values, whereas in the case of the equivalent conductances the reverse is true. This would follow if the chloride ion has the same mobility in the mixtures as in the solutions of the pure salts and one or both of the mobilities of the positive ions are slightly lowered in the solutions of the mixed salts. However, the effect, though definite, is all within 0.1%. There is, quite obviously, no evidence whatever of complex ions in these solutions.

Summary

An addition to the moving boundary apparatus for determining transference numbers is described, with the aid of which the boundary can be formed without disturbing the apparatus while it is mounted on a vibration-free support.

Transference numbers of the chloride-ion constituent in tenth-normal mixtures of sodium and potassium chlorides have been determined. Accurate conductance measurements have been made on the same solutions.

Within the experimental error chloride-ion conductance is the same in the mixtures as in the solutions of the pure salts. There is no evidence of complex ion formation.

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[Contribution from the Baker Laboratory, Cornell University]

A LABORATORY OZONIZER

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It is of general knowledge that ozone is by far the most suitable reagent for the oxidation of double linkages; there is also a general impression that this method requires special and expensive equipment as well as a trained operator. The purpose of this note is to show that the method is exceedingly simple and to give practical information concerning the installation and the cost of the equipment.

L. I. Smith[1] has described an ozonizer which is very satisfactory from the stand-point of the ozone yield. The present apparatus is a simplification of that described by Smith. The purposes of the alterations were to eliminate the use of mercury, which renders the apparatus heavy, expensive and liable to breakage, to modify slightly the shape of the ozone tubes in order to simplify the glass-blowing and to allow the use of sulfuric acid as an electrode, to eliminate the litharge joints, which always have a tendency to expand and break the glass tubes and to render the building of the unit a much shorter and less complicated task. All these features substantially decrease the cost.

[1] L. I. Smith, This Journal, 47, 1844 (1925).

Figure 1, which shows one of the ozone tubes, is self-explanatory. A lead wire dipping in dilute sulfuric acid is used as one of the electrodes; the lead wire (six fuse-wires twisted together) remains straight and centered by virtue of its own weight, so that sparking is prevented. As in the apparatus of Smith, three tubes are sealed in series and almost completely immerged in a bath of water in a battery jar. The water is used as a second electrode and as a cooling medium. Since no mercury is used and since the weight of the tubes is nearly counterbalanced by the weight of the water displaced, it is unnecessary to have an elaborate device to maintain the tubes in position. All that is needed to support the weight is a plate of bakelite blocked 3 cm. from the bottom of the battery jar and fitted with slots to accommodate the lower extremities of the tubes. The lid of the battery jar is fitted with corresponding slots (except that the diameter of the holes is 4 cm. instead of 3.5 cm.); this is quite sufficient to maintain the tubes in position. The tension (10,000 v.) between the electrodes is furnished by a $^1/_4$-kw. transformer. The maximum cost of the whole outfit can be established as follows: transformer, $10; battery jar, $7; material and labor for three ozone tubes, $10. A good glass-blower can make a tube in about an hour and a half, and spoils less than one tube out of four.

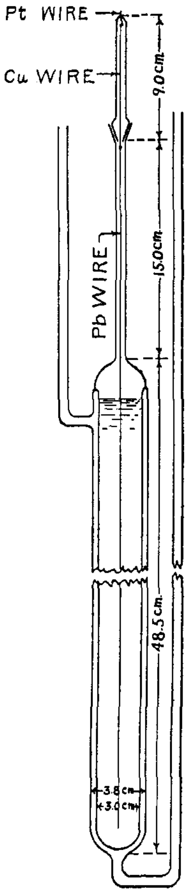

Fig. 1.

The operation of the ozonizer is essentially that indicated by Noller and Adams.[2] It should be remembered that complete drying of the oxygen is a very important feature. Despite the modifications, the yield of ozone is substantially the same as that indicated by Smith; the percentage weight of ozone will be about 14%, 8% and 3% when oxygen is delivered at the rate of 4, 20 and 100 liters per hour, respectively. This corresponds to an hourly output of 0.7, 3.6 and 4.6 g. of ozone.

The inexpensive material used for radio panels is suitable for the bottom plate and for the battery jar lid. A T2355 Thordarson transformer, type RS Cat. 135, and an Exide 21 × 31 × 42.5 cm., type F-9, battery jar were used.

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[2] Noller with Adams, THIS JOURNAL, **48**, 1074 (1926).