the influence of phosphorus upon the physical properties of steel in which it is contained is as much dependent upon the form of combination in which it exists as upon the quantity. This power of phosphorus to exist in two or more forms in steel with the varying influence on the brittleness of the steel according to the form present will, we think, account for many of the apparent inconsistencies in the statements usually made by metallurgists in regard to the behavior of this element. Much remains to be done upon the products of solution of iron and steel along the lines indicated either by the present paper or by that of Mackintosh,[1] or more recently by Juptner's paper, read before the British Iron and Steel Institute, May, 1897, before we shall be able to accumulate sufficient data to enable us to draw reliable conclusions as to the forms in which phosphorus may exist in iron and steel, the conditions under which the different forms are produced, and the influence of the different forms on the physical properties of the metals.

AN ELECTRICAL LABORATORY STOVE.

By M. D. Sohon.

Received July 7, 1897.

THIS apparatus has been designed to economically replace, as far as possible, the ordinary water-baths and gas burners used in the laboratory.

The stove is of copper, preferably cylindrical, about three

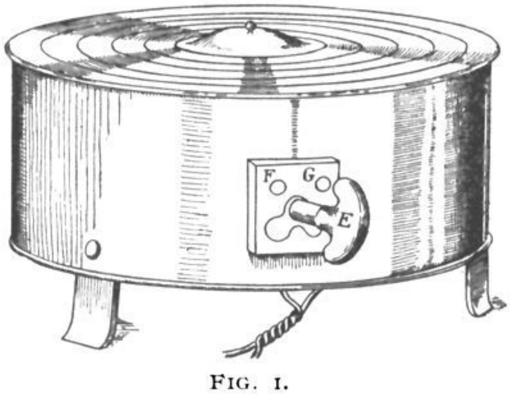

Fig. 1.

inches in height, exclusive of legs, and seven and a half inches in diameter. The top consists of the usual concentric rings; the bottom is open. The heating plate *A* is placed two inches

[1] *Trans. Amer. Inst. Min. Eng.*, 14, 385.

from the top, allowing ordinary flasks and casseroles to rest securely on the rings without touching the bottom. There is a clearance of one-fourth inch between the plate and sides of stove, allowing anything falling into the stove to pass through. The heating plate and body are independently fastened to the legs and may be quickly detached.

The heat is generated by the coils, *B*, of ordinary rheostat alloy, imbedded in silicate insulation, a half inch asbestos board, *C*, supports this and prevents the radiation of heat downward. A copper plate, *D*, turned over the edges, protects the coils and insulation from materials falling upon them, and strengthens the plate. Copper is preferable to the iron plate usually employed in rheostats, heating more rapidly and being less quickly attacked by reagents, and is easily replaced if destroyed.

The heating coil is in two parts of unequal size, either or both

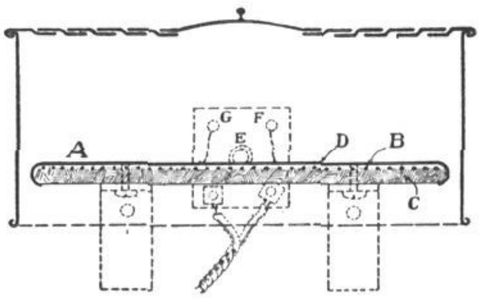

FIG. 2.

of which may be brought into use by means of the switch *E*, thus permitting of three variations of temperature without the use of other apparatus. The most convenient size of coils are such as to maintain the plate at about 90°C., 110°C., and 125°C.

Compared with the water-bath it is clean and dry and requires no attention. It is only necessary to *press the button* and it supplies immediately a constant and dry heat. The heat can be varied, and it is not affected by draught as are gas stoves, nor does it unnecessarily heat the laboratory. By the use of suitable coils or interposing resistance, the stove may be used with more volatile liquids. It especially recommends itself in connection with the distillation of inflammable liquids, extractions, etc., where danger from fire is to be avoided.

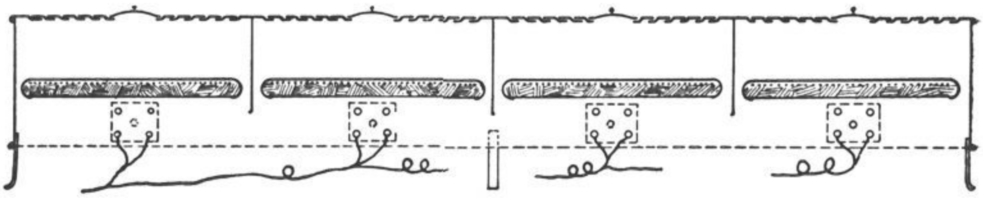

FIG. 3.

A group of the stoves, independently connected, is highly preferable to the large cumbersome water- or steam-baths generally employed.

THE ESTIMATION OF PHOSPHORUS IN STEEL.

BY R. W. MAHON.

Received August 12, 1897.

MANY analysts regard the titration of ammonium phosphomolybdate by standard alkali and acid with phenol phthalein as indicator as the best method for the routine determination of phosphorus in steel.

By two modifications of one of the approved processes for obtaining phosphorus in steel as ammonium phosphomolybdate, I have so shortened the operations as to enable one to execute the analysis in eight minutes, from receiving the drillings to obtaining the result. The results are accurate in the absence of arsenic. I have not experimented with the process in the presence of arsenic. No experiments have been made with steels containing silicon or carbon in considerable quantity. The process was devised for facile determination of phosphorus in steel containing scarcely any silicon, and low in carbon. It appears entirely probable that with high carbon and silicon, perfectly accurate results would be obtained. The two modifications I have to suggest are (1) effecting the partial neutralization in a different manner, and (2) precipitating at a higher temperature. Before the steel drillings are received, the following preparations for the analysis are made: Seventy cc. of water and thirty cc. of nitric acid (sp. gr. 1.4) are poured into a sixteen-ounce Erlenmeyer flask, a measured quantity of standard caustic potash solution and a little water are poured into a small beaker, the reading of the acid burette is recorded, and the filter is placed in its funnel, at the suction-pump, ready for use.

Four grams of drillings are placed in the flask containing the