CASTING THE STANDARD METER.

Some time ago we gave a brief account of the labors of the International Metrical Commission in Paris, with regard to the determination of the exact length, properties, etc., of the standards to be used as the basis of the metrical system of weights and measures, in nearly all the countries of the globe. The metals fixed upon for the alloy were iridium and platinum; and about a year ago, the former component in its proper proportion, some 55 pounds, was prepared in the laboratory of M. St. Claire Deville.

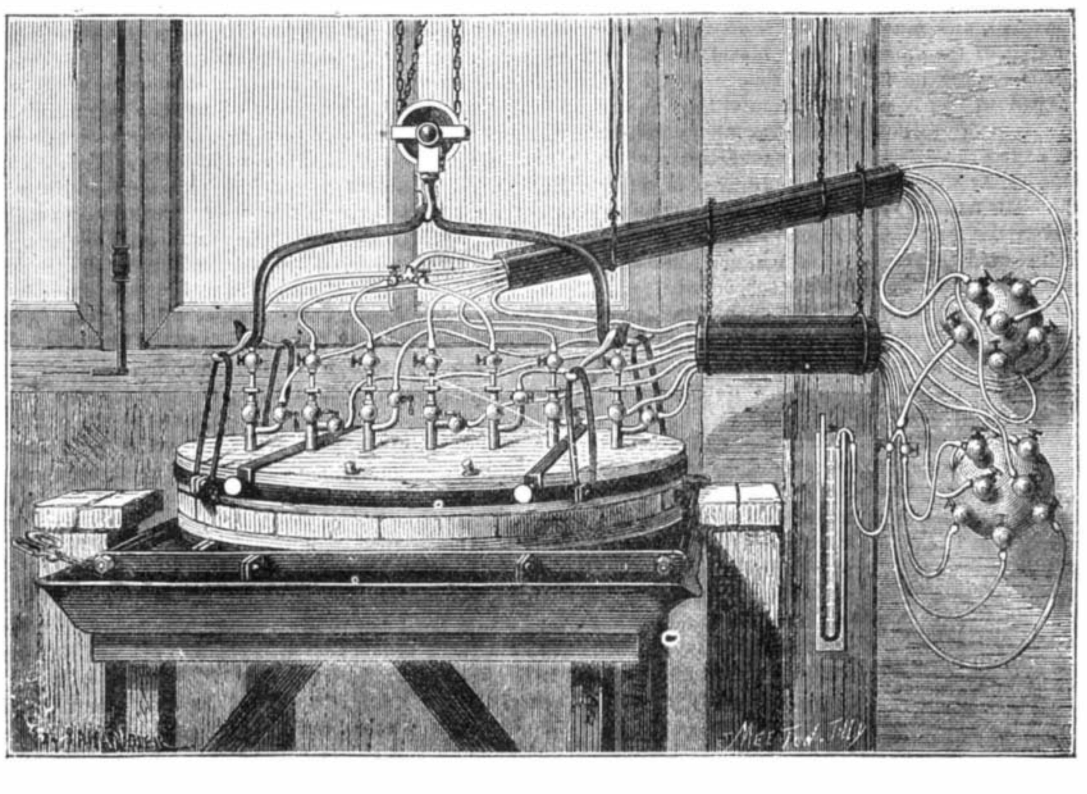
Quite recently the ingot from which the standards are to be made was cast, the utmost care being taken to secure a perfectly homogeneous alloy. The platinum together with the iridium was melted in quantities of 22 pounds. The ingots thus formed were cooled, cut in pieces, and again melted, 176 pounds at a time. These masses were again cooled and once more cut up and finally run into a single block. The work was done at the *Conservatoire des Arts et Métiers* in Paris, and occupied two hours.

We give herewith an engraving, extracted from *La Nature*, showing the furnace used. The apparatus is the largest of the kind ever constructed, and it has served to prove that the liquefaction, by heat, of great masses of platinum is no longer an obstacle to Science. The lump of metal, when inserted, measured 44·8 inches long by 6·6 inches broad, and 3·1 inches thick. Its value was $50,000, and it was the largest quantity of platinum ever melted at a single time.

The crucible was made of Saint Waast stone, a large grained calcareous material, containing about five per cent of silex, and lightly pulverulent. When the platinum was melted, in a cavity hollowed in the stone, the carbonic acid (due to the heating of the mineral) only became disengaged on the edges of the liquid mass, and did not bubble up through the same. The decomposition of the limestone took place through a depth of about 0·6 of an inch, so that the metal rested on a bed of lime of quite considerable thickness.

At each extremity of the crucible were openings through which the platinum, cut up as we have above described, was passed. As soon as the seven oxyhydrogen burners were lit, the fusion began with great rapidity. Through openings left for the purpose, the aspect of the melted metal could be observed. It appeared of a brilliant silver white, as fluid as mercury, and having a mirror-like surface. Large and very brilliant flames also burst forth from the side orifices of the crucible. The temperature of the mass was about 4,172° Fah.

The numerous small tubes shown in the engraving serve to lead the gases to the burners, and each set springs from a copper sphere. The consumption of oxygen was about 3,327 cubic inches to a pound of platinum. During the melting, the ignited products arising from the vessel were carefully examined by means of the spectroscope. Some traces of palladium, it is said, still exist in the alloy. It is stated that, in preparing the iridium, enough osmium was obtained to make 22 lbs of osmic acid, one of the most deadly poisons known. The above quantity, M. Deville said, in addressing the French Academy, was enough to kill every person in the world. The block, after being rolled to 77 times its present length, will be cut into rectangular bars and formed to the proper standards by accurate mathematical measurements.



FURNACE FOR MELTING PLATINUM.

THE CLAMOND THERMO-ELECTRIC BATTERY.

In 1821, Professor Seebeck, of Berlin, discovered that by soldering together a bar of bismuth and a bar of copper, and applying heat to the junction, an electric current was generated of sufficient intensity to be plainly indicated by the galvanometer needle. To this current and couple, he gave the name of thermo-electric, in order to distinguish them from the hydro-electric or ordinary current and couple. The thermo-electric current is ascribed by Becquèrel to the unequal propagation of heat in the different parts of the circuit, since, when all the portions of the latter are homogeneous, no current is produced on heating, because the heat is equally propagated in all directions. As compared with the hydro-electric current, the electro-motive force is very small, producing but feeble chemical action.

It is unnecessary to enter into the details of past investigation into this subject, since a reference to any standard work on physics will afford all necessary information. The principal application of thermo-electricity is to be found in the thermo-electric battery, which accumulates the tensions produced, in a circuit composed of several metals, when the alternate solderings are heated, the others being kept at constant temperature. This battery, in the form of Nobili's pile, employed in connection with a galvanometer, is used in Melloni's thermo-multiplier for measuring temperature, the the slightest differences in which it indicates with unfailing accuracy. Those of our readers familiar with Tyndall's work "Heat as a Mode of Motion" will remember that the thermo-electric battery was the thermometer used in the entire course of brilliant experiments described in that volume.

Save for purposes of demonstration, the thermo-electric pile has been of little practical value. It has played no part in industrial operations, though attempts thus to utilize the current have not been wanting. Farmer exhibited two models at the French Exposition of 1867, of ingenious construction, but they lost their power rapidly, and the bars, being excessively fragile, broke in cooling. In 1869, Becquerel presented to the French Academy a battery constructed by MM. Clamond and Mure, of couples of galena and iron plates, in which, however, the current gradually weakened because of the augmentation in the resistance of the apparatus. As this invention formed the basis on which the remarkable device which we are about to describe is founded, it may be well to notice more carefully its defects and the means taken to cure them. The difficulties lay, first, in the oxidation of the contact of the polar plates with the crystallized bar under the influence of heat. Second, in the splitting of the bar of galena and its separation into different portions in planes perpendicular to its length. The result of M. Clamond's efforts to overcome that was the battery represented in our engraving—in perspective, Fig. 1, section, Fig. 2, and plan, Fig. 3. In order to get rid of the first trouble, he altered the mode of attachment of the iron plate, bending it back on itself irregularly so as to present many re-entering angles. These are made to envelope the bar so that as the latter heated it expanded more than the surrounding metal, and so forced itself all the tighter into the angles. This disposition will be understood from Fig. 3, in which B B are the bars, and L L the plates. The second difficulty offered greater obstacles, as it had been found that, when a thermo-electric body, either metal or metallic sulphide, is cast in a cold cubical mold, splitting ensues, parallel to the faces of the cube. These divisions become visible after heating, and are supposed to be due to the extreme fragility of the body and its crystalization against the surfaces of the mold. In order to prevent the splitting, M. Clamond heated his molds to temperatures nearly equal to the fusing point of the thermo-electric substance, and employed couples made of an alloy of zinc and antimony (in lieu of galena) and his iron plate as before. This alloy he adopted on account of its good electrical conductivity, and because the temperature of its melting point rendered his method of casting easier. Iron he used in preference to copper or argentar, because it resists the effects of the alloy more effectually.

Fig. 1.

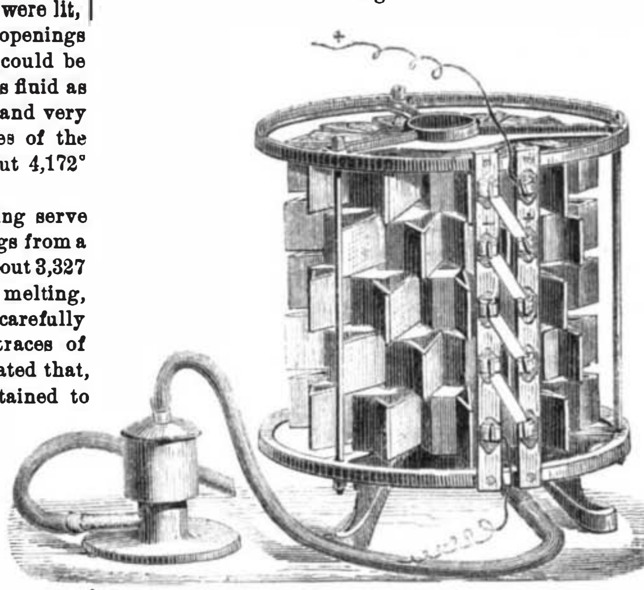
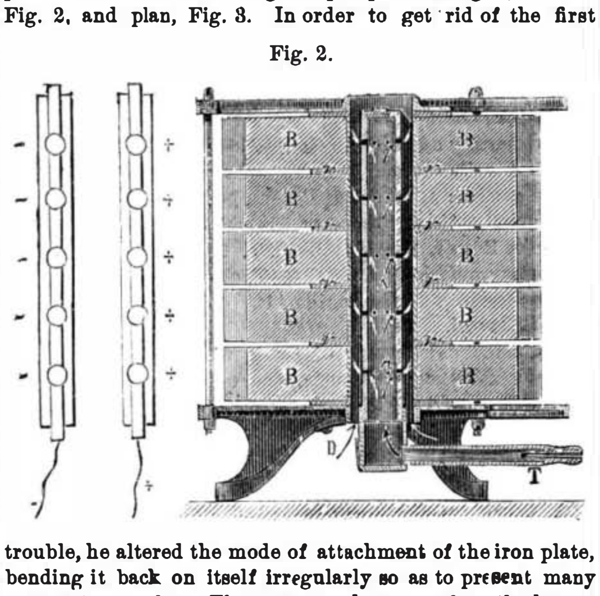


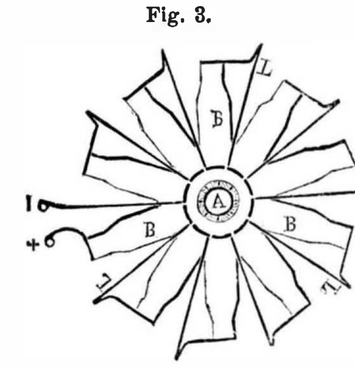
Fig. 2.



The bars of alloy, as shown in our engravings, for which we are indebted to *La Nature*, are assembled in crowns and coupled for tension. These crowns are each composed of ten bars, B, Fig. 2, superposed and separated by collars of asbestos. The apparatus forms a cylinder, the interior of which is lined with asbestos and heated by means of a pipe, A, of refracting clay, pierced with holes. The gas entering at T escapes through these orifices and mingling with air, which comes in at D, burns in the annular space between the tube and bars. The extremities of each crown are held in clamps of copper fixed in two standards, shown separately at the left of Fig. 2, and at the front of the apparatus in Fig. 1. The crowns may be coupled for tension or for surface, the latter for each crown being 7 square feet, or 35 square feet for the entire battery.

The Gerond regulator is used to render the flow of gas uniform; and thus arranged, the battery works for months without requiring the slightest attention. The apparatus exhibited before the French Academy of Sciences uses one cent's worth of gas per hour to deposit 308 grains of copper in similar time. So that for fifty cents 2·2 pounds of the metal may be deposited. The quantity of electricity augments in proportion to the size of the bars, which are made of different dimensions, varying from half an ounce to nine pounds. Experiment also shows that, with an equal number of couples, the weights of copper deposited are proportional to the weight of the couples.

Fig. 3.



The battery, we understand, is now being used in the printing office of the Bank of France, and in the large photo-engraving establishment of Goupil, at Asnières, giving remarkably successful results.

Epsom Salts and Sulphurous Acid in Dyeing.

It has been long remarked that woolen goods dyed with aniline colors, and treated with Epsom salts, will stand the action of soap and soda, and the dressing process generally, better than when not so treated, or than when treated with any other substance.

Dr. Reimann advises the use of Epsom salt on yarns to be dyed violet. By the action of soda, the magnesian salt is decomposed, with separation of insoluble magnesian compounds, which exert no action upon the coloring matter; any alteration in color by the alkali is thus prevented.

All woolen dyers are agreed that, in dyeing with methyl- and dahlia-violet, the use of sulphurous acid is very advantageous. The colors are thus obtained of a brighter, clearer tint.

It may be that, a partial reduction of the methyl-rosaniline to leucaniline having taken place, oxidation then effects the transformation of the latter into the former.—*Dingler.*

A NEW life-saving invention has recently appeared in Paris in the shape of a durable garment which covers the entire body. It is made of rubber, and is provided with a flexible tube which has a mouthpiece. By blowing into the latter, the person in danger inflates the garment, which buoys him up when in the water.