Examples:—

The furnace heated by spiral or platinum wire.

This furnace, Fig. 12, is very useful for laboratory experiments on a small scale. It consists of a tube T, often of porcelain, a spiral of platinum wire, and a heat retaining envelope or lining. An electric current passes through the wire and heats it to any desired temperature below its melting point—1775°C 3227°F—and ultimately the tube and its contents may be heated nearly to the same temperature. The substance to be heated is placed in the tube T. This arrangement is convenient for heating a material in any particular gas, and for observing the operation; as this can be done through glass, or mica windows at the ends of the tube. Provision must be made for preventing the displacement and short circuiting of the coils of wire when expanded by the heat. The temperature that can be attained in this furnace depends upon the refractory qualities of the tube, and envelope, as well as on the melting point of the platinum itself, and in practice, the temperature attained would be far short of the melting point of the platinum wire.

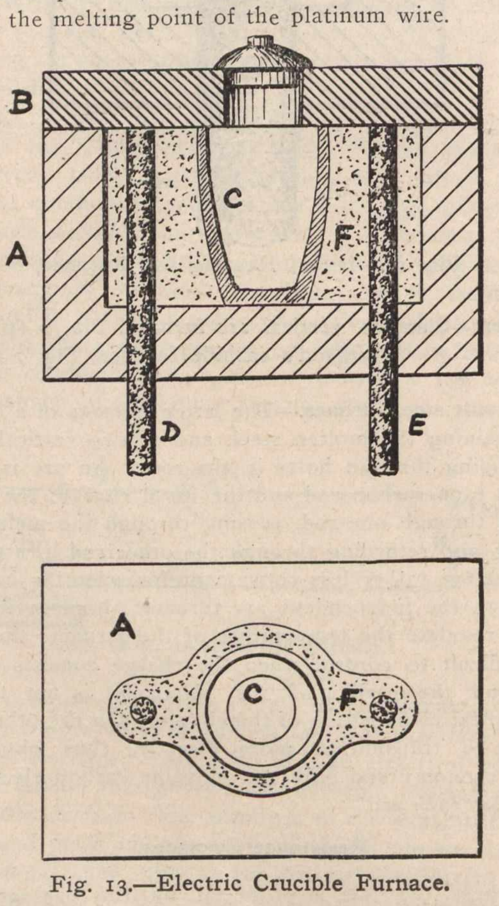

Fig. 13.—Electric Crucible Furnace.

Crucible furnace with carbon resistor.—This represents, in sectional elevation—and in plan with the cover, B, removed—a small electrical crucible furnace, constructed at McGill University, and intended for melting small quantities of metals. It could, however, be made considerably larger, and be used for brass or steel melting. The furnace consists of two fire clay blocks A and B, a crucible C, and carbon electrodes D and E. A receptacle is formed in the block A to contain the crucible and electrodes and broken coke, F, is packed around them. The current passes from D to E through the coke, which becomes hot and heats the crucible and its contents. The temperature can be regulated by a rheostat in series with the furnace. The whole furnace is enclosed in a metal box with a thick asbestos lining to prevent loss of heat.

Conley ore smelting furnace.—One form of the Conley furnace consists of a shaft down which the ore passes and of carbon resistors imbedded in the walls of the furnace. The resistors are heated by the passage of a current, and communicate their heat to the ore passing over them.

Small tube furnaces heated by spirals of platinum wire, are very useful for experimental purposes, but commercial furnaces on these lines have been less successful: mainly on account of the difficulty of maintaining resistors and adjacent parts of the furnace; because, of the slow conduction of heat to the charge, and the large loss of heat through the furnace walls.

(2) **Furnace with the resistors imbedded in the charge.**—The resistor is usually of carbon and horizontal.

Example:—

Borcher's experimental resistance furnace.

In this a thin pencil of carbon C is supported between stout carbon rods A and B, and the charge to be heated

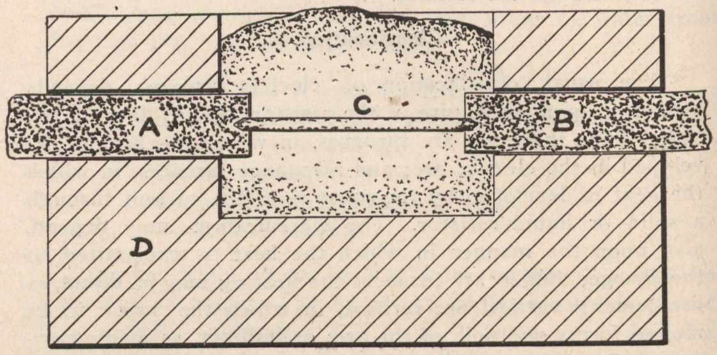

Fig. 14.—Borcher's Resistance Furnace.

surrounds C. The current flows between A and B through C, and may raise the latter to a white heat. The charge serves in part as an envelope to retain the heat.

See Acheson's Furnace for Carborundum, Graphite, Etc. (p. 173.)

In this furnace the conducting core is composed of granular carbon, and is supported and surrounded by the material to be heated. The furnace is efficient, because the heat is developed in the midst of the charge, which serves to retain it. The temperature can also be exactly regulated by varying the current, while by using a number of cores it is possible to obtain a fairly uniform temperature throughout a large portion of the charge. On the other hand, when the furnace has been charged, it is impossible to regulate the resistance of the core, and since this decreases considerably as the furnace becomes hotter, the current, if supplied at constant voltage, may increase during the work of the furnace until it becomes too great for the dynamo, or transformer from which it is supplied; thus involving the use of apparatus for reducing the voltage. As the material to be

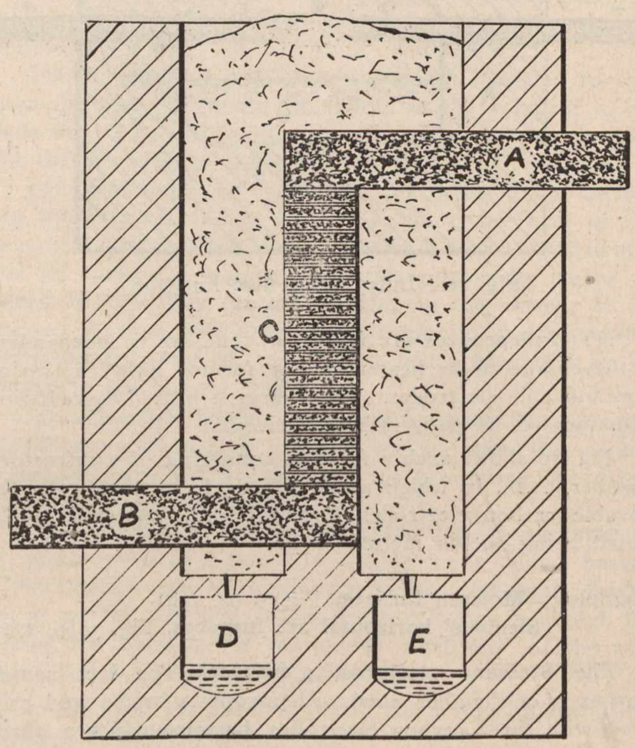

Fig. 15.—Tone's Resistance Furnace.

heated acts as an envelope to retain the heat, and as the charge does not become fused, the outer walls can be of the simplest description; merely serving to retain the charge in position. This furnace would not be directly applicable in case the charge were to fuse, since the core would become broken. The furnace is also essentially intermittent in action, as the charge cannot pass continuously through it;