steel tube. A and A′ were carefully ground into their respective tapers in the steel tube by carrying out the preliminary grinding in several replicas of the tapers of the steel tube. The final light grinding was done in the steel tube tapers. The larger faces of the quartz cones were about 8 millimeters in diameter, the taper was about 3° and the height of the truncated cone about 1 centimeter. A number of unsuccessful attempts to produce a tube of this design capable of withstanding a pressure of 500 atmospheres resulted from non-uniform contact between the steel and quartz. In these cases the windows were shattered or so pulverized internally as to become practically opaque upon application of pressure. Inasmuch as the windows are displaced about 0.5 mm. as the pressure is raised to 500 atmospheres, it is very essential that the peripheries of the faces be round chamfered to prevent chipping. The windows were pressed firmly into the steel tapers covered with molten "picein," and tested with an oil injector. During the testing most of the "picein" was extruded, leaving a bright metallic contact surface. The tubes were vacuum tight and could be evacuated so that the pressure rose to only 0.001 millimeter of mercury on standing overnight. The steel absorption tube was of sufficiently small outside diameter to fit into the tubulation of the quartz Dewar tube mentioned above.

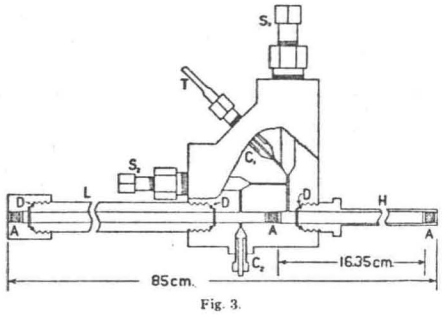

Fig. 3.

A special tube (III) was built for studying Beer's law at high pressures. The general construction was as described for steel tube II. Figure 3 shows a steel absorption tube with three quartz windows (A) affording two absorption chambers of the same internal diameter in tandem. Connection to the vacuum and loading system was made through T, with steel stopcock S_1. The fluid contained in the shorter tube (H) could be expanded to fill both chambers (H and L) by opening stopcock S_2. This afforded a considerable change in density of the fluid accompanied by only a slight change in the amount of matter in the light path. The sum of the internal lengths of the absorption chambers was 81.97 centimeters and the internal length of the short absorption chamber was 16.35 centimeters. The ratio of these lengths was 5.013 and the ratio of the corresponding volumes about 3% less. This tube will be referred to as the double steel tube.

Argon

Shaver[2] found that a column of gas at 140 atmospheres' pressure and 35 centimeters long containing 80% argon and 20% nitrogen was transparent

[2] W. W. Shaver, *Trans. Roy. Soc. Canada*, **16**, III, 135 (1922).

from 7000 to 2150 Å. E. Meyer[3] believed that his measurements showed a slight absorption in the ultraviolet due to gaseous argon at low pressure. Dolezalek,[4] from a study of the vapor pressures of mixtures of argon and nitrogen, concluded that liquid argon contained a considerable proportion of A_2.

Liquid argon was examined, since any absorption that might be found would be that of an aggregate and thus of considerable interest.

Procedure.—The argon, supplied in a glass bulb, by the Research Laboratory of the General Electric Company, was specified to be of a high purity. It was manipulated in a glass vacuum line by the use of liquid air at reduced pressure and distilled into the quartz absorption tube (I) in the tubulated Dewar flask containing liquid air.

Results and Discussion.—Liquid argon at about −180° and 135 centimeters of mercury pressure was examined from 6780 to 2450 Å. Argon, as a glassy solid at about −190° and 20 centimeters of mercury pressure, was examined from 2490 to 2130 Å. No absorption was found. Accordingly, argon exercises no sensible selective absorption in the region examined, and if there is a general absorption it must be very small. If aggregates form in appreciable quantity, their absorption does not lie within this spectral region.

Methane

Glockler[5] found a length of 54 centimeters at atmospheric pressure of methane to be transparent to 2400 Å. Dennison and Ingram[6] found a length of 10 meters of methane at 70 centimeters pressure of mercury to have one absorption band (8800 to 9000 Å.) in the region from 6500 to 9500 Å.

For this investigation the methane was prepared by the method of Keyes, Smith and Joubert[7] and loaded into the short steel tube (II). The methane was examined at a pressure of 400 atmospheres at 20° from 6900 to 2150 Å. It was also examined at this concentration, but at a temperature just above that of the disappearance of the liquid phase, from 4500 to 3240 Å. No absorption was found and the conclusions are identical with those for argon.

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Summary

Apparatus for the examination of the absorption spectra of liquefied

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[4] F. Dolezalek, *Z. physik. Chem.*, **93**, 585 (1918–1919).
[5] G. Glockler, *Proc. Nat. Acad. Sci.*, **11**, 74 (1925).
[6] D. D. Dennison and S. B. Ingram, *Phys. Rev.*, **36**, 1451 (1930).
[7] Keyes, Smith and Joubert, *J. Math. Phys., Mass. Inst. Tech.*, **1**, 192 (1922).