weight, due to the greater solubility of yttrium oxalate in nitric acid than of those earths of higher atomic weight.

The most accurate method for the precipitation of the oxalate of the yttrium earths which has come to the attention of the author has been to use a gram or less of the nitrate in very slightly acid solution and to use a dilution of about 500 cc. The oxalate is precipitated from the boiling solution by means of a dilute solution of pure oxalic acid.

In conclusion, the author wishes to acknowledge his appreciation of the courtesy of Mr. H. S. Miner, of the Welsbach Co., of Gloucester, N. J., who has placed at our disposal a large quantity of rare earth residues from Carolinian monazite and who has been able to secure for us a quantity of rare minerals for the study of the chemistry of the metals of the yttrium group.

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MODIFIED SPECTROSCOPIC APPARATUS.

BY GREGORY PAUL BAXTER.

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In examination of absorption spectra of dilute solutions in long tubes, the faintness of the spectra owing to the necessarily great distance of the source of light from the slit is frequently a disadvantage. A form of container which partially obviates the difficulty is easily constructed of the shape shown in Fig. 1 from a T of glass tubing of suitable diameter. The light passes through the tube B lengthwise and is focused upon the slit S by the solution in the tube A, which acts as a cylindrical lens, thus very much increasing the light intensity. If the tube B is long, the length of path of the outside and middle rays of the beam within the tube is essentially the same, so that absorption is nearly equal in all parts of the beam. Hence this form of apparatus does not possess the disadvantage of a simple cylindrical vessel in which the outside rays pass through a relatively shorter length of solution.

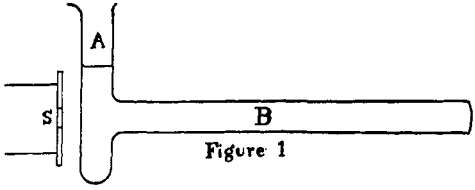

Figure 1

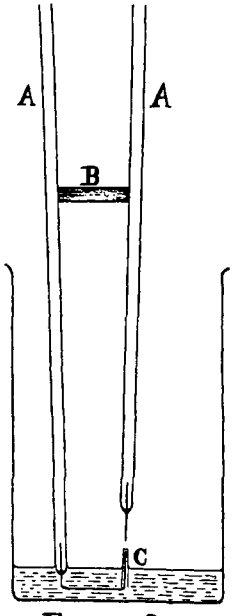

Figure 2

Fig. 2 illustrates a very convenient form of fulgurator for the examination of the spark spectra of a number of different solutions at one time. Such a process is frequently much retarded by the inconvenience in cleaning the ordinary forms of fulgurating apparatus between the examination of each two solutions. Two glass tubes, AA, into one end of each of which platinum wires have been sealed, are fused together in a nearly parallel position by means of a short piece of glass rod, B. One of the wires is bent in the form of a U so that the end is directly below and parallel to the wire in the other tube. The end of the lower wire may be covered with a glass capillary, C, in the usual way. The apparatus is dipped into the solution to be examined until the capillary is completely filled with solution. This system can be readily transferred from one vessel to another and can easily be rinsed into the vessel in which it has been used. If a rod is used in joining the tubes together the tubes may be brought so near without danger of short-circuiting that the apparatus is narrow enough to be inserted into a large sized test-tube. If the tubes are joined through a *tube* there is some difficulty from this source.

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SIMPLE DEMONSTRATIONS OF THE GAS LAWS.

BY WILLIAM M. DEHN.

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The experiments usually given in textbooks to demonstrate Charles's law and Boyle's law involve pieces of apparatus so heavy or so complicated that they are unsafe or too time-consuming to be put into the hands of beginners in chemistry. That a knowledge of these laws and of the effect of aqueous vapor on gases should be developed early in chemical instruction can scarcely be denied, but almost no laboratory course for beginners gives time or attention to these demonstrations. If considered at all and apart from the study of physics, their demonstration is given in the chemical lecture and inevitably large numbers of students fail to develop a working knowledge of the individual laws or a rational conception of their joint application in the formula:

$$V = \frac{v(p - a)273}{760(273 + t)}. \qquad (I)$$

With the apparatus described below, involving use of the moving drop of mercury,[1] all of these effects of heat, pressure and aqueous vapor may not only be demonstrated and calculated *within one hour by the student*, but the pieces of apparatus represent small initial cost

[1] THIS JOURNAL, 29, 1052.