

Fig. 10.

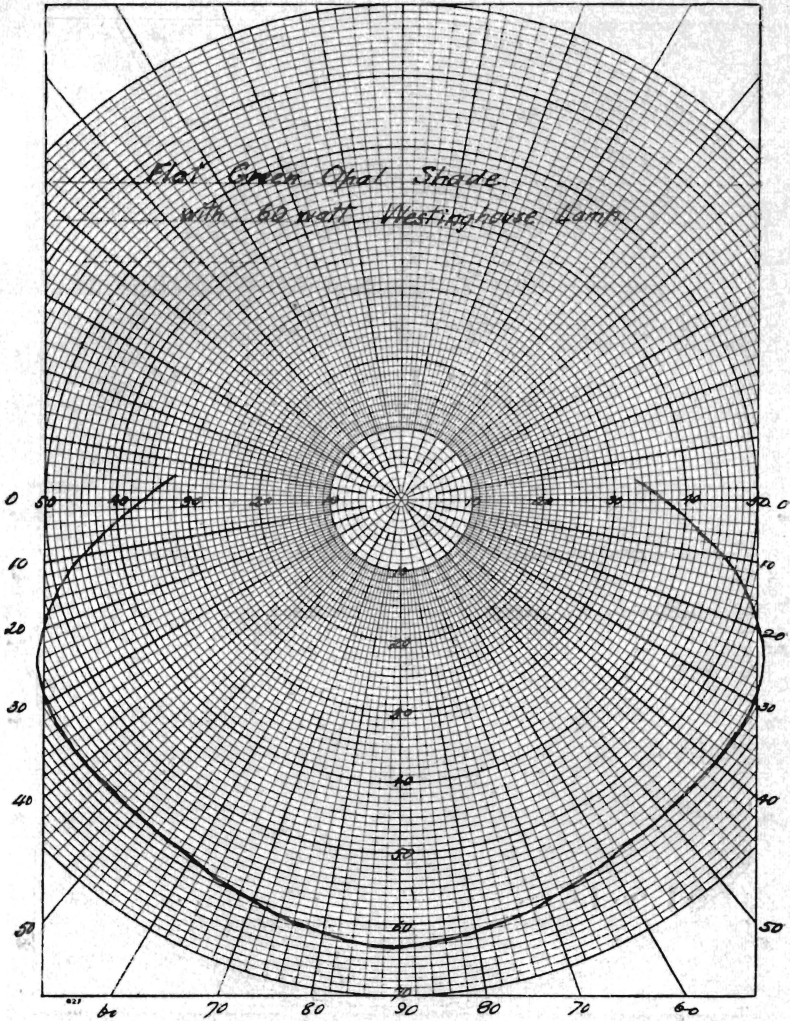


Fig. 11.

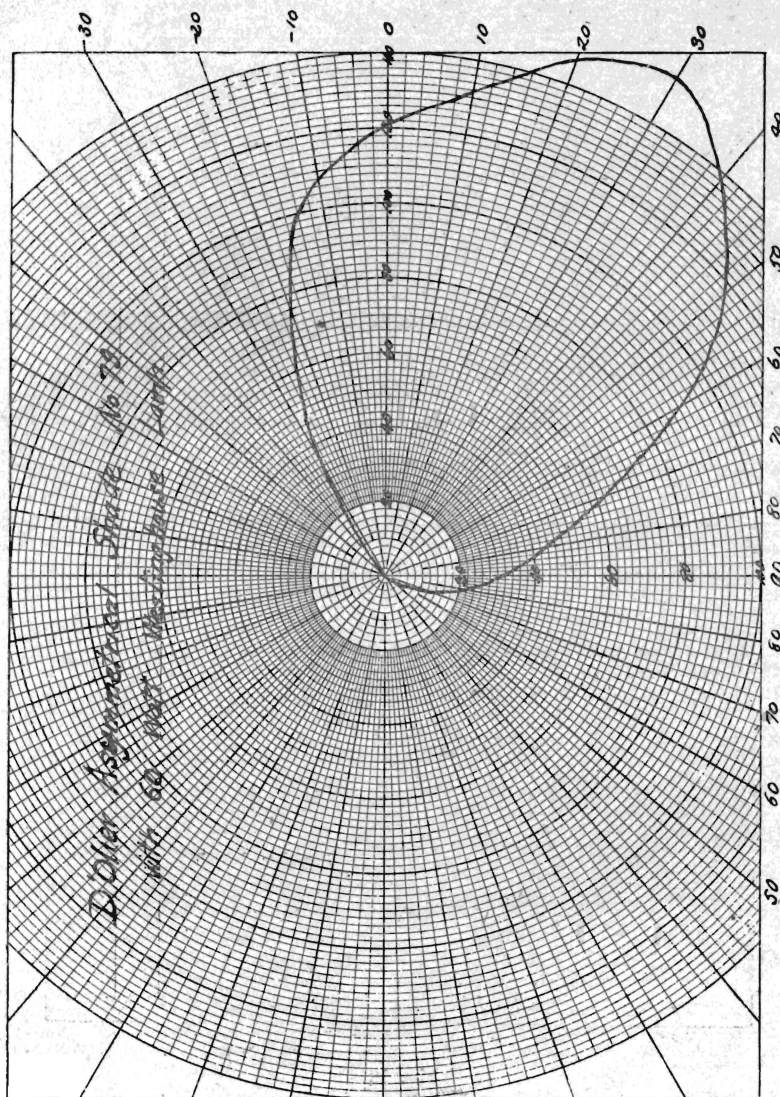


Fig. 13.

The readings were taken with a Trotter portable photometer, provided with a flicker head, and also an attachment for measuring horizontal illumination direct. The instrument contains two standard lamps, which give a measurable range of intensities from .1 to 5 foot candle.

For comparison, some figures are also given of the lighting by gas and electricity of some schoolrooms in Germany (Table IX), and of some experiments made by Messrs. Murphy and Morgan, in which one particular room was illuminated by seven different methods (Table VIII).

In conclusion, the authors desire to express their thanks to the authorities of the Public Works Department for their permission in allowing this paper to be read before the Society, and to the authors of the following publications: "Radiation, Light and Illumination," by C. P. Steinmetz; "The Subtractive Production of Artificial Daylight," by Ives and Luckiesh ("Electrical World," 4th May, 1911); "Chromatic Aberration and Visual Acuity," by Dr. Louis Bell ("Electrical World," 11th May, 1911; "Comparative Costs of Illuminants," by Bryant and Hake ("Electrical World," 29th December, 1910); "The Distribution of Energy in Spectra," by L. Gaster ("Electrician," 10th December, 1909); "Distribution and Efficiency Tests on Lamp Shades," Murphy and Morgan ("Electrical Review," July 7th and 14th, 1911; "A New Method of Measuring Intrinsic Brilliancy," Ives and Luckiesh ("Electrical World," 16th February, 1911); "Table of Illumination Requirements" ("Illuminating Engineer," October, 1911); "Table of Inverted Lighting Results" ("Illuminating Engineer," April, 1911); "Illumination of Schoolrooms in Germany" ("Illuminating Engineer," May, 1911.

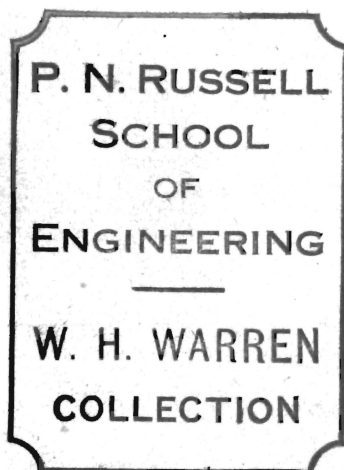


TABLE VIII.
Experiments by MURPHY & MORGAN.

1. Ref. No.	2. Maximum illumination, ft. candles.	3. Minimum illumination, ft. candles.	4. Mean illumination, ft. candles.	5. Magnification of illumination due to shade.	6. Shade Efficiency.	7. Illumination Efficiency.	8. Diversity Factor.	9 REMARKS.
I.	3.87	2.10	2.88	1.00	100%	32.2%	1.84	Ceiling and walls well illuminated, glare from lamps considerable.
II.	6.44	2.84	4.21	1.46	81.3%	46.8%	2.27	Lamps fitted at height recommended by shade makers.
III.	5.85	2.86	3.92	1.36	82.1%	43.7%	2.04	Ceiling and walls fairly bright, lamp filaments entirely screened.
IV.	6.08	2.84	4.38	1.52	82.1%	48.8%	2.14	Ceiling only slightly illuminated, glare worse than III. but not excessive.
V.	5.01	2.63	3.84	1.33	57.8%	42.8%	1.9	Ceiling quite dark, illumination very uniform.
VII.	2.43	.954	1.5	—	—	39.5%	2.55	Excellent general illumination, no glare, very soft shadows.

* Illumination efficiency = Useful light at table level.

Total light produced by lamps.

- I. Bare Lamps.
- II. Lamps with Holophane Reflector (Intensive).
- III. " " " (Semi extensive).
- IV. " " " 10" x 5" Conical Opal Shades.
- V. " " " " Iron (Enamelled).
- VI. Silvered Glass Reflector.
- VII. Semi Indirect Lighting (3 lamps in opal glass bowl).

TABLE IX.

ILLUMINATION IN SCHOOLROOMS IN GERMANY.

(Based on figures derived from data presented by the Munich Commission and other authorities, and tabulated in Grundzuge der Beleuchtungstechnik (L. Bloch), p. 124).

Nature of Lighting.	No. of Lamps.	Power consumed per lamp.	Floor Area (sq. ft.)	Total watts per square foot (approx.)	Total watts per sq. foot per ft. candle.	Illumination in foot candles.			Diversity coefficient
						Mean.	Max.	Min.	Max. Min.
ELECTRIC.		Watts.							
D. C. Arc Lamps, Vertical Carbons.	3	770	1,700	1.35	0.23	5.7	6.9	4.6	1.5
	2	550	780	1.4	0.27	5.2	7.0	3.5	1.95
	2	605	1,040	1.2	0.21	5.7	—	—	—
	4	540	1,650	1.3	0.32	4.0	5.5	2.45	2.2
	2	550	780	1.4	0.33	4.2	5.8	2.45	2.4
D. C. Inverted Arcs.	3	735	1,700	1.3	0.15	8.9	11.2	6.7	1.7
	2	715	1,700	1.25	0.155	8.0	9.7	6.3	1.55
	2	650	780	1.7	0.245	6.9	11.0	3.6	3.0
		Consumption in cub. ft. per hour per lamp.		Total consumption cub. ft. per hour per sq. ft.	Total consumption cub. ft. per hr. per sq. ft. per ft. candle.				
GAS.									
Low Pressure	52	3.8	1,700	0.12	0.016	7.4	8.6	6.0	1.4
Inct.	14	4.2	1,040	0.06	0.0145	4.1	—	—	—
High Pressure (Selas).	10	13.2	1,700	0.08	0.011	7.0	8.0	6.1	1.3
High Pressure (Millenium).	8	17.1	1,700	0.08	0.0115	6.9	8.5	5.8	1.45
	6	8.6	840	0.06	0.0095	6.2	6.7	5.3	1.25