The points S and S' agree with the intersection of the two isothermals in the Vp-diagram, fig. 3^a and 3^b, and with the inter-

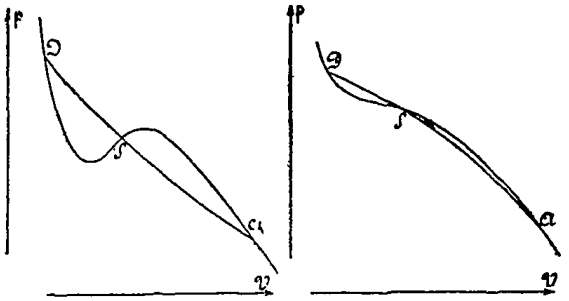

Fig $3a$. Fig. $3b$.

section of the chord and the line of pressure in fig. 1. As no other cases than fig. 2^a and 2^b are possible there is only one such point.

4. With respect to the course of the condensation in the case of mixtures the following remarks may be added.

In the Vp-diagram the experimental isothermal can be either convex or concave towards the V-axis. The first is the case for a mixture which contains only a small proportion of the more volatile component, as occurs in VERSCHAFFELT's experiments [1]) — see fig. 3^a —. The second is the case for mixtures which consist principally of the more volatile substance, as occurs in KUENEN's experiments [2]) — see fig. 3^b —.

The experimental ψ-line will have its greatest curvature near D in the first case, near A in the second (comp. fig. 2^a with fig. 3^a and fig. 2^b with fig. 3^b).

Physics. — "*Measurements on the magnetic rotation of the plane of polarisation in liquefied gases under atmospheric pressure*". I. By Dr. L. H. SIERTSEMA (Communication N°. 57 from the Phys. Labor. of Leiden by Prof. H. KAMERLINGH ONNES).

1. The continuity of the optical properties of substances under different circumstances of pressure and temperature, especially during changes in the state of aggregation is an important point of investigation on which light can be thrown by measurements of the magnetic rotation of the plane of polarisation. If we calculate from the

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[1]) Versl. Kon. Akad. v. Wetensch. Amsterdam 24 Dec. 1898, p. 281; Proc. id. I, p. 288 and 323; Comm. Phys Lab. Leiden, N°. 45.

[2]) Proc. R. Soc. Edinb. 21, p. 433, April 1897. Zeitschr. f. phys. Chem. 24. pag. 672, 1897.

observations the molecular rotatory constant $\varrho_{p,t}$ [1]), this quantity will generally depend on pressure and temperature, and we can consider the manner in which it changes during the transition from the gaseous to the liquid state.

Measurements on this subject have been made by BECQUEREL and by BICHAT [2]) with Carbon disulphide and Sulphur dioxide as liquid and vapour. From these observations, in which no determinations of dispersion have been made, it follows that during the transition into the gaseous state the magnetic rotation of Carbon disulphide decreases much more rapidly than the density; and that BECQUEREL's formula $\frac{R}{n^2(n^2-1)} = \text{Const.}$ holds during the change of the state of aggregation.

My measurements on the magnetic rotation in gases [3]) led me into an investigation in this direction, which also was furthered by the ample means offered by the Leiden laboratory for experiments with liquid gases.

2. For the measurements of the magnetic rotation in liquefied gases under atmospheric pressure some special difficulties have to be surmounted. In the first place care must be taken that the cylinder containing the liquid, which must let through the pencil of light, shall be free from bubbles of gas which may easily be generated on the walls when they are not properly protected against the entrance of heat by conduction. Moreover this cylinder should be closed by plane parallel plates of glass of very good quality, as for these measurements it is difficult to place the nicols *in* the experimental-tube and thus within the closing-plates as could occur in the measurements on gases. These plates must also be protected against the entrance of heat but especially against moisture, as the least formation of ice on these plates hinders the measurements. This renders it necessary to place more than one set of glass-plates between the nicols, which latter circumstance again makes it necessary to use greater rotations than was required for the investigation with gases, as the glass-plates, good as they may be, render the adjustments less accurate.

3. The difficulties mentioned have been taken into account in

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[1]) Comp. Proc. Royal Acad Amsterdam. Vol I, p. 299.

[2]) BECQUEREL, J. de Ph. (I) 8, p. 198. BICHAT. J. de Ph. (1) 8 p. 204; 9 p. 275.

[3]) Proc. Royal Acad. Amsterdam. Vol I, p. 296. Arch. Néerl. (2) 2 p. 291. Comm. Phys Lab. Leiden, Suppl. 1.

constructing the apparatus shown in figs 1 to 3, which consists of glass and ebonite only.

The experimental tube which is filled with the liquefied gas, consists of a glass tube *a*, closed by the glass-plates *b*, fastened to the tube by means of fishglue. By means of some brass collars *c*, acting as springs, a loose glass tube *d* lies in the experimental tube of the same length as the latter. The spaces within and round the tube are connected by means of the two obliquely ground ends at *E*. Through this tube *d* the pencil is directed during the measurements. The experimental tube is filled with the liquefied gas to a little above this loose tube, which thereby is filled with the liquid and entirely surrounded by it. Even supposing that a few bubbles of vapour arise on the walls of the experimental tube, they cannot get into the liquid contained in the loose tube and will not disturb our field of view.

The experimental tube is moreover surrounded by two glass tubes *f* and *g*. Through the openings *h* and *i* the cold vapour of the liquid in the experimental tube can stream successively through the two spaces formed by these glasses, and then escape through the india-rubber tube *k*, fastened to an ebonite ring *l* round the last named tube. The tube *k* conducts the vapour to a caoutchouc bag, in which it is collected provisionally, to be afterwards condensed. The liquid is admitted through an opening in the ebonite nuts *m*, which also serve to connect the various glass tubes.

To fill the tube we use the steel capillary *a* (fig. 3) which is put through the opening in the nuts *m* (fig. 1) so as to reach into the experimental tube, to which it is fastened by means of the cap *b* (fig. 2). When the tube is filled we remove this capillary and close the opening by means of a small stopper.

The two glass tubes *f* and *g* are closed by the ebonite caps *n*, in which caoutchouc rings *o* serve as washers. The caps are mutually connected by six brass tightening rods. The closing plates *b* of the experimental tube are kept in their places by means of the ebonite rings *p* in the caps *n*. These closing plates are shut off from the atmosphere by means of the glass-plates *q*, enclosed by the nuts *r* together with a leather packing *s*. These latter glasses are again protected against the formation of ice by spaces formed by them and the plates *t*, which spaces can be filled with dry air by means of the ebonite tubes *u*, or by placing some Phosphorous pentoxide into them [1]). The spaces between the glass-plates *b* and *q*

[1]) Comp. the Cryostate, Proc. Roy. Acad. Amsterdam, Sept. 1899.

Fig 2

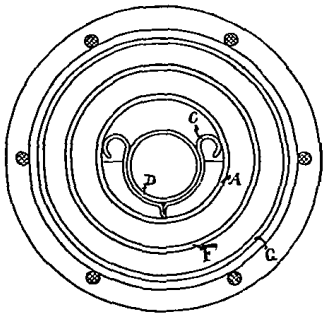


Fig 1.

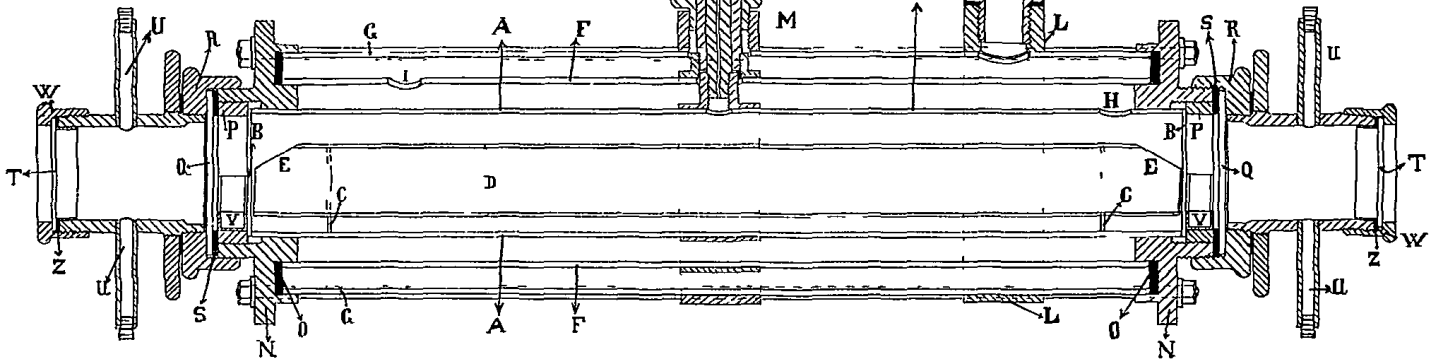
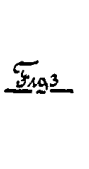


Fig 3



are also kept dry by means of Phosphorous pentoxide in ebonite cups *v*. The nuts *w* with leather packing and washers *z* serve to fasten the glass plates *t*.

4. The magnetic field is obtained by means of a coil with 24 layers of 46 turns of wire of 6 m.m. diameter, along which a current of as much as 70 amp. may pass. The direction of the current and the connection with the dynamo are arranged in the same way as for the investigation with gases [1]). Only the shunt [2]) is removed and replaced by a shunt of a WESTON-millivoltmeter, on which the strength of the current is directly read to within $^1/_{10}$ ampère, an accuracy quite sufficient for this case.

The apparatus described in § 3 is placed within this coil (inner diameter 14 cm.), and can be protected against the radiation of heat by means of a layer of wool or a water-circulation.

5. The optical arrangements also resemble in the main those formerly used for the investigation with gases. Here also the light of an arc-lamp, or of the sun passes successively through the collimator, the polariser, the experimental-tube, the analyser, the prism and the telescope. The rotations of the analyser can be measured by a divided circle, on which minutes can be read, and the adjustments are made by turning this analyser until the dark band in the spectrum has arrived at the desired place.

When we use the arc-light the spectrum is calibrated by causing the light of a mercury arc-lamp, following ARONS—LUMMER, to fall onto the collimator. By means of the spectral lines of this source of light and of the dispersion-curve of the prism determined with the aid of sun-light the telescope can always be adjusted for a definite wave-length.

6. Of all the observations with liquefied gases those with liquid methyl chloride offer the least difficulties. The following preliminary measurements are made with liquid methyl chloride purified by repeated distillation, under atmospheric pressure at —23°. From these measurements it can be shown that the dispersion is about the same as for most gases (comp. the curves and tables in the Proceedings Dec. 1898), as will appear from the following numbers.

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[1]) Comp. Proc. Roy. Acad. Amsterdam, Dec. 1898, fig. 1.

[2]) Comp. loc. cit. fig. 1. T.

In this table ω/ω_D stands for the proportion of the rotation to that for sodium light.

λ	(ω/ω_D) CH_3Cl	(ω/ω_D) gases
0.631	0.90	0.87
0.546	1.17	1.17
0.480	1 58	1.53
0.449	1.76	1.76
0.435	1.90	1.90

Chemistry. — "*A new method for the exact determination of the Boiling-point*". By Dr. A. SMITS (Communicated by Prof. H. W. BAKHUIS ROOZEBOOM).

(Will be published in the Proceedings of the next meeting).

Chemistry. — "*Thermodynamics of Standard Cells*" (2nd part). By Dr. ERNST COHEN (Communicated by Prof. H. W. BAKHUIS ROOZEBOOM).

(Will be published in the Proceedings of the next meeting).

Chemistry. — "*On the Enantiotropy of Tin*" (V). By Dr. ERNST COHEN (Communicated by Prof. H. W. BAKHUIS ROOZEBOOM).

(Will be published in the Proceedings of the next meeting.)

Chemistry. — "*The formation of mixture-crystals of Thalliumnitrate and Thalliumiodide*". By Dr. C. VAN EYK (Communicated by Prof. H. W. BAKHUIS ROOZEBOOM).

(Will be published in the Proceedings of the next meeting.)

(June 30, 1900.)