

with a known quantity of solvent, and it has been found very convenient to have the body of the funnel graduated for this purpose. To operate, the vacuum is attached through a three-way stop-cock to the side arm and the Gooch crucible put in place in the usual manner; when suction is turned on the valve "B" seats itself and filtering and washing are proceeded with. When the vacuum is broken and air admitted through the side arm the valve "B" drops, allowing the contents of the funnel to empty into any suitable receptacle placed beneath it.

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A Modification of Ostwald's Bromide Voltameter.—In the course of an investigation published elsewhere in THIS JOURNAL, it became necessary to make use of a voltameter for excessively small currents, the total precipitates obtained being in general only a few milligrams. The instrument must be free from polarization and e. m. f. due to concentration cell effect or their electrochemical action, since otherwise the current flow to be measured might easily be entirely stopped by the first effect, or modified, even perhaps reversed by the second. The ordinary silver nitrate voltameter had for our purposes two distinct disadvantages, first, that the precipitate obtained is usually non-adhesive, and second, that the electrodes are likely to be slowly attacked in the presence of the air, as has been pointed out by Richards.¹ The bromine precipitate on a silver anode in a solution of potassium bromide, as suggested by Ostwald,² adheres firmly and the electrode is entirely unattacked by the air. This, then, offered an excellent electrode reaction for our purpose, but the platinum point used by him as a cathode introduces polarization and offers the possibility of a cell effect. It was found, however, that this disadvantage could be entirely overcome by a suitable modification of the cathode.

The cathode, a silver plate, was separated from the anodic compartment by a porous cell, and was surrounded by a potassium bromide solution of exactly the same strength as that around the anode. There was added to the cathodic compartment sufficient precipitated silver bromide to completely cover the electrode. The bromide was made by double decomposition of potassium bromide and silver nitrate, was carefully washed by decantation with water, and finally with the potassium bromide solution used for the cell. The potassium bromide solution in both compartments is saturated with silver bromide and consequently the silver ion concentration about both electrodes is the same, since the bromide concentrations are equal. This eliminates any possible con-

¹ Richards, *Z. physik. Chem.*, **41**, 302 (1902).

² Ostwald-Luther, *Phys.-Chem. Messungen*, pp. 430.

centration cell effect. Since the current densities employed are exceedingly small, the solid bromide about the cathode will maintain the silver content of the solution despite its depletion through precipitation of silver on the electrode and in this way polarization is avoided. The electrodes employed were silver plates, 2" \times 1/4", with a silver or platinum wire fused on as a lead. A tumbler was used as a cell, and four to eight separate anodes could be connected simultaneously with a common cathode in the porous cup. The anodic reaction, being the same as that of the Ostwald instrument, has the same desirable characteristics, while the cathodic modification eliminates the above mentioned disadvantages. The instrument gave excellent results with current densities precipitating not more than 1.5-2 mg. bromine per hour. Blank tests showed no action of the air on the electrodes.

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A Modified Form of Gooch Crucible.—On transferring material from a flask or large beaker into a Gooch crucible, there is always risk that some of the substance to be transferred may find its way outside of the crucible and thus be lost. A slight change in the form of the crucible overcomes this difficulty without introducing any serious disadvantage. The change consists in welding to the crucible a flaring brim, which may be as wide as is desired, but usually need not exceed 15 mm. in width. The total diameter of the top of the crucible is thus about doubled. The brim serves not only to prevent the loss already mentioned, but serves also another purpose in stiffening the edge of the crucible, and thus enabling it to keep its form better under the influence of pressure. The only disadvantage seems to be the additional cost, due to the extra weight of platinum. The diagram depicts in section the shape of the crucible thus modified. This improved form of apparatus has been in use for about a year in the Chemical Laboratory of Harvard College, especially by Dr. H. H. Willard and the author in a research on atomic weights. It has demonstrated so conclusively its value that those who have used it are no longer content with the ordinary form.

THEODORE WILLIAM RICHARDS.

On the Formation of Ozone by the Ultra-violet Rays.—Bordier and Nogier, in a recent paper in the *Comptes rendus*, 147, 354 (1908), claim that the odor commonly observed in the neighborhood of a mercury arc enclosed in quartz is not due, as is supposed, to ozone or to oxides of nitrogen. They were unable to detect these gases and found the same odor produced when carbon dioxide and nitrogen were substituted for air. They concluded that the ions produced by the ultra-violet rays