tested with silver nitrate it will be readily seen that any sodium chloride which may have remained in solution, has been converted into perchlorate. Furthermore, unless the sodium chlorate used contained some potassium or on evaporation the acid was exposed to fumes of ammonia, the residue from the evaporation of a portion of the acid prepared as above, will be entirely soluble in alcohol, and the presence of any sodium perchlorate is therefore entirely unobjectionable.

I have in the course of my work on this subject prepared the acid by this method several times, and have always found the process very satisfactory, requiring but little time and attention. In my work, however, I found, as the result of blank determination on the acid thus prepared, a very small residue insoluble in alcohol for which in all cases corrections were made. This correction was very slight, and in no way condemns the process, since it is a very simple matter to determine it once for all on any lot of acid, and make the proper use of the same in the actual determination.

For detail of the process consult Kreider's article in the *American Journal of Science*, 49, 445–446.

[CONTRIBUTIONS FROM THE CHEMICAL LABORATORY OF THE UNIVERSITY OF ILLINOIS.]

IMPROVED APPARATUS.

BY J. L. SAMMIS.

Received October 10, 1898.

BURETTE.

THE frequent use of Mohr's burette with Geissler's glass stop-cock during the past summer called the writer's attention to two points which, it was thought, might be improved.

The handle of the glass stop-cock, as usually made, is turned toward the right. Right-handed persons usually find it easier to operate the stop-cock with the left hand and stir or shake the titrated liquid with the right. In order to facilitate this, the stop-cock of a burette was cut off and sealed on again with its handle toward the left. See Fig. 1.

In titrating, much care has to be exercised lest the mark upon the float should sink below the graduations on the

scale of the burette. To render this impossible and to enable one to see more easily the scale and the titrated liquid at the same time, the tip of the burette was elongated to about fourteen inches by sealing in a piece of glass tubing between the stop-cock and the constricted extremity. This elongated tip was bent to the front and a little to the right just below the stop-cock, and then upwards. Two more bends were so placed that the end of the tip was about three inches in front and one inch to the right of the lowest mark upon the fifty cc. burette. By this arrangement, with the stop-cock wide open, not a drop of liquid will flow out after the liquid meniscus in the burette has reached the level of the end of the tip, which, as described, is just opposite the fifty cc. mark of the scale. If the tip be placed a little higher up, say opposite the forty-nine cc. mark, the instrument may be used with a float or without. The long narrow burette with the new tip can be held much closer to the table by the burette clamp, and the easy reading of the upper end of the scale is thereby facilitated.

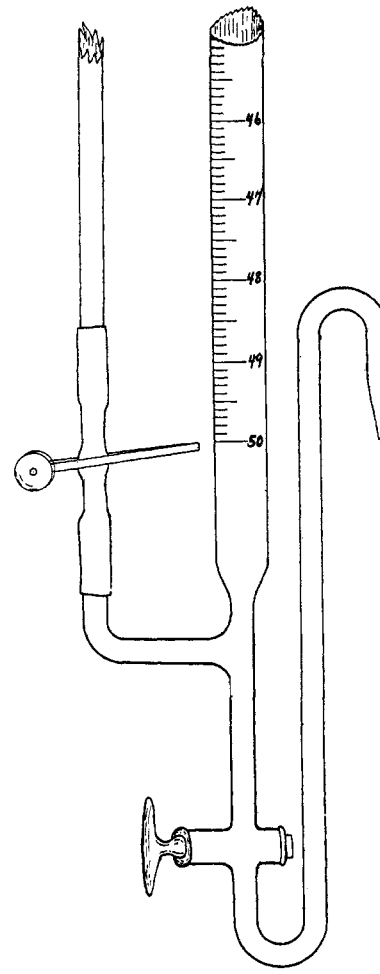

FIG. 1.

ELECTRIC HEATER ADAPTED FOR USE IN ETHER EXTRACTION.

During the past year, a large number of extractions with Sohxlet's apparatus have been performed in this laboratory. In

order to continue this operation during the night time without the danger of fire, an electric heater was devised which could be put in operation by closing a switch and which kept the water at the proper temperature as long as desired. The heater (Fig. 2) is made of coils of No. 24, soft iron wire, wrapped upon a brass rod, and insulated from the rod and from each other by thin sheet asbestos. The winding was done rapidily by placing in

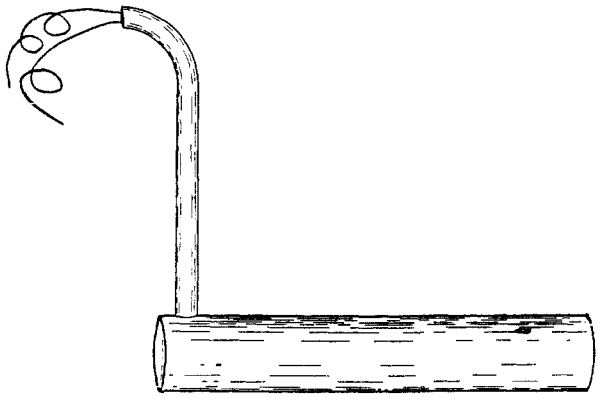

FIG. 2.

the lathe chuck a brass rod six inches long and three-eighths of an inch in diameter, laying a sheet of asbestos paper over it, and winding on the wire, keeping the turns about one-thirty-second of an inch apart to prevent short circuiting. Having wound one coil, a second sheet of asbestos is put on, and a second coil wound on it, and so on until the desired resistance is obtained. The ends of the iron wire are soldered to short pieces of No. 12 insulated copper wire which serve to bring in the electric current. The cylinder thus made is slipped into a closely fitting tube of sheet copper and the ends of the latter are soldered on. A small hole or notch is left at one end of the copper tube through which the insulated wires pass. These copper wires are pushed through a narrow piece of brass tubing about four inches long, and the tubing is soldered to the copper cylinder in a position perpendicular to the axis of the latter. The heater is placed in a four-holed water-bath and the brass tube with the copper wires is pushed up through a small hole made in one corner of the top of the bath. The tube may be soldered to the

edges of the hole. The ends of the copper wires are made fast to binding posts, screwed into a narrow strip of wood upon the front of the battery of water-baths.

One heater is required for each four-holed water-bath, and the heaters are connected in parallel. The length of the iron wire in one heater is seventy feet, and its resistance when hot is twenty-six ohms. The potential difference across the ends of the heating coils is fifty-two volts, thus using two amperes of current and 104 watts per heater. The heat generated is sufficient to keep the water in the bath at 65° C., and the ether in the extraction apparatus falls from the condenser at the rate of twenty or twenty-five drops per minute. The currents from a storage battery and from a 125-volt dynamo have been used to run this apparatus with perfect success, and with little attention and no risk of fire.

September 25, 1898.

GLYCOLLIC ACID: ONE OF THE ACIDS OF SUGAR-CANE.

By Edmund C. Shorey.

Received September 26, 1898.

In continuing work on organic non-sugar in sugar-cane, indicated in a paper[1] "On the Principal Amid of Sugar-Cane," glycollic acid was prepared from the sugar-cane amid by the action of nitrous acid,

$$CH_2NH_2COOH + HNO_2 = CH_2OHCOOH + N_2 + H_2O$$

and the acid so obtained compared in chemical and physical properties with glycollic acid obtained from other sources, monochloracetic acid, hippuric acid, etc. The samples of glycollic acid obtained in various ways were found to be identical in every respect with that obtained from the sugar-cane amid.

The presence of glycollic acid as such in sugar-cane was, in a sense, discovered by accident, and its isolation and identification are of considerable interest to the sugar manufacturer, the analyst, and the student of plant physiology. It was noted that on adding a few drops of strong nitric acid to a sample of cane juice, clarified for the polariscope in the usual way, with a slight excess of lead subacetate, a white crystalline precipitate was thrown down. This, on examination, was found to contain

[1] This Journal, 19, 11.