cipitations are acidified with hydrochloric acid and evaporated to dryness. The residue is dissolved in a minimum amount of water, alcohol is added until the volume is 10 ml and the solution saturated with dry hydrogen chloride, filtered and the sodium chloride washed with absolute alcohol. The filtrate and washings are evaporated to dryness.

The residue, weighing a few milligrams, consists largely of potassium chloride and sulfate, some sodium and magnesium chlorides, and contains the lithium.

Complete separation of the lithium and its direct determination is impracticable, but it may be estimated by use of the spectroscope with comparative ease. The authors use an atomizer (zerstäuber) especially designed to spray a solution into the air inlet of a blast lamp so that the spectrum may be observed continuously.

The solution rises by capillary action in the tube A (Fig. 1) which is open at the point B and sealed off

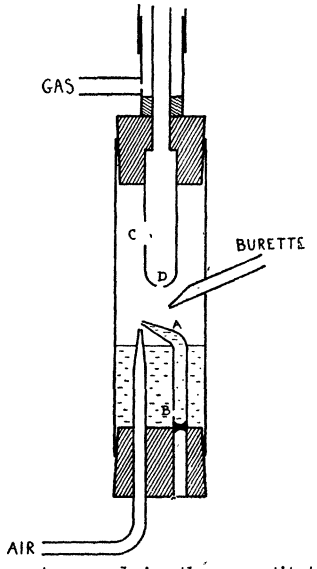

FIG. 1. Apparatus used in the quantitative spectrum analysis for lithium.

just below this point. The air blast produces a fine spray, and a small quantity of this is carried up through C into the burner. The opening at D permits any excess to drain back without interfering with the passage of the spray into the tube. The tube sealed into the side allows solutions to be added during the course of the analysis. The lower part of the apparatus is made of glass, but the burner proper is of brass.

The residue containing the lithium is moistened with a drop of hydrochloric acid, dissolved in two milliliters of water and washed into the reservoir of the atomizer with an additional two milliliters of water. Then, while the spectrum is being observed, a 3 N solution of potassium chloride is added until the red potassium line at 7666 Å is of sensibly the same intensity as the red lithium line 6708 Å. This requires some skill and judgment, since the lines are of somewhat different color. With practise, however, results with known quantities of lithium can be duplicated with an accuracy comparable with other methods of quantitative spectrum analysis.

This method is also useful for estimating small quantities of strontium in the presence of much calcium, using the blue lines of the two elements.

The solution is removed quantitatively from the atomizer (the quantity which was used in the burner is negligible), evaporated, and the residue weighed as potassium chloride.

This entire procedure is duplicated with a synthetic sea water containing a known quantity of lithium and a ratio established between the lithium and potassium, which will give equal intensity to the two lines. This ratio will depend upon the apparatus and to some extent upon the experimenter. The authors found a value of 2:10,000. Since the quantity of potassium chloride actually weighed is relatively large, the results are unaffected by the small amounts of sodium and magnesium which may be present.

In this way the lithium in sea water of ordinary concentration (chlorinity = 19 $^{0}/_{00}$) has been determined to be 0.1 mg per liter.

The importance of lithium in the economy of the sea is not known. No quantitative estimations of the element in the various organisms have been made, although it has been reported qualitatively by many. Possible variations in the quantity of lithium present in sea water, due to marked growth of plankton, are also unknown. The accuracy of the method does not permit, nor does its tediousness encourage, the determination of such fluctuations.

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