XXV. AN INEXPENSIVE ELECTRIC HOT-PLATE

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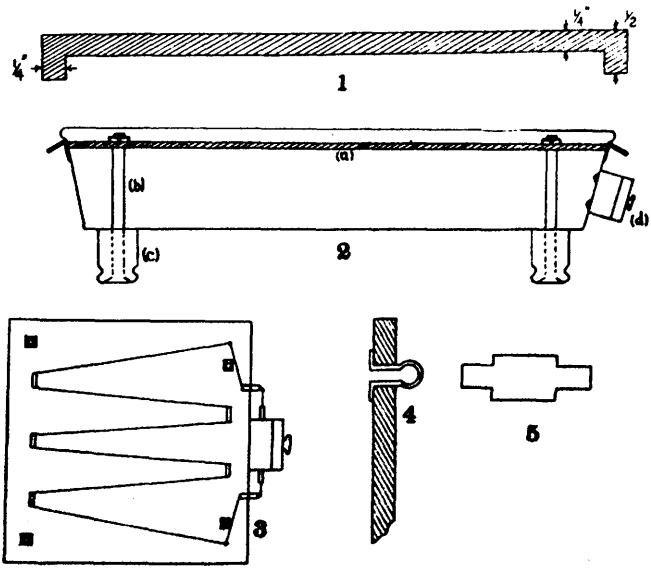
The present paper deals briefly with an attempt to develop a laboratory hot-plate in which are combined cheapness, ease of operation, and simplicity of construction. The following data are not intended to convey the impression that no room is left for improvement, but rather as a suggestion of the possibilities which lie in this direction. The hot-plate, as described, has been found entirely satisfactory as a source of heat, tho it would, of course, be open to such modifications as would seem desirable to anyone wishing to duplicate it.

The plate consists of a common iron bake-pan with the usual sloping sides, the dimensions at the rim inside being 11¾x13¾ inches. A piece of ¼ inch transite board is cut so that it fits tightly in the pan, leaving a rim of from one-half to five-eighths of an inch. One-quarter inch holes are bored thru the bottom of the pan at each corner, with four corresponding holes above in the transite board. Four four-inch by one-quarter inch screw-headed stove bolts are used to hold the parts together. In addition, the bolts are passed thru common porcelain in-

sulators, which serve as legs. The pan may be filled with powdered magnesia or some other suitable heat-insulating material. If desired, a double-throw snap switch may be bolted to one end of the pan, the apparatus thus being entirely portable.

The resistance consists of chromel wire, 22 B & S gauge, having a resistance of 0.97 ohm per ft. In the apparatus as now arranged, 42 feet of this wire is used, which, with a 220 volt direct current gives a theoretical wattage of 1188.

The wire may be conveniently coiled by winding it on a piece of heavy iron wire, one end of which is bent in the form of a crank. The coils may then be pulled apart sufficiently to allow of them being properly distributed over the transite board upon which it is mounted. The coil is secured by means of cast iron strips bent in a circular form, and which pass thru holes in the board, the projecting ends being bent over underneath. Three of these are placed at one end of the board, and two at the other. At the latter end are also mounted two small binding posts by means of which the terminal ends of the coil are secured. (See Fig. III, IV, and V for details).



Tops for the apparatus are made of cast iron, being cast in the shops at the College by students at a cost of about $1.50 per plate. The plates are ¼ inch thick, and are provided with a lug of equal height and thickness which extends around the edge. The purpose of the lug is to fit down around the top edge of the pan, holding it securely in place, as well as excluding all air. (See Fig. I). The outside dimensions of the plate are 12¾x14¾ in., with inside dimensions, of course ¼ inch less because of the lug. The surface of the plate is 188 sq. in. and will easily accommodate six 1000 cc. beakers.

The plate as above described is extremely easy to construct. Outside of the cast iron plate, which must be cast in a shop, the average person can assemble the remainder in three hours time, or four, at the most.

Tests made with such a plate show it to be reliable and thoroly dependable, as well as having all parts instantly accessible. The top is heavy enough to withstand all stresses, and holds heat very uniformly. The heating element may be removed and replaced without removing the transite board upon which it is mounted, merely by disconnecting the ends of the coil from the terminals and pulling the coil out thru the iron re- from the terminals and pulling the coil out thru the iron re- ing off the iron top.

Tests show the above plate capable of bringing water to the boiling point from a cold start in about one-half hour, with a rate of evaporation in proportion. It is suggested that such an apparatus would find use in concentrating filtrates, taking the place of several gas burners. Liquids may be taken down to very small bulk without undue spattering provided there is no very heavy precipitate present. In the latter event, spattering may be obviated by providing, by any convenient means, a space of ½ inch between the bottom of the vessel and the top of the plate.

The pan may be protected from corrosion by painting with any good grade of acid proof paint.

It is hoped that the above data will be of value in suggesting a convenient means of placing more electrical equipment in the laboratories without undue expense. The plate, as designed, should not cost above five dollars for materials, and ought to give as good service as one costing three to five times as much. Further, such a plate can be operated for an hour at a cost of a few cents, while at the same time doing the work of from six to ten gas burners.