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Some studies in the infra-red region of the spectrum

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APPENDIX.



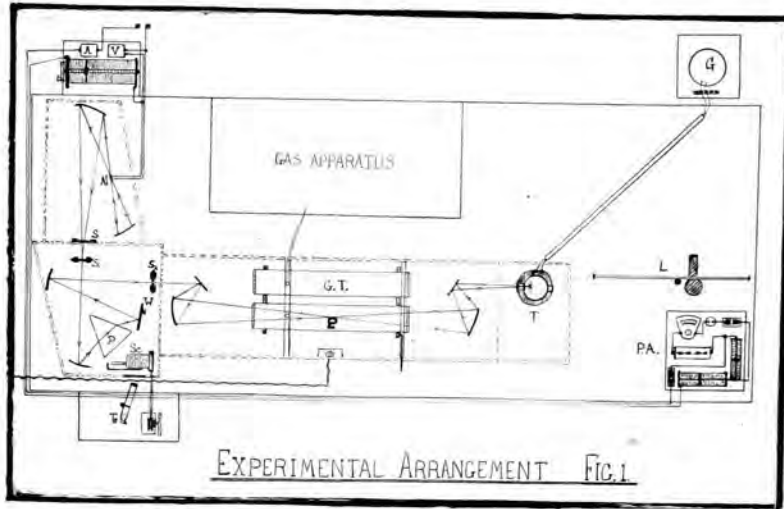


FIG. 1.

Fig.1. First Experimental Arrangement

Monochromatic Method.

- A. V. Ammeter and Voltmeter.
- N. Nernst filament.
- S. Shutter.
- S₁ S₂ . Spectrometer slits.
- W. Wadsworth mirror.
- P. Prism. Rock salt.
- Sc. Wave-length scale.
- Te. Reading telescope.
- G. T. Gas tubes.
- T. Thermopile.
- G. Galvanometer.
- L. Galvanometer lamp and scale.
- P. A. Potentiometer arrangement.

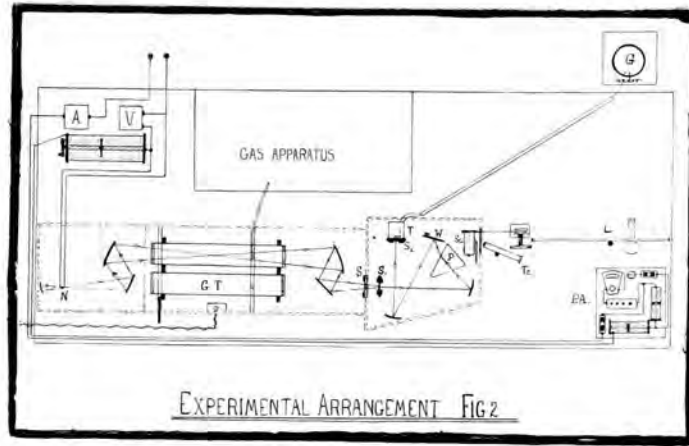


FIG. 2.

Fig.2. Second Experimental Arrangement.

A. V.	Ammeter and Voltmeter
N.	Nernst filament.
S.	Shutter.
S S .	Spectrometer Slits.
1 2	
W.	Wadsworth mirror.
P .	Rock salt prism.
1	
T.	Thermopile.
G. T.	Gas tubes.
G.	Galvanometer.
Te.	Telescope.
L.	Galvanometer scale and lamp.
P. A.	Potentiometer arrangement.
Sc.	Wave-length scale.

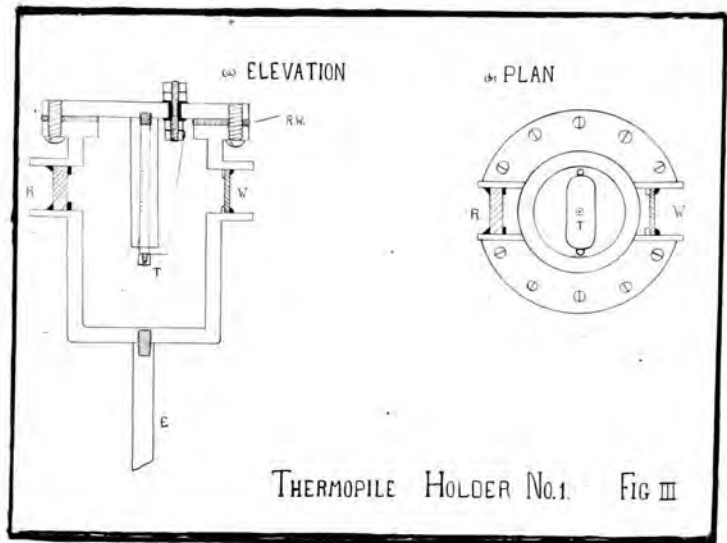


FIG. 3.

Fig.3. Thermopile Holder No.1.

T. Thermopile.

R. Rock-Salt Window.

W. Observation Window.

E. Ebonite Support.

R.W. Rubber Washer.

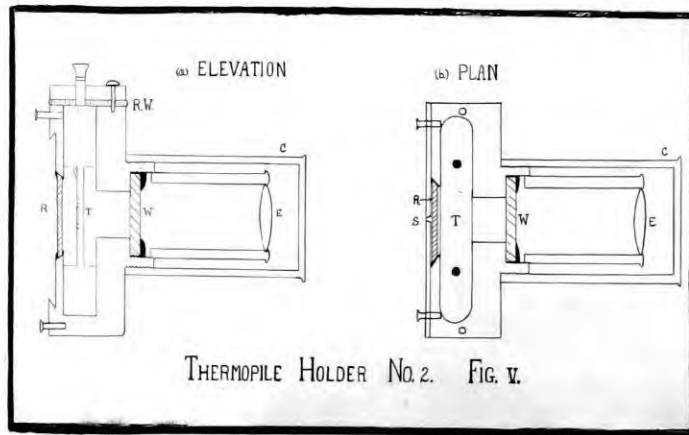


FIG. 5.

Fig.5. Thermopile Holder No.2.

- R.W. Rubber Washer.
- R. Rock salt window.
- W. Observation window.
- E. Microscope eyepiece.
- C. 'Screw-on' Brass Cover.
- T. Thermopile.
- S. Spectrometer Slit.

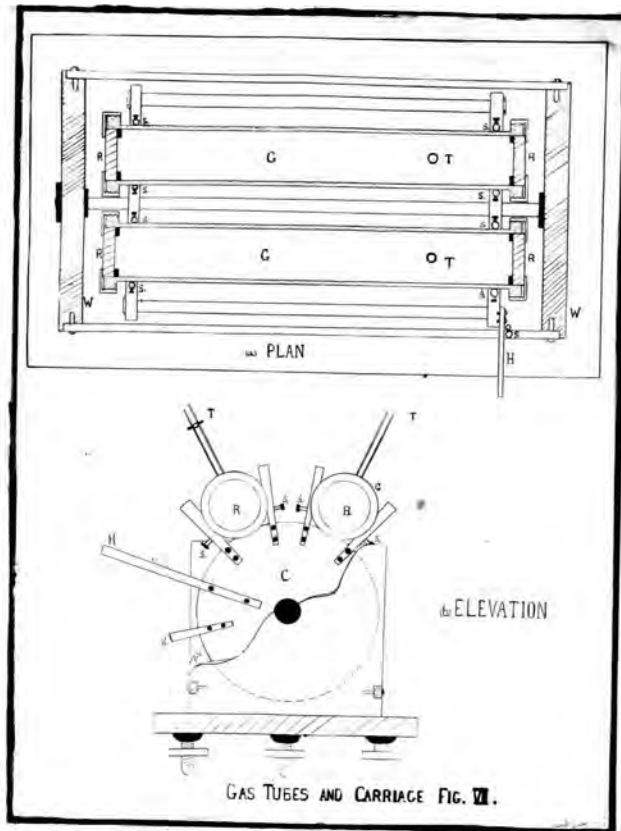


FIG. 7.

Fig.7. Gas Tubes and Carriage

- H. Handle for carriage.
- T. Tubes to Gas apparatus.
- S. Adjustable Stops.
- G. Gas Tubes.
- R. Rock salt windows.
- S₁. Screw Adjustments for Gas Tubes.
- C. Carriage.
- W. Wooden support for carriage.

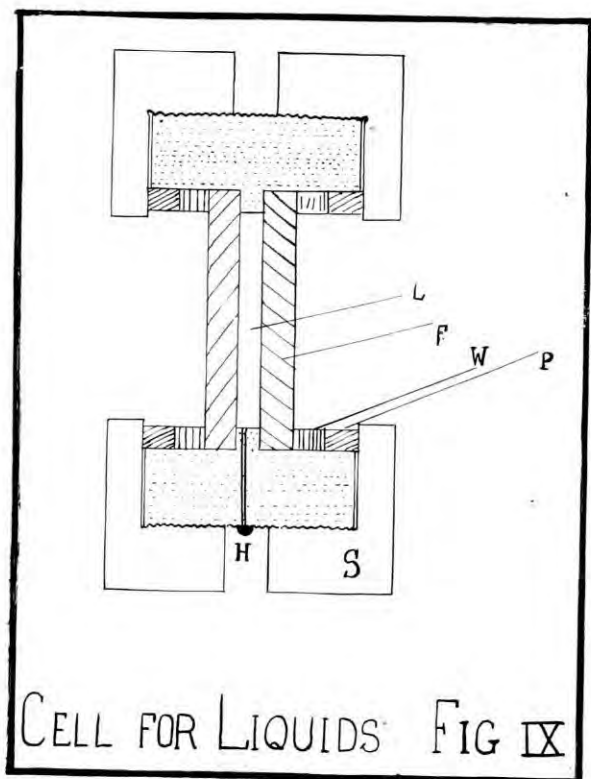


FIG. 9.

Fig.9. Cell for Liquids.

H. Hole for filling cell with liquid.

L. Liquid film.

F. Fluorite windows.

W. Rubber washer.

P. Brass plungers.

S. Brass Screw-on End Caps.

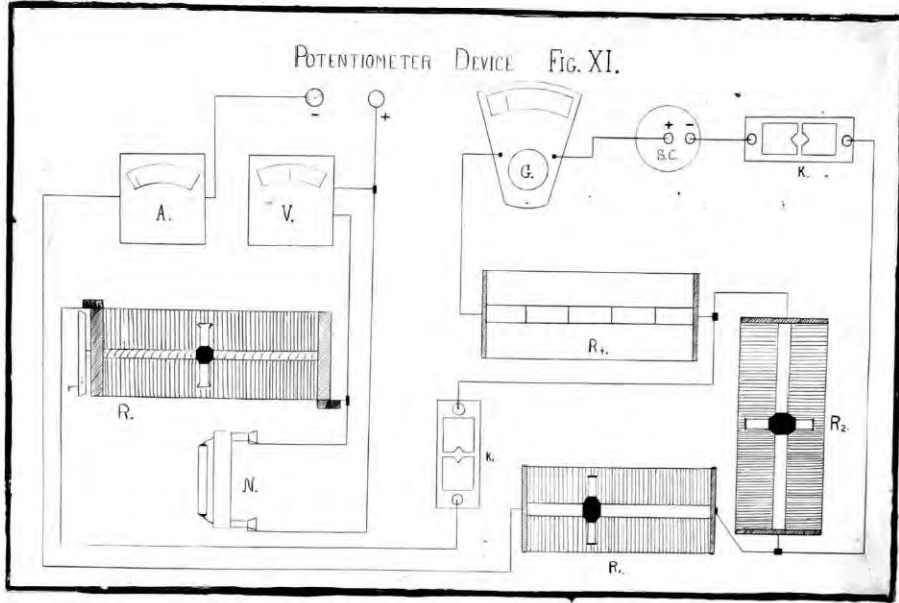


FIG. 11.

Fig.11. Potentiometer Device.

A.V. Ammeter and Voltmeter.

R. Controlling Rheostat.

N. Nernst filament.

K.K₁. Plug Keys.

R₁. Low-resistance Rheostat.

R₄. High-resistance Rheostat.

R₂. Medium-resistance Rheostat.

S.C. Standard Cadmium cell.

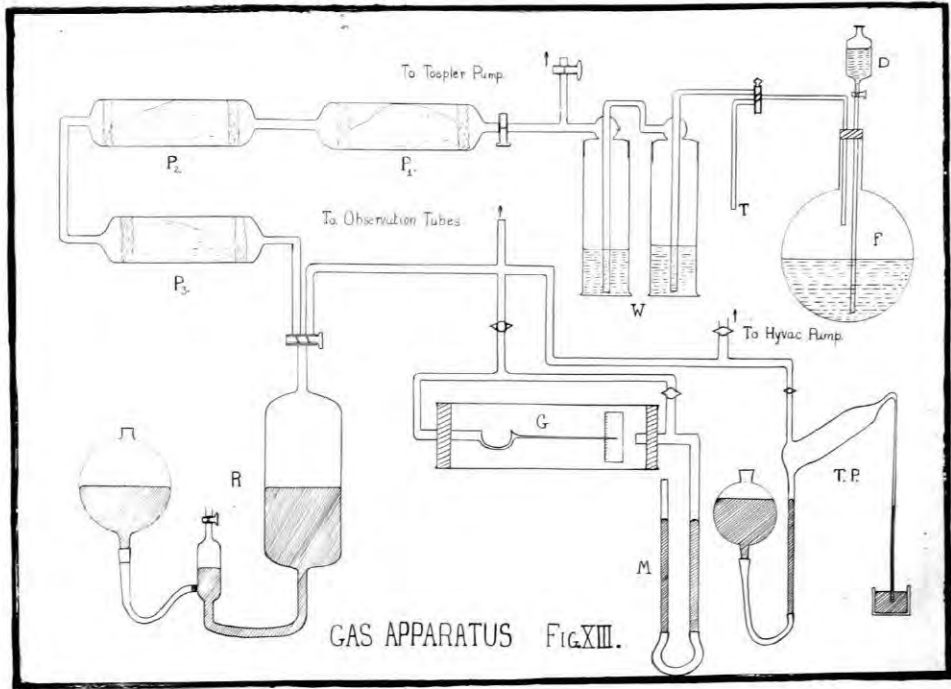


FIG. 13.

Fig.13. Gas Apparatus.

- P₁ P₂ P₃ . Phosphorus pentoxide drying tubes.
F. Preparation.
D. Dropping funnel.
W. Washing Bottles containing
 Potassium Hydroxide.
R. Reservoir.
G. Pressure gauge and scale.
M. Manometer.
T.P. Toepler pump.
T. Trap.

Fig. 46. Calibration Chart of Rock
Salt Prism Spectrometer.

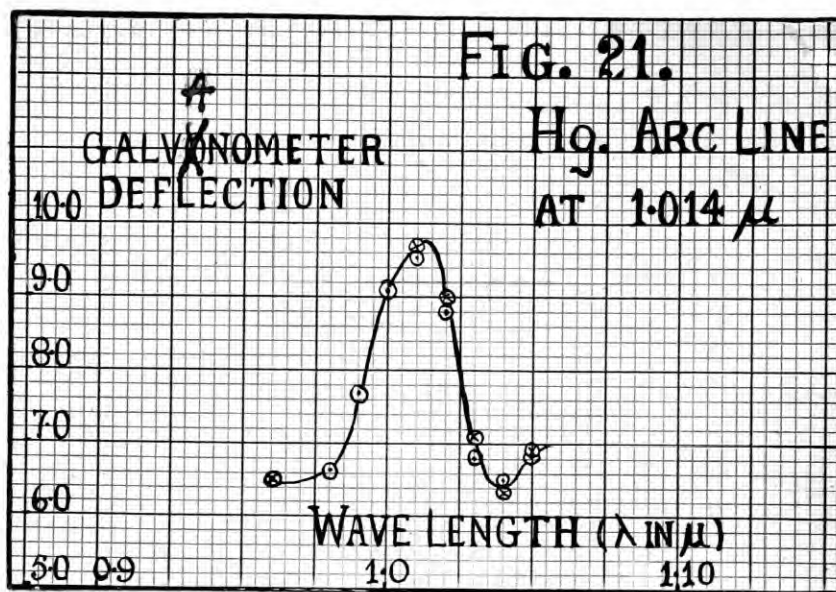


FIG. 21.

Fig. 21. The Emission Line at 1.014μ
in the Mercury Arc Spectrum.

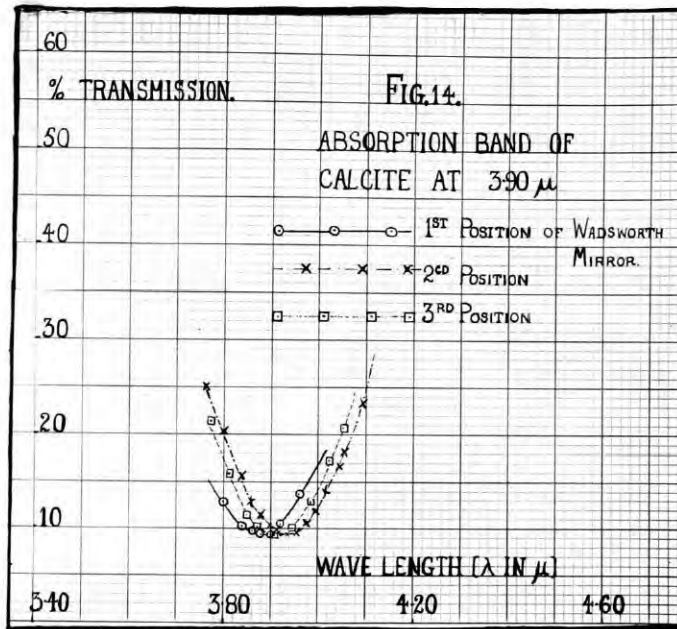


FIG. 14.

Fig.14. Absorption Band of Calcite at 3.90 μ .

1st Position.	Setting A.	= 3.89 μ .
2nd Position.	Setting B.	= 3.94 μ .
3rd Position.	Setting C.	= 3.91 μ .

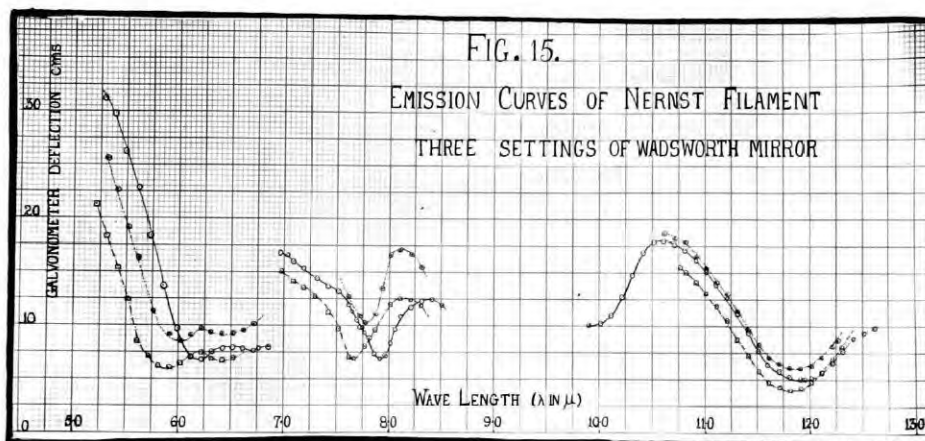


FIG. 15.

Fig.15.

Case A. 1st Position.



Case B. 2nd Position.



Case C. 3rd Position.



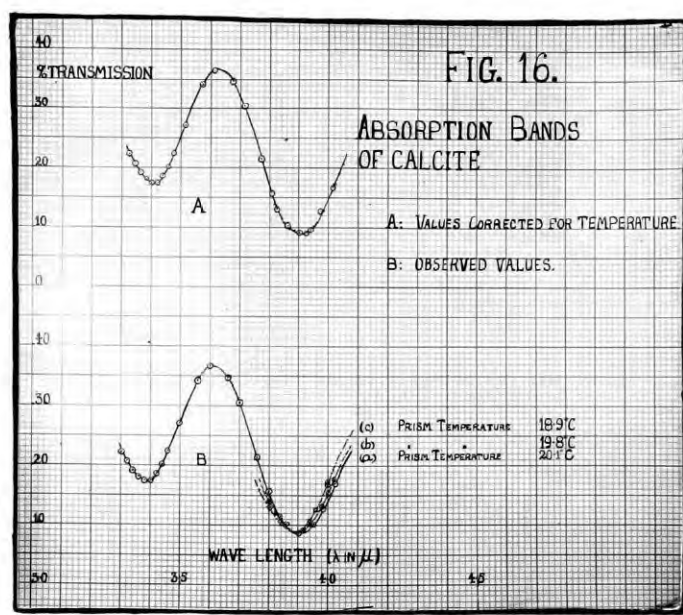


FIG. 16.

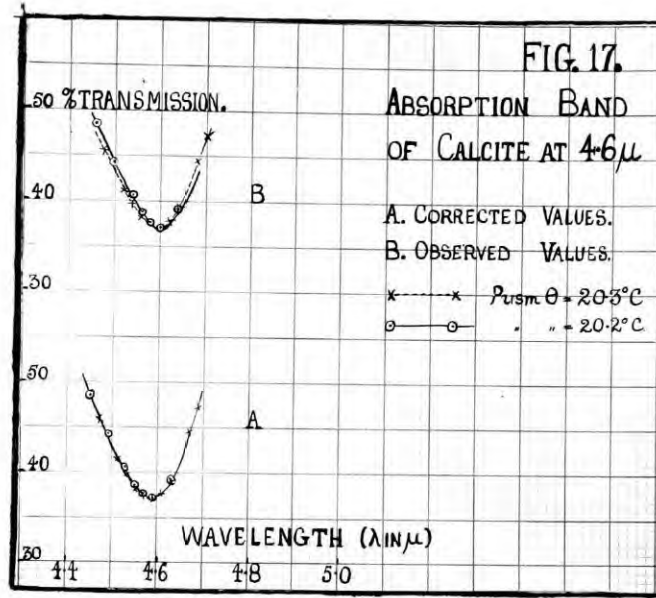


FIG. 17.

Fig.17.

Absorption Band of Calcite at 4.6μ .

Case.1 Prism Temperature 20.3°C .

Case 2. Prism Temperature 20.2°C .

Curve A shows values corrected for temperature.

Slit widths. (Entrance Slit $5/1000''$
(Exit Slit $5/1000''$)

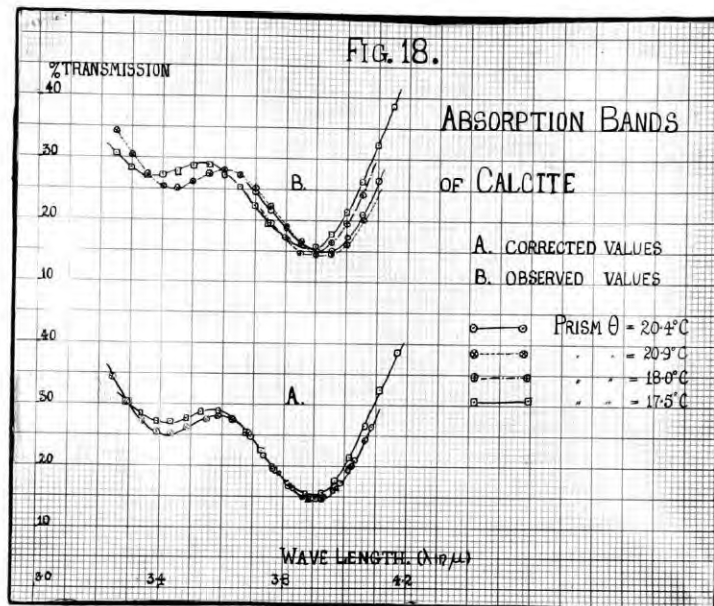


FIG. 18.

Fig.18.

The Absorption Bands of Calcite taken at different
Prism Temperatures.

1. Case A. Prism Temperature 20.4°C.
Wadsworth Mirror set at 19.5°C.
2. Case B. Prism Temperature 20.9°C.
Wadsworth Mirror set at 19.5°C.
3. Case C. Prism Temperature 18.0°C.
Wadsworth Mirror set at 19.5°C.
4. Case D. Prism Temperature 17.5°C.
Wadsworth Mirror set at 19.5°C.

Slit Widths. (Entrance slit 10/1000"
(Exit Slit 10/1000"

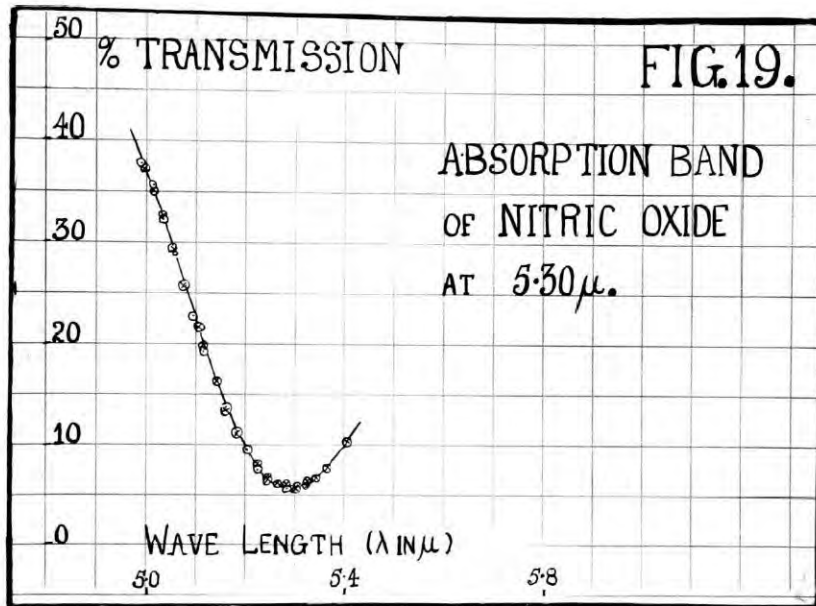


FIG. 19.

Fig. 19.

The Absorption Band of Calcite at 5.30μ taken with the Prism Temperature kept constant.

Case.1. Prism Temperature 20.7°C .
Wadsworth Mirror set at 20.8°C .

Case.2. Prism Temperature 20.7°C .
Wadsworth Mirror set at 20.8°C .

Slit widths. (Entrance Slit $10/1000''$.
(Exit Slit $10/1000''$.)

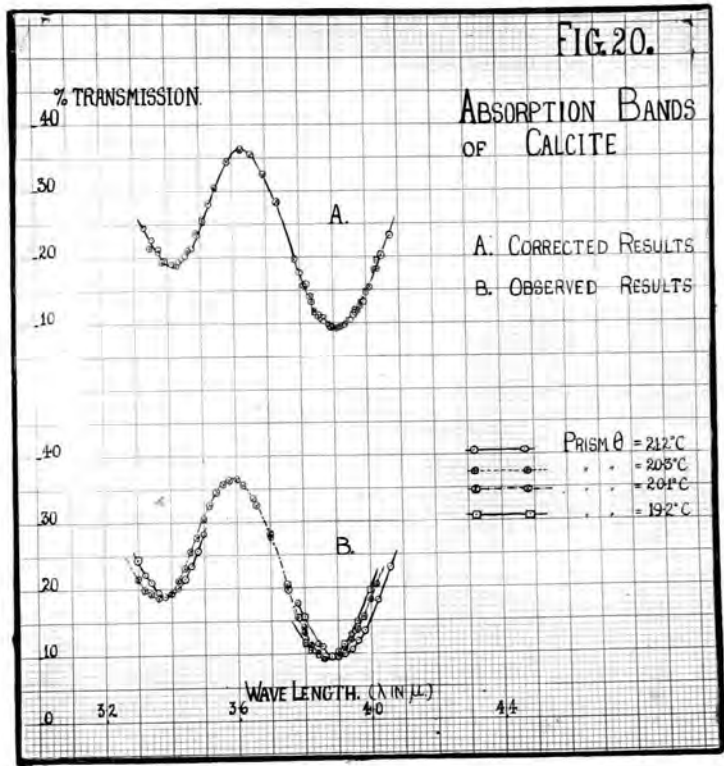


FIG. 20.

Fig. 20.

The Absorption Bands of Calcite observed at Different
Prism Temperatures.

Case 1. Prism Temperature 21.2°C .
Wadsworth Mirror set at 22.9°C .

Case 2. Prism Temperature 20.3°C .
Wadsworth Mirror set at 22.9°C .

Case 3. Prism Temperature 20.1°C .
Wadsworth Mirror set at 22.9°C .

Case 4. Prism Temperature 19.2°C .
Wadsworth Mirror set at 22.9°C .

Slit widths. { Entrance slit $5/1000''$
 { Exit slit $5/1000''$

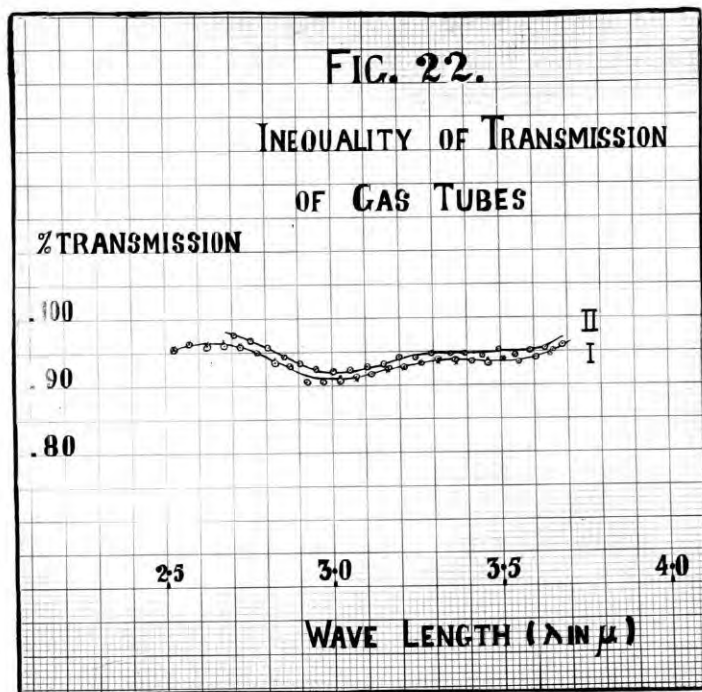


FIG. 22.

Fig. 22.

Inequality of Transmission of the Two Gas Tubes.

1. Case 1. Prism Temperature 20.5°C .
Wadsworth Mirror set at 21.2°C .
2. Case 2. Prism Temperature 20.6°C .
Wadsworth Mirror set at 21.2°C .

(One Tube tilted slightly with respect to the other).

Slit widths. { Entrance slit $5/1000''$.
 { Exit slit $5/1000''$.

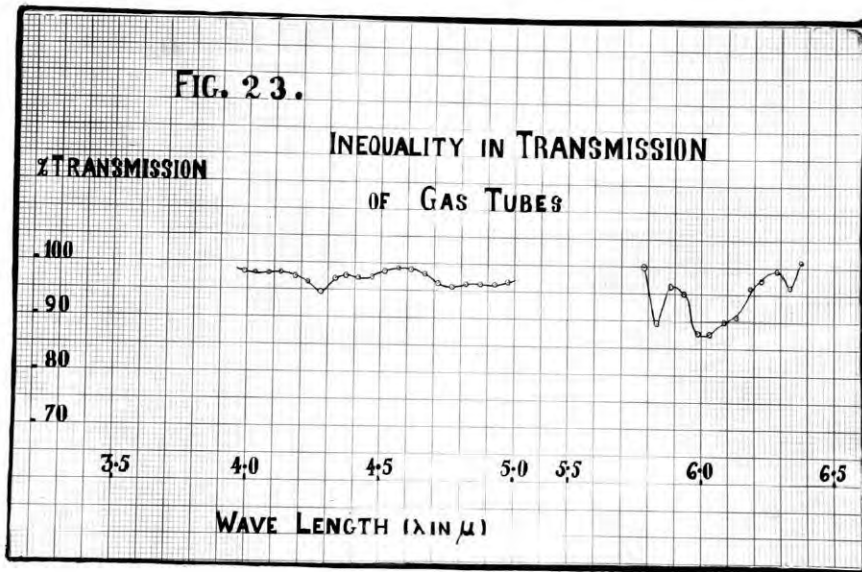


FIG. 23.

Fig. 23.

Inequality in Transmission of the Two Gas Tubes in
the Region 4.0μ - 7.0μ .

4.0μ - 5.0μ . Prism Temperature 18.1°C .
Wadsworth Mirror set at 21.2°C .

6.0μ - 6.5μ . Prism Temperature 19.6°C .
Wadsworth Mirror set at 21.2°C .

Slit Widths. { Entrance slit $5/1000''$.
Exit slit $5/1000''$.

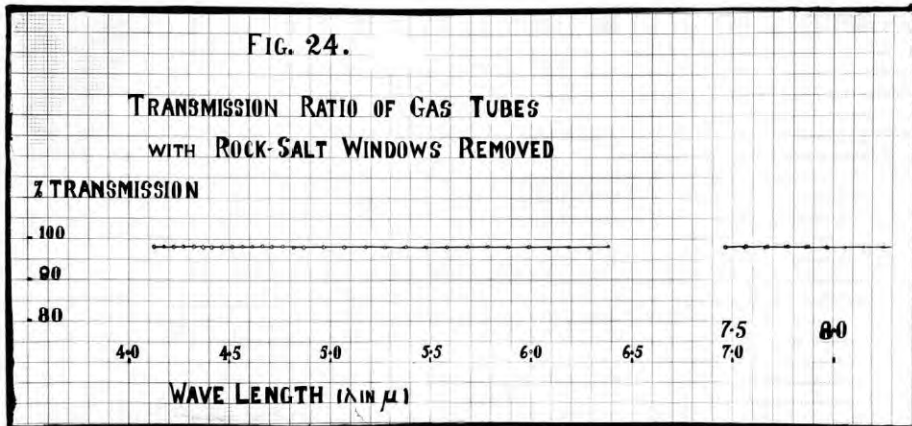


FIG. 24.

Fig. 24.

Graphs showing that the difference in
Transmission Powers of the Tubes is constant
when the rock-salt end plates are removed.

Region 4.0μ - 5.0μ . Prism Temperature 18°C .
Wadsworth Mirror set at 21.2°C .

Region 5.0μ - 6.20μ . Prism Temperature 19.5°C .
Wadsworth Mirror set at 21.2°C .

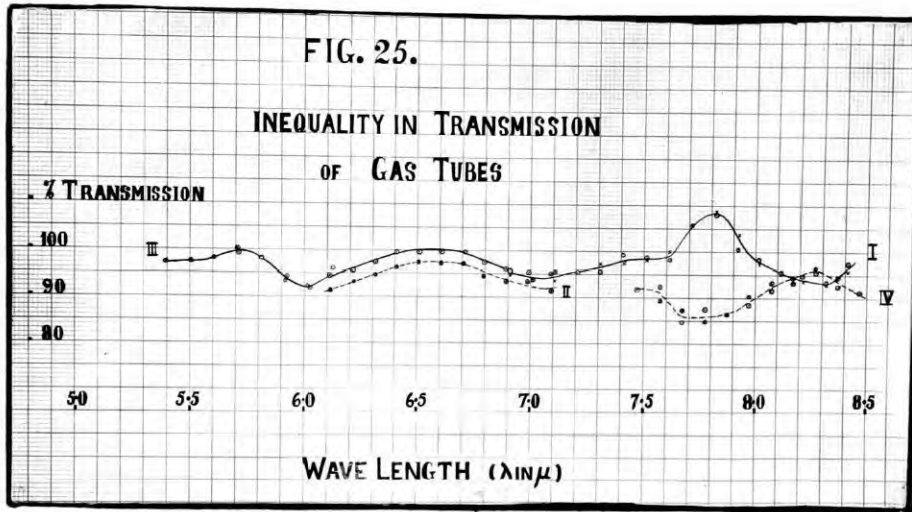


FIG. 25.

Fig. 25.

Graphs showing the persistence of the inequality of Transmission Powers of the two Gas Tubes when the rock salt end plates were replaced.

11 and 1V show the effect of tilting one tube slightly.

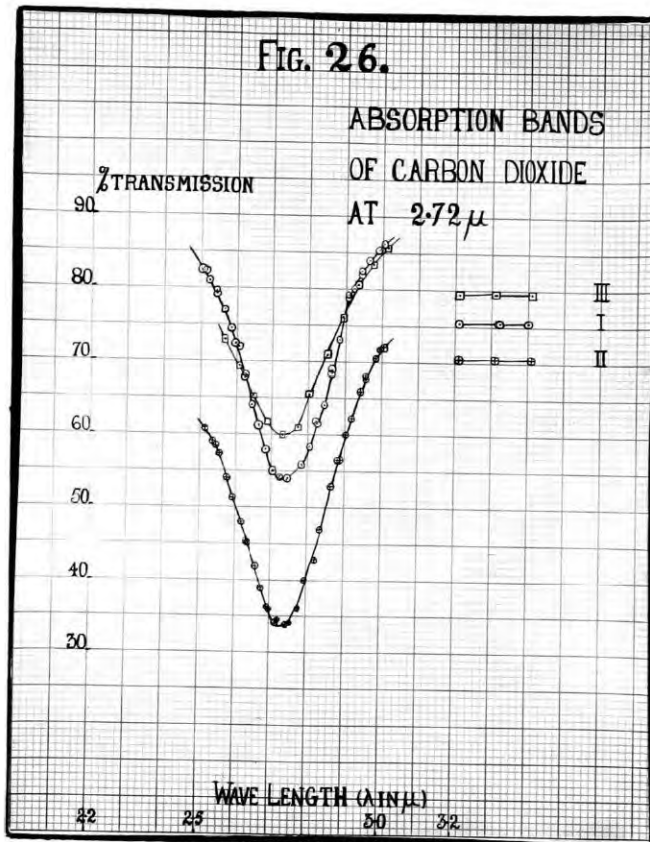


FIG. 26.

Fig.26.

Absorption Curves of Carbon Dioxide at 2.72μ .

Case No.	Prism Temp.	Wadsworth Mirror Set at.	Entrance Slit	Exit Slit.	Gas Pressure, cms. Hg.
1.	28.8°C	23.2°C.	5/1000"	5/1000"	40.3
11.	24.7°C	23.2°C.	5/1000"	5/1000"	65.0
111.	23.7°C	23.2°C.	7½/1000"	7½/1000"	40.2

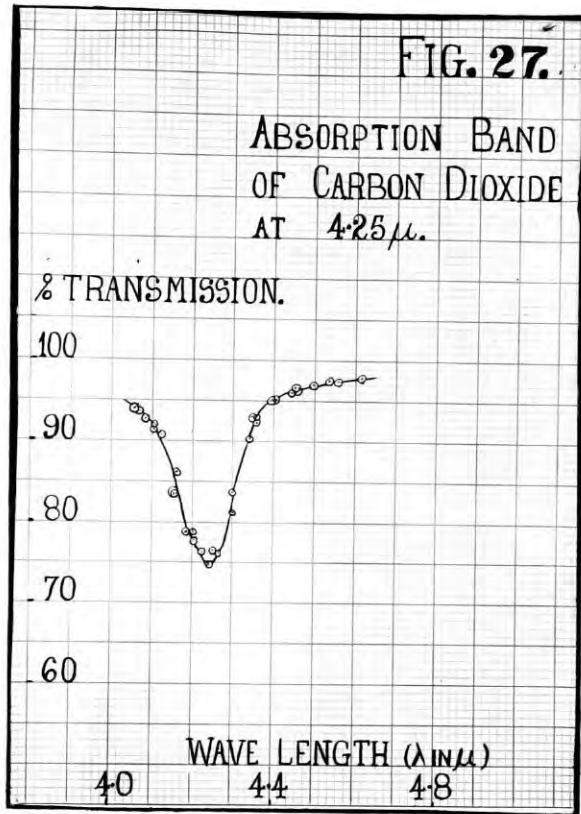


FIG. 27.

Fig. 27.

Absorption Curve of Carbon Dioxide at 4.25μ .

Prism Temperature 19.7°C . Wadsworth set at 20.1°C .

Gas Pressure 35 cms. Mercury.

Entrance Slit $7\frac{1}{2}/1000$ "; Exit Slit $7\frac{1}{2}/1000$ ".

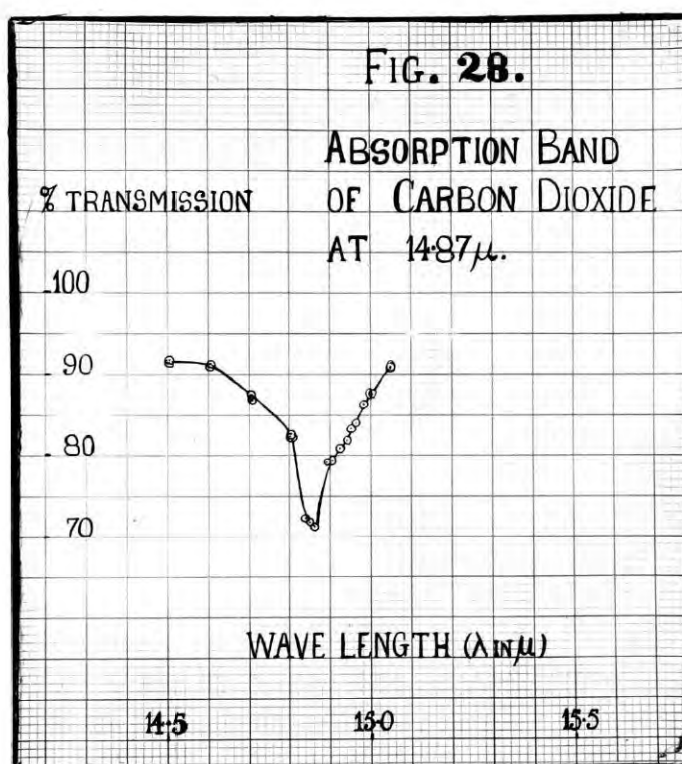


FIG. 28.

Fig. 28.

Absorption Band of Carbon Dioxide at 14.87 μ .

Prism Temperature 23.3°C.

Wadsworth Mirror set at 24.1°C.

Entrance Slit. 20/1000".	}	Gas pressure 50.0 cms. Mercury.
Exit Slit. 20/1000".		

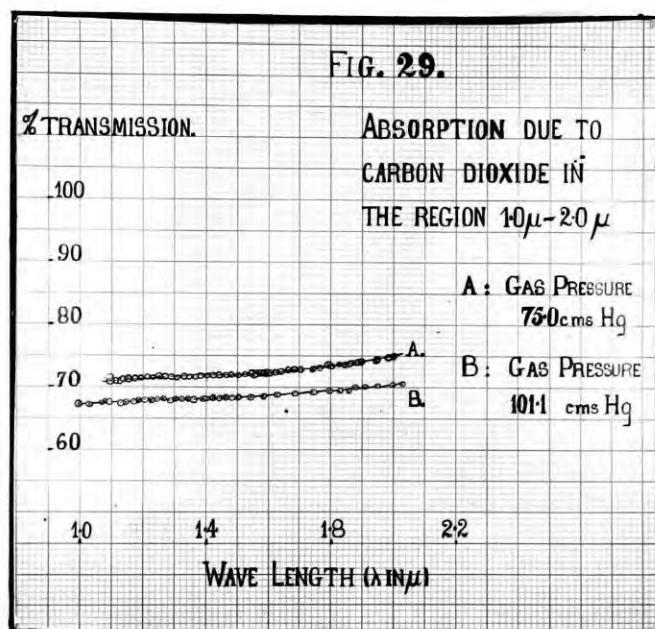


FIG. 29.

Fig. 29.

Absorption due to Carbon Dioxide in the region $1.0\mu - 2.0\mu$.

A. Prism Temperature 21.5°C .

Wadsworth Mirror set at 20.1°C .

Gas Pressure 75.0 cms. Mercury.

Entrance slit $2\frac{1}{2}/1000''$; Exit slit $2\frac{1}{2}/1000''$.

B. Prism Temperature 22.8°C .

Wadsworth Mirror set at 20.1°C .

Gas Pressure 101.1 cms. Mercury.

Entrance slit $2\frac{1}{2}/1000''$; Exit slit $2\frac{1}{2}/1000''$.

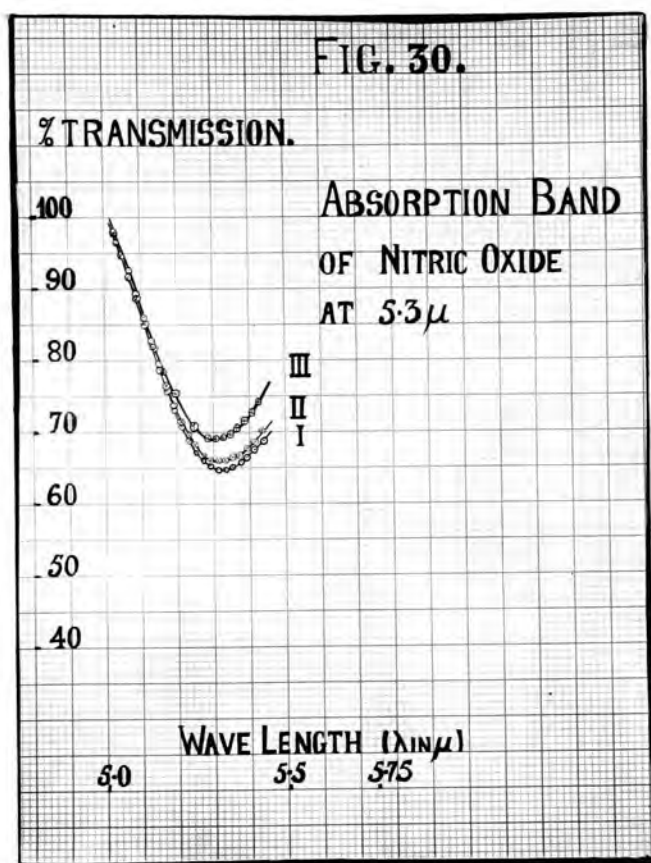


FIG. 30.

Fig. 30.

Absorption Band of Nitric Oxide at 5.30 μ .

<u>Case No.</u>	<u>Prism Temp.</u>	<u>Wadsworth Mirror Set at.</u>	<u>Width. Entrance Slit.</u>	<u>Width. Exit Slit.</u>	<u>Max. Absor.</u>	<u>Gas Pressure.</u>	<u>% Abs. Gas Pressure.</u>
I.	20.5°C.	23.9°C.	10/1000"	10/1000"	35%	69 cms.	.51
11.	20.8°C.	23.9°C.	10/1000"	10/1000"	34%	65 cms.	.52
111.	19.5°C.	23.9°C.	10/1000"	10/1000"	31%	64 cms.	.48

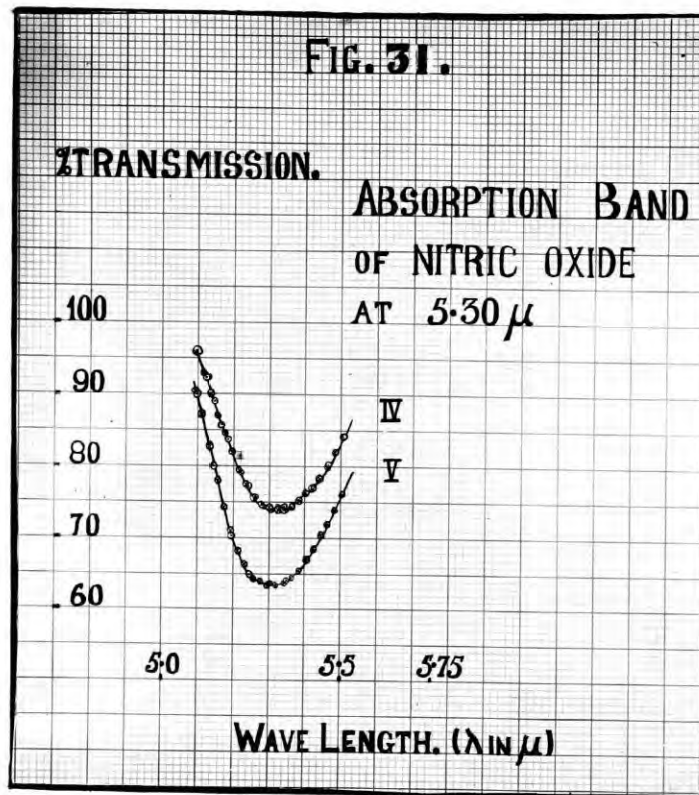


FIG. 31.

Fig. 31.

Absorption Band of Nitric Oxide at 5.30 μ .

Case No.	Prism Temp.	Wadsworth Mirror Set at.	Entrance Slit.	Exit Slit.	Max. Absorption.	Gas Pressure cms. Mercury.	Abs. Gas Pressure
IV.	20.3°C.	20.1°C.	10/1000"	10/1000"	26%	52.0	.50
V.	20.8°C.	20.1°C.	10/1000"	10/1000"	36.5%	73.0	.50

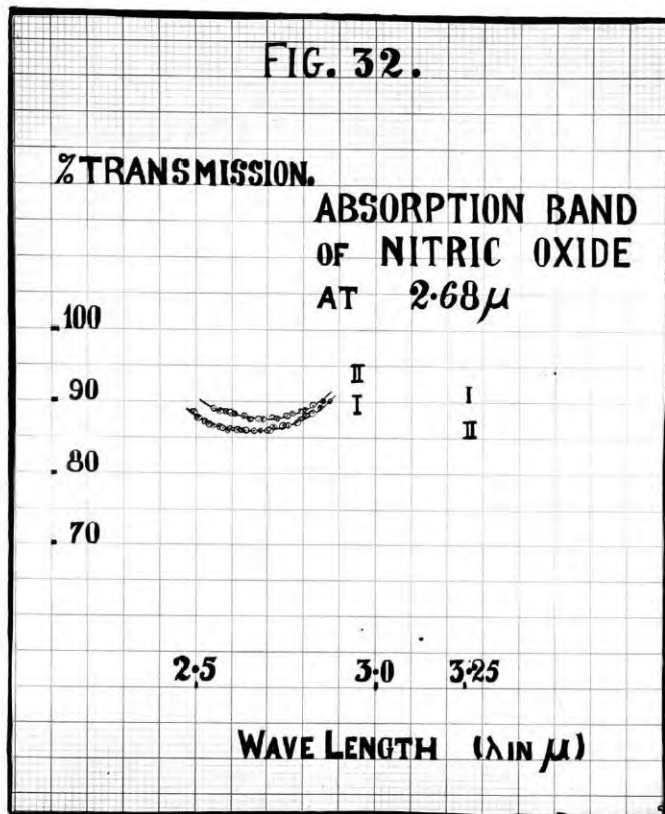


FIG. 32.

Fig. 32.

Absorption Band of Nitric Oxide at 2.68μ .

Case No.	Prism Temp.	Wadsworth Mirror Set at.	Entrance Slit.	Exit Slit.	Gas Pressure.
.	27.1°C.	20.8°C.	5/1000"	5/1000"	52.0 cms. Mercury.
1.	23.3°C.	20.8°C.	7½/1000"	7½/1000"	52.0 cms. Mercury.

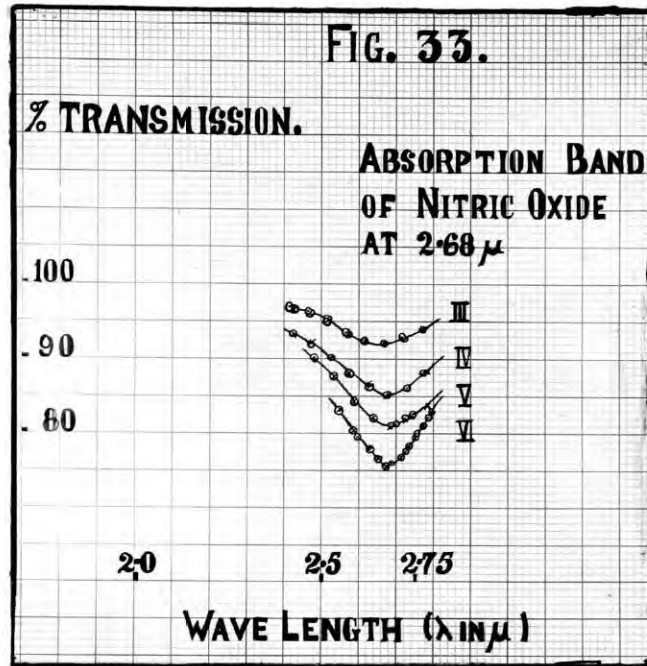


FIG. 33.

Fig. 33.

Absorption Band of Nitric Oxide at 2.68 μ .

Case No.	Prism Temp.	Wedsworth Mirror set pt.	Entrance Slit.	Exit Slit	Max. Absorption %.	Gas Pressure cms. Hg.	Abs. Gas Pressure.
III.	19.2°C.	19.3°C.	5/1000"	5/1000"	8.0	46	0.17
IV.	18.4°C.	19.3°C.	5/1000"	5/1000"	15.0	86.0	0.18
V.	17.6°C.	19.3°C.	5/1000"	5/1000"	19.0	114	0.16
VI.	16.8°C.	19.3°C.	5/1000"	5/1000"	24.0	143	0.17

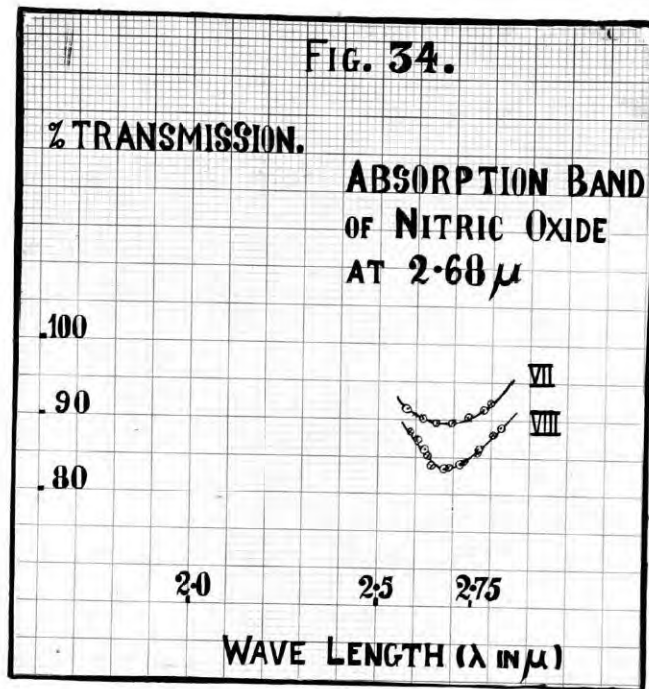


FIG. 34.

Fig. 34.

Absorption Band of Nitric Oxide at 2.68 μ .

Case No.	Prism Temp.	Wadsworth Mirror Set at.	Entrance Slit.	Exit Slit.	Max. Abs.	Gas Pressure cms. Hg.	Abs. % Gas Pressure.
VII.	19.9°C.	20.1°C.	5/1000"	5/1000"	10.5%	62.0	.17
VIII.	19.6°C.	20.1°C.	5/1000"	5/1000"	16.0%	94.0	.17

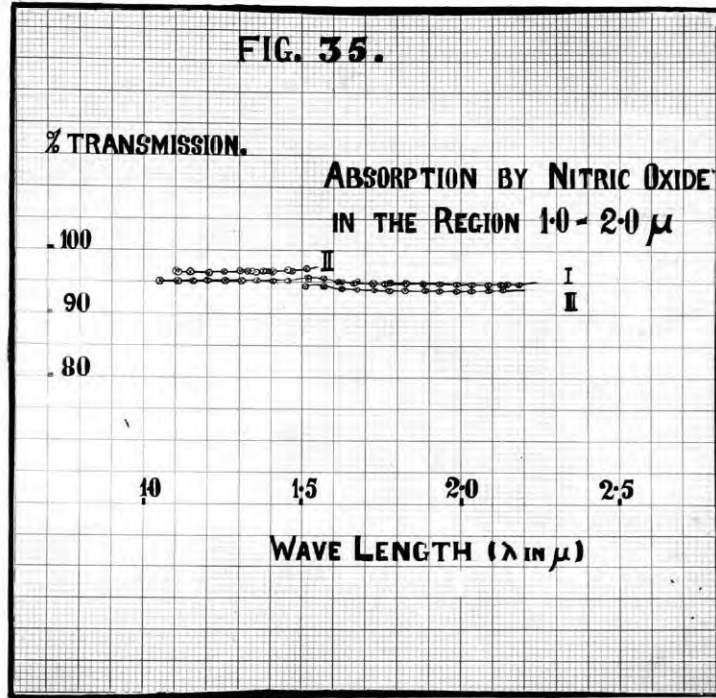


FIG. 35.

Fig. 35.

Absorption by Nitric Oxide in the Region 1.0μ - 2.20μ .

Case No.	Prism Temp.	Wadsworth Mirror Set at.	Entrance Slit.	Exit Slit.	Gas Pressure cms. Hg.
1.	18.7°C. 17.8°C.	20.1°C. 20.1°C.	2 $\frac{1}{2}$ /1000" "	2 $\frac{1}{2}$ /1000" "	70.0 cms. "
11.	20.1°C. 18.8°C.	20.1°C. 20.1°C.	2 $\frac{1}{2}$ /1000" "	2 $\frac{1}{2}$ /1000" "	57.0 cms. "
111.	17.4°C. 16.6°C.	20.1°C. 20.1°C.	2 $\frac{1}{2}$ /1000" "	2 $\frac{1}{2}$ /1000" "	84.1 cms. "

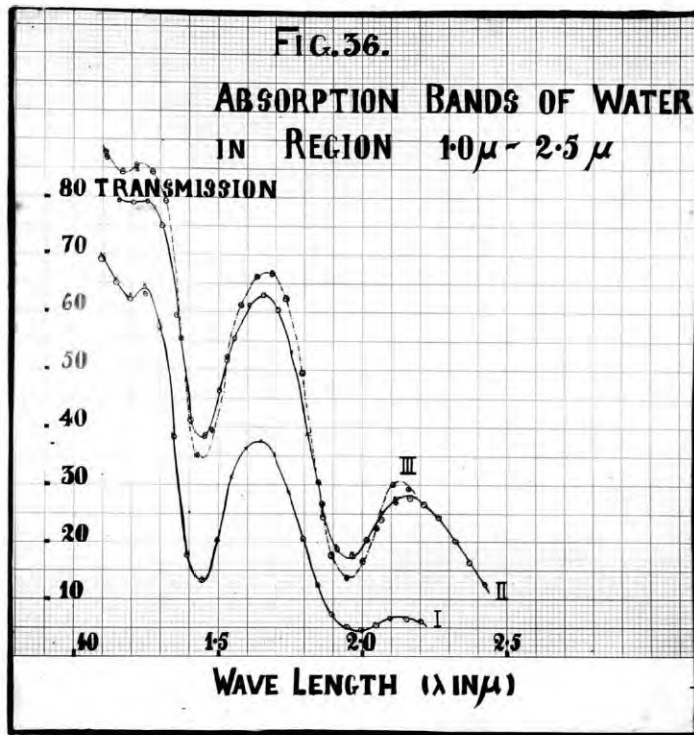


FIG. 36.

Fig. 36.

Absorption Bands of Water in the Region $1.0\mu - 2.5\mu$.

Case No.	Prism Temp.	Wadsworth Mirror Set at.	Entrance Slit.	Exit Slit.	Thickness of film.
1.	27.6°C.	27.0°C.	5/1000"	2½/1000"	0.1 cms.
11.	26.4°C.	27.0°C.	5/1000"	2½/1000"	0.05 cms.
111.	22.9°C.	27.0°C.	2½/1000"	2½/1000"	0.05 cms.

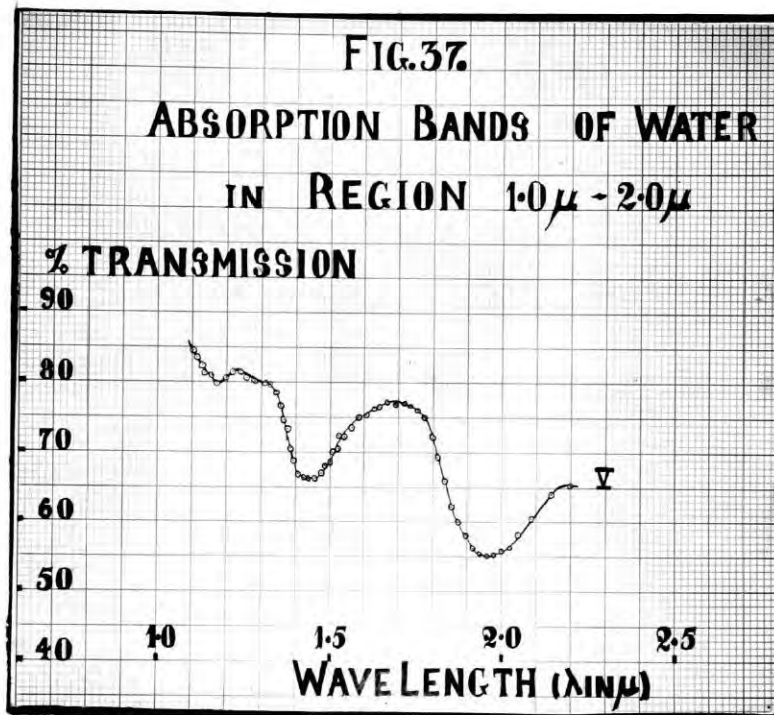


FIG. 37.

Fig. 37.

Absorption Bands of Water in the Region 1.0μ - 2.0μ .

Case V. Prism Temperature 24.0°C .

Wadsworth Mirror set at 27.0°C .

Slits:- (Entrance $2\frac{1}{8}/1000''$.
(Exit $2\frac{1}{8}/1000''$.)

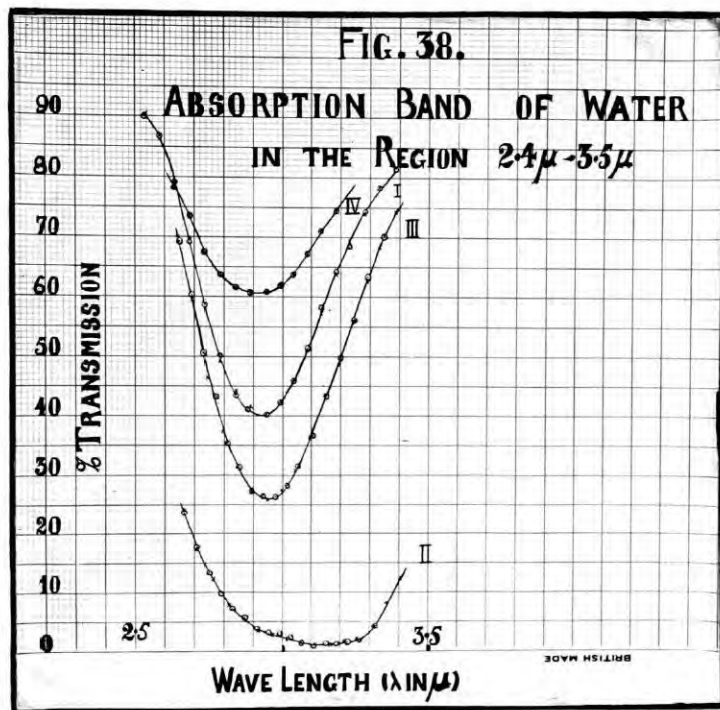


FIG. 38.

Fig. 38.

Absorption Band of Water at 3.0μ .

Case No.	Prism Temp.	Wadsworth Mirror Set at.	Entrance Slit.	Exit Slit.	Thickness of film.
I.	25.5°C.	27°C.	2.5/1000"	2.5/1000"	1/100 mm.
II.	23.2°C.	27°C.	2.5/1000"	2.5/1000"	$\frac{1}{2}$ mm.
III.	24.5°C.	27°C.	2.5/1000"	2.5/1000"	1/50 mm.
IV.	25.4°C.	27°C.	2.5/1000"	2.5/1000"	1/200 mm.

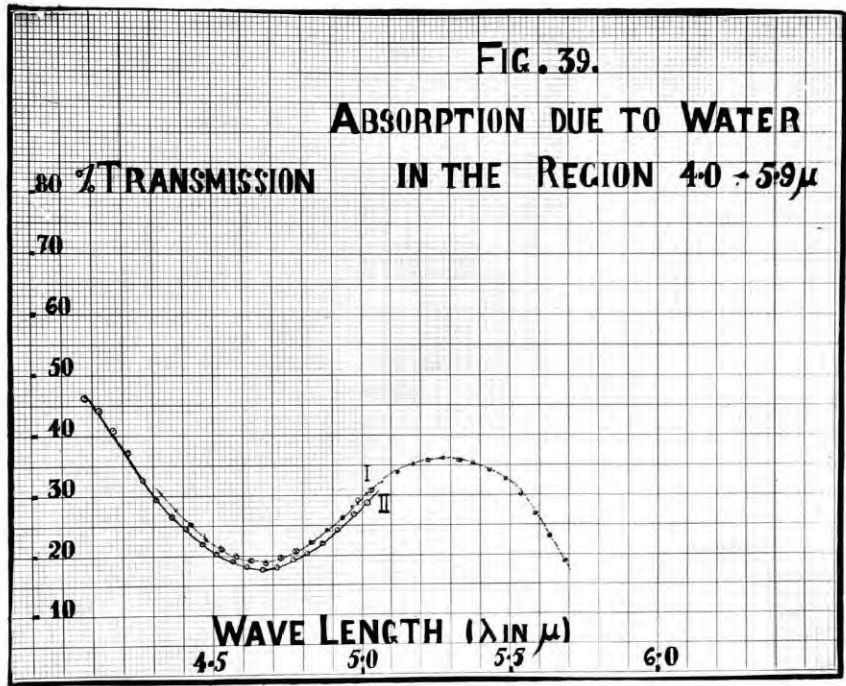


FIG. 39.

Fig. 39.

Absorption Due to Water in the Region $4.0\mu - 5.9\mu$.

Case.1	Prism Temperature 22.8°C .	Entrance Slit $7\frac{1}{2}/1000$ "	Thickness of film
	Wadsworth set at 27°C .	Exit Slit $5/1000$ "	$1/200$ mm
Case.11.	Prism Temperature 24.3°C .	Entrance Slit $7\frac{1}{2}/1000$ "	Thickness of film
	Wadsworth set at 27°C .	Exit Slit $5/1000$ "	$1/250$ mm

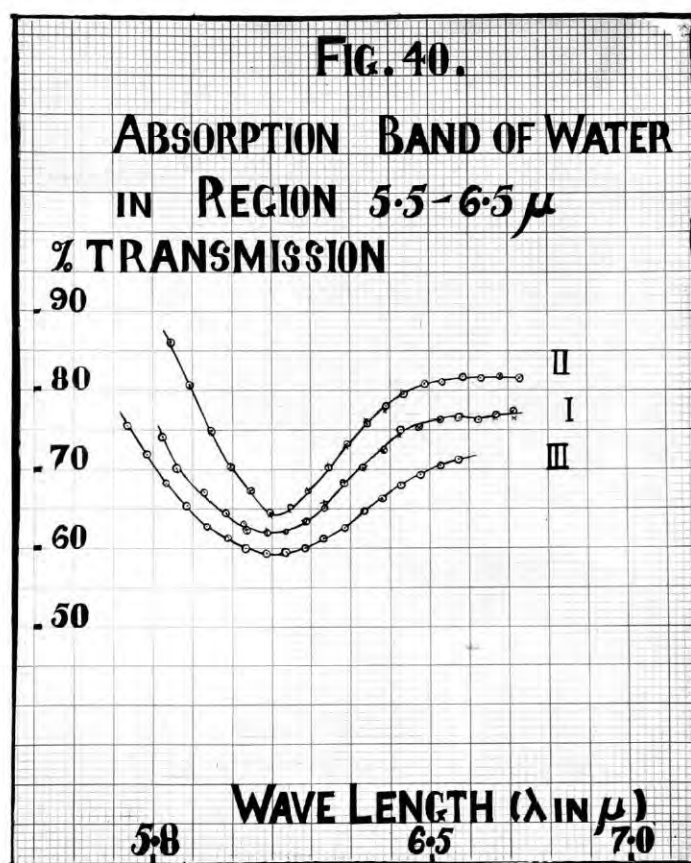


FIG. 40.

Fig. 40.

Absorption Band of Water in the Region 3.5μ - 6.5μ .

Case No.	Prism Temp.	Wadsworth Mirror Set at.	Entrance Slit.	Exit Slit.	Thickness of liquid film.
1.	25°C.	27°C.	7.5/1000"	7.5/1000"	1/200 mm.
11.	23.9°C.	27°C.	7.5/1000"	7.5/1000"	1/250 mm.
111.	25.2°C.	27°C.	7.5/1000"	5/1000"	1/100 mm.

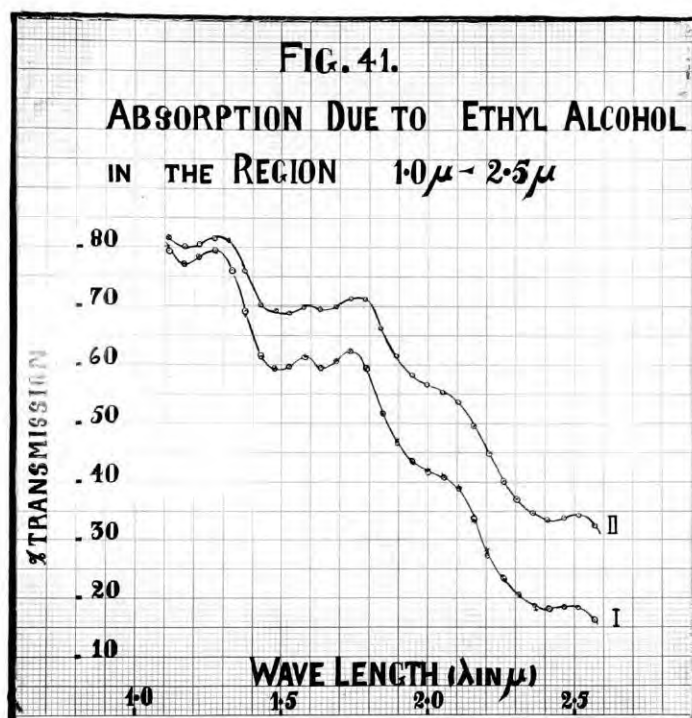


FIG. 41.

Fig. 41.

Absorption Due to Ethyl Alcohol in the Region $1.0\mu - 2.5\mu$.

Case No.	Prism Temp.	Wadsworth Mirror set at.	Entrance Slit.	Exit Slit.	Thickness of liquid film.
1.	23.1°C.	27°C.	2.5/1000".	2.5/1000".	1 mm.
11.	23.4°C.	27°C.	2.5/1000".	2.5/1000".	0.75 mm.

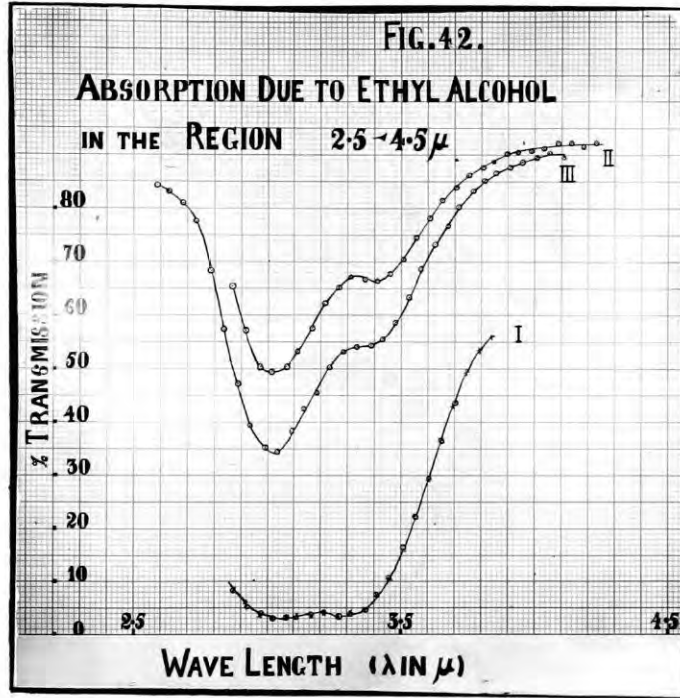


FIG. 42.

Fig. 42.

Absorption Due to Ethyl Alcohol in the Region $2.5\mu - 4.5\mu$.

Case No.	Prism Temp.	Wadsworth Mirror Set at.	Entrance Slit.	Exit Slit.	Thickness of film.
1.	23.4°C.	27°C.	4/1000".	4/1000"	1 mm.
11.	23.4°C.	27°C.	4/1000".	4/1000"	0.5 mm.
111.	22.1°C.	27°C.	5/1000".	2.5/1000"	0.7 mm.

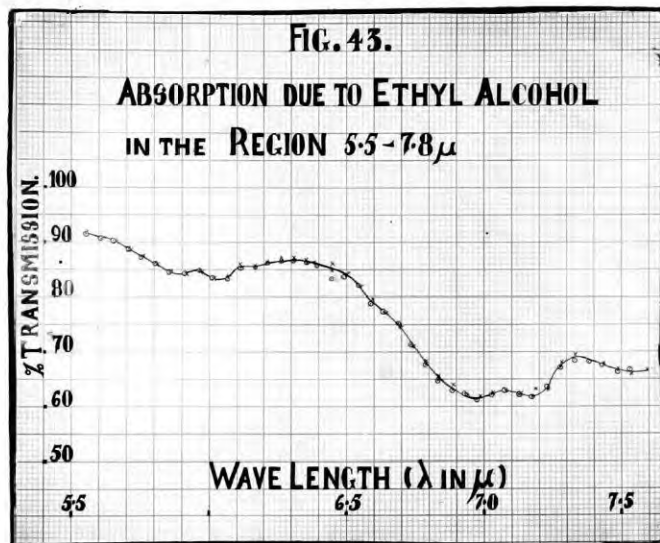


FIG. 43.

Fig. 43.

Absorption Due to Ethyl Alcohol in the Region $5.5\mu - 8.0\mu$.

Prism Temperature 22.4°C . Entrance Slit $7.5/1000''$.

Wadsworth Mirror set at 27°C . Exit Slit $5/1000''$.

Thickness of Liquid Film $1/50$ mm.

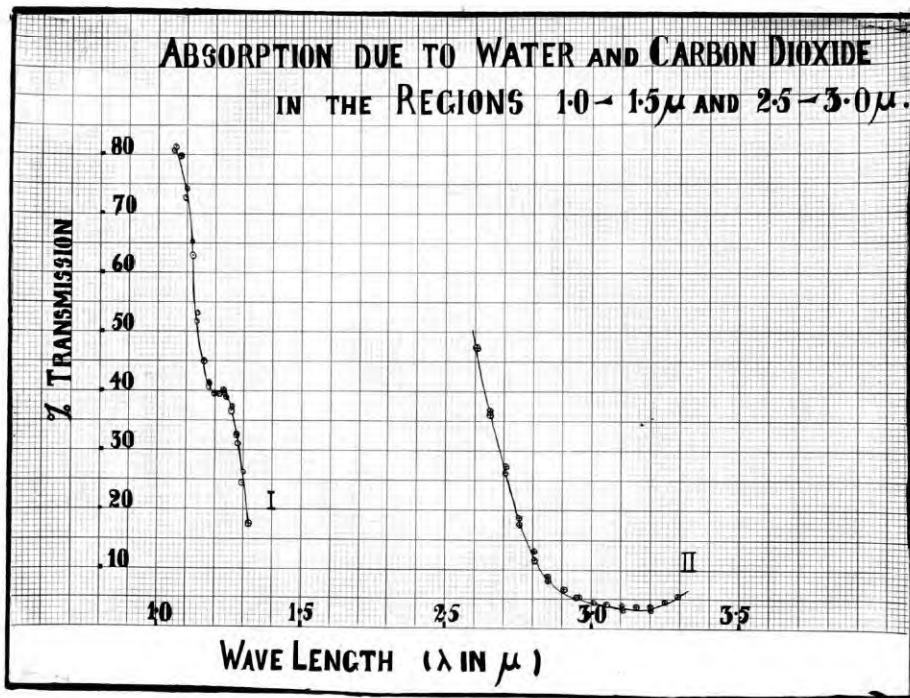

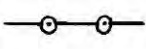


FIG. 44.

Fig. 4.

Absorption Due to Water and Carbon Dioxide.

Case No.	Prism Temp.	Wadsworth Mirror Set pt.	Entrance Slit.	Exit Slit.		
1.	26.6°C. 27.2°C.	27°C. 27°C.	2.5/1000" 2.5/1000"	2.5/1000" 2.5/1000"	Water + Carbon Dioxide	Water.
1.	28°C.	27°C.	2.5/1000"	2.5/1000"	"	"

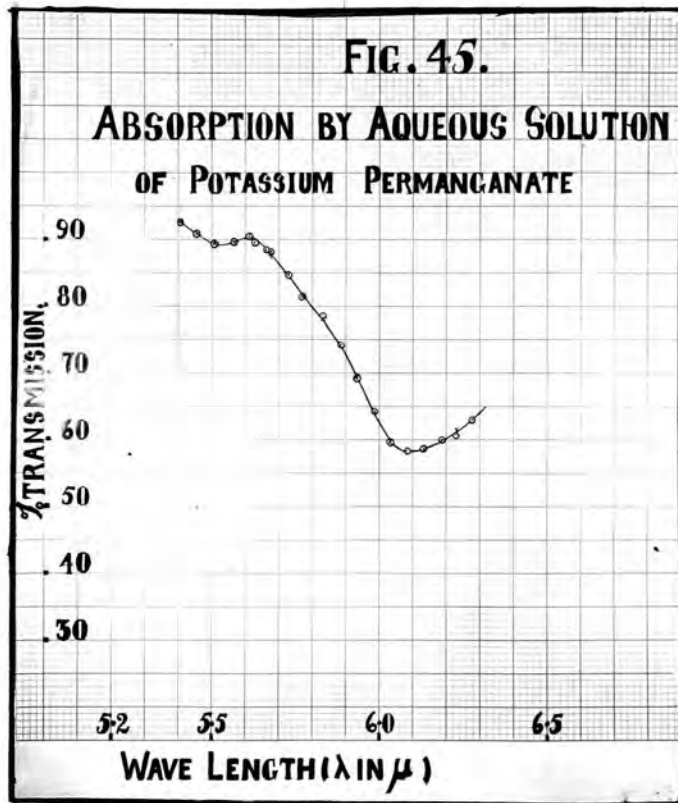


FIG. 45.

Fig. 45.

Absorption Due to an Aqueous Solution of
Potassium Permanganate.

Prism Temperature 23.5°C . Entrance Slit $7.5/1000''$ }
Wadsworth Mirror set at 27°C . Exit Slit $5/1000''$ }
Thickness of Liquid Film $1/100$ mm.

W.S.W. / 25.

