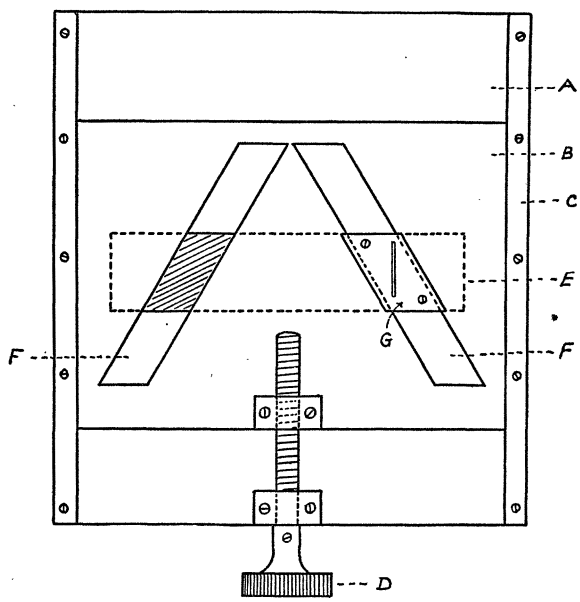
SCIENTIFIC APPARATUS AND LABORATORY METHODS

AN ADJUSTABLE DOUBLE-SLIT

CERTAIN experiments in diffraction and interference require a double-slit in which the distance between two slits may be varied while the slits remain parallel to each other and the space between them is kept closed. It is this last requirement which is, of course, the difficult one to meet.

In preparing a 4-inch telescope to illustrate Michelson's interference method for measuring stellar angular diameters it was found desirable to have an adjustable double-slit which would satisfy the above requirements. The method devised for accomplishing the desired results is quite simple and efficient.

The apparatus consists of two brass plates A and



B which are placed in contact as shown in the figure. Plate B is kept in place by the guides C, and it may be moved over A by means of the screw D.

A rectangular opening E is cut in plate A, and two openings F are cut in plate B. The latter openings make an angle of 60 degrees with each other in the present case. With such openings in A and B it is apparent that two parallelogram shaped holes will extend through both plates. The cross-hatched area at the left side of the figure indicates one of these holes, and the other is at the place marked G. It follows that these holes may be moved close together or far apart by turning the screw D which slides plate B over plate A. It is in these holes that the blocks containing the slits are placed.

G shows one of the slit-blocks in more detail. The slit-blocks consist of three parts. One is a parallelogram shaped piece of brass made just the size of the holes through the two plates. This piece has a thickness equal to that of both plates A and B. To each side of this piece is screwed a thinner brass plate which has the same parallelogram shape but which is slightly larger than the first. The overlapping portions of these plates form flanges which hold the center piece in place. The overlapping of the thin front plate over B is shown in G. A similar overlapping occurs on the back side of A. Apertures of the desired size and shape may be cut in these slit-blocks.

Since the slit-blocks extend through both plates A and B, the wedge action of the openings F in B is able to cause only a lateral motion of the slit-blocks. At the same time the space between the slit is kept closed since the remainder of plate B is solid.

If the plates and blocks are carefully fitted, the slits will remain quite parallel to each other, and no trouble will arise from binding of the parts. In the apparatus described the slits may be moved from 1 inch to 4 inches apart.

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A FUSED QUARTZ FÉRY PRISM

THE following apparatus was constructed to test the possibilities of a fused quartz Féry prism for ultra-violet spectrographic work. A light-tight box was constructed as indicated in Fig. 1, with the quartz

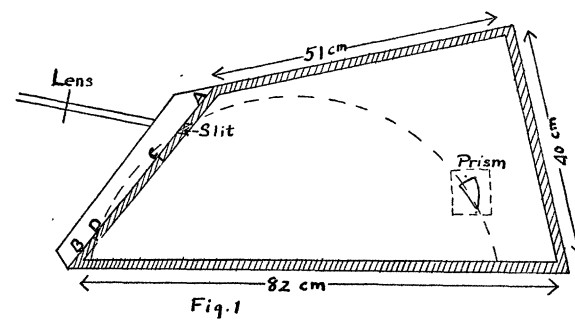

Fig. 1

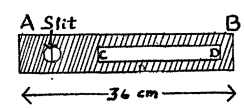

Fig. 2

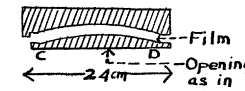

Fig. 3

condensing lens and the quartz prism the only optical parts. The prism, which was cast by the Thermal Syndicate of Brooklyn, N. Y., has a front surface of 28 inches in radius, and makes an angle of 30°

with a rear surface, silvered, of 27 inches radius. The spectrum, slit and prism lie on an arc of a circle of 28 inches diameter. The spectrum can be thrown on a screen or photographed (*DC*, Fig. 1). The dispersion increases with decreasing wave-length, and from the red to 2,000 Å gives about a 10-cm spectrum. Eastman portrait film cut 3 cm wide and held against a curved wooden support (Fig. 3) was used satisfactorily for the photographic work, with a metal slide to prevent fogging. The prism is loosely held in a simple frame. Rough adjustments of aligning and focussing can be made quite quickly as the prism is the only movable part.

The apparatus was designed and practically completed by Dr. John F. Mohler in the physics laboratory of Dickinson College, in an attempt to find an inexpensive piece of apparatus for student work in the ultra-violet. There is no record of the exact cost, but it was certainly less than fifty dollars.

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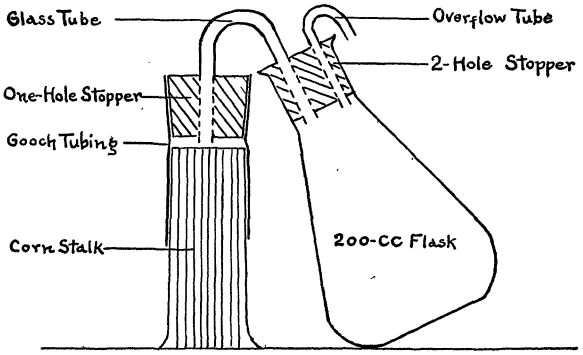
SAP FOR ANALYSIS BY BLEEDING CORN PLANTS

DURING the past three summers at Athens, Georgia, clear sap has been secured by bleeding corn plants on various fertilizer plats. The bleeding has been done by cutting the stalk just below one of the nodes near the surface of the soil and attaching a flask to the stump. A single plant about the silking stage and under favorable conditions will bleed more than 500 cc in a three-day period. This sap contains much less organic and inorganic material than expressed sap which is being studied in connection with soil fertility experiments at several experiment stations. The analyses made of the bled sap to date indicate that it is much nearer the composition of the displaced soil solution than is expressed sap. The ease of securing sap by bleeding, its similarity to the displaced soil solution, and its favorable condition for analysis with a minimum of corrective treatments are distinct advantages in a method for studying plant-soil relations by sap analysis. Doubtless the method can be used with many agricultural plants.



A beginning was made in the use of this method of securing sap for analysis by bleeding plants in 1864.[1] Ulrich bled potato plants for five consecutive days and analyzed each day's run for dry weight, ash and combustible material.

It has been found necessary to remove tillers and green leaves of the corn plant below the point where the stalk is cut if a good flow of sap is to be secured. Removal of these several days before cutting is preferable. There should be a perfect fit between the stalk and the rubber tube to prevent leaking. A few drops of formalin have been used in each flask to prevent fermentation of the sap. Where extended bleeding has been carried on, it has been necessary to make fresh cuts on the stalk every three or four days to renew the bleeding face. Under very favorable conditions, stalks have been bled for fifteen consecutive days and in this time the most vigorous have yielded slightly more than 1,700 cc of sap each.

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SPECIAL ARTICLES

HUMIDITY AND COMFORT

EXPERIMENTS reported by the New York State Commission on Ventilation (1922) indicate that a variation of 30 per cent. in relative humidity (20 to 50 per cent.) at a room temperature of 75° F. does not exert any very distinct influence upon the sense of comfort, after an exposure of as much as three and a half hours. Later work by Miura carried out with care upon a few subjects showed that at 70° F. an increase of 50 per cent. in relative humidity (20 to 70 per cent.) was accompanied by a small but distinct increase in the subjective sense of warmth, although at a lower room temperature (61° to 62° F.) a change in humidity of this magnitude had no perceptible effect. In his effective temperature chart, Yaglou has given a graphic representation of this influence of humidity upon the sense of comfort.

Since the question frequently arises as to whether or not it is desirable to humidify the air of lecture rooms, a series of observations in regard to this point

[1] Palladin-Livingston, "Plant Physiology," 3rd ed, p. 142.