sults are not affected by the presence of chloride ions at a concentration equal to that of the dichloro chloride (0.008 *M*).

4. The hydrolysis constant of the hexa-aquo chloride at 25° has been measured over a wide range of concentrations by five methods. An average value of $K_b = 1.58 \times 10^{-4}$ at 25° was obtained, with an average deviation of less than 5%.

5. Incidentally, in applying the method depending on the rate of inversion of sugar, it was necessary to determine the acceleration produced by 0.0074 *M* acid at 25°, a much lower concentration than had previously been worked with at this temperature. A satisfactory empirical equation representing the results of Lamble and Lewis was also derived.

6. In applying the Walker method to the hexa-aquo chloride, it was also necessary to determine the location of the equilibrium between the dichloro and the hexa-aquo chloride at a concentration of 0.008 *M*, both in the presence and absence of hydrochloric acid. It was found that in the former case 1.5% and in the latter 0.25% of dichloro salt was present in the equilibrium at 25°.

CAMBRIDGE, 38, MASS.

NOTES

A Method for Producing Dry Ammonia.—In the work described previously in this number of THIS JOURNAL, it was desirable to have a source of dry ammonia gas which could be used at variable pressures up to two atmospheres. For this purpose, we have modified the method for producing ammonia used by Keyes and Brownlee,[1] consisting of warming a solution of ammonium nitrate in ammonia, by substituting ammonium thiocyanate for the nitrate. The thiocyanate has the advantage of taking up more ammonia than the nitrate at a given pressure, but its chief advantage lies in the extreme rapidity with which it absorbs ammonia.

The apparatus consists merely of a heavy-walled salt-mouth bottle holding about 500 cc., with a stopper provided with an outlet tube, and with an inlet tube for charging. The bottle is nearly filled with dry ammonium thiocyanate to act as an absorbent. The inlet and outlet tubes may be provided with glass stopcocks or even with heavy-walled rubber tube and screw pinchcocks.

The apparatus is stored with ammonia by passing in the dry gas, keeping the bottle cooled with ice during the process. When saturated with ammonia at 0° and atmospheric pressure, the solution contains about 45% ammonia. The gas is absorbed with a rapidity comparable to that of ammonia in water, so that a very rapid current can be run in with almost no loss. By placing the bottle, after being stored, in a water-bath, and keeping at room temperature or slightly above, the ammonia can be drawn off as desired. The ammonia in this generator is nearly the equivalent of liquid ammonia as purchased in tanks, except that its

[1] Keyes and Brownlee, THIS JOURNAL, 40, 25 (1918).

freedom from moisture can be assured, and it is delivered at a much lower pressure which can be varied at will by adjusting the temperature. It is well to recharge the generator before the thiocyanate crystallizes in too great amount. Otherwise, the inlet tube may become blocked by the salt.

H. W. FOOTE AND S. R. BRINKLEY.

DEPARTMENT OF CHEMISTRY, YALE UNIVERSITY,
NEW HAVEN, CONN.

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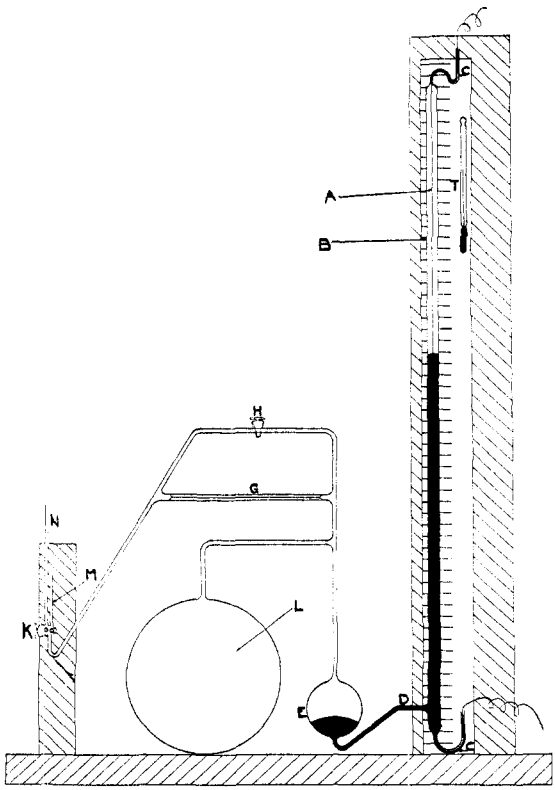
A Variable Resistance.—The following is a description of a variable resistance which has several advantages over the ordinary slide wire resistance. The accompanying diagram illustrates the instrument.



A platinum wire A (one ohm per 50 cm.) is held taut in the center of a Tube B(1 to 2 cm. in diameter) by de Khotinsky cement at C, C. The bulb E has a greater volume than Tube B. Pure mercury is distilled into E while the apparatus is evacuated. The rest of the apparatus is sealed to F and then the instrument is ready for use. One exit N of K leads to a suction pump, while the other exit M is open to the air. To facilitate the control of the mercury in B a volume L and a fine capillary G are introduced, as shown in the diagram.

In the instrument employed 50 cm. of wire corresponded to one ohm, so that by reading to 0.2 mm. the accuracy is of the order of 0.002 ohm. The resistance of the mercury—relatively very small—is taken into account by calibrating the resistance for various positions of the meniscus. A 1° temperature difference of the platinum changes the resistance 0.00008 ohm per cm. and by use of calibration curves for each degree between 17° and 23°—usual limits of room temperature, any error due to temperature coefficient is rendered negligible. The temperature of the wire is read from T.

All variations in contact resistances are clearly eliminated in this apparatus. The ease and speed of manipulation was found to be a pronounced advantage over that of the slide wire bridge. The fact that the exposed part of the wire is in a vacuum is another distinct advantage. After 8 months' use the resistance was recalibrated and the change during this period was shown to be less than 0.001 ohm.

O. MAASS AND C. H. WRIGHT.

DEPARTMENT OF CHEMISTRY, MCGILL UNIVERSITY,
MONTREAL, CANADA.

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