two. These are lighted constantly. Another four-candle lamp is connected with the regulator. These are placed in an asbestos-lined box beneath the bath. The whole apparatus surrounded with non-conducting material is packed in a box with a hinged cover. The only surface exposed when the box is opened is the top of the bath. Thick pads cover the moat, as it is lower than the top of the bath. This makes it possible to heat eight cups of paraffin, using at the same time less current than would be used by a single sixteen-candle incandescent lamp. Taking out from or putting into the regulator a small drop of mercury makes it possible to either raise or lower the temperature of the bath. Old lamps can be taken out and new ones put in through holes in the bottom of the box.

Such a bath has been in use more than a month, maintaining a temperature constant (54° C.) to within a fraction of a degree.

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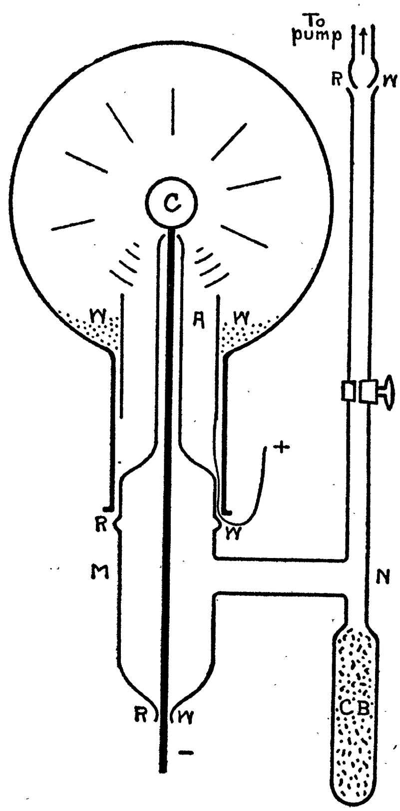
A SIMPLE DISCHARGE TUBE FOR DEMONSTRATION PURPOSES

AT the present time when so much interest is centered on electric discharge phenomena in evacuated tubes it may not be out of place to describe one of the discharge tubes that the writer used recently for class-room demonstration. The experiment is purely qualitative, and in principle contains nothing new. Its aim is to present with simple and easily constructed apparatus some of the phenomena that are usually given with more elaborate and expensive outfits. It does, however, require that the experimenter have access to, and be familiar with, the operation of an ordinary Geissler mercury pump and an induction coil. Aside from these the things needed are found in almost any laboratory and require no more skill to make than the blowing of a glass Tee.

The discharge tube in question is shown in the figure. The bulb may well be a two- or three-liter florence flask. The part to be blown is MN. It supports the aluminum rod carrying at its upper end the spherical or oblong cathode, C, of the same metal. The anode, A, is a cylinder of not too light weight



aluminum foil placed in the neck of the flask as shown. Connection to this is made by a fine copper wire led out through the wax joint, RW, at the mouth of the flask. The exhaust tube should contain a glass valve and terminate in a sort of ball and socket joint (to be sealed with wax) so that the apparatus may be readily disconnected from the pump. The charcoal bulb, CB, may be dispensed with where liquid air is not available. Liquid air is not a necessity; its use, as is well known, is to hasten the exhaustion. The three joints, RW, may be closed sufficiently air-tight by a good grade of red sealing wax.

The various steps, as the exhaustion proceeds, may be vividly shown—the stringy discharge, the Geissler stage, the formation of striæ, the Faraday dark space followed by

Crookes dark space, and finally the formation of cathode and X-rays. The phosphorescence due to the latter is strikingly shown by introducing into the bulb a few cubic centimeters of willemite flour (*W* in the figure). This should be well dusted over the inner surface of the bulb before sealing the apparatus to the pump. A particularly beautiful effect, at the cathode-ray stage, is to disconnect the pump and then shake the bulb vigorously so as to throw the flour through space while the discharge is passing.

Pressure in Mm. Hg	Induction Coil Discharge	Minimum D.C. in Volts Required to Glow Tube	Maximum D.C. Available Was 1,000 Volts	Remarks
2.0	Passed freely.	480	The dischage in each case was more voluminous than with the induction coil.	Blue at cathode.
1.5	More freely.	440		" " "
.5	Still more freely.	360		" " "
.08	Same.	360		Willemite began to phosphoresce.
.01	Less freely.	500	Discharge same as induction coil.	Willemite a beautiful green.
.006	Still less freely.	560	Less than induction coil.	Weaker.
.005	Small.	680	Much less than induction coil.	Still weaker.
.004	Faint.	——	No discharge.	Ceased to phosphoresce.
.003	None.	——	——	——

It may be of interest to add that the tube works well on direct current of fairly low voltage. For that purpose ordinary high potential storage cells (of capacity one tenth ampere normal discharge rate) may be employed. To guard against too great a current flowing through the discharge tube an adjustable water resistance should be included in the storage-battery discharge circuit. The effect upon the ease with which the storage battery discharge passes through the tube may be nicely shown by first ionizing the remaining gases in the tube by means of the high potential induction coil discharge, and then switching instantly to the storage cells. The minimum direct-current voltage that will, for a given pressure, produce a discharge may thus be obtained. This minimum voltage together with other data and remarks are given in the accompanying table.

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THE CONVOCATION WEEK MEETINGS OF SCIENTIFIC SOCIETIES

THE American Association for the Advancement of Science and the national scientific societies named below will meet at Cleveland, Ohio, during convocation week, beginning on December 30, 1912.

American Association for the Advancement of Science.—President, Professor Edward C. Pickering, Harvard College Observatory; retiring president, Professor Charles E. Bessey, University of Nebraska; permanent secretary, Dr. L. O. Howard, Smithsonian Institution, Washington, D. C.; general secretary, Professor H. E. Summers, State College, Ames, Ia.; secretary of the council, Professor H. W. Springsteen, Western Reserve University, Cleveland, Ohio.

Section A—Mathematics and Astronomy.—Vice-president, Professor E. B. Van Vleck, University of Wisconsin; secretary, Professor George A. Miller, University of Illinois, Urbana, Ill.

Section B—Physics.—Vice-president, Professor Arthur Gordon Webster, Clark University; secretary, Dr. W. J. Humphreys, Mount Weather, Va.

Section C—Chemistry.—Vice-president, Professor W. Lash Miller, University of Toronto; secretary, Professor C. H. Herty, University of North Carolina, Chapel Hill, N. C.

Section D—Mechanical Science and Engineering.—Vice-president, Dr. J. A. Holmes, U. S. Reclamation Service; secretary, G. W. Bissell, Michigan Agricultural College, East Lansing, Mich.

Section E—Geology and Geography.—Vice-president, Professor James E. Todd, University of Kansas; secretary, Professor George F. Kay, University of Iowa.

Section F—Zoology.—Vice-president, Professor William A. Locy, Northwestern University; secretary, Professor Maurice A. Bigelow, Teachers College, Columbia University, New York City.

Section G—Botany.—Vice-president, Professor D. S. Johnson, The Johns Hopkins University;