work until you get two results that correspond with each other. Arrange the results as in the preceding experiment.

Then repeat this work, using phenolphthalein in the place of methyl orange. The hydrochloric acid must be added very cautiously, keeping the solution well stirred so as to avoid effervescence. Arrange results as before.

Are the amounts of acid that react with a given quantity of sodium carbonate the same in the two cases? If not, is there any simple ratio between them?

This experiment has immediately followed one illustrating the law of definite proportions, by the titration of acid with alkali, using phenolphthalein as an indicator so that the directions for manipulation are not as full as would otherwise be needful. The stock solutions are approximately normal. Students have obtained better results by working with solutions of this strength and diluting in the beaker than by using more dilute solutions directly.

A variation of the above experiment is to dissolve an indefinite amount of sodium carbonate in the beaker, add both indicators and titrate with acid. This method does not give as exact results in the hands of students, but, on the other hand, it is simpler, and the principle involved is more easily grasped.

TWO SIMPLE AND CONVENIENT GAS GENERATORS.

BY C. E. LINEBARGER.

I. The form of gas generator commonly used by students in elementary chemistry consists of a bottle or flask fitted with a two-hole stopper through which pass a delivery tube and a funnel or "thistle" tube. While such a generator is simple and inexpensive, it does not give a very regular flow of gas, and the "thistle" tube is rather fragile. The substitution of a stopcock funnel for the "thistle" tube makes the apparatus, however, all that could be desired. But stopcock funnels are too expensive for general use in the laboratory. Still one can be readily improvised by the student from his stock of apparatus, which answers very well.

A bit of rubber tubing about a centimeter long and of such a size as to fit rather snugly in the neck of the funnel, has a hole about a millimeter in diameter cut in its side near one end. (Fig.

1.) This is fastened securely in the neck of the funnel by means of a cement prepared by melting about equal parts of beeswax and rosin together. The neck of the funnel is cautiously warmed by holding it above a small Bunsen flame, and a little cement applied to it. The glass should not be warmer than just necessary to melt the cement. The rubber tube is heated a little in a flame, and then inserted in the funnel. When the glass is cold, the rubber is held very firmly, and may be removed at any time by warming the glass somewhat to melt the cement. A glass rod fitting rather tightly in the rubber tube completes the stopcock funnel. By raising the rod, more or less of the hole in the rubber tube is exposed, so that a liquid in the funnel can be made to flow or drop out with a speed which can be regulated very nicely. It is advisable to grease the rod with vaseline so as to prevent sticking and to insure a smooth action.

With such a stopcock funnel, the gas generator takes the form shown in Fig. 2.

Fig. 1.

Fig. 2.

Of course, this generator cannot be used with any liquids which attack rubber, as strong sulphuric or nitric acid.

The generator just described has been in use in my laboratory for some time with most satisfactory results. It has especially been employed in the generation of *acetylene* by the action of water on calcium carbide, of *chlorine* by the action of concentrated hydrochloric acid on bleaching powder, and of *oxygen* by the action of water on sodium peroxide.

II. A generator which stands always ready to give a small current of hydrogen sulphide may be constructed as follows: A wide-mouthed bottle is fitted with a cork pierced with a hole just large enough to permit the passing with some friction of a test tube of ordinary size. The bottom of the test tube is cut off, and the end held in a flame until the edges fall together so as to render the end of the tube a little narrower than its diameter. A thin cork disk is perforated with several small holes and slipped into the test tube down against the ledge formed at the end of the tube. The mouth of the tube is fitted with a cork and delivery tube.

The bottle is partly filled with dilute sulphuric acid, and a couple or so lumps of iron sulphide dropped into the test tube so as to rest on the cork disk. By pushing the tube down so that the acid may enter and react with the sulphide, a current of hydrogen sulphide may at a moment's notice be obtained. By lifting the tube up out of the acid, the generation of the gas ceases.

In qualitative analysis, such a generator has proved very useful and convenient and the noisome nuisance of sulphuretted hydrogen has been much abated. With one charging it can be used quite a number of times.

Metrology.*

THE FIFTY-SIXTH CONGRESS AND THE METRIC SYSTEM.

BY RUFUS P. WILLIAMS.

December 4, 1899, at the first session of the Fifty-sixth Congress, Representative Littauer of New York, introduced into the House the following bill, H. R. 104, which was referred to the Committee on Coinage, Weights and Measures:

Be it enacted, etc. "That from and after the first of July, 1902, all the departments of the government of the United States, in the transaction of all business requiring the use of weight and

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