

as a miniature cup in which any substance can be placed in order to study its behavior at these high temperatures.

The writer has placed a small cylinder of refractory material around the lower carbon of such an arc, and, with this simple apparatus, was able to repeat some of Moissan's well-known experiments on the production of the diamond.

In another form of electric furnace, the heat is produced by the passage of the electric current through a solid or liquid conductor. This method of producing electrical heat is typified in the common incandescent lamp. The earliest use of this method of heating was in 1815, when W. H. Pepys* solved an important question in regard to the nature of steel by means of a miniature resistance furnace operated by a battery. He placed some diamond dust (a pure form of carbon) in a cut in a piece of wrought iron wire, and passed an electric current through the wire, thus heating it to redness. The iron absorbed the diamond dust and became converted into steel.

Although the principle of electric heating had thus been discovered early in the century, very little progress was made with the practical application of this source of heat until the discovery of the dynamo. Among those who attempted to utilize electrical heat in small furnaces, with the aid only of powerful electric batteries, may be mentioned—Napier, who, in 1845, produced a small arc in a plumbago crucible, intending to reduce certain metals from their ores; Despretz†, who, in 1849, made a small tube of charcoal, about an inch long, and heated it by passing through it an electric current from a battery of 600 Bunsen cells; and Pichou,‡ who described, in 1853, a furnace, heated by a series of electric arcs. The furnace, which was probably never constructed, was intended for the reduction of metallic ores. Joule and Thompson also attempted to utilize the high temperature of the electric arc.

Until the invention of the dynamo, in 1867, experiments requiring any considerable amount of electrical power could only be conducted at great trouble and expense by means of electric batteries. Sir W. Siemens, with the aid of the dynamo, began, in 1878, to experiment on the electric furnace, which he used mainly for melting metals. The form of furnace usually associated

*Phil. Trans. Roy. Soc., 1815, vol. cv., p. 371.

†Despretz, *Comptes Rendus de l'Acad. des Sciences*, vol. xxviii., p. 755, and vol. xxix., pp. 48, 545, 712, (1849).

‡Mentioned by Andreoli, *Industries*, 1893, see Borchers' *Electric Smelting*.