ELECTRIC FURNACES.

The elegant experiments of Mr. H. Moissan have particularly attracted the attention of chemists and physicists to the important results that can be obtained by the use of the elevated temperature of the voltaic arc. The electric furnace employed by Mr. Moissan we have already described. This eminent chemist, in collaboration with Mr. J. Violle, has recently presented to the Academy of Sciences a note in which he furnishes some new information. Messrs. Moissan and Violle presented to the academy two models of electric furnaces. The first, which is analogous to the one we have already described, is adapted to the fusion of refractory metals, such as chromium and manganese. The second is designed for calorimetric researches serving to establish the temperature of the arc. We represent this furnace (Fig. 2) above the calorimeter. The bottom of the jacket of the furnace consists of a movable plate, after the manner of a slide. At the positive pole there is a fragment of carbon held by a rod of the same substance sliding by slight friction in a tube of carbon. One has only to give the rod a pull at the proper moment in order to cause the fall into the calorimeter of the fragment converted into graphite that has reached the desired temperature. No. 2 of Fig. 2 gives a view of the electric furnace with the piece of carbon that is detaching itself therefrom to fall into the calorimeter. The figure to the left (No. 1) shows the details of the carbon and of the receiver of the calorimeter.

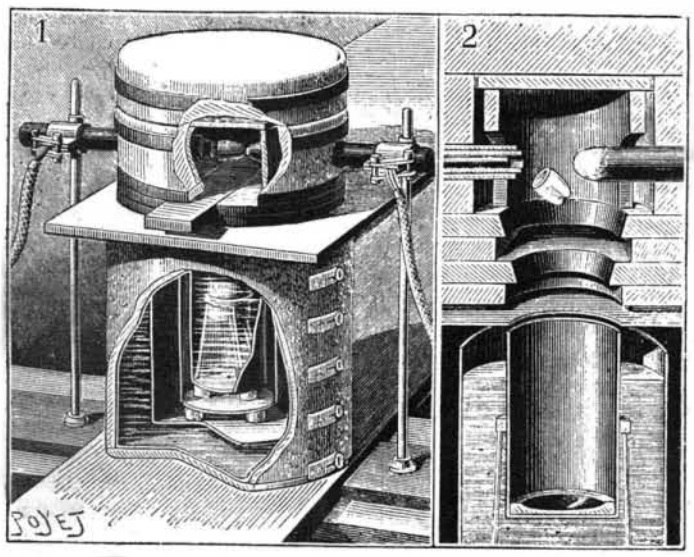


Fig. 2.—MOISSAN AND VIOLLE'S ELECTRIC FURNACE.

1. Furnace placed upon its calorimeter. 2. The carbon falling into the calorimeter.

The temperatures produced by these electric furnaces are the highest that can be obtained. They may vary under the following circumstances:

The temperatures obtained, says Mr. Moissan, naturally vary according to the duration of the experiment, and also according to the size of the furnace. They have no other limits than those of the voltaic arc. The more the calorific field is limited, the closer we shall approach the temperature indicated by one of us as being the calorific maximum that the arc is capable of producing. Practically, we obtain in our apparatus temperatures above 3,000° without any trouble.

These furnaces were constructed at the physical laboratory of the Normal School by Mr. Nion, superintendent of the workshop.

We shall now make known another model of electric furnace that any one may procure. It is constructed by Messrs. Ducretet and Lejeune. This apparatus was presented to the Academy of Sciences March 20, 1893, under the name of the electric crucible, and was devised for laboratory researches and assays. It is shown in Fig. 1.

The crucible, C R, of refractory material, receives two carbons, C and C', inclined at an angle of about 90°, and which are capable of sliding in special supports that permit of bringing them into contact or of separating them. The apparatus as a whole is inclosed in a metallic frame fixed to the base, K. The front and back faces are closed by plates of mica with joints of asbestos cardboard. The phenomena of fusion or reduction may thus be observed and a spectral analysis be made of them.

Through this arrangement we obtain a completely closed chamber in which the reactions take place without contact with the air and in the presence of certain gases. Two lateral tubes, as may be seen in the figure, serve for the circulation of the gases. An opening above closed by a cover, Bo, permits of the introduction into the crucible of the substances to be submitted to electrothermic action. The current is led by the two terminals, A B, whose wires in circuit may be seen in the figure.

The arc formed between the two carbons, says Mr. Ducretet, is converted at a distance into an elongated flame, forming a true electric blowpipe in consequence of the directing action of a magnet, Ai, placed near the apparatus. The arc may thus be directed upon the material contained in the crucible and be gradually brought to the maximum temperature. This arrangement, devised by us, is a new application of a known phenomenon already utilized by Jamin in his electric lamp. The model that we present to the academy is capable, with carbons of proper diameter, of supporting a current of 40 amperes. With a current of 12 amperes and 60 volts, it is possible to obtain the reduction of oxides and the fusion of the most refractory metals in quantities more than sufficient for their chemical or spectral analysis.

All the classical experiments and laboratory assays that require an elevated temperature can be carried out with this apparatus.—*La Nature.*

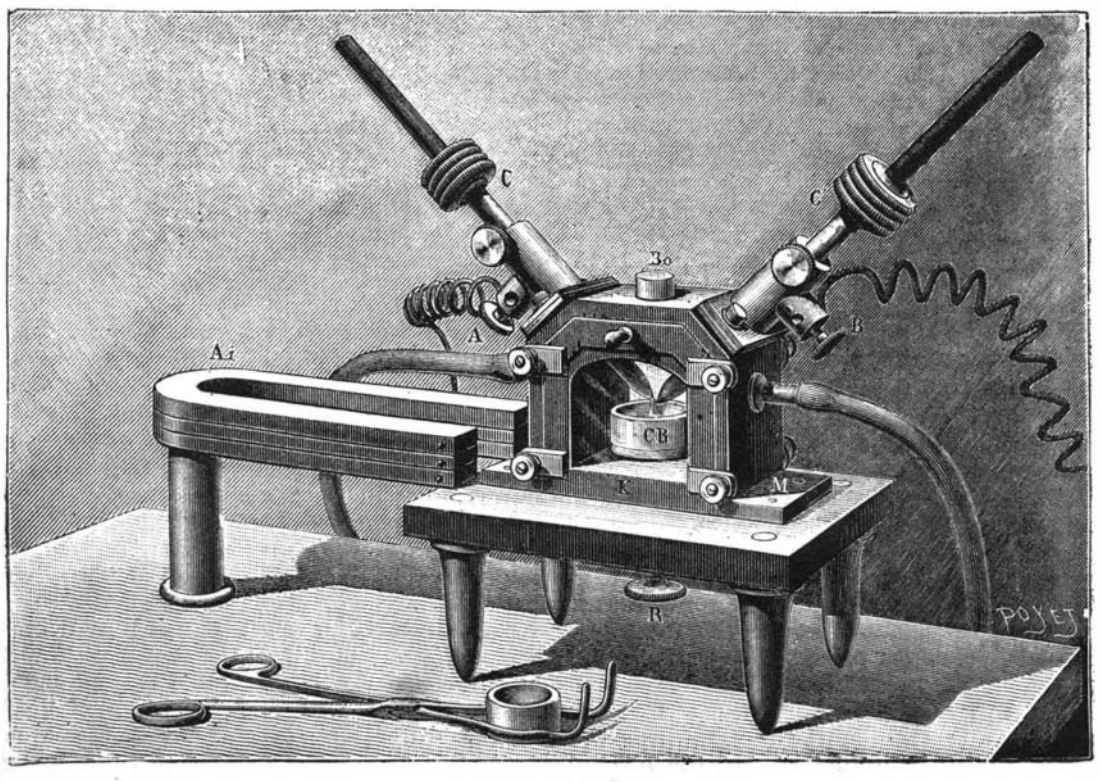


Fig. 1.—DUCRETET'S ELECTRIC CRUCIBLE.

Irrigation in Arizona.

Chief Engineer B. S. Church, of the New York water works, who built the celebrated Croton aqueduct, and who was at the head of the Croton water department, has been for some time consulting engineer in the building of great canals and reservoirs by the South Gila Canal Company, sixty miles east of Yuma, on the Gila. He says the engineering work has been completed, and the contract for constructing the canals and reservoirs has just been let to a Mr. Earland, of Los Angeles.

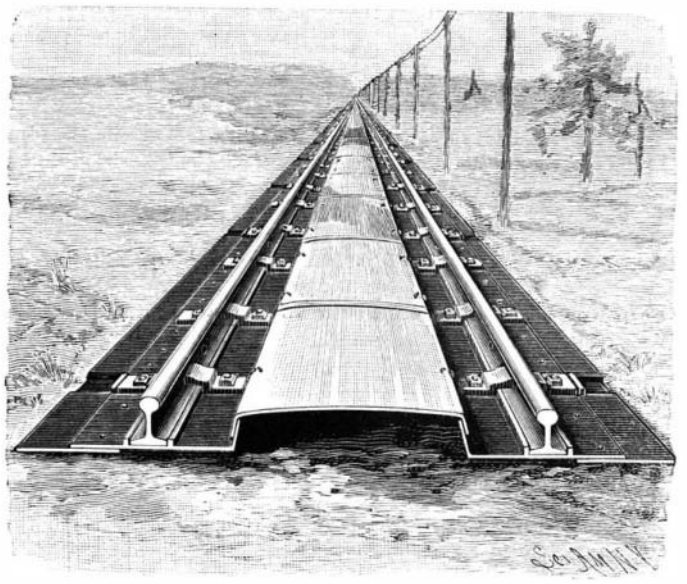
"The canal and reservoirs will, on the start," he said, "irrigate in the neighborhood of 300,000 acres, and the system may be extended to include more than 1,000,000. The canal system, it is expected, will cost $2,000,000. It is a very extensive system; will bring an immense tract of what is now arid land under cultivation, and will do much for Arizona.

"There is to be a canal with a levee, reservoirs and jetties, the jetties forming a series of lakes for fourteen miles, which give storage, and enable the projectors to overcome engineering difficulties. The diverting dam will be of masonry and earthwork, and probably be 50 feet high and 1,400 feet long. It will direct the water into the chain of lakes.

"Beyond the chain of lakes it is smooth going. There are no natural obstacles. The canal will probably be fifty feet wide, and carry eight feet of water."—*Pacific Lumberman.*

AN IMPROVED RAILWAY ROADBED.

In the roadbed shown in the accompanying illustration there is no wood to rot, the ordinary ballasting is not requisite, grass and weeds do not grow along the tracks, cattle will not travel upon it, and the spreading of the rails is made impossible. A metallic covering laid in sections, with movable water tight joints, covers the central portion of the roadbed, this covering being tied by wire fastenings at each side to side flanges upon metallic longitudinal sills, the latter having in their top surface rolled ribs between which is received the bottom of the rail. On the bottom of the sill, near its outer edge, is riveted a strip of lighter metal, widening the track base, this strip having depressions to receive the ends of the metallic crossties. The tie has a shoulder at each outer end, against which the outer edge of the sill rests, and the rail is held in place by cleats clamping the base of the rail to the sill and crosstie by means of bolts and nuts. With this improvement, after the grading has been completed, it is designed that the passing of a heavy roller over the ground shall afford sufficient preparation of the roadbed, without the ordinary ballasting of stone, etc. The crossties are first embedded in the ground, the sills and outer strip placed in position, and the earth tamped between the flanges on the inner edges of the strips, after which the rails and cleats are fastened in place, the central covering being laid last.



KAUFMAN'S METALLIC RAILWAY TRACK.

Further information relative to this improvement may be obtained of Mr. Daniel Kaufman, Boiling Springs, Pa.

Life Insurance.

However desirable a good physical condition together with a good family record may be in an insurance sense, unless you add to that a well-balanced mind and good habits you do not have a first class risk.

No matter how perfect the family history or how sound the physical condition, unless a man has good habits he will not prove to be a good risk. On the other hand, suppose the applicant is not in the enjoyment of vigorous health, but has a good family record, if that man is of temperate habits, is not guilty of many excesses of any kind, if he is disposed to take care of his health and give his system a chance to recuperate from any lost energy from overwork or any accidental exposure, or error in diet, that man, as a rule, is a better risk than the man of remarkable vigor but inclined to dissipation.—*The Guardian.*

Steel Barrels.

The manufacture has been commenced, at Barrow, of steel barrels for the carriage of petroleum in the place of wooden casks. The barrels are made in halves by means of dies and compression while the thin plates of steel are hot. These halves are welded together by means of electricity, and the barrels, when produced, are to be used in the petroleum trade in hot climates. The new process is one possessing great interest, not only to those engaged in steel manufacture, but to those engaged in the shipping trade, and particularly the bulk petroleum trade.