



FIG. 1. Wiring diagram for thyratron control for incubators and water-baths.

The 100,000 ohm resistances are of the type commonly used for grid leaks in radio sets. The thermoregulator may be of any make-and-break type. The wiring diagram shown is such that when contact is made at the thermoregulator, the heating current is off and *vice versa*. Care should be taken that the filament current is turned on some fifteen seconds before the heating current comes into the circuit.

JAMES W. MAJOR  
EVERETT W. THATCHER

UNION COLLEGE

### THE PREPARATION OF BIXIN

THE dried seeds of *Bixa orellana*, a plant native to the West Indies, are known to contain much of the red pigment, bixin, as well as a little carotene and other materials.

Attempts to isolate this bixin by methods devised by Riffart,<sup>1</sup> Heiduschka and Panzer,<sup>2</sup> and van Hasselt<sup>3</sup> were quite unsuccessful in our laboratory, giving a very small yield. In order to obtain a good yield of pure crystalline material with the minimum of manipulation, the following method was developed:

A several hundred gram portion of Jamaica annatto seeds was ground in a nut-meat grinder and then allowed to stand in a large, wide-mouth, loosely corked bottle for two days to allow the coarse meal to dry. This coarse material was then further ground to a fine powder in a large laboratory mill and sifted through a 60-mesh sieve.

<sup>1</sup> Riffart, Dissert., München, 1911.

<sup>2</sup> A. Heiduschka and A. Panzer, *Ber.*, 50: 546, 1917.

<sup>3</sup> van Hasselt, Dissert., Delft, 1910.

About 250 grams of this pulverized annatto was treated with a liter and a half of cold acetone in a three-liter flask for fifteen to twenty minutes, the mixture being agitated every few minutes. The deeply colored (red-brown) acetone solution was then decanted and discarded because of the large amount of oily and resinous material that it contained. The remaining solid was extracted repeatedly with one-liter portions of boiling acetone until the color of the solid residue was a pale yellow when dry. The combined acetone extractions were filtered and then evaporated to about one tenth their former volume, whereupon there was precipitated a mass of metallic, lustrous purple crystals. With a sufficiently large Soxhlet extraction apparatus, the rather large total volume of acetone was much diminished. (The acetone reclaimed in the process of evaporating the decanted and filtered acetone solution may be used in further extraction of the raw material.)

The final volume, now one tenth of the total volume, was cooled and the precipitated crystalline material filtered therefrom. This crystalline material was crude bixin. It was suspended in about a liter of purified dry acetone and refluxed for a period of an hour in order to saturate the acetone at the boiling point. The hot solution was quickly filtered through a hot-water funnel to remove the undissolved material, and the resulting filtered solution rapidly cooled, first at room temperature and then in an ice-salt mixture. The resulting crystals were deep purple in color and possessed a bright metallic luster. Microscopic examination showed individual crystals to be rhombic in shape and a deep red color by transmitted light. When slowly heated, the crystals melted at 192° C. Treated with concentrated H<sub>2</sub>SO<sub>4</sub>, the crystalline material, even minute traces, dissolved to give a blue solution. The crystalline material was readily soluble in alkali. The crude bixin, which was about 4.5 per cent. of the annatto powder, was converted into purified bixin crystals with a yield of about 3.5 per cent.

HARRY N. HOLMES  
WERNER H. BROMUND

OBERLIN COLLEGE

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