from areas of the same leaves obtained with a planimeter.

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A SIMPLE QUARTZ MERCURY ARC

THE small and inexpensive arc to be described has proved to be exceedingly useful for many laboratory purposes. It can be used conveniently with a monochromator or filters to obtain fairly intense visible and ultra-violet monochromatic radiations. In our laboratory it has been used for the following purposes: (1) In conjunction with a quartz monochromator and quartz microscope to make photomicrographs with visible and ultra-violet monochromatic radiation and to study the effects of these radiations on micro organisms.[1] (2) In conjunction with a microscope to make cinema films of micro organisms. (3) For dark field photomicrographs. (4) As a source of ultra-violet radiation for fluorescence microscopy. (5) With filters as a monochromatic light source for the polariscope. (6) As a light source for studying Raman spectra.

The arc can be made in practically any shape to meet specific experimental requirements. Two types which will satisfy most requirements, one having a vertical and one having a horizontal discharge tube, will be described.

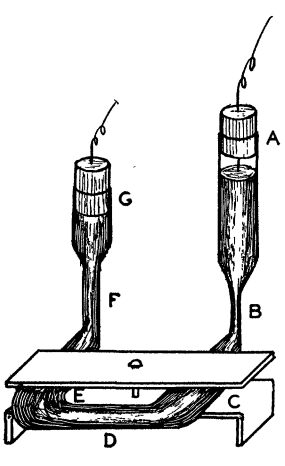

FIG. 1a.

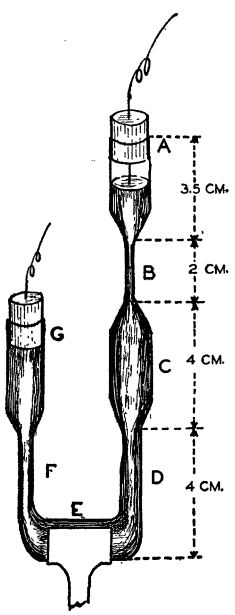

FIG. 1b.

Following are instructions for constructing the arc (see Fig. 1 (a) and (b)): A clear fused quartz tube 25 cm long with an approximate bore of 8 mm is pulled down to about 0.5 mm bore at B. This is done to prevent the arc from oscillating. The tube is then pulled down to 3–4 mm at D, which is the part in which the arc is maintained. The tube is also pulled down at F to a 1–2 mm bore. This constriction serves to diminish the heat conduction to G. The tube is then bent into the desired form; the horizontal type is shown in Fig. 1 (a) and the vertical type in Fig. 1 (b). The tube is then filled with very clean mercury and heated until all air bubbles are expelled by boiling. A tight-fitting cork stopper containing an iron electrode is inserted into G. A small flat head stove bolt serves admirably, for the nut can be turned up so as to expand the cork, causing a tight fit when the cork has been inserted into the tube. A loose-fitting stopper is inserted at A so as to allow air to escape when the mercury column is heated. The arc is operated from a 110 V. D.C. circuit in series with a 1.5 ampere 100 ohm variable resistance (a 150 watt lamp will often suffice). The arc is started by heating at D with the flame of a Bunsen burner until the mercury is separated by the vapor pressure of the mercury. When the arc is struck, about one ampere flows through the circuit. An inductance placed in series often improves the operation of the lamp. The portions C and E are made larger to provide more cooling surface. Part C of the vertical lamp tends to become too hot, causing the arc to migrate from D to C and it is sometimes necessary to wind copper wire about this part to cool it adequately. In the horizontal type a holder, made of $\frac{1}{8}''$ lead sheet, as indicated in Fig. 1 (a), provides adequate cooling surface to stabilize the arc. Lead is used on account of its flexibility and weight. For use with the microscope, the holder can be made so as to facilitate placing the arc just under the condenser and thus eliminate the use of a mirror. A fan can be used to prevent excess heating of the microscope.

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Dr. Ellice McDonald, Director

[1] Allen, A. J., Franklin, R. and McDonald, E. *Jour.* Franklin Inst. Vol. 218, No. 6, p. 701. December, 1934.

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