

A COMBINED FILTER-FUNNEL AND BEAKER.

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In Fig. 1 is shown a piece of apparatus which the writer has found very serviceable in large classes in elementary chemistry, especially in experiments where precipitation, filtration and weighing are combined, as, for example, where a comparison is made of the weights of different metals replaced from their salts by a certain weight of another metal. As can be seen from the sketch, it is really a large thistle-funnel, *A*, having a bulb *B* and a short stem *C*, which can be closed by means of a piece of

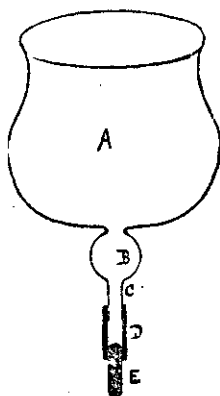


Fig. 1.

rubber tubing *D* and glass rod *E*. The diameter of the large bulb *A* is from 6 to 8 cm., its capacity about 100 cc., and its weight less than 20 g. These can be made by anyone rather skilled in glass blowing.

Use of the Funnel.—Suppose the experimental problem to be: “To determine the equivalent of silver by finding the weight of the metal displaced from a solution of silver nitrate by a known weight of magnesium.”

The clean and dry funnel (without the rubber tubing and glass rod) has its bulb *B* lightly stuffed with *dry* glass wool, and is then carefully weighed. It is then supported on a ring of a retort stand and the stopper *DE* placed upon the stem. A strong solu-

tion of silver nitrate is placed in *A* and then a weighed piece of magnesium (about 0.01 g.). This is stirred about with a glass rod so as to remove the silver from the ribbon as fast as it is deposited. When all the magnesium has disappeared, the stopper is removed. As the solution runs out, the precipitated silver is retained by the glass wool in *B*. After well washing the metal, the funnel is placed in a drying oven or on a sand bath to dry. On weighing the funnel with the silver, the weight of the precipitated metal is found and its equivalent calculated. For example:

Weight of magnesium used = 0.104 g.

Weight of funnel alone = 17.215 g.

Weight of funnel + silver = 18.156 g.

Weight of silver = 0.941 g.

Accordingly, 0.104 g. of magnesium has displaced 0.941 g. of silver, and since the equivalent of magnesium is 12, that of silver is $0.941 \times 12 \div 0.104 = 108.1$.

In a similar manner the equivalents of other metals can be determined, it being necessary in some cases to use *hot* solutions in *A* and in the case of an easily oxidized metal (*e. g.*, copper) it is as well to aid the drying by washing it with a little alcohol and ether.

Numerous other experiments can be performed by means of this simple piece of apparatus, which under ordinary circumstances could not be undertaken by *beginners*, owing to the great manipulative skill required, but the results of which are of great educational value when "discovered" by the pupil. Thus, one can set a class of 30 pupils to work to find out the equivalent of chlorine by dissolving a known weight of silver in nitric acid, and precipitating the metallic chloride in the funnel, and on comparing the results it will be found that the equivalent obtained by *each* pupil is the same within less than one per cent of error.

A SIMPLE AUXANOMETER.

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Many simple auxanometers have been devised for recording the growth of a plant at all hours of the day.* Perhaps it will be sufficient to state that simplification of apparatus, so as to

*Ganong's Plant Physiology, 1901, p. 105, refers to a number of these, and choice may be had among them.