to the washings in which the portion of ammonium chloride removed by filtration had also been dissolved. This solution was evaporated to dryness and the ammonium chloride weighed. This method was shown to be accurate within 0.05%.

The approximate mean of this determination and the previous value of 42,030 is 41,800 calories, and this is taken as the best value for the heat of the reaction of one mole of nitrogen trichloride and four moles of hydrogen chloride.

Heat of Formation of Nitrogen Trichloride.—This may be calculated as follows.

$4HCl = 2H_2 + 2Cl_2 - 4 \times 2203$[12] =	$-88{,}012$ calories
$^1/_2\ N_2 + 2H_2$(gas) $+ ^1/_2\ Cl_2$(gas) =	NH_4Cl (solid)[12] $+ 75{,}070$ calories
$NH_4Cl + 3Cl_2$ (gas) =	NCl_3 (solution in CCl_4) $+ 4HCl$ (gas) $- 41{,}800$ calories
$^1/_2\ N_2$(gas) $+ ^3/_2\ Cl_2$(gas) =	NCl_3 (solution in CCl_4) $- 54{,}700$ calories

The heat of formation is negative and quite large, being of the same order of magnitude as that of acetylene. This is, of course, in accord with the explosive character of the compound. Just as a solution of acetylene in acetone is harmless, a solution of nitrogen trichloride in carbon tetrachloride does not explode.

Summary

The following determinations have been made.

1. The heat of solution of one mole of gaseous chlorine in carbon tetrachloride is 4539 calories.

2. The heat of solution of one mole of gaseous hydrogen chloride in carbon tetrachloride is 3680 calories.

3. The heat of the interaction of one mole of nitrogen trichloride in solution with three moles of gaseous hydrogen chloride giving solid ammonium chloride and three moles of gaseous chlorine is 41,800 calories.

4. A combination of the last value with the known values for the heats of formation of hydrochloric acid and ammonium chloride gives the heat of formation of nitrogen trichloride in solution in carbon tetrachloride from gaseous nitrogen and gaseous chlorine as —54,700 calories.

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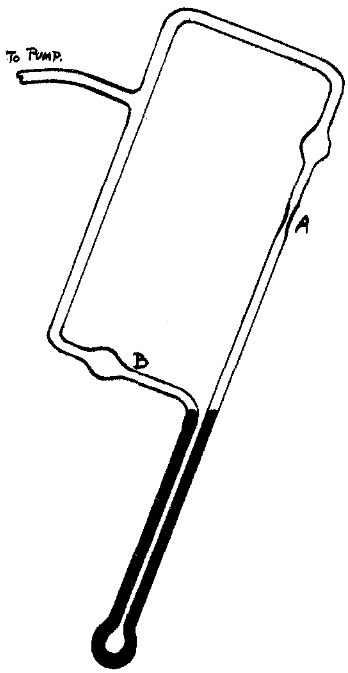
NOTE

The Use of Long Mercury Manometers.—In view of the frequent use made of long mercury manometers in research work, it is believed that the following note will prove of help to those involved in making pressure measurements on gaseous systems.

[12] From International Critical Tables by private communication.

The Manometer AB (0.6 to 0.7 cm. in internal diameter) which is made part of a system of glass tubing as shown, is filled with clean, dry mercury to the top of the short limb and connected to an efficient mechanical pump. When a high vacuum, say 0.0001 cm. is reached, the mercury in both limbs is boiled by heating with a small Bunsen burner, starting at the top and working first to the bottom and then up to the top again. In this way the mercury is thoroughly boiled and no risk is incurred of bumping against the top of the manometer. When both limbs of the manometer have thus been boiled out, the constriction at A is sealed, using a blow-pipe flame, and by means of a piece of glass rod the sealed portion is separated into two sealed ends. Air is *slowly* admitted and finally the manometer cut from the system at B.



Such manometers connected to a system at 0.0001 cm. pressure usually show a zero pressure when allowance is made for the different heights of the two menisci.[1] Thus, the following results were obtained for two different manometers of internal diameter 0.6 cm.

Height from a fixed point below to— Closed limb— Top of meniscus Cm.	Closed limb— Bottom of meniscus Cm.	Open limb— Top of meniscus Cm.	Open limb— Bottom of meniscus Cm.	Height of meniscus Closed limb Cm.	Height of meniscus Open limb Cm.	Meniscus correction Cm.	Hence true pressure Cm.
2.81	2.69	2.80	2.67	0.12	0.13	−0.01	0.00
1.34	1.20	1.34	1.20	.14	.14	± .00	.00

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Received February 11, 1925
Published May 5, 1925

[1] Correction obtained from Kaye and Laby, "Physical and Chemical Constants," Longmans, Green and Company, **1921.**