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AN ELECTRICAL DEVICE FOR SECURING AND MAINTAINING CONSTANT HIGH TEMPERATURES.

W. E. TISDALE.

In a paper read before this Academy last year, a device for controlling comparatively high temperatures (up to about 600° C) was explained, together with the necessary auxiliary apparatus, an ordinary electro-magnet circuit breaker, and the source of constant potential necessary to operate this magnet. The oven described in that paper consisted of a properly insulated porcelain tube 30 cm. long and 5 cm. in diameter. It required 10 amperes to heat it to 450° C. The dimensions of the oven limited the size of the tubes in which the crystals were to be produced to not more than 3 cm. in diameter and 15 cm. in length, and admitted but one at a time. Inasmuch as it requires several months to produce crystals of a size such as is necessary for optical and electrical work, the disadvantage of the oven may be readily seen.

In the catalogues of the various manufacturers of regulated electrical ovens, there are no descriptions of ovens that go above 300° C, so that the only method of obtaining one that would suit our purposes was to manufacture it ourselves.

Accordingly, the oven shown in figures 24 and 25 was designed. Except for the angle irons used in the corners, and the necessary bolts, it is made entirely of asbestos board three-eighths inch thick. The oven is double walled, the interspace on the sides being filled with loose asbestos, and that on the top with air. The inside dimensions are 12x12x14 inches, the longer dimension being the height. In figure 24 an elevation view is shown. The asbestos board with the double row of holes shown at the left in the figure is the bottom of the oven space, and belongs immediately above the heating coils, which may be seen in place on the bottom. The top shown tipped up is the top of the oven space, and between it and the top of the entire apparatus (shown in the front of the oven) is a space of three inches of air. The thermometer is seen projecting at the left, and on the inside the controlling device (figure 26) is seen in

position hanging on the right wall. In figure 25 a plan view is shown, with the tops and the bottom of the oven space removed. At the left is shown the electro-magnet device for breaking the current through the heating coils. This magnet is operated by a

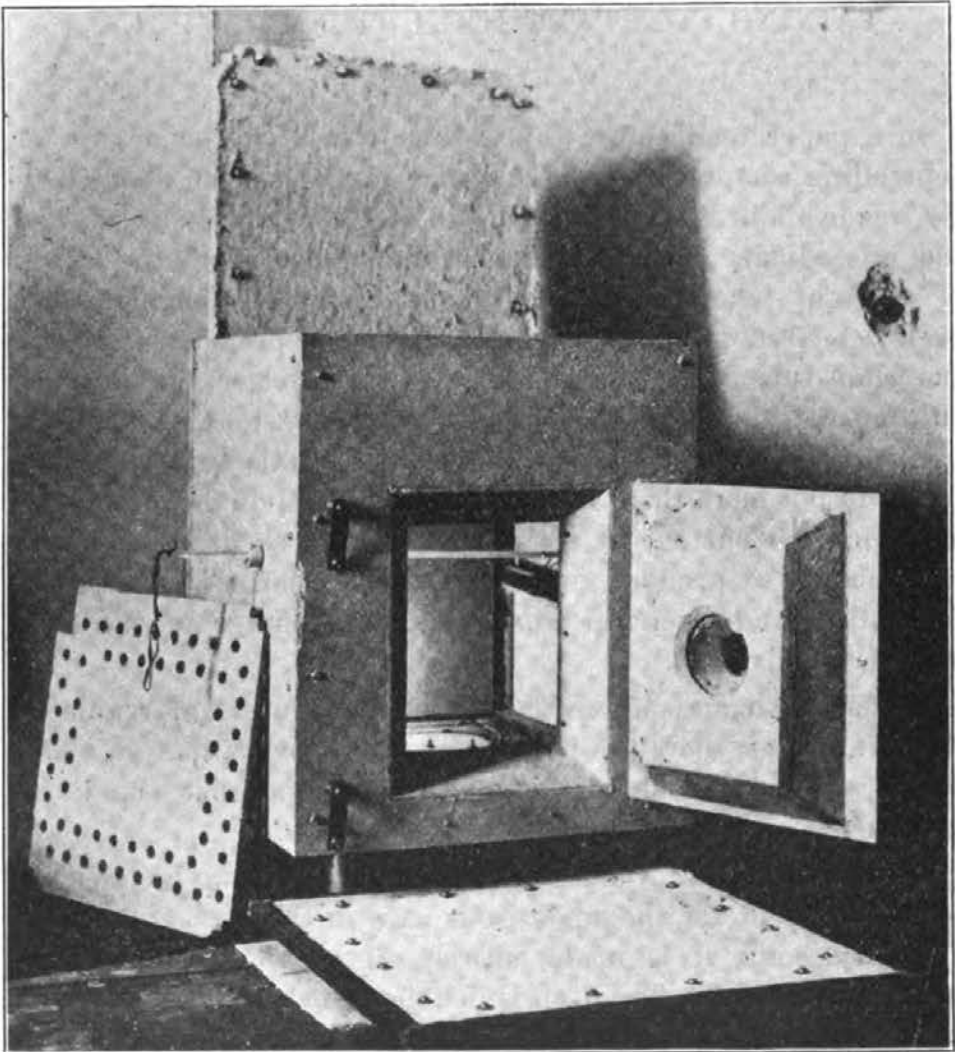


FIG. 24.

current controlled by the device shown in figure 26. This consists of a bar of asbestos board, to which is attached a thin metal strip. The gap shown between the silver tipped screw and the silver plug in the metal strip immediately below is 8 mm. This is the amount of rise of the center of the strip for a change of temperature from 20° C to 360° C.

The oven requires 8 amperes of current to heat it to 450° C, making the cost about 10 cents an hour to operate it at standard electrical rates. The controlling device regulates at 450° C to

not more than one degree variation above or below this value, and has so maintained the temperature for the six weeks that it has been in constant operation. It is possible to maintain constant temperature with this apparatus up to 700°C , or about

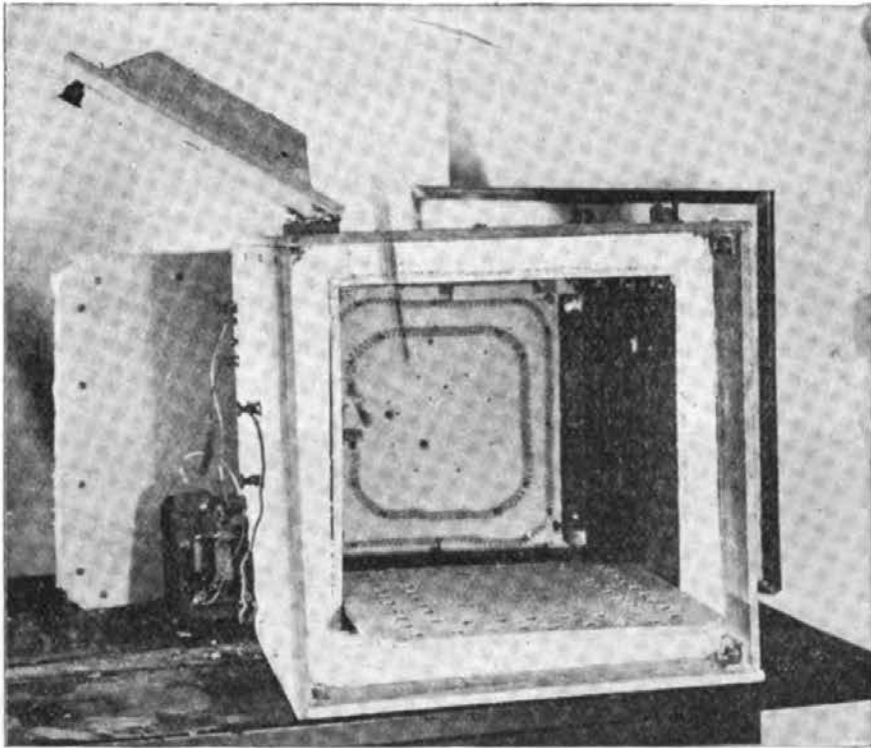


FIG. 25.

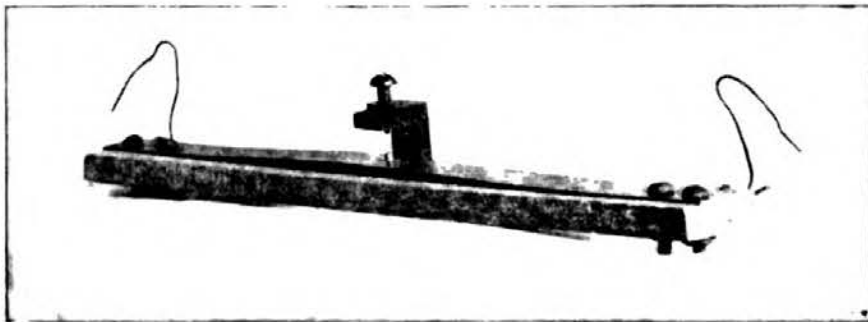


FIG. 26.

1300°F . The apparatus was made completely in the shop of the Physics department of the University of Iowa, at a cost for materials only of about \$20.00. It has been entirely satisfactory in its results, having produced crystals for the researches of four different men.