

periodic, or continuous additions of the raw material, and removal of the products.

Apart from the furnace itself, the following operating factors have to be considered:—

(6) **Source of electric current.**—The electric current is produced by means of a dynamo, and as it is usually supplied at a higher voltage than is suitable for the furnace, a transformer may be required to reduce the voltage; the amount of current being simultaneously increased almost proportionately to the reduction in the voltage. The current may be alternating, or direct, but an alternating current is usually preferred, as it can be transformed more readily from one voltage to another. In cases where electrolysis is required, as in the production of aluminium or sodium, the direct current can alone be used.

(7) **Cables, measuring instruments, and regulating devices.** Cables are used for bringing the electric current from the transformer or dynamo to the furnace. Measuring instruments, such as ammeters, voltmeters and wattmeters are used for measuring and recording the current, electro-motive-force and electrical power supplied to the furnace. Regulating devices are required for advancing the electrodes as they are consumed in the furnace, and for regulating by this means, or in some other way, the amount of current flowing through the furnace.

Classification.

The usual classification of electric furnaces depends primarily upon the nature of the resistor used to develop the heat. Thus there are arc furnaces, in which the heat is developed in the electric arc; and resistance furnaces, in which the heat is developed by the passage of the current through a solid or liquid resistor. The classification may depend, also upon the manner in which the heat is transmitted to the charge; thus in arc furnaces the heating may be direct, as in Siemens' vertical arc furnace, in which the metal to be melted forms one pole of the arc; or indirect, as in his horizontal arc furnace, where independent electrodes are employed, and in which the heat is transmitted from the arc to the charge by radiation and conduction.

In resistance furnaces the charge to be heated may itself constitute the resistor, or else an independent resistor may be employed. The latter nearly always consists of a solid core, usually of carbon, and it may be surrounded by the charge that is to be heated, or imbedded in the walls of the furnace. A charge that