liquid chlorine. We have failed to find any inorganic substance which is ionized in this liquid. Bromine, hydrochloric acid, hydrobromic acid, water, and a number of salts may be cited as examples of substances which are not ionized. Ether, alcohol, ketones, esters, and other organic substances containing oxygen dissolve and give compounds of the general type, ether$_x$ Cl$_y$, and these substances also fail to carry the current; but if a small amount of hydrochloric acid be added, the solution immediately conducts, and the appearance of the separated compound is altered. Ether dissolved in hydrochloric acid gives a compound, $C_4H_{10}O$—HCl, which conducts well.

It seems probable therefore, that the conductivity produced in liquid chlorine by the addition of ether and HCl is due to the formation of this compound.

Plotnikov[1] has shown that ether dissolved in bromine gives a conducting solution. It is well known that this substance forms a compound, $C_4H_{10}O$—Br_3, and to the ionization of this compound the conductivity is ascribed. Other oxygen compounds act in the same way. All these, however, are acted on by the bromine with the formation of HBr.

In the light of the experiment with chlorine, and the similarity in the organic complexes of chlorine and bromine, it is reasonable to suppose that the conductivity in the case of bromine is due to the ionization of a compound of the type of ether + HBr, rather than to the ionization of a compound of the Br + ether type.

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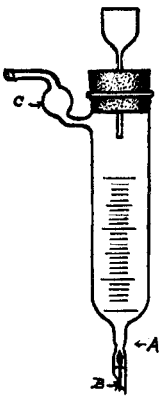
NOTES.

Automatic Filter Funnel.—The accompanying illustration shows a filter funnel with automatic discharge which has been found very convenient as a substitute for the ordinary filter flask, or bell-jar and beaker, usually employed in filtering with suction. The tube, which may be of any convenient size, terminates in a small glass stem constricted at point "A" and having a little plug "B" ground to fit against the lower surface of this constriction. Two or three small points on the inside of the stem just below the head of the valve serve to hold it in position and prevent its falling out of the tube when the vacuum is turned off, but allow it to drop down far enough, from the seat, so that the liquid above it can readily discharge. A small bulb "C," as a sort of safety trap, is blown in the side arm. In many cases it is desirable to wash



[1] *Z. physik. Chem.*, **57**, 502 (1906).

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.