circuit produced by all the inducing coils of the drum may be divided proportionately to the current obtained in the auxiliary apparatus. The wires which surround the induced cores, B, terminate the one at the manipulator, M, the other at N.

The manipulator is divided into as many parts as the machine can furnish currents capable of producing a light, and this number naturally depends on the number of induced bobbins. Thus, in a 24 coil machine, twelve currents may be produced, as two coils are required for each current. There are, therefore, twelve partial manipulators, each comprising two binding keys, M M', one of which, M, receives the wire from the machine, the other the wire which leads to the lamp regulator; the interrupter, I, interrupts or re-establishes the passage of the current between these two wires. All parts of the manipulator are, besides, provided with interrupters which connect said parts together so as to produce instantaneously the coupling or separation of the partial currents. Thus, with a 24 coil machine, twelve lamps may be supplied, and then, on eleven being extinguished, the one remaining continues with no variation. At the same time, by means of the interrupters, the currents may be concentrated in one or more lamps, so that each may have double, triple, or quadruple intensity, as desired.

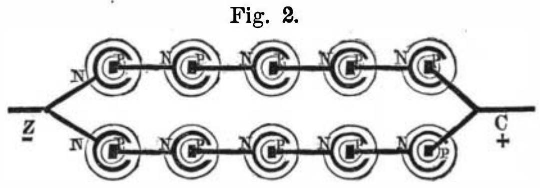
The entirely novel application which M. Lontin has made on his regulator, of the dilatation of a metallic wire by the heat produced by the passage of the current in order to obtain the separation of the carbons and to maintain the same rigorously constant, has enabled him to avoid the use of electro-magnets (the resistance of which, interposed in the circuit, was the cause of a notable increase in expenditure of electricity) and to regulate with accuracy the length of the arc. The approximation of the carbons is obtained by a resistance coil which contains an easily movable rod which acts as a stop for the motor which brings the carbons together for the proper distance. If, however, the separation augments, part of the current passes into the core and renders it active. The movable rod is then drawn back, and the motor, freed from its stop, operates to move the carbons forward until the correct interval is attained. The solenoid then ceases its work, and the rod again stops the motor. The latter having nothing to do but to move the carbons is exceedingly simple. It is of no consequence how the regulator is placed, as it works well in any position. The editor of *Les Mondes* states that it operated with perfect uniformity when suspended from a cord, swung about, and subjected to violent shocks.

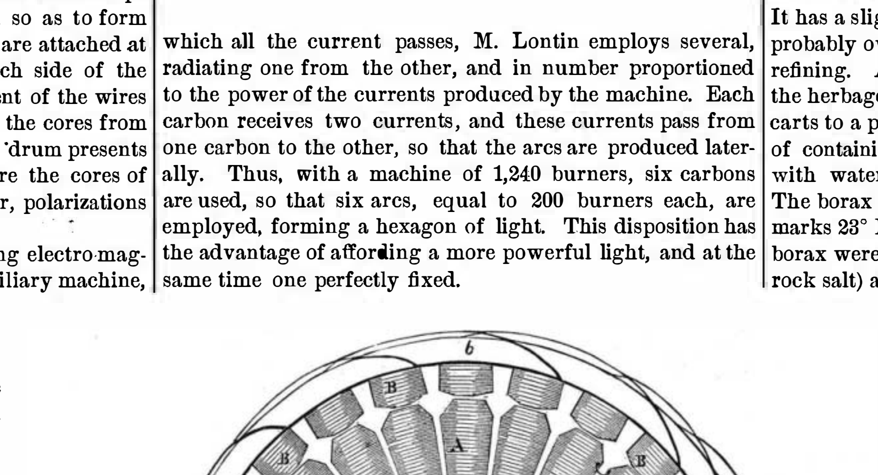


NEW ELECTRICAL MACHINE.—Fig. 1.

The machine, says our contemporary, has been tested under a variety of conditions. Aboard ship one single apparatus is capable of supplying the three electric lights usually carried, and it is unaffected by any motion of the vessel. For lighthouses, instead of using two carbons, through which all the current passes, M. Lontin employs several, radiating one from the other, and in number proportioned to the power of the currents produced by the machine. Each carbon receives two currents, and these currents pass from one carbon to the other, so that the arcs are produced laterally. Thus, with a machine of 1,240 burners, six carbons are used, so that six arcs, equal to 200 burners each, are employed, forming a hexagon of light. This disposition has the advantage of affording a more powerful light, and at the same time one perfectly fixed.

Fig. 2.





MAGNETO-ELECTRIC MACHINE.—Fig. 3.

The apparatus represented in Fig. 1 may also be used as an electro-magnetic engine. If a current be passed into the electro-magnet, A A', and thence to the induction coils on the wheel, the magnet will have two poles of opposite name, and in the coils the two halves will also be oppositely magnetized. So that, the five upper cores, for example, constituting the negative pole, the five coils below will form the positive pole. The negative pole, A, of the electro-magnet will then replace the upper negative pole of the wheel, while the latter will be attracted by the positive pole, A', of the electro-magnet. The effect will be the same below, and a rotation of the wheel will be caused. We find it stated that a single machine, of the size mentioned in the beginning has been applied to the production of a fine light and at the same time has lifted a weight of 42 lbs. by means of a pulley.

AMERICAN BORAX PRODUCTION.

The principal industrial utilization of borax is in glass making and the ceramic arts, as it possesses the property, at a high temperature, of dissolving the metallic oxides and forming transparent glass, the color of which depends upon the metal used. It is also largely employed in the manufacture of enamels, glazings for earthenware, and strass. In the large glass and porcelain factories of Europe its utilization has only been limited by the high cost of the product, chiefly obtained from Italy; but the discovery of the immense borax deposits in our western territory has materially removed this restriction, so that at the present time its employment is rapidly extending, and the export of the salt from this country bids fair to become a very important branch of our commerce.

Some interesting information relative to the mode of working the borax deposits of California and Nevada is given in a report recently made by Mr. Emile Durand, who has had several years experience in the extraction of the material, to the French Society for the Encouragement of the National Industry. The various compounds of boric acid commonly found are the borate of soda, various borates of lime, hayesine or ulexite, cryptomorphite and datolite. Tourmaline may be added to this list, although it is quite rare, except in the tin mines of San Jacinto, where it forms the gangue of the ore.

The principal deposits form a kind of band in the ancient volcanic soil, which surrounds the Sierra Nevada at the north and east. This region is rich in hot springs, some sulphurous, and containing in solution in their waters various salts. The borax, which is found in the saline deposits of the valleys, may have been produced by one of two causes, either by deep springs containing boric acid or borax in solution, or by the surface water of a vast basin accumulating in a reservoir and there concentrating over an unknown period. The second hypothesis is considered as the most probable, as the salts which accompany the borate of soda (sulphate, chloride, and other magnesia salts) are found in large quantities in the adjacent mountains.

The borate of lime found in these deposits is formed probably by double decomposition. It appears in crusts on the surface or in masses in the soil. The latter are of all sizes, sometimes weighing over four pounds and containing the borate in long silky filaments, or in an amorphous powder mixed with sand and soda salts. When obtained at the surface the borax is in small crystals, yellowish white in color. It has a slightly sweetish and quite agreeable taste, which is probably owing to organic matters, as it disappears after the refining. A thin steel shovel with a sharp edge for cutting the herbage is used for collecting the salt, which is taken in carts to a platform placed above large wooden vats capable of containing some 3,500 gallons. These vessels are filled with water, heated to boiling by the injection of steam. The borax is thrown in by shovelsful until the areometer marks 23° B. This concentration would be too great if only borax were put in, but the impurities (sulphate of soda and rock salt) added, besides the mud and borate of lime in suspension, greatly augment the density. When the above degree is reached, the solution is allowed to rest, the herbage which floats on the surface is skimmed off, and the liquid is carried by long india rubber tubes into the crystallizing vessels. The latter are large tanks 9 feet 6 inches in length, about 6 feet high and 39 inches wide. The liquid cools slowly to a temperature of 77°, occupying about ten days in so doing. A faucet at the lower part of the tank is then opened, and the mother liquor, mud, and large borax crystals which are formed by aggregations of small crystals are removed. These crystals are washed with the mother liquor in another vessel, by agitating them with a rake in a long trough filled with water. They are afterwards kept for refining.

At the bottom of the crystallizing vat is found a deposit of borax sometimes 6 inches in thickness, which is broken up with the pickaxe. The salt is then left to dry on platforms for four or five days, and finally is packed in coffee sacks, the filled bag weighing 165 lbs.

The distance from Columbus, Nevada, the site of one of the principal deposits, to Wadsworth, the nearest station on the Central Pacific Railroad, is about 360 miles over a desert country. The means of transportation is a train composed of three wagons, the pole of one fastened in the axle of the preceding. Twenty-four mules are harnessed to the first wagon. In this way the load of about 30 tons is distributed on the six axles, an important precaution, as the route lies over sandy plains and marshes, where roads are unknown. When a difficult place is reached, the three wagons are separated and the whole force of mules is attached to one vehicle at a time, which is thus hauled over or through the obstacle. Generally the owner of the train conducts it, aided by one or two assistants, and in the last wagon is stored the necessary provision, which includes both food and water, for