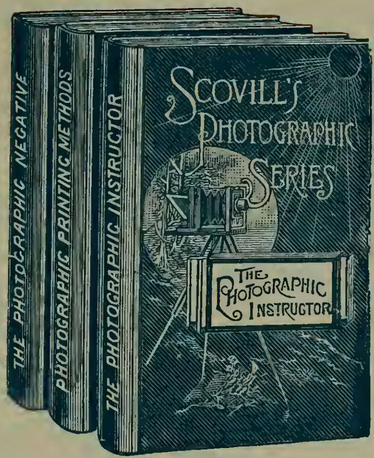
THE AMERICAN ANNUAL of PHOTOGRAPHY and PHOTOGRAPHIC TIMES ALMANAC for 1892

THE SCOVILL

PHOTOGRAPHIC SERIES.



Price Per Copy.

No. 1.—**THE PHOTOGRAPHIC AMATEUR.**—By J. TRAILL TAYLOR. A Guide to the Young Photographer, either Professional or Amateur. (Second Edition.) Paper Covers.......... $0 50
Library Edition. Reduced to.......... 75

No. 2.—Out of Print.

No. 3.—Out of Print.

No. 4.—**HOW TO MAKE PICTURES.**—By HENRY CLAY PRICE. (Fourth Edition.) The A B C of Dry-Plate Photography. Paper covers.......... 50
Library Edition.......... 75

No. 5.—**PHOTOGRAPHY WITH EMULSIONS.**—By Capt. W. DE W. ABNEY, R.E., F.R.S. A treatise on the theory and practical working of Gelatine and Collodion Emulsion Processes. (Second Edition.) Paper covers.......... 75
Library Edition.......... 1 00

No. 6.—Out of Print.

No. 7.—**THE MODERN PRACTICE OF RETOUCHING NEGATIVES.**—As practiced by M. Piguepé, and other celebrated experts. (Seventh Edition.) Paper covers.......... 50
Library Edition.......... 75

No. 8.—**LIGERAS LECCIONES SOBRE FOTOGRAFIA DEDICADOS A LOS AFICIONADOS.**—Paper covers.......... 50
Library Edition. Reduced to.......... 75

THE SCOVILL PHOTOGRAPHIC SERIES.

No. 9.—TWELVE ELEMENTARY LESSONS IN PHOTOGRAPHIC CHEMISTRY.—Presented in very concise and attractive shape. (Second Edition.)
Paper covers.................................... $0 50
Library Edition.................................... 75

No. 10.—Out of print.

No. 11.—Out of print.

No. 12.—HARDWICH'S PHOTOGRAPHIC CHEMISTRY.—A manual of photographic chemistry, theoretical and practical. (Ninth Edition.) Edited by J. TRAILL TAYLOR. Leatherette binding. Reduced to........ 2 00

No. 13.—TWELVE ELEMENTARY LESSONS ON SILVER PRINTING. (Second Edition.) Paper covers. 50

No. 14.—ABOUT PHOTOGRAPHY AND PHOTOGRAPHERS.—A series of interesting essays for the studio and study, to which is added European Rambles with a Camera. By H. BADEN PRITCHARD, F.C.S. Paper covers.. 50
Library Edition...... 75

No. 15.—THE CHEMICAL EFFECT OF THE SPECTRUM.—By Dr. J. M. EDER. Of value to Orthochromatic Workers. Paper covers...................... 25
Library Edition.................................... 50

No. 16.—PICTURE MAKING BY PHOTOGRAPHY.—By H. P. ROBINSON. Author of Pictorial Effect in Photography. Written in popular form and finely illustrated. Paper covers............................ 75
Library Edition.................................... 1 00

No. 17.—Out of print.

No. 18.—Out of print.

No. 19.—Out of print.

No. 20.—DRY-PLATE MAKING FOR AMATEURS.—By GEO. L. SINCLAIR, M.D. Pointed, practical, and plain. Leatherette Binding........................ 50

No. 21.—THE AMERICAN ANNUAL OF PHOTOGRAPHY AND PHOTOGRAPHIC TIMES ALMANAC FOR 1877. (Second Edition.) Paper cover (postage twelve cents additional)............................ 50
Library Edition (postage twelve cents additional).... 1 00

No. 22.—PHOTOGRAPHIC PRINTING METHODS.—By the REV. W. H. BURBANK. A Practical Guide to the Professional and Amateur Worker. (Third Edition.) Cloth bound.................................... 1 00

THE SCOVILL PHOTOGRAPHIC SERIES.

No. 23.—A HISTORY OF PHOTOGRAPHY.—Writen as a Practical Guide and an Introduction to its Latest Developments, by W. JEROME HARRISON, F.G.S., and containing a frontispiece of the author. Cloth bound.... $1 00

No. 24.—THE AMERICAN ANNUAL OF PHOTOGRAPHY AND PHOTOGRAPHIC TIMES ALMANAC FOR 1888.—Illustrated. Second Edition. Paper (by mail twelve cents additional)...................... 50
Library Edition (by mail twelve cents additional).... 1 00

No. 25.—THE PHOTOGRAPHIC NEGATIVE.—A Practical Guide to the preparation of sensitive surfaces by the calotype, albumen, collodion and gelatine processes, on glass and paper, with supplementary chapter on development, etc., by the Rev. W. H. BURBANK. Cloth bound. Reduced to.......................... 1 00

No. 26.—THE PHOTOGRAPHIC INSTRUCTOR.—For the professional and amateur. Being the comprehensive series of Practical Lessons issued to the students of the Chautauqua School of Photography. Revised and enlarged. Edited by W. I. LINCOLN ADAMS, with an Appendix by Prof. CHARLES EHRMANN. Third edition. Paper covers.............................. 1 00
Library Edition.................................. 1 50

No. 27.—LETTERS ON LANDSCAPE PHOTOGRAPHY.—By H. P. ROBINSON. Finely illustrated from the Author's own photographs and containing a photogravure frontispiece of the Author. Cloth bound.... 1 50

No. 28.—THE AMERICAN ANNUAL OF PHOTOGRAPHY AND PHOTOGRAPHIC TIMES ALMANAC FOR 1889. Out of print.

No. 29.—THE PROCESSES OF PURE PHOTOGRAPHY.—By W. K. BURTON and ANDREW PRINGLE. A standard work, very complete and freely illustrated. Paper covers.. 2 00
Library Edition.................................. 2 50

No. 30.—PICTORIAL EFFECT IN PHOTOGRAPHY.—By H. P. ROBINSON. A new edition. Illustrated. Mr. Robinson's first and best work. Cloth bound........ 1 50

No. 31.—A DICTIONARY OF PHOTOGRAPHY.—For the Professional and Amateur Photographer. By E. J. WALL. Illustrated. Cloth bound.................. 1 50

No. 32.—PRACTICAL PHOTO-MICROGRAPHY. — Finely illustrated. By ANDREW PRINGLE. Cloth bound.... 2 50

PHOTO & COPYRIGHT. 1891. BY H. McMICHAEL.

N.Y. PHOTO-GRAVURE CO.

FLIRTATION

The American Annual of Photography and Photographic Times Almanac for 1892

New York.
The Scovill & Adams Company.

Photo. Times Print.

PREFACE.

IN presenting this, the sixth volume of THE AMERICAN ANNUAL OF PHOTOGRAPHY, to the photographic fraternity, the publishers and editors wish to express their appreciation for the kindly interest which has been shown in its preparation by all—writers, illustrators, and advertisers. They desire to thank all who have participated in making this volume the success which they cannot help but feel it is. The authors have united to make the book an adequate record of photographic progress during the year 1891; the illustrators have exhibited in the pictures which embellish the volume the advances which have been made not only in the reproduction processes now in general use, but also in the various departments of practical photography—pictorial and scientific; and the advertisers have furnished not the least important part of the book in presenting to its readers a completer list of photographic materials, apparatus, and novelties, than has ever before been collected in such a publication. All are entitled to the gratitude of the reader, and in presenting the result of the combined efforts of all to the SIXTEEN THOUSAND photographers in various parts of the world, to which this book will go, the wish and confident expectation that the efforts of all will be duly appreciated, is indulged by

THE PUBLISHERS.

Table of Contents.

INDEX TO CONTRIBUTED ARTICLES.

AUTHOR'S INDEX.

ILLUSTRATIONS.

INDEX TO CALENDARS, FORMULAS, TABLES, ETC.

INDEX TO ADVERTISEMENTS.

REFERENCE CALENDAR FOR THREE YEARS.

1891

	S	M	T	W	T	F	S		S	M	T	W	T	F	S		S	M	T	W	T	F	S
Jan.	..	..	..	..	1	2	3	May	..	..	..	..	..	1	2	Sept.	..	..	1	2	3	4	5
	4	5	6	7	8	9	10		3	4	5	6	7	8	9		6	7	8	9	10	11	12
	11	12	13	14	15	16	17		10	11	12	13	14	15	16		13	14	15	16	17	18	19
	18	19	20	21	22	23	24		17	18	19	20	21	22	23		20	21	22	23	24	25	26
	25	26	27	28	29	30	31		24	25	26	27	28	29	30		27	28	29	30	..	..	..
	..	..	..	..	..	..	..		31	..	..	..	..	..	..	Oct.	..	..	..	..	1	2	3
Feb.	1	2	3	4	5	6	7	June	..	1	2	3	4	5	6		4	5	6	7	8	9	10
	8	9	10	11	12	13	14		7	8	9	10	11	12	13		11	12	13	14	15	16	17
	15	16	17	18	19	20	21		14	15	16	17	18	19	20		18	19	20	21	22	23	24
	22	23	24	25	26	27	28		21	22	23	24	25	26	27		25	26	27	28	29	30	31
	..	..	..	..	..	..	..		28	29	30	..	..	..	..		..	..	..	..	..	..	..
Mar.	1	2	3	4	5	6	7	July	..	..	..	1	2	3	4	Nov.	1	2	3	4	5	6	7
	8	9	10	11	12	13	14		5	6	7	8	9	10	11		8	9	10	11	12	13	14
	15	16	17	18	19	20	21		12	13	14	15	16	17	18		15	16	17	18	19	20	21
	22	23	24	25	26	27	28		19	20	21	22	23	24	25		22	23	24	25	26	27	28
	29	30	31	..	..	..	..		26	27	28	29	30	31	..		29	30	..	..	..	..	..
April	..	..	..	1	2	3	4	Aug.	..	..	..	..	..	..	1	Dec.	..	..	1	2	3	4	5
	5	6	7	8	9	10	11		2	3	4	5	6	7	8		6	7	8	9	10	11	12
	12	13	14	15	16	17	18		9	10	11	12	13	14	15		13	14	15	16	17	18	19
	19	20	21	22	23	24	25		16	17	18	19	20	21	22		20	21	22	23	24	25	26
	26	27	28	29	30	..	..		23	24	25	26	27	28	29		27	28	29	30	31	..	..
	..	..	..	..	..	..	..		30	31	..	..	..	..	..		..	..	..	..	..	..	..

1892

	S	M	T	W	T	F	S		S	M	T	W	T	F	S		S	M	T	W	T	F	S
Jan.	..	..	..	..	..	1	2	May	1	2	3	4	5	6	7	Sept.	..	..	..	..	1	2	3
	3	4	5	6	7	8	9		8	9	10	11	12	13	14		4	5	6	7	8	9	10
	10	11	12	13	14	15	16		15	16	17	18	19	20	21		11	12	13	14	15	16	17
	17	18	19	20	21	22	23		22	23	24	25	26	27	28		18	19	20	21	22	23	24
	24	25	26	27	28	29	30		29	30	31	..	..	..	..		25	26	27	28	29	30	..
	31	..	..	..	..	..	..	June	..	..	..	1	2	3	4	Oct.	..	..	..	..	..	..	1
Feb.	..	1	2	3	4	5	6		5	6	7	8	9	10	11		2	3	4	5	6	7	8
	7	8	9	10	11	12	13		12	13	14	15	16	17	18		9	10	11	12	13	14	15
	14	15	16	17	18	19	20		19	20	21	22	23	24	25		16	17	18	19	20	21	22
	21	22	23	24	25	26	27		26	27	28	29	30	..	..		23	24	25	26	27	28	29
	28	29	..	..	..	..	..	July	..	..	..	..	..	1	2		30	31	..	..	..	..	..
Mar.	..	..	1	2	3	4	5		3	4	5	6	7	8	9	Nov.	..	..	1	2	3	4	5
	6	7	8	9	10	11	12		10	11	12	13	14	15	16		6	7	8	9	10	11	12
	13	14	15	16	17	18	19		17	18	19	20	21	22	23		13	14	15	16	17	18	19
	20	21	22	23	24	25	26		24	25	26	27	28	29	30		20	21	22	23	24	25	26
	27	28	29	30	31	..	..		31	..	..	..	..	..	..		27	28	29	30	..	..	..
April	..	..	..	..	..	1	2	Aug.	..	1	2	3	4	5	6	Dec.	..	..	..	..	1	2	3
	3	4	5	6	7	8	9		7	8	9	10	11	12	13		4	5	6	7	8	9	10
	10	11	12	13	14	15	16		14	15	16	17	18	19	20		11	12	13	14	15	16	17
	17	18	19	20	21	22	23		21	22	23	24	25	26	27		18	19	20	21	22	23	24
	24	25	26	27	28	29	30		28	29	30	31	..	..	..		25	26	27	28	29	30	31

1893

	S	M	T	W	T	F	S		S	M	T	W	T	F	S		S	M	T	W	T	F	S
Jan.	1	2	3	4	5	6	7	May	..	1	2	3	4	5	6	Sept.	..	..	..	..	..	1	2
	8	9	10	11	12	13	14		7	8	9	10	11	12	13		3	4	5	6	7	8	9
	15	16	17	18	19	20	21		14	15	16	17	18	19	20		10	11	12	13	14	15	16
	22	23	24	25	26	27	28		21	22	23	24	25	26	27		17	18	19	20	21	22	23
	29	30	31	..	..	..	..		28	29	30	31	..	..	..		24	25	26	27	28	29	30
Feb.	..	..	..	1	2	3	4	June	..	..	..	..	1	2	3	Oct.	1	2	3	4	5	6	7
	5	6	7	8	9	10	11		4	5	6	7	8	9	10		8	9	10	11	12	13	14
	12	13	14	15	16	17	18		11	12	13	14	15	16	17		15	16	17	18	19	20	21
	19	20	21	22	23	24	25		18	19	20	21	22	23	24		22	23	24	25	26	27	28
	26	27	28	..	..	..	..		25	26	27	28	29	30	..		29	30	31	..	..	..	..
Mar.	..	..	..	1	2	3	4	July	..	..	..	..	..	..	1	Nov.	..	..	..	1	2	3	4
	5	6	7	8	9	10	11		2	3	4	5	6	7	8		5	6	7	8	9	10	11
	12	13	14	15	16	17	18		9	10	11	12	13	14	15		12	13	14	15	16	17	18
	19	20	21	22	23	24	25		16	17	18	19	20	21	22		19	20	21	22	23	24	25
	26	27	28	29	30	31	..		23	24	25	26	27	28	29		26	27	28	29	30	..	..
April	..	..	..	..	..	..	1		30	31	..	..	..	..	..	Dec.	..	..	..	..	..	1	2
	2	3	4	5	6	7	8	Aug.	..	..	1	2	3	4	5		3	4	5	6	7	8	9
	9	10	11	12	13	14	15		6	7	8	9	10	11	12		10	11	12	13	14	15	16
	16	17	18	19	20	21	22		13	14	15	16	17	18	19		17	18	19	20	21	22	23
	23	24	25	26	27	28	29		20	21	22	23	24	25	26		24	25	26	27	28	29	30
	30	..	..	..	..	..	..		27	28	29	30	31	..	..		31	..	..	..	..	..	..

CENTURY CALENDAR.

For explanation see opposite page.

Table 1. Years 1800-1901.

For economy of space, the century prefixes "18" and "19" have been omitted.

00	01	02	03	**04**	04	05
06	07	**08**	08	09	10	11
12	12	13	14	15	**16**	16
17	18	19	**20**	20	21	22
23	**24**	24	25	26	27	**28**
28	29	30	31	**32**	32	33
34	35	**36**	36	37	38	39
40	40	41	42	43	**44**	44
45	46	47	**48**	48	49	50
51	**52**	52	53	54	55	**56**
56	57	58	59	**60**	60	61
62	63	**64**	64	65	66	67
68	68	69	70	71	**72**	72
73	74	75	**76**	76	77	78
79	**80**	80	81	82	83	**84**
84	85	86	87	**88**	88	89
90	91	**92**	92	93	94	95
96	96	97	98	99	00	01

Table 2. 1st day of Month.

JAN	W	Th	F	S	𝕾	M	Tu
FEB	S	𝕾	M	Tu	W	Th	F
MAR	S	𝕾	M	Tu	W	Th	F
APL	Tu	W	Th	F	S	𝕾	M
MAY	Th	F	S	𝕾	M	Tu	W
JUNE	𝕾	M	Tu	W	Th	F	S
JULY	Tu	W	Th	F	S	𝕾	M
AUG	F	S	𝕾	M	Tu	W	Th
SEP	M	Tu	W	Th	F	S	𝕾
OCT	W	Th	F	S	𝕾	M	Tu
NOV	S	𝕾	M	Tu	W	Th	F
DEC	M	Tu	W	Th	F	S	𝕾

Table 3. Days of Month.

1	𝕾	M	Tu	W	Th	F	S	1
2	M	Tu	W	Th	F	S	𝕾	2
3	Tu	W	Th	F	S	𝕾	M	3
4	W	Th	F	S	𝕾	M	Tu	4
5	Th	F	S	𝕾	M	Tu	W	5
6	F	S	𝕾	M	Tu	W	Th	6
7	S	𝕾	M	Tu	W	Th	F	7
8	𝕾	M	Tu	W	Th	F	S	8
9	M	Tu	W	Th	F	S	𝕾	9
10	Tu	W	Th	F	S	𝕾	M	10
11	W	Th	F	S	𝕾	M	Tu	11
12	Th	F	S	𝕾	M	Tu	W	12
13	F	S	𝕾	M	Tu	W	Th	13
14	S	𝕾	M	Tu	W	Th	F	14
15	𝕾	M	Tu	W	Th	F	S	15
16	M	Tu	W	Th	F	S	𝕾	16
17	Tu	W	Th	F	S	𝕾	M	17
18	W	Th	F	S	𝕾	M	Tu	18
19	Th	F	S	𝕾	M	Tu	W	19
20	F	S	𝕾	M	Tu	W	Th	20
21	S	𝕾	M	Tu	W	Th	F	21
22	𝕾	M	Tu	W	Th	F	S	22
23	M	Tu	W	Th	F	S	𝕾	23
24	Tu	W	Th	F	S	𝕾	M	24
25	W	Th	F	S	𝕾	M	Tu	25
26	Th	F	S	𝕾	M	Tu	W	26
27	F	S	𝕾	M	Tu	W	Th	27
28	S	𝕾	M	Tu	W	Th	F	28
29	𝕾	M	Tu	W	Th	F	S	29
30	M	Tu	W	Th	F	S	𝕾	30
31	Tu	W	Th	F	S	𝕾	M	31

EXPLANATION OF CENTURY CALENDAR.

(See opposite page.)

To ascertain the day of the week corresponding to any date from the 1st January, 1800, to the 31st of December, 1901, both inclusive: find the given year in Table 1, and follow downward the vertical column containing it, until reaching, in Table 2, the horizontal line beginning with the given month; at the intersection of the column and line will be found the day of the week with which the month commences. In Table 3, find the vertical column beginning with that day of the week, and follow it downward until reaching the horizontal line beginning with the given day of the month; at the intersection of the column and line will be found the day of the week corresponding to the given year, month and day.

NOTE.—Leap-years will be found entered twice in Table 1; first in heavy-faced type; and afterward in ordinary characters. The first entry is to be used when the given date is in January or February of the given year; the second, (ordinary type), when falling in any other month.

EXAMPLES.—Given the 29th of February, 1824:—To find the day of the week on which it fell. Under the first entry of 24, in Table 1, and opposite Feb., in Table 2, is found Sunday. Under Sunday in Table 3, and opposite 29, is found Sunday, which is the required day of the week. Given the 22d of December, 1864:—Under the second entry of 64, in Table 1, and opposite Dec., in Table 2, is found Th. In Table 3, under Th., and opposite 22, is found Th., which is the required day of the week. Given the 12th of September, 1855:—Under 55, in Table 1, and opposite Sept., in Table 2, is found S. In Table 3, under S and opposite 12, is found W., which is the required day of the week.

ECLIPSES IN 1892.

NOTE.—*Local mean time for the latitude of New York City is used in reckoning eclipses, sunset and sunrise. Subtract four minutes to change the reckoning to Eastern standard time of 75th meridian.*

Moons' phases are calculated for Eastern standard time. "Morn." is understood to extend from Midnight to Noon; "Eve." from Noon to Midnight.

There will be four eclipses in 1892.

I.—*A total eclipse of the Sun*, April 26, invisible at Washington.

II.—*A partial eclipse of the Moon*, May 11, partly visible at Washington, the moon rising eclipsed. Moon enters penumbra, 2.46 p.m. Middle of eclipse, 5.45 p.m. Moon leaves penumbra, 8.45 p.m.

III.—*A partial eclipse of the Sun*, October 20, visible at Washington. Eclipse begins 11.15 a.m. Greatest eclipse, 1.36 p.m. Eclipse ends, 3.57 p.m.

IV.—*A total eclipse of the Moon*, November 4, invisible at Washington.

THE SEASONS.

SPRING begins	March 19, 10 p.m.	AUTUMN begins	September 22, 9 a.m.
SUMMER begins	June 20, 6 p.m.	WINTER begins	December 20, 11 p.m.

CHURCH DAYS.

Septuagesima	Feb. 14	Easter Sunday	April 17
Sexagesima	Feb. 21	Low Sunday	April 24
Quinquagesima	Feb. 28	Rogation Sunday	May 22
Ash Wednesday	March 2	Ascension Day	May 26
Quadragesima	March 6	Whitsunday [Pent.]	June 5
Mid-Lent Sunday	March 27	Trinity Sunday	June 12
Palm Sunday	April 10	Corpus Christi	June 16
Good Friday	April 15	Advent Sunday	Nov. 27

CHRONOLOGICAL CYCLES.

Dominical Letter	C, B.
Epact	1
Golden Number (Lunar Cycle)	12
Solar Cycle	25
Roman Indiction	5

CHRONOLOGICAL ERAS.

The year 1892, which comprises the latter part of the 116th and the beginning of the 117th year of the INDEPENDENCE OF THE UNITED STATES OF AMERICA, corresponds to the year 6605 of the JULIAN PERIOD; the years 7400-7401 of the BYZANTINE ERA; the years 5652-53 of the JEWISH ERA; the year 2645 since the FOUNDATION OF ROME, according to Varro; the year 2668 of the OLYMPIADS; the year 1608 of the era of DIOCLETIAN; the year 2552 of the JAPANESE ERA; the years 1309-10 of the MOHAMMEDAN ERA.

The 1st day of January of the year 1892 is the 2,412,099th day since the commencement of the JULIAN PERIOD.

The JULIAN CALENDAR, which is still used in the Russian empire, dates twelve days back of our own—the GREGORIAN CALENDAR. Thus a letter from St. Petersburg dated January 1st was really written on January 13th.

The Russians generally use, in official documents and frequently in business correspondence, two dates, which they call "old style" and "new style;" and in Alaska three dates have been used on their documents, because the early navigators forgot to make allowance for the crossing of the 180th meridian in sailing from Siberia to North America.

JANUARY, 1892.

1st MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
1	**1**	F	7 25	4 43
2	**2**	Sa	7 25	4 44
3	**3**	$	7 25	4 45
4	**4**	M	7 25	4 46
5	**5**	Tu	7 25	4 47
6	**6**	W	7 25	4 48
7	**7**	Th	7 25	4 49
8	**8**	F	7 24	4 50
9	**9**	Sa	7 24	4 51
10	**10**	$	7 24	4 52
11	**11**	M	7 24	4 53
12	**12**	Tu	7 23	4 54
13	**13**	W	7 23	4 55
14	**14**	Th	7 23	4 56
15	**15**	F	7 22	4 57
16	**16**	Sa	7 22	4 59
17	**17**	$	7 21	5 00
18	**18**	M	7 21	5 01
19	**19**	Tu	7 21	5 02
20	**20**	W	7 20	5 03
21	**21**	Th	7 19	5 04
22	**22**	F	7 18	5 05
23	**23**	Sa	7 17	5 07
24	**24**	$	7 17	5 08
25	**25**	M	7 16	5 09
26	**26**	Tu	7 16	5 10
27	**27**	W	7 15	5 11
28	**28**	Th	7 14	5 13
29	**29**	F	7 13	5 14
30	**30**	S	7 12	5 15
31	**31**	$	7 12	5 16

Moon's Phases.

First Q., Jan. 6, 8 h. 12 m., eve.
Full M., Jan. 13, 10 h. 27 m., eve.
Last Q., Jan. 21, 10 h. 43 m., eve.
New M., Jan. 29, 11 h. 38 m., morn.

FEBRUARY, 1892.

2d MONTH. 29 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
32	**1**	M	7 11	5 18
33	**2**	Tu	7 10	5 19
34	**3**	W	7 09	5 20
35	**4**	Th	7 07	5 21
36	**5**	F	7 06	5 22
37	**6**	S	7 05	5 23
38	**7**	$	7 04	5 25
39	**8**	M	7 03	5 26
40	**9**	Tu	7 02	5 27
41	**10**	W	7 01	5 28
42	**11**	Th	7 00	5 30
43	**12**	F	6 58	5 31
44	**13**	S	6 57	5 32
45	**14**	$	6 56	5 34
46	**15**	M	6 55	5 35
47	**16**	Tu	6 53	5 36
48	**17**	W	6 52	5 37
49	**18**	Th	6 51	5 39
50	**19**	F	6 49	5 40
51	**20**	S	6 48	5 41
52	**21**	$	6 46	5 43
53	**22**	M	6 45	5 44
54	**23**	Tu	6 44	5 45
55	**24**	W	6 42	5 46
56	**25**	Th	6 41	5 48
57	**26**	F	6 39	5 49
58	**27**	S	6 38	5 50
59	**28**	$	6 37	5 51
60	**29**	M	6 36	5 52

Moon's Phases.

First Q., Feb. 5, 4 h. 39 m., morn.
Full M., Feb. 12, 2 h. 38 m., eve.
Last Q., Feb. 20, 7 h. 15 m., eve.
New M., Feb. 27, 10 h. 47 m., eve.

MARCH, 1892.

3d MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
61	**1**	Tu	6 35	5 53
62	**2**	W	6 34	5 53
63	**3**	Th	6 32	5 54
64	**4**	F	6 30	5 55
65	**5**	Sa	6 29	5 56
66	**6**	S	6 27	5 57
67	**7**	M	6 25	5 58
68	**8**	Tu	6 24	5 59
69	**9**	W	6 22	6 00
70	**10**	Th	6 20	6 01
71	**11**	F	6 19	6 02
72	**12**	Sa	6 17	6 03
73	**13**	S	6 16	6 04
74	**14**	M	6 14	6 05
75	**15**	Tu	6 12	6 06
76	**16**	W	6 11	6 08
77	**17**	Th	6 09	6 09
78	**18**	F	6 07	6 10
79	**19**	Sa	6 06	6 11
80	**20**	S	6 04	6 12
81	**21**	M	6 02	6 13
82	**22**	Tu	6 01	6 14
83	**23**	W	5 59	6 15
84	**24**	Th	5 58	6 16
85	**25**	F	5 56	6 17
86	**26**	Sa	5 54	6 18
87	**27**	S	5 52	6 19
88	**28**	M	5 51	6 20
89	**29**	Tu	5 49	6 21
90	**30**	W	5 47	6 22
91	**31**	Th	5 45	6 23

Moon's Phases.

First Q., March 5, 2 h. 14 m., eve.
Full M., March 13, 7 h. 55 m., morn.
Last Q., March 21, 0 h. 16 m., eve.
New M., March 28, 8 h. 18 m., morn.

APRIL, 1892.

4th MONTH. 30 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
92	**1**	F	5 44	6 24
93	**2**	Sa	5 42	6 26
94	**3**	S	5 41	6 27
95	**4**	M	5 39	6 28
96	**5**	Tu	5 37	6 29
97	**6**	W	5 36	6 30
98	**7**	Th	5 34	6 31
99	**8**	F	5 33	6 32
100	**9**	Sa	5 31	6 33
101	**10**	S	5 30	6 34
102	**11**	M	5 28	6 35
103	**12**	Tu	5 26	6 36
104	**13**	W	5 25	6 37
105	**14**	Th	5 24	6 38
106	**15**	F	5 22	6 39
107	**16**	Sa	5 20	6 40
108	**17**	S	5 19	6 41
109	**18**	M	5 17	6 42
110	**19**	Tu	5 16	6 43
111	**20**	W	5 11	6 44
112	**21**	Th	5 13	6 45
113	**22**	F	5 11	6 46
114	**23**	Sa	5 11	6 47
115	**24**	S	5 08	6 48
116	**25**	M	5 07	6 49
117	**26**	Tu	5 06	6 50
118	**27**	W	5 04	6 51
119	**28**	Th	5 03	6 52
120	**29**	F	5 02	6 53
121	**30**	Sa	5 00	6 55

Moon's Phases.

First Q., April 4, 1 h. 21 m., morn.
Full M., April 12, 1 h. 26 m., morn.
Last Q., April 20, 1 h. 0 m., morn.
New M., April 26, 4 h. 46 m., eve.

MAY, 1892.

5th MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	Sun sets. H. M.
122	1	S	4 59	6 56
123	2	M	4 58	6 57
124	3	Tu	4 56	6 58
125	4	W	4 55	6 59
126	5	Th	4 54	7 00
127	6	F	4 53	7 01
128	7	Sa	4 52	7 02
129	8	S	4 51	7 03
130	9	M	4 49	7 04
131	10	Tu	4 48	7 05
132	11	W	4 47	7 06
133	12	Th	4 46	7 07
134	13	F	4 45	7 08
135	14	Sa	4 44	7 09
136	15	S	4 43	7 10
137	16	M	4 42	7 11
138	17	Tu	4 41	7 12
139	18	W	4 40	7 13
140	19	Th	4 39	7 14
141	20	F	4 39	7 15
142	21	Sa	4 38	7 16
143	22	S	4 37	7 17
144	23	M	4 36	7 18
145	24	Tu	4 36	7 19
146	25	W	4 35	7 20
147	26	Th	4 34	7 20
148	27	F	4 34	7 21
149	28	Sa	4 33	7 22
150	29	S	4 32	7 23
151	30	M	4 32	7 23
152	31	Tu	4 31	7 24

Moon's Phases.

First Q., May 3, 2 h. 12 m., eve.
Full M., May 11, 5 h. 59 m., eve.
Last Q., May 19, 9 h. 53 m., morn.
New M., May 26, 0 h. 49 m., morn.

JUNE, 1892.

6th MONTH. 30 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	Sun sets. H. M.
153	1	W	4 31	7 24
154	2	Th	4 30	7 25
155	3	F	4 30	7 26
156	4	Sa	4 30	7 26
157	5	S	4 29	7 27
158	6	M	4 29	7 28
159	7	Tu	4 29	7 28
160	8	W	4 29	7 29
161	9	Th	4 28	7 30
162	10	F	4 28	7 30
163	11	Sa	4 28	7 31
164	12	S	4 28	7 31
165	13	M	4 28	7 32
166	14	Tu	4 28	7 32
167	15	W	4 28	7 32
168	16	Th	4 28	7 33
169	17	F	4 28	7 33
170	18	Sa	4 28	7 33
171	19	S	4 28	7 34
172	20	M	4 29	7 34
173	21	Tu	4 29	7 34
174	22	W	4 29	7 34
175	23	Th	4 29	7 34
176	24	F	4 29	7 34
177	25	Sa	4 30	7 35
178	26	S	4 30	7 35
179	27	M	4 30	7 35
180	28	Tu	4 29	7 35
181	29	W	4 29	7 35
182	30	Th	4 29	7 35

Moon's Phases.

First Q., June 2, 4 h. 51 m., morn.
Full M., June 10, 8 h. 32 m., morn.
Last Q., June 17, 4 h. 1 m., eve.
New M., June 24, 9 h. 7 m., morn.

JULY, 1892.

7th MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
183	**1**	F	4 32	7 35
184	**2**	Sa	4 32	7 35
185	**3**	S	4 33	7 34
186	**4**	M	4 33	7 34
187	**5**	Tu	4 34	7 34
188	**6**	W	4 35	7 34
189	**7**	Th	4 35	7 33
190	**8**	F	4 36	7 33
191	**9**	Sa	4 37	7 33
192	**10**	S	4 37	7 32
193	**11**	M	4 38	7 32
194	**12**	Tu	4 39	7 31
195	**13**	W	4 39	7 31
196	**14**	Th	4 40	7 30
197	**15**	F	4 41	7 30
198	**16**	Sa	4 42	7 29
199	**17**	S	4 43	7 29
200	**18**	M	4 44	7 28
201	**19**	Tu	4 44	7 27
202	**20**	W	4 45	7 26
203	**21**	Th	4 46	7 26
204	**22**	F	4 47	7 25
205	**23**	Sa	4 48	7 24
206	**24**	S	4 48	7 23
207	**25**	M	4 49	7 23
208	**26**	Tu	4 50	7 22
209	**27**	W	4 51	7 21
210	**28**	Th	4 52	7 20
211	**29**	F	4 53	7 19
212	**30**	Sa	4 54	7 18
213	**31**	S	4 55	7 17

Moon's Phases.

First Q., July 1, 9 h. 13 m., eve.
Full M., July 9, 8 h. 44 m., eve.
Last Q., July 16, 8 h. 48 m., eve.
New M., July 23, 6 h. 31 m., eve.
First Q., July 31, 2 h. 45 m., eve.

AUGUST, 1892.

8th MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
214	**1**	M	4 56	7 16
215	**2**	Tu	4 57	7 14
216	**3**	W	4 58	7 13
217	**4**	Th	4 59	7 12
218	**5**	F	5 00	7 11
219	**6**	Sa	5 01	7 10
220	**7**	S	5 02	7 09
221	**8**	M	5 03	7 07
222	**9**	Tu	5 04	7 06
223	**10**	W	5 05	7 05
224	**11**	Th	5 06	7 04
225	**12**	F	5 07	7 02
226	**13**	Sa	5 08	7 01
227	**14**	S	5 09	7 00
228	**15**	M	5 10	6 58
229	**16**	Tu	5 11	6 57
230	**17**	W	5 12	6 55
231	**18**	Th	5 13	6 54
232	**19**	F	5 14	6 53
233	**20**	Sa	5 15	6 51
234	**21**	S	5 16	6 50
235	**22**	M	5 17	6 48
236	**23**	Tu	5 17	6 47
237	**24**	W	5 18	6 45
238	**25**	Th	5 19	6 44
239	**26**	F	5 20	6 42
240	**27**	Sa	5 21	6 41
241	**28**	S	5 22	6 39
242	**29**	M	5 23	6 37
243	**30**	Tu	5 24	6 36
244	**31**	W	5 25	6 34

Moon's Phases.

Full M., Aug. 8, 6 h. 57 m., morn.
Last Q., Aug. 15, 1 h., 37 m., morn.
New M., Aug. 22, 5 h. 59 m., morn.
First Q., Aug. 30, 8 h. 29 m., morn.

SEPTEMBER, 1892.

9th MONTH. 30 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	Sun sets. H. M.
245	**1**	Th	5 26	6 33
246	**2**	F	5 27	6 31
247	**3**	Sa	5 28	6 29
248	**4**	$	5 29	6 28
249	**5**	M	5 30	6 26
250	**6**	Tu	5 31	6 24
251	**7**	W	5 32	6 23
252	**8**	Th	5 33	6 21
253	**9**	F	5 34	6 20
254	**10**	Sa	5 35	6 18
255	**11**	$	5 36	6 16
256	**12**	M	5 37	6 15
257	**13**	Tu	5 38	6 13
258	**14**	W	5 39	6 11
259	**15**	Th	5 40	6 09
260	**16**	F	5 41	6 08
261	**17**	Sa	5 42	6 06
262	**18**	$	5 43	6 04
263	**19**	M	5 44	6 03
264	**20**	Tu	5 45	6 01
265	**21**	W	5 46	5 59
266	**22**	Th	5 47	5 58
267	**23**	F	5 48	5 56
268	**24**	Sa	5 49	5 55
269	**25**	$	5 50	5 53
270	**26**	M	5 51	5 52
271	**27**	Tu	5 52	5 50
272	**28**	W	5 53	5 48
273	**29**	Th	5 54	5 46
274	**30**	F	5 54	5 44

Moon's Phases.

Full M., Sept. 6, 4 h. 8 m., eve.
Last Q., Sept. 13, 7 h. 50 m., morn.
New M., Sept., 20, 8 h. 16 m., eve.
First Q., Sept. 29, 1 h. 19 m., morn.

OCTOBER, 1892.

10th MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	Sun sets. H. M.
275	**1**	Sa	5 56	5 43
276	**2**	$	5 57	5 41
277	**3**	M	5 58	5 39
278	**4**	Tu	5 59	5 38
279	**5**	W	6 00	5 36
280	**6**	Th	6 01	5 35
281	**7**	F	6 02	5 33
282	**8**	Sa	6 03	5 31
283	**9**	$	6 04	5 30
284	**10**	M	6 05	5 28
285	**11**	Tu	6 07	5 27
286	**12**	W	6 08	5 25
287	**13**	Th	6 09	5 23
288	**14**	F	6 10	5 22
289	**15**	Sa	6 11	5 20
290	**16**	$	6 12	5 19
291	**17**	M	6 13	5 17
292	**18**	Tu	6 14	5 16
293	**19**	W	6 15	5 14
294	**20**	Th	6 16	5 13
295	**21**	F	6 18	5 12
296	**22**	Sa	6 19	5 10
297	**23**	$	6 20	5 09
298	**24**	M	6 21	5 07
299	**25**	Tu	6 22	5 06
300	**26**	W	6 23	5 04
301	**27**	Th	6 24	5 03
302	**28**	F	6 26	5 02
303	**29**	S	6 27	5 01
304	**30**	$	6 28	4 59
305	**31**	M	6 29	4 58

Moon's Phases.

Full M., Oct. 6, 1 h. 12 m., morn.
Last Q., Oct. 12, 4 h. 38 m., eve.
New M., Oct. 20, 1 h. 21 m., eve.
First Q., Oct. 28, 4 h. 26 m., eve.

NOVEMBER, 1892.

11th MONTH. 30 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	Sun sets. H. M.
306	**1**	Tu	6 30	4 57
307	**2**	W	6 31	4 56
308	**3**	Th	6 32	4 54
309	**4**	F	6 34	4 53
310	**5**	Sa	6 35	4 52
311	**6**	S	6 36	4 51
312	**7**	M	6 37	4 50
313	**8**	Tu	6 38	4 49
314	**9**	W	6 40	4 48
315	**10**	Th	6 41	4 47
316	**11**	F	6 42	4 46
317	**12**	Sa	6 43	4 45
318	**13**	S	6 44	4 44
319	**14**	M	6 46	4 43
320	**15**	Tu	6 47	4 42
321	**16**	W	6 48	4 41
322	**17**	Th	6 49	4 40
323	**18**	F	6 50	4 39
324	**19**	Sa	6 51	4 39
325	**20**	S	6 53	4 38
326	**21**	M	6 54	4 38
327	**22**	Tu	6 55	4 37
328	**23**	W	6 56	4 36
329	**24**	Th	6 57	4 36
330	**25**	F	6 58	4 35
331	**26**	Sa	6 59	4 35
332	**27**	S	7 00	4 35
333	**28**	M	7 01	4 34
334	**29**	Tu	7 03	4 34
335	**30**	W	7 04	4 34

Moon's Phases.

Full M., Nov. 4, 10 h. 49 m., morn.
Last Q., Nov. 11, 5 h. 2 m., morn.
New M., Nov. 19, 8 h. 19 m., morn.
First Q., Nov. 27, 5 h. 28 m., morn.

DECEMBER, 1892.

12th MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	Sun sets. H. M.
336	**1**	Th	7 05	4 34
337	**2**	F	7 06	4 33
338	**3**	Sa	7 07	4 33
339	**4**	S	7 08	4 33
340	**5**	M	7 09	4 32
341	**6**	Tu	7 10	4 32
342	**7**	W	7 11	4 32
343	**8**	Th	7 12	4 32
344	**9**	F	7 13	4 32
345	**10**	Sa	7 14	4 32
346	**11**	S	7 15	4 32
347	**12**	M	7 15	4 32
348	**13**	Tu	7 16	4 33
349	**14**	W	7 16	4 33
350	**15**	Th	7 17	4 33
351	**16**	F	7 18	4 33
352	**17**	Sa	7 18	4 33
353	**18**	S	7 19	4 34
354	**19**	M	7 20	4 34
355	**20**	Tu	7 20	4 35
356	**21**	W	7 21	4 35
357	**22**	Th	7 21	4 36
358	**23**	F	7 22	4 37
359	**24**	Sa	7 22	4 37
360	**25**	S	7 23	4 38
361	**26**	M	7 23	4 39
362	**27**	Tu	7 23	4 39
363	**28**	W	7 23	4 40
364	**29**	Th	7 24	4 40
365	**30**	F	7 24	4 41
366	**31**	Sa	7 24	4 42

Moon's Phases.

Full M., Dec. 3, 9 h. 17 m., eve.
Last Q., Dec. 10, 9 h. 30 m., eve.
New M., Dec. 19, 3 h., 13 m., morn.
First Q., Dec. 26, 4 h. 22 m., eve.

STANDARD TIME.

For the convenience of the traveling public, the railroads of the United States and the Dominion of Canada on the 18th of November, 1883, adopted an arrangement by which 5 time-standards take the place of the 54 previously used in preparing their time-tables.

The standards adopted with names by which they are distinguished, and their distance in longitude and consequent difference in time from Greenwich are shown by the following table.

Name.	Central Meridian		Hours.	
Intercolonial..................	60°	West from Greenwich.	4	Slower than Greenwich.
Eastern......................	75°		5	
Central......................	90°		6	
Mountain.....................	105°		7	
Pacific...	120°		8	

There are thus formed five "Time Belts," each comprising the area lying within 7½ degrees on each side of the different meridians, and measuring approximately 700 miles in breadth. In each of these time-belts, the standard time is one hour faster than in the adjoining time-belt on the West, and one hour slower than in that adjoining on the East. The boundary lines between the different time-belts are not strictly geographical, being arranged to correspond with important railroad points, as follows:—

Intercolonial Times is practically disregarded, as the country included lies so far to the eastward.

Eastern Time prevails over the whole section east of a line drawn frcm Buffalo, N. Y., through Pittsburgh, Pa.; Parkersburgh and Huntington, W. Va.; Bristol, Tenn., and Augusta, Ga., changing at these places (except Grand Trunk, of Canada, which changes at Sarnia) to

Central Time which extends to the irregular line drawn from Brandon, Man., through Mandan, Dak.; North Platte, Neb.; Dodge City, Kan., to El Paso, New Mexico. West of this line,

Mountain Time is in use, and covers the district up to another line, which, starting from Heron, Mont., passes through Ogden, Utah, to Yuma, Ariz.

Pacific Time is used from this line to the Pacific Ocean.

The Standards adopted by the Railroads have also been very generally adopted by the cities and towns throughout the country in place of the local time; from which it may differ by nearly thirty minutes fast or slow, according as the locality is east or west of the standard meridian. The exact *plus* or *minus* correction to be applied in changing from local to standard time or *vice versa* may be easily calculated in the following manner:— Reduce the longitude of the given locality to time (by multlplying the degrees, minutes and seconds by 4, which gives hours, minutes and seconds) and subtract the longitude of the given meridian from it. For example, the longitude of Boston is 71° 4′ = 4h. 44m. Subtracting the longitude of the Eastern Standard Meridian 75° = 5h. from this, gives a *minus* result of 3° 56′ or 15m. 44sec. (say 16m.), as the difference by which Boston local meantime is faster than the Eastern Standard. In a similar manner, the local time of a place 3° 56′ West of the meridian, that is, long. 78° 56′ west, would be 15m. 44 sec. slow.

The following table gives the correction for a number of the principal cities of the continent.

Standard Time Table.

Correction to be applied to local mean time to obtain standard time.

	Standard	Correction		Standard	Correction.		Standard	Correction.
		m.			m.			m.
Eastport, Me. ...	Intercol.	+28	Columbia, S. C...	Eastern.	+24	Memphis, Tenn..	Central.	——
Portland, Me.....	Eastern.	—19	Columbus, O....	Central.	—28	Mobile, Ala......	"	— 8
Montpelier, Vt...	"	—10	Detroit, Mich....	"	—28	New Orleans, La.	"	——
Boston, Mass.....	"	—16	Indianapolis, Ind.	"	—16	Austin, Tex......	"	+31
Springfield, Mass.	"	—10	Chicago, Ill......	"	—10	Cheyenne, Wyo..	Mount'n.	— 1
Providence, R.I.	"	—14	Springfield, Ill...	"	— 2	Denver, Col.	"	——
Hartford, Conn..	"	— 9	Galena, Ill.......	"	+ 2	Santa Fé, N. Mex	"	+ 4
Albany, N. Y....	"	— 5	Milwaukee, Wis.	"	— 8	Helena, Montana	"	—28
New York, N. Y.	"	— 4	St. Paul, Minn...	"	+12	Virginia City, N.	Pacific.	— 2
Utica, N. Y......	"	+ 1	St. Louis, Mo....	"	+ 1	San Franclsco, C.	"	+10
Rochester, N. Y.	"	+11	Lawrence, Kan..	"	+21	Portland Ore.....	"	+11
Philadelphia, Pa.	"	+ 1	Omaha, Neb.....	"	+24	Quebec, Quebec.	Eastern.	—15
Harrisburg, Pa..	"	+ 7	Bismark, Dakota.	"	+43	Montreal, Quebec	"	— 6
Pittsburg, Pa....	"	+20	Savannah, Ga....	"	—36	Ottawa, Ont.....	"	+ 3
Baltimore, Md...	"	+ 6	Milledgeville. Ga	"	—27	Toronto, Ont...	"	+18
Washington, D.C	"	+ 8	Jacksonville, Fla.	"	—33			
Wheeling, W.Va.	"	+23	Louisville, Ky. ..	"	—18			

DIFFERENCE IN TIME (For Cable Purposes),

BETWEEN NEW YORK AND SOME OF THE PRINCIPAL COMMERCIAL CITIES OF THE WORLD.
This Table is Approximate; the odd seconds are not given.

	H.M.		H.M.		H.M.		H.M.
Aden	7 56 F	Brussels	5.14 F	Gibraltar	4 35 F	Moscow	7.25 F
Alexandria	6.56 F	Buenos Ayres	1.02 F	Greenwich	4.56 F	Panama	.12 S
Algiers	5.08 F	Cadiz	4.27 F	Hamburg	5.36 F	Paris	5.02 F
Amsterdam	5.16 F	Calcutta	10.50 F	Havana	.33 S	Rio de Janeiro	2.03 F
Antwerp	5.13 F	Canton	11.31 S	Hong Kong	11.27 S	Rome	5.46 F
Athens	6.31 F	Cape Town	6.10 F	Lisbon	4.19 F	St. Petersburg	6 57 F
Bahia	2.34 F	Christiana	5.39 F	Liverpool	4.44 F	Stockholm	6.08 F
Berlin	5.50 F	Constantinople	6.53 F	London	4.56 F	Sidney	9.59 F
Berne	5.26 F	Copenhagen	5.46 F	Madrid	4.42 F	Valparaiso	.10 F
Bombay	9.48 F	Dublin	4.31 F	Melbourne	9.14 F	Vera Cruz	1.29 S
Bordeaux	4.53 F	Edinburgh	4.43 F	Mexico City	1.40 S	Vienna	6.01 F
Bremen	5.31 F	Geneva	5.21 F	Montevideo	1.11 F	Yokohama	10.45 S

F—*Fast of N. Y. Time.* S—*Slow of N. Y. Time.*

The Difference in time is calculated on actual New York Mean Time, 74° of longitude west of Greenwich. For the new Standard Time, 75th Meridian west of Greenwich, for places west of New York, subtract 4 minutes; for places east of New York, add 4 minutes.

LEGAL HOLIDAYS IN THE VARIOUS STATES.

JANUARY 1. NEW YEAR'S DAY: In Alabama, Arkansas, California, Colorado, Connecticut, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Louisiana, Maine, Maryland, Michigan, Missouri, Nevada, New Jersey, New York, North Carolina, North Dakota, Ohio, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, West Virginia, Wisconsin, and Wyoming.

JANUARY 8. ANNIVERSARY OF THE BATTLE OF NEW ORLEANS: In Louisiana.

* FEBRUARY 22. WASHINGTON'S BIRTHDAY: In Alabama, California, Colorado, Connecticut, Georgia, Idaho, Illinois, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nevada, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Pennsylvania, Rhode Island, South Carolina, South Dakota, Texas, Utah, Virginia, Wisconsin, and Wyoming.

MARCH 1. MARDI GRAS: In Louisiana.

MARCH 2. ANNIVERSARY OF TEXAN INDEPENDENCE: In Texas.

MARCH 4. FIREMEN'S ANNIVERSARY: In New Orleans, La.

APRIL 15, 1892. GOOD FRIDAY: In Louisiana, Maryland, and Pennsylvania.

APRIL 21. ANNIVERSARY OF THE BATTLE OF SAN JACINTO: In Texas.

* APRIL 26. MEMORIAL DAY: In Georgia.

MAY 30. DECORATION DAY: In California, Colorado, Connecticut, Iowa, Illinois, Kansas, Kentucky, Massachusetts, Michigan, Nevada, New Hampshire, New Jersey, New York, North Dakota, Ohio, Oregon, Pennsylvania, Rhode Island, South Dakota, Utah, Vermont, Wisconsin, and Wyoming.

JULY 4. INDEPENDENCE DAY: In all the States except Nebraska.

SEPTEMBER 5, 1892. LABOR DAY: In Colorado, Connecticut, Illinois, Iowa, Kansas, Maine, Massachusetts, Montana, Nebraska, New Hampshire, New Jersey, New York, Ohio, Oregon, Pennsylvania, and Tennessee.

NOVEMBER 8, 1892. GENERAL ELECTION DAY: In California, Kansas, Maryland, Missouri, New Hampshire, New Jersey, New York, North Dakota, Ohio, Oregon, South Carolina, South Dakota, and Wisconsin.

NOVEMBER 24, 1892. THANKSGIVING: Is observed in all the States, though in Nebraska and some others it is not a statutory holiday.

DECEMBER 25. CHRISTMAS DAY: In all the States except Nebraska.

Sundays and Fast Days (whenever appointed) are legal holidays in nearly all the States.

ARBOR DAY is a legal holiday in Idaho and Kansas, the day being set by the Governor. Arbor Day is also a legal holiday in Rhode Island, but does not affect the payment of notes, etc.

In Minnesota, Washington's Birthday is the only general holiday expressly provided by law. As to the maturity of bills and notes, the following days are by implication holidays: Thanksgiving Day, Good Friday, Christmas, January 1st, and July 4th; as to schools—Christmas, January 1st, July 4th, Memorial Day, and Thanksgiving Day.

In Nebraska, there are no legal holidays established by statute. The same is the case in New Mexico,

Every Saturday after 12 o'clock noon is a legal holiday in New York.

---

* *NOTE.*—Holidays falling on Sunday are usually kept on the Monday following.

WEATHER INDICATIONS.

Sunset Colors.—A gray, lowering sunset, or one where the sky is green or yellowish green, indicates rain. A red sunrise, with clouds lowering later in the morning, also indicates rain.

Halo (Sun Dogs).—By halo we mean the large circles, or parts of circles, about the sun or moon. A halo occurring after fine weather indicates a storm.

Corona.—By this term we mean the small colored circles frequently seen around the sun or moon. A corona growing smaller indicates rain; growing larger, fair weather.

Rainbows.—A morning rainbow is regarded as a sign of rain; an evening rainbow, of fair weather.

Sky Color.—A deep blue color of the sky, even when seen through clouds, indicates fair weather; a growing whiteness, an approaching storm.

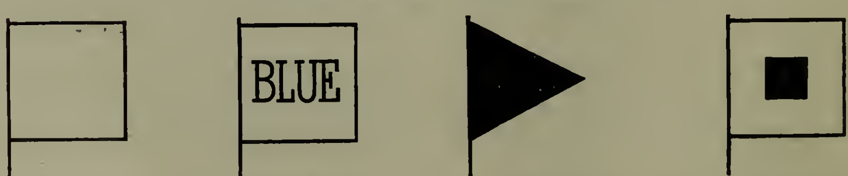
Fog.—Fogs indicate settled weather. A morning fog usually breaks away before noon.

Visibility.—Unusual clearness of the atmosphere, unusual brightness or twinkling of the stars indicates rain.

Clouds.—In observing clouds, we observe their kinds, motions, and outlines. The clouds frequently called "mare's tails" we term Cirri. They are marked by their light texture, fibrous and sundered as in the "mare's tail," or interlacing, as in the far-spreading white cloud, which produces the halo. Small, regularly formed groups of these clouds are frequently seen in fair and settled weather. The Cirri are also the clouds on the forepart of the storm. In this case they are usually more abundant, their outline is very ragged, and they gradually blend into a white, far-reaching cloud bank. The cloud well known as "cotton bales," or "thunder heads," we term cumulus. When they appear during the heat of the day and pass away in the evening, continued fair weather may be expected. When they increase with rapidity, sink into the lower part of the atmosphere, and remain as the evening approaches, rain is at hand. If loose patches appear thrown out from their surfaces, showers may be expected. The clouds usually seen after nightfall, lying in one horizontal plane, and not of great extent, are attendant on fine weather. Small, black, inky clouds and dark scud indicate rain.

Frost.—The first frost and last frost are usually preceded by a temperature very much above the mean.

WEATHER SIGNALS.



WHITE FLAG. CLEAR OR FAIR. | BLUE FLAG. RAIN OR SNOW. | BLACK TRIANGLE. TEMPERATURE. | WHITE, BLACK CENTRE COLD WAVE.

G. LEUPELT, NEG. F. GUTEKUNST, PRINT.

DON'T BE AFRAID.

(*Copyrighted 1891.*)

The American Annual of Photography, and Photographic Times Almanac.

1892.

THE PAST AND FUTURE OF THE ALBUMEN PRINT.

JUDGING from the abuse heaped upon the innocent albumen print by many writers for the journals, a stranger from the planet Mars would doubtless wonder why it is not immediately suppressed. According to these writers, the head and front of its offending is its want of permanency, while, as we are informed, those made on plain paper, gelatine, or collodio-chloride, are much superior in point of durability. Again, it has a vulgar gloss that no person of refined taste can admire, so the alleged critics say.

Yet in spite of all their faults, real and imaginary, those made on albumen paper probably comprise ninety-nine hundredths of all the prints issued from the studios of the world. While it is not to be denied that for certain special purposes the mat surface is preferable, it is neither this nor the low gloss albumen paper that satisfies the general taste. It is the extra brilliant that is wanted, and not only that, but its high gloss must be supplemented by the service of the most approved burnisher known to the craft.

Polish in itself, and in its proper place, is not to be decried. Who would have the beautiful native woods of our own or tropical countries finished with mat surfaces? Or who would prefer the emerald, the sapphire, or the diamond unpolished? Is it not likewise true of most photographs as of these, that burnishing or enameling adds to their beauty by giving greater depth and transparency of shadows, and therefore increased brilliancy of effect?

Present appearances certainly warrant the belief that it will be long before the latter will be superseded in by far the largest part of general photographic work. When was ever suffrage more unanimous than that of which the returns are in from all nations in favor of the albumen print? From Japan to New Zealand, from Australia to Nova Zembla, from Greenland to Terra del Fuego, from continent to continent—in all lands—it is the one chosen medium of transmission for the messages of photography. Such is the verdict in the court of last resort. What has criticism to do but to accept the decree?

In regard to the important question of permanency, I hold that it has not been proved that albumen prints when properly made are not as durable as any other silver prints whatever. There are those made thirty years ago which are still in a state of perfect preservation; and there are many more twenty-five years old in the same condition. What is the lesson to be learned from these facts if it is not that if all had been made in the same way, they might also have been in the same condition to-day. Had this been the case we should now point with pride to their record, instead of making them a by-word and reproach, as is the fashion. Those who unqualifiedly decry albumen prints would do well to wait until it is proved that something better can be produced.

The old prints of thirty years ago were made on very strongly salted paper, which required vigorous negatives and a silver bath fully twice as strong as those now used. These prints took a liberal quantity of gold, and it is not improbable that to the large metalic deposit was due their power to resist agencies which were fatal to weaker fabrics. It is probable also that those which have survived unharmed were properly fixed and washed.

At that time the importance of using only fresh hypo was not thoroughly understood; and many made a practice of using the same solution repeatedly, adding a few crystals each time to keep up its strength. I firmly believe that if the prints made on that highly salted paper, requiring as it did such strength of silver to prevent mealiness, had been fixed and washed as it is now known they ought to have been, they would be to-day to all intents and purposes as good as when first made. I have within two or three years been frequently asked to find negatives made during the war of prints brought for identification; which latter had remained almost entirely unchanged. They may have been and probably were carefully kept, for their originals had long since passed away.

It is, however, not probable that careful keeping would have saved them if they had been fixed in partly decomposed hypo, or if they had not been well washed.

This brings us to consider the reverse side of the subject. If there are some prints in good preservation after twenty-five or thirty years, the number of those which are in the various stages of decay and demoralization is beyond computation. I have in my possession a package of card pictures which I obtained in 1865, just after the close of the war, as souvenirs of that event. As these prints have been always kept together, they afford an interesting study as to the remarkable variety of the changes which time has wrought in them.

Some have partly faded away, having lost all details except in the dark parts. Two plain prints, namely, one of President Johnson and one of Boston Corbett, originally among the best of the lot and printed from faultless negatives, are in a sorry plight, being covered with light spots as of a rash which has eaten through the print. But there is one each of Secretary Chase, McCullough, Gen. Howard, Gen. Custer, Robert Lincoln, and some others, in good condition, of which one of Kit Carson, by J. A. Scholten, of St. Louis, is unexcelled.

There must be some good and sufficient reason for these extreme differences in the behavior of prints kept together in the same package, for the same length of time as these have been; and that can hardly be any other than the differences in the constituents of the prints themselves. Now as all but four of the entire lot were made at the same establishment (two of the four being among the best, and the other two not being the worst of the lot), it is highly probable that the only material difference in their original structure consisted in the different conditions of the hypo bath; that those which are well preserved were fixed in fresh hypo; and that the different degrees of deterioration in the others are the consequences of impure states of this bath. Some of the worst cases may have suffered the additional disadvantage of careless and insufficient washing.

But my alloted space is exhausted, although the subject is not. I believe the albumen print will be the print of the future, as it is that of the present. It is for the present and coming photographers to make its future better and more enduring than its past.

W. H. Sherman.

A "PARALLACTIC" METHOD OF FOCUSING.

Every one who uses a copying camera is well aware of the shortcomings of the ordinary ground glass screen, when it is a question of accurate focusing. The difficulty grows as the scale of enlargement increases; and the employment of a magnifying glass often serves only to make matters worse—as it exaggerates the inherent defects of the ground glass surface to such a degree that the finer lines of the enlarged image are with difficulty seen, and with still greater difficulty brought to a satisfactory focus.

Examine a piece of ground glass with a microscope; it will be found to be not a plane surface, by any means, but a very rough aggregation of hills and valleys, strewn all over with jagged points which reflect the light in all directions. Mathematical accuracy of focus cannot be secured on such a surface; we might as well expect to make fine micrometer measurements on a cobblestone roadway.

In the plan of focusing now proposed in this article, the focusing screen, as such, is discarded altogether (its office being merely to give a general idea of what will appear on the plate), and the image, formed *in space*, is examined and made clear and sharp by a specially made magnifier. The method is called a "parallactic" one, from its likeness to the well-known usage of astronomers in getting a sharp focus on a faint telescopic object. The working eye-pieces of telescopes—as everybody knows who has peeped through them—have one or more fine lines stretched across the field, lying in the precise focal plane of the eye-piece. These lines are variously called "cross-hairs," "spider-lines," "contact-wires," etc., etc. Now when an observer at the eye end of a telescope wishes to assure himself that an object within the field of view is accurately focused, he first brings it into contact with one of the cross-wires of the eye-piece. Then he moves his eye very slightly from one side to the other, or up and down. If the observed object "wabbles" in the slightest degree, as the eye changes place, the focus is at once known to be inexact. (For unless the image and the wire are in the same plane, there will be an apparent movement of the former, due to parallax.) But when, by moving the eye-piece in or out, a position is found in which the object seems quite stationary on the wire, the focus is perfect.

Now, to apply this procedure to the camera:

Get any optician to make what is known as a "positive eye-piece," magnifying, say, twenty or twenty-five times, with two cross-wires placed thus + at its focus. (Such eye-pieces ought not to cost more than $5 each.) Around the tube of this eye-piece have a collar fitted—like the "flange" of a lens —so that when the collar, or flange, rests against the smooth face of the ground glass screen, the cross-wires will be in the exact plane of its roughened or focusing surface, the eye-piece, of course, projecting through an aperture in the glass.

Instead of going to the trouble of boring a hole in the ground glass, the focusing screen could be made in two pieces or strips, leaving an open space as wide as the diameter of the eye-piece tube, along the median line (laterally or vertically, as found most convenient) along which the eye-piece slides; thus giving a choice of objects to focus on.

For example, an 8 x 10 focusing screen adapted in this way for use with an eye-piece of 1 inch outside diameter would be made of two strips each $3\frac{1}{2}$ x 10 inches, fastened in the upper and lower halves of the containing frame, leaving a 1-inch slot for the eye-piece to travel along. These strips are preferably made of *plate* glass with truly parallel surfaces, and they should be selected first of all, and given to the optician so that he can adjust the eye-piece flange to correspond.

To use:—

Get the picture approximately focused on the ground glass strips. Place the eye-piece in the groove. Move it about so that the cross-wires are in contact with any convenient object in the picture. Rack the focusing screen in or out until a movement of the eye in any direction produces no apparent displacement of the image on the wire. The focus is then accurate.

Clarence E. Woodman, Ph.D.

SULPHITES.

Sulphites are now so largely used as constituents of developers and other solutions employed in photography, that it seems desirable to correct certain wide-spread inaccuracies that are to be found, not only in books on photography, but also in books on chemistry. These inaccuracies relate chiefly to the so-called acid sulphites.

Sulphurous acid, H_2SO_3, is a dibasic acid and contains two atoms of hydrogen that can be replaced by two atoms of sodium or potassium, or by an equivalent quantity of some other metal.

The products formed in the first two cases are ordinary or normal sodium sulphite, Na_2SO_3, and normal potassium sulphite, K_2SO_3.

If only half the quantity of sodium or potassium is used, only half the hydrogen will be replaced, and we should expect to obtain the compound, $NaHSO_3$, or $KHSO_3$; the first would be called sodium hydrogen sulphite, sodium bisulphite, or acid sodium sulphite; and the second, potassium hydrogen sulphite, potassium bisulphite, or acid potassium sulphite. Now, it may surprise many photographers to learn that although they may see sodium bisulphite frequently mentioned in photographic formulas, *neither sodium bisulphite nor potassium bisulphite has ever been prepared in anything like a pure condition.* Many attempts have been made, but without success. Among others, Berthelot made many experiments with a view to prepare potassium bisulphite, and I myself have endeavored to prepare both the sodium and the potassium salt under a variety of conditions, but in neither case were the experiments successful.

The reason is that as soon as they are formed, and even in presence of a large quantity of water, the bisulphites change in the manner indicated by the equation $2NaHSO_3 = Na_2S_2O_5 + H_2O$, or $2KHSO_3 = K_2S_2O_5 + H_2O$. In other words, water is eliminated from the bisulphite and a new compound is formed. These compounds, $Na_2S_2O_5$, and $K_2S_2O_5$ are called *anhydro-sulphites*, or, since they arise from alteration of bisulphites, *metabisulphites*.

It will at once be asked, what is the substance that is sold as sodium bisulphite? The answer is that it is usually a very impure substance, consisting of a mixture of the metabisulphite with the sulphate. I analyzed four samples of so-called sodium bisulphite, obtained from some of the best English sources, and found that they contained respectively 8.1; 34.1; 22.3; and 39.0 per cent. of sulphurous anhydride. The percentage of sulphurous anhydride in pure sodium bisulphite would be 65.4. The importance of not using such an impure and variable product is obvious.

In England, and I presume also in America, the only sulphites that can be obtained in a state of purity as ordinary commercial products are crystallized normal sodium sulphite, sodium metabisulphite, and potassium metabisulphite.

Crystallized sodium sulphite, $Na_2SO_3 \cdot 7H_2O$, is usually a very good product, containing only a small quantity of sul phate. It is important to bear in mind, however, that it almost always contains a small quantity of sodium carbonate, which makes it strongly alkaline. The presence of the carbonate can be detected by means of a solution of phenolphthalein, which is turned crimson. Pure sodium sulphite is alkaline to litmus paper, but has no action on phenol-phthalein. When sodium sulphite is used for making up solutions of pyro or quinol, any sodium carbonate that it contains should be neutralized by adding sulphurous acid or some other acid to the solution until it no longer affects phenol-phthalein paper.

Sodium metabisulphite and potassium metabisulphite come into commerce in well defined crystals; the purity being greater, as a rule, the larger the crystals. The potassium salt crystallizes more easily than the sodium salt and is usually purer. Both salts keep well and are readily soluble in water, and their use is to be strongly recommended in place of the very indefinite and impure so-called sodium bisulphite.

Solutions of the metabisulphites are strongly acid, so that no further addition of acid is needed in order to preserve solutions of pyro or quinol.

A solution of a metabisulphite, too, affords the readiest and best means of preparing an acid fixing bath; a definite quantity of the solution is added to a definite quantity of hypo solution.

When the metabisulphites are used in the preparation of developers, it should be remembered that one part of a metabisulphite is equivalent to about three parts of ordinary sodium sulphite. It is also very important to bear in mind that since the metabisulphite is strongly acid it will neutralize part of the alkali that is added, and consequently it will seem to act as a retarder of development. The retardation is, however, due to the removal of part of the free or effective alkali and not to any retarding action on the part of the sulphite itself. This neutralizing effect must of course be taken into account in calculating the quantity of alkali that must be added. The quantities of the various alkalies that are neutralized by one part of each metabisulphite are given in the following table:

	Sodium Metabisulphite.	Potassium Metabisulphite.
Real ammonia (NH_3)	0.18	0.15
Ammonia solution, about	0.50	0.45
Caustic soda	0.42	0.36
Caustic potash	0.59	0.50
Sodium carbonate anhydride	0.56	0.48
Potasium carbonate anhydride	0.73	0.62

C. H. Bothamley.

THE EMPLOYMENT OF BORACIC ACID IN THE DEVELOPER.

I HAVE proper respect for pyrogallic acid and the oxalate of iron as developers; but I am, however, a decided partisan of hydrochinon, and especially of eikonogen. I believe that either, with a judicious use of carbonate of potash, will produce as good results with less chances for failure and greater ease. With the addition of a product which, so far as I know, has not been used in photography, I obtain excellent results, and my success induces me to give out a formula which I should be happy to have meet the approval of my photographic colleagues. I will only refer to eikonogen, which I use in preference, because I get more transparency in the blacks with this product, but equal quantities may be used of hydrochinon.

I prepare beforehand separate solutions, which keep almost indefinitely, and only mix sufficient quantity at the time of using. In the first place I dissolve hot, 10 parts of sulphite of soda in 100 parts of water, and I add a trace of some weak acid, such as citric acid, about 2 to 4 parts per thousand. The object of this addition is merely to neutralize the solution of sulphite of soda, which is always alkaline, and contains carbonate of soda. To this warm solution I add 2 parts of eikonogen (or hydrochinon) and I obtain, after cooling, a liquid slightly tinged with yellow, which, thanks to the citric acid, can be kept for a long time.

My second solution is composed simply of 100 parts of carbonate of potash dissolved in 100 parts of water. I exclude entirely the carbonate of soda, as being often less pure and liable to stain the negative, also caustic soda, or caustic potash, which is more difficult to control and which often has a tendency to frill the plate.

The two solutions may be mixed in different proportions according to the object in view and the special conditions of the negative, such as the time of exposure, the quality of plates used, etc. It may range from 1 to 20 per cent. of the carbonate of potash solution, without losing sight of the fact that intensity is produced by eikonogen, and the details by the carbonate: however, it happens that such an energetic developer has a tendency to produce fog if the development is carried too far. This difficulty may be obviated by using a few drops of an alkaline bromide dissolved in water in the proportion of 10 per cent., but I prefer another system, and it is to this point that I call the attention of operators.

I keep always in the dark room a saturated solution of boracic acid, and I dilute my developing mixture with a quarter, a third, or sometimes with a half of this solution. This acid is sufficiently weak not to alter the carbonate of potash, and sufficient to prevent the negative from staining yellow when the development is prolonged. It takes the place in all cases of the alkaline bromide, does not give opacity to the blacks, and does not in any way restrain the development, though the quantity of the solution is sensibly augmented by its addition.

I use boracic acid, with no less advantage, in the fixing bath. I dissolve the hypo in a saturated solution of boracic acid—there is no decomposition or separation of the sulpho-hydric acid, as is the case with stronger acids or with alum; but the same advantages are derived as with the addition of this last mentioned salt to the fixing bath; that is to say, the purity of the image and cleaning of the film. Another decided advantage is that the bath can be kept in its original clear state for a long time, and does not get dark after fixing a few plates, as is generally the case.

I believe, therefore, that I am rendering a service to those who aim at cleanliness in photographic manipulations, and clearness in the negative by engaging them to try the use of boracic acid in the developer and fixing bath. The expense is not great, as the boracic acid is not very soluble in cold water and the proportion used is not considerable.

E. Audra.

A SIMPLIFIED KALLITYPE PRINTING PROCESS.

As every one who has used the kallitype paper for printing purposes knows, this process is based upon the phenomena that certain iron salts when submitted to the action of light are reduced, and that the salts thus formed in turn are able to precipitate the metal from silver, gold, and platinum salts under certain conditions. In the kallitype process the ferrous picture is developed with an alkaline solution of silver nitrate, thus producing a black and white image in silver.

Now, it is a well-established fact, that the majority of amateur workers prefer to have nothing to do with silver nitrate, the use of this chemical being equivalent to badly stained hands, which are not easily put into society shape again.

In order to do away with this hand fiend in the use of the kallitype process, I proposed some six months ago to simplify matters greatly by preparing a printing process, based upon the kallitype formula, to which the silver nitrate and bichromate of potassium have already been added; in other words, my paper is not only coated with the iron salt, but with the latter *and the silver salt*, a difference similar to that existing between the hot and cold processes of platinotype printing. The developer to be used consists of nothing more than a solution of neutral citrate of soda, made alkaline by the addition of some ammonia. After developing, the same solution is used as a clearing bath, after the use of which the prints are washed in ordinary water for three or four minutes.

The process is a very quick one and exceedingly simple, the results obtained greatly resembling platinotypes, although they somewhat lack the finest half tones, which places the latter process so high above all others, in my opinion. Various tones can be obtained with the new paper, they depending upon the sodium salt used as a developer.

Alfred Stieglitz.

DOUBLES.

Photography being, with the amateur, essentially a pastime, and the attainment of originality and novelty a prime incentive, I have often wondered why so few of us have tackled the mystery of double photographs, or, indeed, why there should be any uncanniness about them at all. It is just as easy to take a picture of a girl playing chess with herself, or of a small boy squaring off at his own *doppelgänger*, as to make an ordinary negative, and the accessory apparatus is of the simplest. When it comes to reproducing the same face in a dozen or more different spots on the plate, as in the now well-known picture of one good-looking, full-bearded man serving as a whole court of justice—judge, clerk, and twelve jurymen—there is more mechanical complexity in the job, and besides a black velvet background is necessary to success; but a simple double picture can be taken with any background, indoors or out, still-life or instantaneous, just like like any other view.

All that is needed is some sort of opaque half screen, before or behind the lens, so arranged that two successive exposures can be made on the same plate, first on one half, then on the other. For my part, I prefer to set the screen before the lens, for if it be placed within the camera it is hard to adapt it so as to be reversed without removing and reinserting the plate-holder, and this, by slightly moving the plate from its first position, often makes a patchy joint of the two halves of the picture.

My own reversible screen is a simple, home-built affair, of thin wood, like that of which cigar boxes are made. I have a base-board of seasoned pine, as wide as the bottom of the camera and long enough to project about 4 inches beyond the hood of the lens. Cleats nailed along the sides make sliding ways, between which the camera rests tightly. It is better to bolt or button the camera down to the base-board. A screw-hole in the bottom of the board allows it to be attached firmly to a stout and rigid tripod.

In front of the lens and fitting snugly between the sliding ways is set a shallow box or hood of thin wood, open in front and behind, a little higher and wider than the face of the camera, the depth of the box being such that, when the back touches the camera frame, the front will project about 3 inches from the hood of the lens. When a wide-angle lens is used, the box should flare generously outward, so as not to cut off the top or sides of the view. Two flap doors, meeting edge to edge in the middle, are attached with small hinges to the sides of the box. The thing is to have these doors thin at the edge, and to have them meet in a straight, true joint when both are closed. See that their meeting is accurately centered on the optical axis of the lens prolonged, so that the field of view will be truly bisected when one flap is open and the other closed. Paint the inside of the box and flaps with a lusterless black pigment—Devoe's ebony black is good for this and a thousand tinkering jobs besides in connection with camera or dark room.

I generally take my doubles by flash light, for in this way an equal illumination of the two halves of the view is obtained. Prosch's new lamp, or any lamp which evenly and entirely burns a weighed charge of magnesium will do. I use from 25 to 30 grains for each charge, for a group, with $\frac{f}{16}$ aperture and a rapid plate.

It is convenient to fix attention on some median line in the background, a fold of curtain, or the edge of a door post or bookcase, which when focused on the center of the screen (both flap-doors being open) will exactly bisect the view. The subject to be photographed in double should stand or sit six inches or more to one side of this median line. If dress or feet approach the line there is a blur; if any part laps the line, it produces a ghostly effect, the background showing through it more and more until it utterly vanishes.

Having posed your subject, say on the right-hand side of the median line, open the right-hand flap and shut the left one. Draw the slide, and *don't joggle the camera.* Uncap, flash, and cap again. While you are closing the dark slide, re-charging the lamp and opening the left-hand flap (closing the right-hand one of course), your subject, previously drilled by careful rehearsals, moves over to the left side of the median background line and takes the pose agreed on. Quickness is indispensable, for in a moment the air will be filled with a fine mist of descending magnesia dust, and the second flash must be let off before it falls, or half the plate will be fogged. All ready? Draw slide (avoiding joggle), uncap, and flash again. Recap. "That's all. Thank you ever so much."

Open-air doubles are often spoiled by unequal illumination. It is hard to time the two exposures exactly alike, and it is quite surprising how much more dense one side of the negative will be than the other if there is a fraction of a second's difference between them. Drop-shutter exposures are more nearly uniform and are therefore preferable.

The most pleasing, and, so far as I know, unusual application of double photography is to a stereoscopic view. The box-hood before the lens should have a dividing septum and two sets of flaps. A sliding screen of wood or tin, working in grooves, and with two upright oblong apertures cut in it, is more convenient. The axes of the lenses being 3¼ inches apart, these apertures should be, manifestly, 1⅝ inches wide and separated by the same interval. Pins set in the edges of the grooves regulate the distance to which the screen moves either way, and this should be carefully adjusted, or a blur up and down the plate will suggest unskillful patching.

Some of us are prone to mistakes. To amateurs of that stamp I confidently recommend a course of experimentation with double views. The opportunities of blundering are interestingly varied. Perhaps the most encouraging is to open the wrong flap, on the opposite side from your subject, for then you get a fine background, but no dual chess-player or duplex pugilist.

A. A. Adee.

THE TIMING OF SHUTTERS.

There are various means of finding out accurately what is the length of exposure given by a shutter; yet how few there seem to be who take the trouble to find out this most important element in the success of instantaneous work! How few, even of the makers of shutters, know how long the exposures of their shutters really are, or, if they know, seem to be willing to tell the truth about the matter.

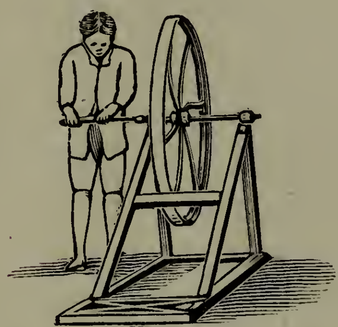
The indifference rises, I think, from two things: one is the mistaken notion that there is something definite about such terms as instantaneous, snap-shot, shutter exposure, etc. There could be nothing more delusive. One who describes the exposure of a plate as a "shutter exposure" certainly gives no more definite information than he would were he to describe his exposure as "somewhere between one second and ten."

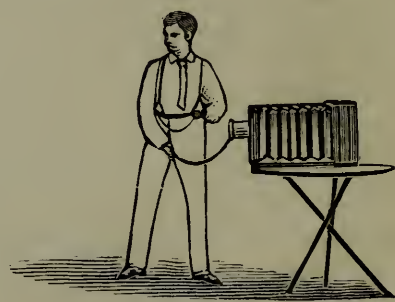
The second reason why so few trouble much about the time of exposures of their shutters is that they have an idea that the estimation of the time is a terribly complicated matter, needing knowledge of mathematics and heaven knows what besides. Now as a matter of fact it is so simple that the most inexperienced photographer could undertake it, while the highest "mathematics" needed is simple division.

Of all the various methods that have been invented for timing shutters, I consider the "wheel method" to be far the best, just because it is the simplest, and gives at least as accurate results as any other. The only apparatus needed is any kind of large wheel that can be made to spin round at a tolerably uniform speed. A "cycle" wheel will do excellently, and a bright silver colored mirror ball of any kind. The smaller size of thin glass ball, mirrored inside, hung on Christmas trees in England and, I suppose in America, will do well, or the bulb of a mercurial thermometer may be used.

The whole principle of the method is this: The ball is fixed on or near the periphery of the wheel. If it is a glass ball this may be done with wax; if a thermometer is used, it may be tied to the wheel with string. The wheel is set spinning at a uniform rate, preferably one revolution a second, or sixty a minute, in bright sunshine, against a dark background, and a photograph of the revolving wheel is taken with the shutter that is to be timed. The spot of light from the ball draws a distinct line on the plate, whose length is proportional to the exposure, and whose fraction of the complete circumference of a circle that it would draw in one revolution is, if the revolution of the wheel be at the rate of sixty revolutions a minute, the fraction of a second at which the shutter is working. Thus if the line drawn is one-twentieth of a complete circumference, the exposure was one-twentieth of a second.

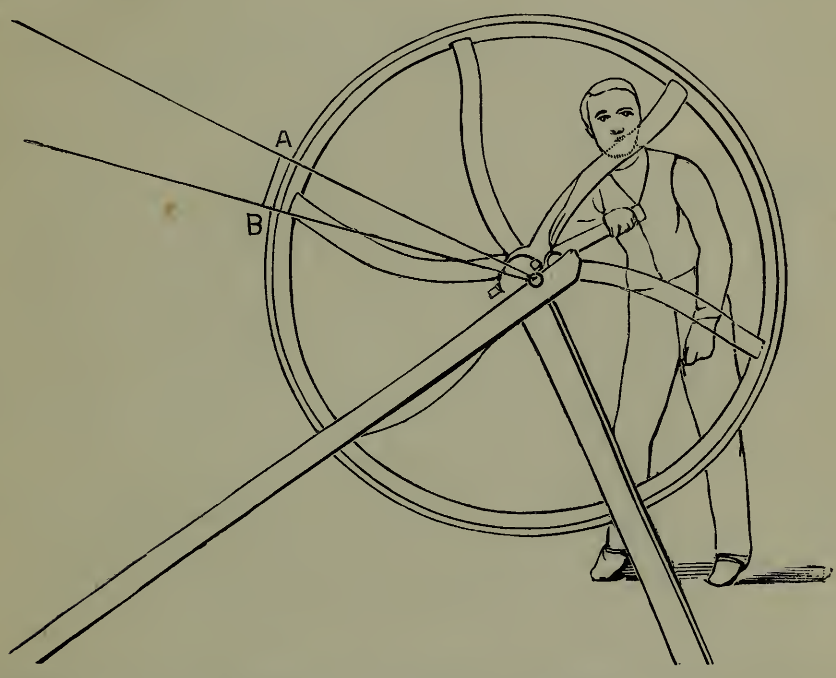
It may be supposed that any small white object—say, a spot of white paint—would do as well as a mirror ball. This is not so, however, and for two reasons. In the first place, the reflection of the sun in the small mirror ball is, practically, a mathematical point, and the length of the line drawn by it is, therefore, quite definite—a thing that would not be the case with a white spot. Secondly, the brightness of this minute spot is the same as that of the sun itself, less a small percentage due to imperfect reflection, assuming the ball to be a perfect sphere. Practically it is so intensely bright that it will draw a line at whatever speed the wheel is revolved.





The common objection urged against this system is that it is not accurate, because it is not possible to revolve a wheel at an absolutely uniform speed. This objection is quite imaginary. It is very easy with a little practice—many people can do it without—holding a watch in the hand and counting the revolutions, to keep the speed to within 5 per cent. on either side of what is wanted, and who wants to know the time of his shutter more accurately than that? Who will not, for example, be satisfied if, when he is told that his shutter gives an exposure of about one-twentieth of a second, he is assured that that means somewhere between one-nineteenth and one-twenty-first of a second? As a matter of fact I will venture to say that, in the case of hand exposures, under five seconds, no photographer knows to within 5 per cent. what his exposure has been; very few know within 20 per cent., and the majority do not know within 50 per cent. The fact is that, if we knew the exposures of our shutters to within 20 per cent., that would be enough for nearly all practical purposes.

I here describe exactly the way that I have been working lately, timing the exposures of all my own shutters and of those of my various friends. I give a photograph of the apparatus at work. It will be seen that a large wheel is being turned by an assistant, while the operator keeps a watch in his hand to check the speed of revolution. The wheel in this case is a somewhat heavy fly-wheel 4 feet in diameter. This is a good form of wheel, because, on account of its weight, the velocity is not so liable to vary as with a light wheel. It is not by any means necessary to use such a wheel, however. I used it simply because it happened to be ready mounted for work of a different kind. Fixed to one of the spokes of the wheel,



with the stem inclosed in a piece of bamboo for protection, will be seen the thermometer, the bulb projecting a little beyond the periphery of the wheel. The center of the wheel is marked by a white spot so that if the exposure is so short that the whole of the wheel is not distinctly seen, the position of the center at least may be known.

Opposite the wheel *and with the lens level with its center* is placed the camera with the shutter to be timed. When the wheel is revolving uniformly at the desired speed the shutter is released.

Now, as to the resulting developed picture. In the first place it is to be noted that it is not *necessary* to get out, in development, more than the line drawn by the ball, and something to mark the center of the wheel, but generally more will be got.

I show here one of the results of my recent experiments with my apparatus, made by a needle point on the film after it is dry. Here A B is the line drawn by the point of light reflected from the ball, and C is the center of the circle. A C and B C are joined, and the angle, A C B, is measured either with a section or a scale of chords. It is then divided by 360, when we have the exposures in the form of a fraction of a second. Thus, for example, in this particular case, the angle, A C B, $= 10\frac{1}{2}$ deg. $\therefore$ the exposure $= \frac{10.5}{360} = \frac{1}{34.28} =$ a little less than $\frac{1}{34}$ second, or say simply $\frac{1}{34}$ second.

In the case of extremely rapid shutters the line, A B, may be so short, if the revolutions be only 60 per minute, that the angle, A C B, cannot be accurately measured. I give here, for example, the result of a very rapid shutter. In this case the difficulty is increased by the fact that, the lens being only a quarter plate one, the scale is very small. It will be seen that the silver ball gives but little more than a spot on the plate. I could only estimate from this that the exposure seemed to be somewhat shorter than $\frac{1}{100}$ of a second; by making a second exposure with the wheel revolving at 180 revolutions per second, I found it to be $\frac{1}{130}$ second.

W. K. Burton.

Alvey A. Adee, Photo. DOUBLES. Levytype Co., Phila.

DEVELOPING AND FIXING GELATINE NEGATIVES.

It is now pretty generally conceded that the gelatine dry plate, by progressive improvements, has reached a perfection nearly or quite equaling wet collodion. Far excelling the latter in sensitiveness, and in being always ready for exposure, the gelatine dry plate still lacks some advantages in manipulating which the wet collodion has, inducing experimenters to continue their efforts to produce a dry collodion plate which shall equal the gelatine in rapidity. As yet this consummation has not been reached, though the patient seekers are still striving, and occasionally notify us (prematurely) of their success. The dense structure of gelatine in comparison with the porous texture of collodion. opposes the penetration of the developing and fixing baths, making them slow in action, and the final elimination of the hypo still more tedious and unsatisfactory.

It is scarcely to be hoped that gelatine can be made porous without becoming at the same time rotten or impairing its adhesion to the glass or other support, or that dry collodion can ever be made as sensitive as gelatine. Instead of striving to attain these more than problematical ends, could not our efforts be more profitably employed in finding developers and fixing baths more suitable to the structure and texture of the dry gelatine we now have?

It seems true that the developers now in use have been selected for other reasons than fitness, and strange, too, that their use has been continued, because of some *national* prejudice after this fact has been demonstrated. For instance, our British cousin will have none other than his pyro and ammonia, though he groans always over the time he has to spend in the trying light of his dark room, almost asphyxiated by its irritating fumes. The Germans have preferred to use almost exclusively the ferrous oxalate developer; though for a time perhaps inclined to accept the eikonogen of their own countryman, they are already beginning to return to their first love. The French have given strong testimony to their appreciation of hydrochinon, but there is reason to believe that they will soon give in their adhesion to the new French discovery, the paramidophenol developer, as they, like the Americans, are not ultra-conservative, and, like them, promptly dropped ammonia from the pyro in favor of a less objectionable alkali.

Developers come so thickly and quickly now, that the "developer of the future" is always to be looked for, since none that has as yet been proposed is as perfectly suitable to the gelatine film as the old iron developer was to the wet collodion. It seems advisable, now that the list is so rapidly extending, to drop some which have served their day. Pyro, with ammonia or any other alkali, could now be spared with profit, I think, from their liability to fog or stain without tedious watching. The ferrous oxalate developer, as now used, from the unstable character of the iron stock solution, could also be banished; but since we have lately learned how to preserve it surely and effectually, it should rather come to the front as one of the most certain, cleanest, and cheapest developers we have. As this fact does not appear to be generally known I will give the formula for the preparation of the iron solution which makes it "a thing of beauty and a joy for ever."

Ferrous sulphate	8 ounces
Water (hot)	16 ounces

Dissolve and filter; when cool, add

Tartaric acid	5 drams

The commercial "copperas" or "green vitriol" even, may be used if we select clear crystals. It may be prepared by the gallon, if necessary, and if *kept in the light* and *exposed occasionally to the sunshine*, it will always remain a clear bright-green limpid liquid.

Thus prepared and added to the neutral oxalate stock solution as usually directed (though by cautious additions much more iron may be added without a precipitate), it will give you a developer infinitely better suited to the gelatine plate than the alkaline pyro in any form, and only equaled, according to my competitive experiments, by a properly prepared hydroquinon developer, which it far excels in rapidity.

The Germans were wise in their preference for this developer, and now that the only serious objection to it can be so readily removed, it should hold its own for most general uses before any other now at our command.

Eikonogen is fast losing its prestige on account of its instability, though as now prepared in the form of dry cartridges for extemporaneous solution in water, it can be made available under many circumstances which would preclude the carrying of solutions in bulk of other more permanent developers. I have given my reasons for preferring hydroquinon to pyro or eikonogen in previous articles in this Annual, though I now think that for general use the ferrous oxalate with the permanent iron stock solution will never disappoint the user.

As to a fixing bath it would be desirable to find a substitute for hypo, but as this seems unlikely at present it is essential that the best strength and combination of that agent be determined. This, according to my experience, is afforded by the "acid fixing bath" as now published and which is most readily made as follows:

Hypo	8 ounces
Water	40 ounces
Dissolve and filter; then add	
Acid bisulphite soda lye	2 ounces

Joseph B. Brown, U. S. Army.

COPYING AND ENLARGING PORTRAITS.

From a prolonged experience in this important branch of photographic work, I will attempt to describe the method which I have found to be most successful.

Slow working objectives, aplanats or antiplanats are the best lenses for this work, not only because the required time of exposure is calculated by minutes and not by seconds, but also because they copy a plane surface more correctly than others. Whether the draw of the camera is longer or shorter is of but little moment, in fact there are suitable cameras found in every well-appointed atelier. The original must be placed vertically and horizontally toward the focusing screen in order to attain uniform sharpness all over the plane. How to focus need not be described; still the image should not be absolutely sharp, as a slight deviation is of material and favorable influence upon the finished work. Of high importance is the illumination of the subject.

If direct sunlight can be utilized, place the apparatus in a right angle towards it, and cover the space between objective and original with a hood constructed of tissue paper. In this the light is strong and energetic, and with it the grain and pores of the paper are much diminished and but slightly perceptible in the copy. In the absence of sunlight place the camera so that the light source is at its back.

To efface from the original shadows cast by the elevations of points in the paper, perceptible to the eye, attach to the objective a piece of white cardboard, bent at its lower end right angularly, and of a width of 5 c.cm., or reflect light upon the original from below, care being taken that no direct reflection is generated upon the glossy surface of the albumen paper.

Having all these preliminaries arranged, and the enlarged image appearing uniform and sharp upon the ground glass, then expose.

It is always better to use for reproductions a slow plate, perfectly free from fog; it gives better details in the shadow portions; finer tone gradations in middle tints and lights—results not possibly attainable with highly sensitive plates. The time of exposure must be extended till grain and pores are distinctly brought out in the shadows. An under-exposed reproduction plate can not proportionally print different from an under-exposed original negative. The negatives should not be of extreme intensity. Prints of negatives of a softer character impress the eye more favorably than others, and show details in the half tones not visible in the original superficially viewed.

Negative retouching should be limited to a certain degree, and only the most necessary defects be touched out; a mere spotting out, as it were, being generally sufficient. To represent linen perfectly white, cover the respective parts with opaque on the glass side of the negative; but high toned lights in the face obtained by similar procedure result frequently in unjustifiable effects comparable with bumps or excrescences.

An experienced and intelligent retoucher can, however, produce the desired effect by working in rhomboidal hatchings by means of lithographic ink. Tyros are advised never to undertake this; they will certainly fail.

It is not advisable to print from enlarged negatives in very bright light. With albumen paper, by comparatively long exposures better tones will evidently result.

The positive retoucher should use the original to guide him in his work; the enlargement is intended to correspond with it in every respect. He is advised to interrupt work occasionally and rest the eye, and to view from a distant point what has been done. When working up the positive, limit your exertions to effect merely, even with a sacrifice of fine execution. Correct likeness is always the main object in view; others are subordinate to it. When the picture is framed and hung, its good qualities, especially the true reproduction of the likeness, will be striking, and minor matters, like fine execution, be overlooked without comment.

The well-known fact that all photographic papers will stretch in different directions more or less, must be allowed for in reproductions. Where, for example, the head of the original is stretched lengthways, the enlargement must be printed on the opposite, the broad side of the paper. The difference occurring is thereby not corrected with mathematical truth, but sufficiently so to avoid stretching to an extent when likeness and characteristics of the orignal are equally endangered in the reproduction. The attention of photographers is particularly directed toward this important point.

Friedrich Müller.

TONING WITHOUT GOLD.

Paper for photographic printing has been introduced in the market under as many names as there are manufacturers.

This paper is prepared with a gelatine emulsion of chloride of silver, and each manufacturer gives a special formula for its treatment.

Some of the methods recommended provide for the gold to be introduced into the hypo fixing bath, so that the toning and fixing proceed simultaneously. One formula was given for treating this paper without gold.

I tried it, but found that it was not properly constituted, as the toning was completed before the prints were properly fixed. This bath was composed of hypo and alum, equal parts.

I then commenced a series of experiments which resulted in my compounding the following toning and fixing bath:

No. 1.

Water	16 ounces
Hypo	4 ounces

No. 2.

Water	16 ounces
Nitrate of lead (finely pulverized)	$1\frac{1}{4}$ ounce

When the contents of No. 1 and No. 2 are dissolved add No. 2 to No. 1. This should leave a clear solution, as the hyposulphate of lead which is formed on the introduction of No. 2 to No. 1 is dissolved as fast as formed, and there is not lead sufficient for saturation. This compound will produce fine tones with very pure whites, but the gelatine becomes soft and has to be handled with considerable care, therefore to this compound should be added $1\frac{1}{2}$ ounce of pulverized alum in small quantities at a time, stirring continually while adding it.

This will produce a reaction, and the solution will become turbid and should stand for twenty-four hours, when it will be ready for use.

It can be used repeatedly, only adding a little hypo occasionally.

The prints should be immersed without washing and kept in the bath until the desired tone is reached. They should be thoroughly washed, and can then be finished by laying them on a polished surface, rubbing them down or mounting them in the usual way and burnishing. The question will, of course, be suggested whether prints so treated and toned will be permanent.

For some samples of gelatine paper this formula works better:

No. 1.

Water	16 ounces
Hypo	3 ounces

No. 2.

Water	16 ounces
Nitrate Lead	1 ounce
Alum	¾ ounce

Compounded the same way as above described.

There is, I know, a popular prejudice against any process of toning in the hypo bath, and the production of what has been termed sulphur tones. What may have been the result with similar processes in the treatment of albumen paper should be no criterion by which to decide this question of permanency of gelatine paper.

The fading of silver prints on albumen paper is a well-known fact, and the causes which produce it have been discussed by multitudes of able writers on photographic problems for many years past. My opinion is that the main cause of the trouble resides in the action of the silver on the albumen.

By some it is claimed there is a combination of silver and albumen, forming what has been termed albuminate of silver. I have never seen an analysis of such a compound and do not believe any such exists. The fact that silver nitrate coagulates albumen is no reason for supposing there is a combination. A great variety of things will coagulate albumen without combining with it; for instance, boiling water, alcohol, and quite a number of the mineral nitrates. I am writing now of egg albumen, which in some respects differs from serum albumen in its power of forming compounds.

Coagulated albumen when washed and dried is the same in its chemical constituents as when dried without being coagulated. The discussion, however, of this subject at length would not be appropriate in a paper of this kind. I will say here, however, that there are prints on plain paper in existence—or were a few years since—which, after the ordinary exposure to the action of the atmosphere and light for more than *twenty years*, had undergone no perceptible change, or no more change than the paper would have undergone had no prints been made on it.

That the hypo should be eliminated from the prints is taken for granted, but prints fixed in a hypo bath that has been used for that purpose before will not keep, no matter how much they are washed.

If the keeping of the prints made on this new gelatine paper should depend on the thorough eradication of the hypo, I would recommend that it be done with nitrate of lead in the following way:

Water, 16 ounces; nitrate of lead, 48 grains. The lead in dissolving will produce a trace of carbonate of lead; this *must* be dissolved before using, and is done by adding a *few* drops of acetic acid.

After the prints have been washed sufficient to remove the surface hypo, immerse them for five minutes in this bath and then wash in clean water for five minutes, and every trace of hypo will be removed. This bath of lead nitrate should not be used stronger than I have given it, because of its toning properties, and if used stronger would carry the toning too far before the decomposition of the hypo was effected.

I have prepared prints which have been cleaned in this way, which are now six months old, and so far seem all right, and others which have been cleaned in the ordinary way, by washing. Time will answer the question of durability better than any theory based on chemical action, on certain substances which differ constitutionally from the one being treated. With this toning and fixing bath a great variety of tones can be obtained, from warm brown to very black, with remarkably pure whites.

Very fine tones and brilliant prints can be produced with this toning and fixing bath on the commercial ready-sensitized albumen paper, but by very different treatment. Prints on this paper, in the first place, must be thoroughly washed, and then fixed in a fresh solution of hypo. When fixed they should be immersed in the lead, hypo and alum bath until the desired tone is obtained, then washed in the usual way. The brilliancy of prints so prepared cannot be surpassed on albumen paper. The prints on either paper dry much darker than they appear when wet.

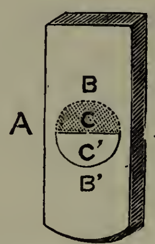
Henry J. Newton.

HOW TO OBTAIN CLOUDS IN A LANDSCAPE.

I HAVE often been struck by the absence of clouds in a landscape, and oftener still by the inability to print the clouds existing on the negative. Appreciating how much a sky with clouds adds to the appearance of a landscape, and not wishing to be obliged to substitute clouds I begun to cogitate whether some means could be devised to modify the admission of light through the lens.

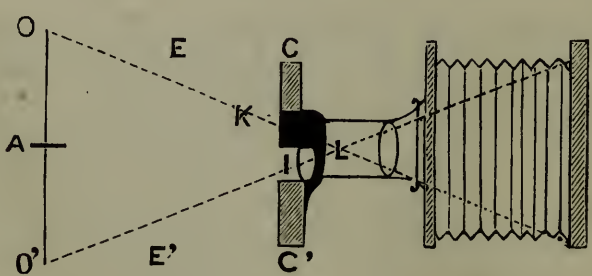
Taking as a basis that the rays reflected by the part forming the sky are a great deal more powerful than those reflected by the ojects in nature, it is evident that the sky should impress the plate more intensely than the objects of nature in the same space of time, hence the clouds outlined on the negative, being in fact over-exposed, blend and are lost entirely with the rest of the sky. I believe to have found the remedy to obviate this difficulty by modifying the opening of the shutter, a simple guillotine shutter (drop shutter).

The frame of the shutter that fits on to the lens and on which the working mechanism is placed should have a semicircular opening; also the dropping slide which makes the exposure, as indicated by the following diagram :



A—Outside frame of shutter. BB—Circumference of lenses. C—Half of the circumference covered up, marking half of the lenses. C'—The open part of lenses, equal to the other half which is covered.

What is the result? The diagram will furnish the explanation.



Let us suppose that OO' embraces view reflected by the objective, divided in two parts: OA the sky, AO' objects in nature.

Albert Can'yn, Photo. BLANKENBERGHE' BEACH. M.'Wolfe, Dayton, O.

The luminous rays emanating from the objects of nature pass freely by the lower part of the lenses which remains open, IL, in direction E', and impress the plate normally, by double reflection the rays of the sky, OA, take direction E, and strike the part of the lenses, K, covered by the shutter, CC', therefore the rays from sky cannot impress the plate without the aid of the lower rays.

I thus accomplish my object, that of weakening the rays from the sky, which permits me to get an even exposure all over.

The illustrative prints were taken by this device.

Blankenberghe Beach at 3 P.M., cloudy sky, $\frac{1}{50}$ exposure, oxalate and iron developer.

Albert Canfyn.

STEREOSCOPIC PHOTOGRAPHY.

One is hearing now, in this country at least, that in the near future we may look for a great revival of stereo photography, and if the rumor is well founded and turns out to be fulfilled prophecy, we may expect once more to find the stereoscope "on every drawing-room table," as of yore. Now this prospect is not by any means an appalling one to the amateur photographer who sighs for new worlds to conquer. There is much of interesting work in the production of stereo views; several pretty optical theories are involved and must be put into practice; and several ingenious instruments are used in the work. Moreover when a stereo slide is completed it is a thing of considerable beauty, and is calculated to interest not only the producer but many of his friends. If the prophecy comes to be fulfilled it will be a good thing for the camera and lens makers, and that is a point not to be overlooked by those who wish well to the photographic world in general.

If any of the readers of this Annual propose to take up this branch of photography they will do well to prepare themselves at once for the production of the best possible transparencies, for however good a paper print may be for the stereoscope a transparency is a great deal finer.

Writing from experience I will advise those who intend to practice stereo photography to get a pair or pairs of twin lenses at once, rather than run the risk of failure by having to make two separate exposures for each stereo negative. A negative can be made with one lens, but at any time it is not a very easy thing to make sure of giving equivalent exposures consecutively, even if the light remains practically equal for the necessary time. There is plenty of scope as to the size of plate used, provided the centers of the two halves of the stereo plate are not more than 3 inches apart. That is to say that the precise height of the plate is of little importance provided the plate is not too long. The size of plate I have been using lately is $6\frac{3}{4} \times 3\frac{1}{4}$, which is equal to two slide plates with a small interval of separation. But good workers have used plates 5 x 8, and others use $6\frac{1}{2} \times 4\frac{1}{4}$. On the whole I should be inclined to recommend the latter size, which is in fact used by Mr. Chadwick, who is a good judge in the matter.

The lenses may be mounted at a distance of 3 inches from center to center, but I like to have my camera arranged so that this distance can be varied to suit varying conditions. Thus for a very close view I should put the lenses a little closer, and *vice versa*. As to focal length of lenses there is no unusual condition to consider or meet. A lens of suitable focal length for the half-stereo plate will answer. A pair of lenses of about 4 inches and another pair of about $5\frac{1}{2}$ or 6 inches will be found convenient. The shorter focus pair may be of the rectilinear type for architecture, which shows very well in stereoscopy. In particular it will be found that interiors look their best in the the stereoscope

I have had trouble in making exposures exactly equal with two lens-caps, and I therefore recommend a shutter with two apertures. This shutter should of course be arranged for time exposures as well as instantaneous ones.

A point that sometimes puzzles the beginner is the transposition of the two prints produced from a stereo negative done with two lenses or with one lens used consecutively on the two sides of the camera partition. If we make a paper print there is no difficulty in cutting and transposing the two halves of the print after it is finished; but if we have to deal with transparencies on glass the transposition is not so easy. My own plan is as a rule to cut the negative down the middle with a diamond, and this seems the simplest plan. But sometimes glass plates intended for negative making are so uneven in thickness that we cannot get proper contact on both halves of the plate at once, and in that case we require to use a printing frame made for the special purpose. All photo dealers probably keep this frame in stock, or at least can make one. It consists of a frame at least twice the length of the stereo plate, with an aperture in the center about 3 inches square. The negative is pushed as far as it will go in the frame to the right, and a print is made on the right half of the positive plate, and then the negative is pushed to the left, and a print is made on the left half of the plate, the negative being taken as lying face up, and the sensitive plate as face down. Here again we must take care to have the exposures nearly equivalent, so that the density and detail of the two halves may be approximately equal in the finished transparency. Absolute equality is not essential.

In my experience a somewhat shiny surface shows up a paper stereo print better than a mat surface; for instance an albumen print looks better in the stereoscope than a platinum print. But as already stated a transparency shows better than any opaque print, and for the transparency I can strongly recommend the albumen process. But there is no doubt that the albumen process is somewhat troublesome to work, and it will be found that a good positive on gelatine bromide or chloride will answer every purpose. A stereo slide must not have any very glaring high lights, and in fact should be well exposed and not over developed.

These remarks are only general, but it is hoped they may to a small degree clear the way for any one who thinks of beginning to work at stereo photography.

Andrew Pringle.

A FEW HINTS ON COMPOSITION.

It seems to have gradually grown into an unwritten law that articles for year-books, almanacs, and the like, shall be compressed into the smallest possible compass. Bearing that in mind I am constrained to offer a few very concentrated hints on the great domain of "form in composition." I will first suggest to my readers that it may be of some slight aid to memory (if they connect by way of *memoria technica*) ten great laws, rules, or principles—call them what you will—with the ten fingers and thumbs; also, carrying this fanciful division farther, and grouping them into five pairs, so that of each pair one may be supposed to be connected with the right hand—the other with the left.

I will mention them in pairs, in each case drawing attention to the stronger one first. Thus:

A. *Principality—i. e.*, some one line, light, figure, idea, etc., stronger than all the rest.

a. Subordination—i. e., the remaining parts, not equal, but in graduated scale, so that no two elements are rivals.

B. *Contrast*—*i. e.*, of form; of light; of subject; to give strength.

b. Interchange—of one part into and with another, to bind, interest, and give relief to monotony.

C. *Balance*—of line, of light, etc.; to keep up interest; to give variety.

c. Symmetry (within very reasonable limits)—to give aid to unity, etc.

D. *Radiation;* to aid; suggest a community of origin, etc.

d. Repetition; to help repose, and calm; to support the main idea.

E. *Continuity*—of parts, of planes of thought—oneness.

e. Curvature—for the sake of relief, of beauty, of, poetry.

Now take those of the right hand and run through them a thread of *consistency*, so that all shall be real beyond reality—ideal beyond ideality. And in like manner thread those on the left side with an invisible yet unbreakable film of *harmony*. Finally, now tie these two threads into one indissoluble knot, and call this *unity*.

Alas! the ten have run to a dozen and more—the unlucky thirteen—but yet not thirteen—only one, viz., *unity*—the end and aim of all true art. The binding together of parts into one *harmonious* and united, consistent,.whole. Creating, by taking this beauty and that—bringing them together in a manner which *nature suggests and sanctions;* thus giving them *together* a new beauty, such as alone and apart neither can have.

The creation of making one thing of many, of showing that which by its own native worth grows in value the more we contemplate the part it plays as a part—a perfectly adapted part—of that which is in itself not many but one—viz., a work of art.

F. C. Lambert.

THE DARK ROOM IN THEORY AND PRACTICE.

Much has been written and said on the subject of dark rooms, the proper method of construction, the arrangement of the water supply and outlet, the best kind of light, the best way to ventilate, how to preserve wastes, the action of the fumes of chemicals upon dry plates, paper, etc., etc. Great stress has been laid upon the necessity for the entire absence of every particle of dust. There should be no ledges or projections upon which the smallest atom of dust can find a resting place. Chemicals must be kept in tight closets where no fumes can escape to destroy plates or ruin the health of the photographer. Albumen paper must be kept in cellars according to one man and in garrets according to another. Some want it damp, so that the prints will not blister or measle, and some want it dry for the same reason. The text books give instructions galore as to plumbing, water supply, sinks, saving of wastes, light, etc., and cuts without number are given showing the proper thing for the convenient and correct development of the plate. Now these instructions are of course all right. It is a good thing to have a dark room as handsome as a picture and as convenient as a pocket in a shirt, but to say that it is a necessity is quite another thing. Should the majority wait until they could have a dark room similar to those presented in the books they would never get into photography, and much of the enjoyment of life would be lost to them for ever. Most amateurs are forced to take what they can get in the way of a room or a closet for a dark room. They don't have the pick of the house by any manner of means, and some of the places I have seen in regular use for all the operations of negative making are far from being the conveniently arranged, well lighted and ventilated rooms that one sees in the text books, or reads about in the various journals. This is not owing to a want of desire on the part of the amateur in most cases to have a dark room according to theory; but necessity knows no law, and he takes what he can get, and makes up in enthusiasm what he lacks in comfort and convenience in his work. It is not my purpose to find fault with any of the dark rooms I have seen. I don't feel that I'm in any position to throw stones. I only wish to describe my dark room, which is about as far from being what I wish it was as can be, or what I could make it by an unlimited outlay, but it is the best I can do for the time-being, and "it goes." Here it is:

It is a room on the top floor of my house, about 9 by 12 feet.

It has one window in it. In my anxiety to exclude light I have so covered it up that I cannot open it for ventilation without tearing out the whole business, so I don't open it. There is a closet in the room where I used to keep my plates. That was a good while ago, before it got so full of truck that I cannot shut the door. Along one end of the room there is a wide bench, one end of which is occupied with a miscellaneous collection of chemicals too numerous to mention, the names of some of which I know, and a good many I don't. The middle of the bench and the other end is loaded with a mass of tools usually found only in a machine shop, and mixed with these are the parts of an electric motor now approaching completion. Under the bench a steam engine and boiler elbow my box containing albumenized paper. On the floor my silver bath looks across at my foot lathe with its many gears and wheels, while further along a large pigeon-holed rack for negatives takes up most of the wall space on that side, and right across is my developing apparatus. This is a large box standing on end, with a couple of wide boards nailed across the top, making a table some 2 by 5 feet. I have no sink, and my water supply is a two-quart pitcher, and my sewer connection a four-quart pitcher. The former is always empty and the latter always full, and between them both, I get good exercise running the length of the house for filling the one and emptying the other. My multum-in-parvo lantern is a wooden box with a sliding front covered with one thickness of "post office" paper, and my source of illumination a kerosene lamp with a "Leader" burner.

This is my room, and it is really mine. No one ever goes into it for anything, because it would not do them any good if they did. They could not find what they wanted if they should hunt a week. I never allow any one to clean it up but myself, and I always sweep it when it is swept, which is bi-occasionally. The room is such a mixture of machine shop and photographic dark room, and so full of both, that while I should like to separate the two departments, there is not space enough left for a partition. Familiarity from long use enables me to find my way through the intricate spaces still left, and growing fewer in number and smaller in size as the months go by; but I venture to say that a stranger would meet with disaster in trying to cross the room, and I should hate to turn a near and dear friend loose in there without a light. The utter confusion does not incommode me in the least, and it is a safeguard against intrusion.

It is said that the odor of chemicals is injurious to plates, and that all bad smells in the dark room should be carefully avoided. Keeping my room shut up, as I have to, it has never had the odor of sweet smelling flowers. The air gets loaded with the smell of machine oil, albumen paper and old hypo, and it is sometimes just awful in there, even to me. But then again this is a protection. No one wants to go into such an ill-smelling place, so I am left alone. A stranger being thrust into that room blindfolded upon a hot damp day would know at once that he was not surrounded by beds of English violets. There is no chimney in the room, so in winter I have no fire, and as the seasons change from hot to cold I alternately broil and freeze, but I get some good negatives just the same.

It is said also that minute atoms of iron dust floating in the air will cause black spots on the prints. I think this is true, but I have had iron dust enough floating in the air in my room when I have been working on my lathe to cover a mile of paper with more spots than can be seen on the sun through a whole season, and I don't seem to be troubled so very much. Of course I keep my graduates and dishes perfectly clean, and while I don't mop up the floor of my dark room with a damp cloth every day, as I have seen recommended, I don't go stamping around like a wild elephant every time I enter the room.

Now running water would be a joy, but one can get used to even a two-quart pitcher, and if they are careful they can pour water out of it if they elevate the bottom of the pitcher enough. Lots of space is good, but even lots of space will disappear with everybody in the house relegating to the dark room all the rubbish that they don't know what to do with, and they consider this room always legitimate prey because they never have to go into it. A window that would open without having to take a half day to repair damages would be a delight, but it is not a necessity, as I have found. A patent lantern costs a good deal of money, but it don't give any better light than my wooden box, and my box is four times as large as the largest lantern I have seen yet.

Pin holes in plates are not always caused by dust, but many of them are made by trying to economize in the use of developer, by using it over and over. Fresh developer for every plate is good enough for me, and will be until I am too poor to afford such extravagance, and then I shall be too poor to take pictures, so it won't make any difference. Black spots on prints are sometimes caused by iron dust, I suppose, but not always. An excessive economy in the use of developer will spoil many a good plate, and the plate maker takes the blame, of course. If one cannot afford a fresh developer for at least every other plate he cannot afford to go into amateur photography. This is a pastime that requires a cash foundation at the outset and and all the way through. It is no something-for-nothing-snap. A good negative and paper that has been properly floated on a good bath rich in silver are the elements for a good print at the hands of even an ordinary workman. Don't keep out of photography because you have not got and cannot get a dark room such as you see illustrated in the books. You can get along with most anything after you get used to it, and have lots of fun. It is good discipline too. If you have a small place you can put your hypo pan on the floor. If you put a plate in to clear and forget that the pan is there while developing another plate, and turning around step in it, smash the plate, upset the hypo, generally mix things up, and can then softly and cheerfully whistle "Over the garden wall," or some classic selection, and keep right on with your operations, you will have learned something of your temper, and will know about what you can do with it and what you can't. You may not be quite perfect if you can do this, but you will be near it, yes, very near it.

W. J. Hickmott.

ON THE TONE AND TONING OF MAGIC LANTERN SLIDES.

A good tone in a slide is most necessary for detail. Interesting subjects, etc., cannot make up for a poor tone, while sometimes simple views will acquire beauty from their tone.

There are a number of ways of getting toned slides. One of the best is collodio-chloride emulsion, formulas for which will be found in one of the former Annuals or standard works on the subject, to which I would refer those who may wish to follow up this branch. This being one of printing out it has the advantage of being susceptible to the printing-in of clouds, vignetting out of blemishes, and in other ways improving the general look of the finished plate. Besides you can get any range of color you may desire, the same as though you were printing on ordinary silver paper. Your emulsion should be rich in silver and the printing must be deep.

The toning of bromide of silver as formed in the ordinary developing is what I shall devote my remarks to. While the wet plate lends itself the most readily to toning, this need not

Ellerslie Wallace, Photo. MECHLIN CATHEDRAL, BELGIUM. The Moss Eng. Co., N. Y., Eng.

Ellerslie Wallace, Photo.

SWISS VILLAGE STREET.

The Moss Engr. Co., N. Y., Engrs.

Ellerslie Wallace, Photo. ON THE VIA MALA, SWITZERLAND. The Moss Engr. Co., N. Y. Engrs.

discourage the earnest worker who has only spare evenings to devote to it and must necessarily use dry plates, as some of the best that I have ever seen were made on the ordinary commercial dry plates. Their greatest faults are a likelihood to streak and a tendency to make the plate look as though it has been burnt; these, with a few minor things, constitute the chief faults about them. A little perseverance will overcome them, and I am sure you will agree with me that they are well worth the trouble and pains taken.

As to the question how stable they are, some that have been made six months or more are just the same as when first made.

Now, to start with, you should make three solutions; with these you can obtain all the range of tone desired.

No. 1 is :—

Red prussiate of potash	4 grains
Water	1 ounce

No. 2 consists of :—

Nitrate of uranium	4 grains
Water	1 ounce

While No. 3 is merely a saturated solution of perchloride of iron.

After having these solutions made add equal parts of No. 1 No. 2. Expose your plate or rather over-expose it, so as to get what you would call a flat plate, one with full detail but no contrast. This is a stumbling block and one which is of most importance in slide toning.

The process is one of intensification—uranium intensification.

Shake the bottle well, allow to settle, pour off clear solution (this is only to prevent the sediment from toning in spots), and with a bath of water at your side, you are ready to commence toning.

Place your plate in your tray, taking it out every few moments; wash in the water and examine to see about the tone. Repeat this until the desired tone is reached. Wash, but not too long, as it is very slightly soluble in water.

The tone is now more or less of a burnt sienna one.

Perchance you may wish a blue or a green tint. Here we use the perchloride of iron solution :—

Perchloride of iron solution	3 or 4 drams
Water	4 ounces

Your plate will first assume a greenish-brown tint (good for wooded brooks, etc.), then rapidly change to a decided blue tone. Wash and soak for a few minutes in :—

Theosulphate of sodium	1 ounce
Water	5 ounces

This serves to make it more transparent, after which it should be washed thoroughly.

David G. Archibald.

ARTISTIC COMPOSITION IN OUT-DOOR PHOTOGRAPHY.

Any one who is familiar with art study, by which I mean the making of pictures or statues, the practice of music or literature, and other things of the kind, may well smile at the rude attempts so often made to give formulas and royal-road-to-learning-short-cuts, so to speak, for the producing of those peculiar effects in photography which are the outcome of a natural feeling for the beautiful and the picturesque, with good art education superadded.

The best preparative study for the producing of artistic effect in photography from nature is monochrome, in any of its more usual forms—outline drawings, etchings and engravings particularly. Inasmuch as the photograph itself is monochromatic and deals chiefly with form and outline, a study of oil or water color paintings, while perhaps more seductive to beginners, would be less likely to produce good and quick results in the artistic education of the eye, which is the chief desideratum. After a good grounding in monochrome, however, paintings of course should be studied; and supposing some proficiency in photography to have been already attained, the calculation of the various color-values and actinic effects of the colors of rocks, trees, water and sky will be fascinating in the extreme. For it is obvious that special study of paintings, with reference to photographing the same scenes from nature, is the proper and natural preparative for out-door photography.

If an enthusiastic amateur were to take up the subject of artistic photography in earnest and consult the literature of the topic, of which there is no lack, I can well imagine that he would give up in disgust. I think really it is not going too far to say that nine-tenths of what the photographic journals have published and still are publishing upon the matter is worse than useless and does more harm than good. To really impart instruction in the art of making artistic photographs from nature means, in other words, to take the pupil through a tolerably severe course of general æsthetics first; afterwards through the introductory principles of drawing and painting; this in turn being followed by exhaustive consideration of practical photography, including all the "dodges" for the artistic improvement of the negative and print; and finally (or rather primarily), the uselessness of all this study unless there be decided artistic talent in the pupil.

No better expression than the term "artistic composition" has ever been coined for this peculiar and difficult work. The etymology of the word (*con* and *pono*, I place or set together) is a help to us at the very start. When a man attempts artistic delineations of nature by the aid of photography, he *places* or *sets together* the various objects comprised in the picture, and it is his business to see that they fit together properly. Now some one will say "Oh, no; this is quite wrong. Nature does the composing or setting together, and the artist only selects." The answer to this apparent truth is that nature does indeed set together or combine objects, but that in the process of transcribing her or in making a picture—no matter whether it be painting, etching, or photograph, the artist, as I before said, combines or disposes the different portions of the picture into a harmonious whole.

I believe that I can make these remarks most useful to readers of the ANNUAL by not enlarging upon such subjects as chiaroscuro, the balance of lines, the treatment of masses, the doctrine of repetition, of principality, of harmony, etc., etc. Just to show, however, that the study of the balance and disposition of lines plays an important part in landscape photography, let me first ask attention to the simple fact that a straight stick like a cane may be made to take the form of a line horizontal, vertical, diagonal, long, short, or no line at all, but merely a spot, if held, say at arms length, and its position varied. By applying this principle to the view of the *Via Mala* where there is considerable complexity of line, but very simple chiaroscuro, it will be seen that the line vertical occurs twice in the precipitous rocks at the middle and right of the view, while the line diagonal is seen at least six times on the summit of the high rock at the right, again in the sharp contrast between the shrubbery and white rocks below on the same side; and that these lines are composed and put into harmony by the opposing diagonals of the hills and trees on the left, and the very important verticals on the right. The faint outline of the distant mountain is nearly enough horizontal to act as a sharp opposer to the verticals; indeed if the diagonals were absent the effect would be intolerable.

Street views are generally easy to arrange. In the Swiss village the eye is forcibly directed to a point near the base of the tower at the entrance to the little garden behind the standing figure of the woman in shadow. It would have been easy to have shown more of the street by moving further to the right, but this would have destroyed the nice arrangement of the perspective, which leads the eye to one of the *forte points* in the picture, as artists say. The gist of this is that, as a general rule, the *center* of a picture is its weakest part artistically, and the eye should not be directed there without some good reason. But on the other hand, objects of interest ought not to be scattered at random over the plate, so that the eye is confused and wearied by skipping from one to the other. As the interest in this picture is largely concentrated in the street itself, even though there is nothing whatever there to attract attention, there is a suitable opposition or repetition made in the broken sky line of the distant mountains which in turn help to balance the powerful descending diagonal line of the roof. The stiff vertical lines of the wood-pile, so near to the center of the picture, do no harm, for the eye is carried away from them by the three windows in the house wall, and by the rude flight of stone steps to the door. Contrast is provided for by the intense high-light of the wall and the mass of deep shadow up under the eaves, while there is sufficient half-tone in the mountains and shaded portions of the houses on the right.

In architectural photography the general plan of the picture is frequently quite simple, as in the third illustration. In so far as this subject is reducible to a study of lines, it might be said that it consists of one principal vertical line, the tower, harmonized by a secondary or subordinate curved line on the right, formed by the points of the Gothic tourelles and spire, or *flèche*, of the cathedral, and running off by the chimneys of the Hotel de Ville and quaint gables of the houses on the extreme right. But this picture is rather to be regarded as a light-and-shade, or chiaroscuro study. The horizon is seen to be unusually low in order that the great height of the tower may be included. The large expanse of sky necessarily appearing as a high-light, or nearly so, is then broken up first, by the tower; second, by the projecting tourelles and high chimneys; and third, by the flag-poles on the houses at the left, which favor things very much by pointing to one of the chief centers of interest in the picture, namely, the summit of the tower with the curious clock dial, which, let me say in passing, is no less than 50 feet in diameter. The high-light on the Hotel de Ville creates a strong secondary interest on the other side of the view from the principal object or tower, and of opposing quality to it. The absolute center of the view is again seen to be vacant; lying, as it does, in the sky just above the roof of the cathedral. The high-light of the sky is repeated or echoed along the paved square in the middle distance. The monotony of this large expanse of "Belgian blocks" is broken by the shadows in the foreground, which greatly help the perspective and distract attention from the unsightly booths on the right. I may add, in concluding, that I waited for the sun, when taking this negative, for nearly three hours.

Ellerslie Wallace.

HOW TO MAKE A PHOTO MAT.

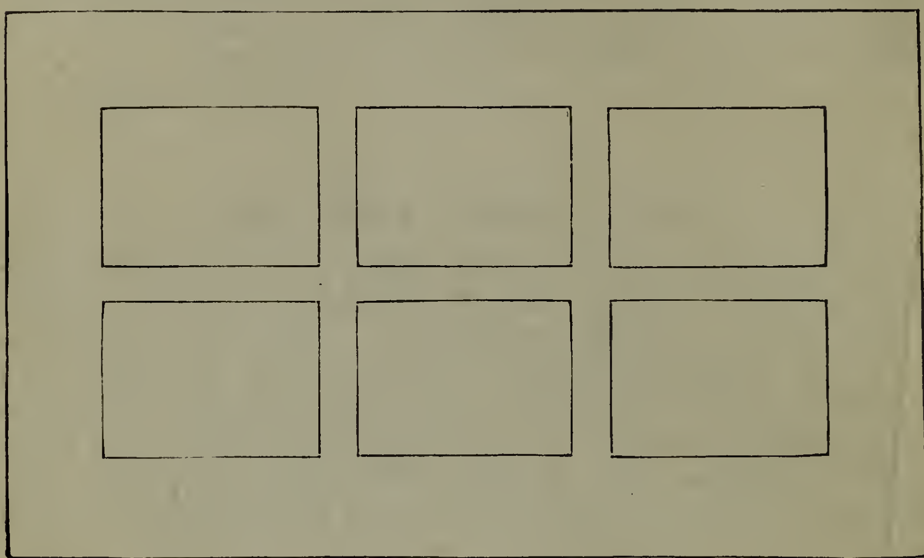
Frequently we have several pictures that are closely associated with each other, and if placed together, in a group, would make a pleasing combination. Then again we sometimes have frames of various sizes and shapes that have been discarded, and which with little trouble could be restored. By arranging a group of photographs tastefully in a mat made to fit the frame, it can be made decidedly ornamental. The various sizes of our pictures allow us to utilize almost any size and shape of frame, without the necessity of altering.

Let us first consider the things that are necessary to make the mat. The material for the body should be a heavy quality of binders' board, from $\frac{1}{8}$ to $\frac{3}{16}$ of an inch in thickness. Do not get thinner, because the thinner the board the more it will curl when pasted. The paper for the covering: I have found that rough white drawing paper gives the best effect, yet tinted papers give variety and can be used with good taste.

Now as to the arrangement of the openings; first cut the board to fit the frame, then decide upon the width of the margin desired, which should be greater than the space between the pictures, then take a glass form the size of the pictures that are to be framed, and by laying on the board, ascertain how many openings can be obtained, and yet allow a proper width between each, which should be equal both ways, if possible; but this is not absolutely necessary, provided the margin around the outside is the same width on all sides, as in the diagram.

After the openings are laid out they should be reduced a trifle smaller than the glass form. Then cut by using a beveled edge ruler and a very sharp knife, carefully following the bevel of the ruler. When the four sides are cut, if you have been successful you will have an opening with evenly beveled edges.

After all the openings are cut, the paper is pasted on the board by giving it a good coat of paste and rubbing it in perfect contact with the board by means of a print mounter or a blotting paper and then allowed to dry. After it is dry cut



the paper over the openings diagonally from corner to corner, and draw it through and tightly across the edge of the opening, and fasten back with a little prepared glue. It is not necessary to put it on the edge, only at the back so it will hold tightly over the edge.

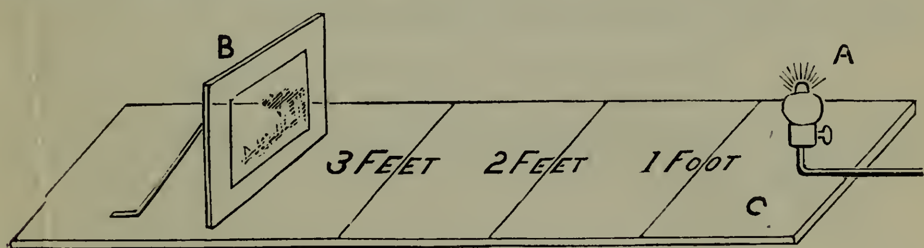
After it has dried burnish the edges with the ivory handle of an ink eraser. It can be greatly improved by burnishing two or three narrow parallel lines around each opening with the same ivory handle, and by cutting another mat of thinner paper, tinted, and laying under the first, the squares being cut somewhat smaller, say $\frac{1}{4}$ of an inch, just enough to allow it to show around the edges of the opening. But in this case the first square should be cut proportionately larger.

W. S. Waterbury.

BROMIDE PAPER DEVELOPING.

As I do all my printing on bromide paper, I take that for my remarks for the 1892 Annual. The great advantage of learning how to work bromide papers is that you can do either enlarging or contact printing and always get the same tone, that is by sticking to the same brand of paper, but if you try first one and then another brand you are sure to come to grief; so get hold of a really good make* and learn how to work it, and then when you know how to do so properly, you can go in for trials on other papers.

I am by this time sure that if bromide paper is properly worked results can be got that can not be told from platinotype, and at a much less cost, with the great advantage of being able to get a print at any time by day or night. The best way to work bromide papers by contact is to have a fixed light in your dark room so that you may always be sure of giving the same exposure, and *if possible* use gas, as then with a good burner your light is always the same, besides the advantage, if you use a bye-pass, of not having to use a frame or door to shut off your light. I give a drawing of the board used for my printing, as it will explain what I mean:



A, Gas Burner. B, Printing Frame. C, Board marked in distances.

I make a board as above, C, on which I place at one end a gas burner (with bye-pass so as to turn on or off the gas without it going out); I then mark it off in distances from the burner of 1, 2, and 3 feet, so that I am able to give the negative the required exposure, and always be right as to exposure. That is, if I have a very dense negative I place it at 1 foot from the burner for the required exposure, but if the negative is thin, then I place it at 2 feet or 3 feet distance, and by so doing I get good results by judging the negatives by the eye before printing from them. It is impossible to say what exposure one should give, as all depends on the negative and paper used, but with the bromide paper I use

* Donaldson's "Star" brand.

I give for a very thick and dense negative from thirty seconds to fifty seconds, 1 foot from burner; but if a thin negative I give from six seconds to twelve seconds, 2 feet from burner, and only go off to the three foot distance when the negative is extra thin. When one has had a few trials it will be found very easy to work bromide paper if they only have a little patience. Of course, the point in bromide printing is to learn to develop it properly, as a deal depends on that; in fact, it is just the same as negative work, only you use a slow emulsion on paper instead of a fast one on glass; and good results depend on the worker, that is, if he has the knowledge of what is required and how to do it, which, as I said before, is easy if the worker will be careful how he develops, judge what is required and use a little brains, not working as most amateurs do by rules given in the various books, as one must remember that even if rules and formulas are given, what I can work with perhaps others cannot, as I am used to the paper and developer I use, and of course that gives me the advantage.

It is hard to lay down a strict rule as to what developer to use, but I feel sure that iron developer as a rule is far the best. I can get good results with either quinone or eikonogen, but I must say if I am doing printing on bromide I am anxious about I always use the iron developer, viz.:

Saturated solution protosulphite of iron
Saturated solution oxalate of potash,

both made acid with acetic acid. For use I take:

Oxalate potash	5 parts, or ounce
Iron	1 part, or ounce

and add to above 4 drops of a 10 per cent of bromide potassium.

Always (to my idea) use the acid bath (viz.: acetic acid, 2 drams, water, 403) after developing and before washing, and if you do *not want* your prints to *fade*, use the hypo strong and leave print in hypo for a good time, as most bromides that fade do so because they have not been fixed properly. I use my hypo solution half saturated solution, and leave print in from fifteen to twenty minutes, then wash in running water for say four or five hours, and have a print that will last as long as any kind of print going. I have only used bromide paper for about six or seven years, but so far have found no prints fade that were properly fixed, but those I made, the first time I tried and used my hypo (as told), about one to five or six have nearly or quite faded away.

I find many amateurs do not like bromide, as they say they like a warm color and not a black. I always go in for the black tones, but it is quite possible to get a rich warm brown on bromides. I often make prints a rich brown when I find that color more suitable to the subject; there is no trouble in doing so, but one has to use extra care about it, and so I seldom advocate it, as if it is not properly done and well-washed the print will be light in patches; also prints done this way should not be mounted with starch, but with some mountant that has no acid in it, as acid is sure to fade the prints when toned by formulas I give.

The way to proceed to get a rich brown color is to develop your print as usual; a print that takes about right when developed fixed and dried, is about right for getting this color.

After the print has been dried, wet it and flood with a solution of mercury (as used for intensifying negatives), and leave on till the image has got quite white, then well wash, and flood with one-half saturated solution washing soda, or if the color required is not to be quite so deep use one-quarter saturated solution washing soda. Now here you have to mind and leave the solution of washing soda on long enough to do its work properly, say five minutes at least, in fact ten would be better; the print will turn a yellow-brown color, but will dry much darker.

Now I beg to give these few hints to my brother amateurs, and trust the reading of them will lead more to go in for bromide printing, as I feel sure it is the paper of the future.

A. R. Dresser.

A HINT.—WHO WILL TAKE IT?

I offer no apology to the readers of the Annual for again alluding to the stereoscope, for I should deem myself culpable, did I not endeavor to interest some of the host of amateur photographers of both sexes in that phase of photography and optics which, in my estimation, will give more real pleasure to those who adopt it than he or she has enjoyed since first engaging in the fascinating pastime.

I have no word to say to the pusher of the button, for the kodak and like instruments are as useful to the development of the budding photographer as is the little magnifying-glass to the coming astronomer, or the toy globe to the geographer or North-Pole explorer. There must be a beginning to everything; and I see no reason why the to-be photographer ought not to receive his first inspiration through the simplest methods possible, rather than by dipping at once into the mysteries of development, printing and toning.

If the beginner shall prove to be a *lover* of the newly-found pastime, the toy will be set aside, and a deeper hold laid upon the principles, which lie at the foundation of photography.

Then will follow the mastery of all the interesting processes essential to the production of a first-class print; and when the lover of the art shall have reached thus far, the next step onward and upward should be the making of the stereograph.

As I have said many times before, more real delight then awaits him than he has yet enjoyed in all his photographic experience.

This is not the time, neither have I the space at my command, to enlarge upon the superiority of the stereograph over the single picture, but I am willing to do what may, perhaps, be more satisfactory and convincing.

I will send, upon application, to those desiring them, one or more stereographs, which shall embody some of the interesting characteristics about which I have been descanting, in the hope that they may be instrumental in leading some, now in the dark, to a realization of this great scientific fact, once so fully appreciated, but now alas! known to comparatively few of the rising generation.

I would prefer to limit the applicants to such workers as are capable of making a good negative and producing therefrom, unaided, a satisfactory print; to those who have access to a stereoscope and who are willing to proclaim themselves desirous of adding to their stock of knowledge as to the stereograph. To such persons, of either sex, it will afford me pleasure to send sterographs, and to impart any further information in my power.

Lest it may be thought by some that my enthusiasm is born of a recent conversion to stereoscopy, it will only be necessary to say that I have pursued it with constantly increasing pleasure since 1867; and now, in 1891, I find no diminution of the sense of satisfaction, and I may add of wonder, as well.

W. H. Metcalf.

SYSTEMATIC WORK FOR THE HAND CAMERIST.

The land is full of "snap-shot" photographers, but where are the results of all their button pressing? The hand camera is being fearfully abused, and the remark, "Here's another of those photographic fiends," greets the hand camerist everywhere, no matter what kind of instrument one carries.

Instead of snapping at this, that and the other thing in a slip-shod, hap-hazard way, producing a few pictures of passing interest, and soon growing tired of the pursuit, would it not be far more instructive, and the results lasting, if this branch of photography were carried out in a systematic, thorough manner?

Let each hand camerist at the outset have a line of work laid out, say a collection of types of character met with every day outdoors; or a series of pictures of historical interest, revolutionary relics in the way of old buildings fast passing away.

Suppose he undertakes to illustrate various trades and industries at different stages of progress, for instance "Cotton, from the field to the street:" the first picture of the series showing the cotton picker at work, and the last (after photographically following the material through the factory), the finished fabric upon the form of a dusky-hued maiden, perhaps the cotton picker herself.

Another subject is "The old arm-chair, from the forest to the fireside." The initial photograph would be a great oak tree; next a group of wood cutters; and so on through the planing mill into the furniture factory, and finally an old fellow sitting in his favorite nook in an ancient oaken rocker.

A few flashlight pictures showing the method of mining coal, loading on to cars, storing in the yards, delivering to the customer, and a chunk of it throwing dancing lights and shadows on the hearthstone, would furnish an interesting group of pictures.

The field is wide and the subjects limitless, only waiting for the camerist to delve them out and do his best to thoroughly illustrate them.

In conclusion: If the devotee to the art wishes to make it a fascinating and profitable study, let him from the outset carry on all the operations from pressing the button to the finished print or lantern slide, himself.

The best method of showing your work is by means of lantern projection, as it enables one to keep a set of pictures together better than a collection of prints, which have a habit of going astray. *W. N. Jennings.*

TESTING HAND CAMERAS.

The specifications for a hand camera, to suit my taste, should be as follows:

A rapid rectilinear lens of large aperture and medium angle with diaphragms, and a smooth working, noiseless shutter arranged for time or "snap" shots, as may be needed.

A reversible finder.

A handy focusing device by which a range of distances of from 5 feet to 100 feet can be readily and quickly obtained. A removable roll-holder with a hard rubber dark slide, an adapter to take the place of the roll-holder and to carry the plate-holders when in use.

A screw plate on two sides of the box to fasten the same to a tripod. The whole to be put into a case or box as compact as possible, the box or case to have a strong handle to carry it by; also a shoulder strap secured to it, and to have a good lock on it to secure it from the intrusion of meddlesome persons.

After procuring such a camera I would take it out on a fine day and test its capabilities. I would take two of my plate-holders and load them with Carbutt's fast plates and focus on a slowly moving object about 50 feet distant, making the exposure at an angle to the moving object, or as it approached or receded from the camera, but not square or at right angles with the line of movement of said object. I would expose with fast speed of shutter, provided the light is good, then expose another plate on a view having considerable distance in it, with a foreground having prominent objects and much detail. I would expose this plate a little slower than the last, say at a medium shutter speed, then expose two more plates on architectural subjects, where there are vertical and horizontal lines. These exposures made, develop them in hydrochinon developer, Chautauqua formula, exercise patience and don't be in a hurry. If the light and time were suitable the high lights will soon begin to show, and the picture will slowly but surely come out until all the details are out in the shadows, when, if not dense enough. When these four plates are developed we can tell just what kind of an instrument we have. The first exposure will prove its utility on moving objects. If such are clear, sharp and well defined, then the lens (which, remember, is the soul of the apparatus) is quick and sharp.

The second plate is now to be examined, and if the prominent objects in the foreground are sharp and clear, and the distant objects also clear, then the lens has depth and good definition, or, in the language of professionals, the lens "cuts" far and deep. We have still another test on the plates which were exposed to the buildings, bridge, etc. These two plates we examine closely, especially around the sides of the buildings which are near the edge of the plate; and if we find the lines true and at right angles to each other with the mouldings, lattice works and carving clear, clean, and sharp, we conclude that the lens is rectilinear and capable of not only doing "square work," but of doing it well and sharp. Such a lens is therefore quick acting, with good depth and definition, and is practically rectilinear. Beyond this we cannot go, and a lens that will perform the above satisfactorily will do interiors, copying, time exposures of all kinds, equally as well as snap shots, hence may be termed a universal one, and is the kind best suited to the general wants of an amateur.

Thos. J. Bray.

HOW TO PRODUCE A HIGH GLOSS ON ALBUMEN PRINTS.

Burnishing photographs is such a simple operation that it is to be presumed both amateurs and professionals know all about it; but paradoxical as it may seem, its very simplicity is often a stumbling block in the way of securing the best results. I will describe how a polish, almost, if not quite, equaling the aristotype may be produced upon any first-class albumen paper; such, for instance, as the "Three Crown" extra brilliant paper.

One of the great claims made for the aristotype and other similarly prepared papers is the high glossy surface. This being the case the same can be as easily produced upon albumen paper.

In the first place, the mounting must be done in *perfect contact* with first-class cards. Prints mounted upon cheap, spongy cards cannot be made to receive the highest polish. A Scovill roller squeegee is about the best means of bringing the prints into perfect contact with the mounts and should be found in every gallery.

With the prints properly mounted on good cards we may let them become *thoroughly* dried, when they will be in condition for burnishing.

You must possess a burnisher with heating facilities capable of being *overheated.* Now, I do not wish to be understood that the machine must be used in that condition; for, on the contrary, an overheated burnisher will ruin your prints, either by burning on to the burnishing surface, blistering or ruining the tone.

It is not necessary to overheat, but, possessing the facilities for so doing, you are prepared for any degree of heat that may be required to give the high gloss that albumen paper is capable of taking.

The older and drier the print the greater the heat required. Albumen paper requires greater heat than other surface papers.

The prints should be well rubbed with a canton flannel pad, upon which some good lubricator has been distributed (imported castile soap, dry, is as good as anything). It is claimed by the manufacturers of roller burnishers that lubricating is unnecessary, but I have found that a print well lubricated will burnish easier, quicker and better than one not lubricated.

Now, to produce the extra high polish on albumen paper, have your burnisher as hot as possible without injury to the print, and pass it through until you have a surface resembling polished glass. Examine the print by turning to catch different reflections of light, and if it shows undulations or waves, continue to pass through the burnisher until they disappear, and you have one unbroken high glaze. If you are unable to produce such a glazed surface you may be sure your heating facilities are inadequate.

When burnishing a large number of prints the burnishing surface becomes cooled. This especially happens where the heat has been turned down. The remedy is to wait a few moments or increase the heat.

The exact degree of heat necessary to produce the best results can only be found by practice. Observe everything in connection with the operation, and you will soon acquire a knowledge of the proper heat and the sufficiently burnished print. The sense of feeling as the print passes through the burnisher will indicate much to an experienced operator.

Albumen prints that I have burnished and shown to photographers were declared by them to be aristotypes. If you wish to produce a close resemblance to the aristotype use the "new rose" tint paper, and give it the high polish which you can do with little practice, and you will have such a close imitation that your customers will be unable to distinguish the difference.

W. H. H. Clark.

A CONVENIENT CAMERA STAND.

Any one using a tripod for indoor work, especially for portraits, will soon find what an inconvenient and awkward piece of furniture it is.

It is often impossible to set the tripod just where you ought; and again, when, as is often the case, it is necessary to lower the camera, the tripod being so spread out is unsteady and liable to fall.

In an endeavor to get something better, I planned and constructed the stand which is described in this article, as follows, viz.:

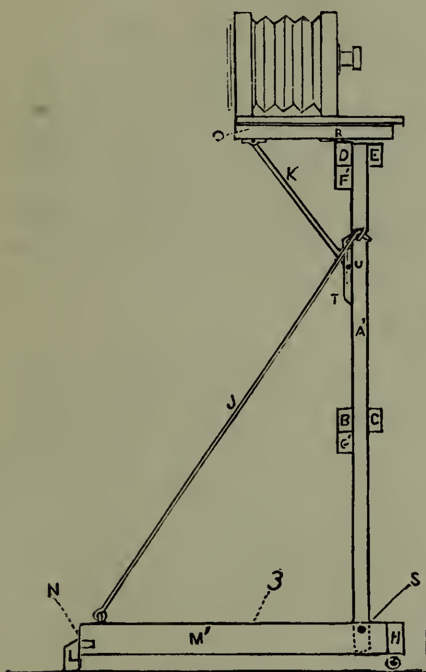


Fig. 1.

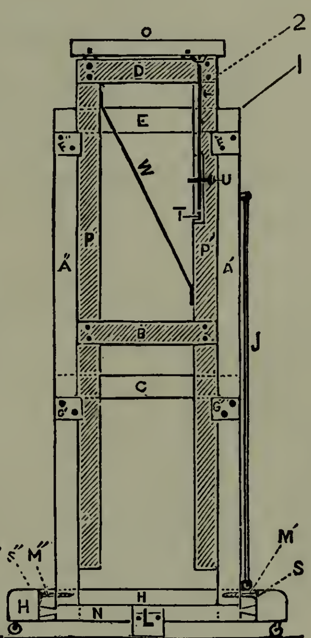


Fig. 2.

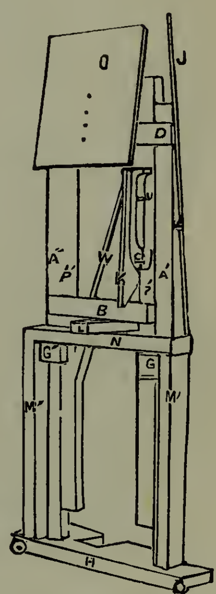


Fig. 3.

Fig. 1 shows a side elevation. Fig. 2, the rear elevation, with the stand raised somewhat. Fig. 3, perspective view, showing the stand closed.

It consists essentially of three frames, as indicated, Nos. 1, 2, and 3. No. 1, A′—A″—C—E. No. 2, P′—P″—B—D. No. 3, M′—M″—H—N. Frame No. 2 slides vertically inside frame No. 1, being kept in place by F′—F″—G′—G″. In the one which I made they fit so closely that No. 2 remains in position at whatever height it may be placed.

Frame No. 1 is attached to frame No. 3 by two screws S′—S″, as indicated at S. This permits No. 3 being folded on No. 1. Frame No. 1, when the stand is in use, is maintained in a vertical position to No. 3, by a hook J, of quarter-inch iron. Brace W is to render frame No. 2 rigid.

The camera is supported by the table O, which is hinged to the top of frame No. 2, at R. The table, O, may be inclined at various angles by shifting the position of pin U—which supports the end of strut K,—either to a higher or a lower hole in T.

By removing the pin U, the table falls down, and by unhooking J, the base frame No. 3 folds up over the upright frames, in which form it occupies a very small space, being convenient to store or to carry.

As this is constructed it has three points of support, viz.: a short leg L, and two casters under the front.

These could well be omitted on a level surface, and the frame No. 3 rest directly on the floor, as the whole is light and easy to move. I have tried to make the description plain and easy to be understood, and it is offered to the brotherhood and sisterhood of amateurs on its merits. *F. E. Fairbanks.*

TWO DODGES.

To Arrange a Handy Packing Box pad the inside with excelsior and coffee sack, or any good material. Make the lid to open on the side instead of the top; it will then fall down and open toward you, and one box can be placed on top of the other and each one can be opened without disturbing the other, thus forming a set of shelves with lids or doors. The bottles can be set in and small sacks or excelsior placed between them.

A Handy Folding Table can be made by taking four pieces 2 inches square and of sufficient length for the height desired; put a bolt through the center of each two pieces, as if to form a buck saw. Then get two boards 4 or 6 inches wide and as long as it is desired to have the table, and bolt the end of one on to the top end of one of the two pieces already bolted together; then bolt the other end on to the top end of one of the other two, and fasten the other board to the other two in the same way. Take two straps and fasten across the top to prevent them spreading farther than you wish for the height of the table. Strips of flooring fastened together with battens will make a handy top which can be set away and the legs folded together when not in use.

J. W. Pendergast.

Stholl, Photo., Chicago. A STAGE BEAUTY. Photo. Eng. Co., N. Y.

ART IN PHOTOGRAPHY.

I CAME across a line the other day in an art lecture by Fuseli which defines admirably the art that is to be found in photography.

That line is "choice directed by judgment and taste." So far then as one exercises wisely this choice the result will be of more *artistic* value than work of an individual without either judgment or taste. How may the judgment and taste be best cultivated. Assuredly by constant practice, and by earnest study of the best examples of the leading artists of all schools.

The artist who is only a clever technician can have little more to say to any thoughtful or poetic student than the photographer who devotes his attention wholly to the chemistry of his acids and alkalies. Indeed are we not often far more delighted by a poor (technically speaking) photograph than by a good piece of imitative painting of a commonplace or vulgar subject. I hold that to the proficient photographer opportunities are offered for the exercise of "choice directed by judgment and taste," which makes the line a very thin one which debars him from calling himself an artist. We have painters and photographers, but few artists having a right to be dubbed thus because of qualities in their work that are elevated.

The photographer must reach out toward perfection in his work; but, thus far, it seems as though the perfection sought by the professional conflicts with that valued by the painter. Where shall the line be drawn between a strong, vigorous, clear negative and one fogged, the image badly focused, thin and flat, if nine out of ten professional landscape or figure painters unite in deeming the latter preferable to the former. On what ground do these painters stand if their judgment is honest and so diametrically opposed to that of the photographer whose whole life—and that often a long one—has been devoted to making plates? How can the bad be good? Yet unquestionably it often is, and would be less good if better. In other words it must be said that the ideal of the professional photographer, if we may judge by the work shown, is in the minds of most painters deemed to be bad. Who are in fault? Surely the painters have no desire to call photographers names, neither can they believe themselves to be entirely wrong.

J. Wells Champney.

THE ARTLESSNESS OF ART IN PHOTOGRAPHIC LITERATURE.

WE amateurs who have but little to say and considerable nimbleness in saying it are creating a photographic sort of literature not unlike "Brer Rabbits'" style of conversation, for he, you remember, under the most trying circumstances, always "kept on saying nothing." We keep on saying nothing for pages and pages, till an earnest seeker after information despairs and turns from the fat annuals to some illiterate pyro-stain-professional, who cannot write well enough to make out his bills, to get answers to the simplest questions.

"Take a piece of butter the size of your thumb," says the cook-book; "but whose thumb, yours or mine?"

"Develop in the usual way according to the printed direction, and then proceed to," etc., etc., etc. Certainly, but whose printed directions?

"Choose one brand of plate and stick to it, and then prepare the following solutions, which never fail to," etc., etc., etc. Good friend, you know all about it, but we do not; and pray, why do not you tell us?

"Experiment by yourself and gain the delights of practical success." Yes, of course, but how, where and when? If you know, make haste to say it or else give some other good men a chance. Is photography to be for ever a black art because those who know how to do it are not those who know how to tell; or is the failure of the dissemination of information to be explained on the same grounds that one explains the failure of some women's love stories? Those who know will not tell, and those who do not know cannot tell.

Then, there is another class of writers in whose ranks many amateurs are concealed, who experiment rather for the sake of advertising than for the love of photography, *per se*. Perhaps, this is right; perhaps, it is wrong, but it does not seem to me to be developing art for its own sweet sake and smacks rather of a soapy flavor. For instance:

Good morning! Have you tried ——? Take 2 drams of eikonogen and 6 packages of the new ——

This is direct, but not always trustworthy, as the next week the enthusiast who has sold his right of free speech to no photographic supply house may have found his paper to deteriorate and may be trying something better or worse while his blind follower in some distant town blunders along by the dark of what he has read till in despair he swears he will never trust magazines again.

One explanation of all this waste of printer's ink may lie in the fact that the information is of too scrappy a nature, and while editors might well object to contributions as long as Chinese operas, it would mend matters considerably if Mrs. Alexander Hamilton Burr and Mr. Vanderbilt Jay Gould Astor Smith would take time to tell us what sort of "suitable pieces of wood" they used in their home-made trays, or how they contrived "to throw the shadows so happily on the family group on the lawn." Nobody knows, I believe, how to get a view of the baby in grandmother's lap in a shaded corner of the parlor with one second's exposure, although we have all tried it; but the other things may be open to explanation, and therefore I would suggest that the Photographers' Association of America should pass a law that no one should teach, or preach, or leach in photography without a license. Then would we have fewer quacks, and more people would be benefited by reading magazines which are, when all is said, so much better than nothing that we long to have them better than anything.

Adelaide Skeel.

EARLY TALBOTYPES AND WHERE TO FIND THEM.

Genuine early Talbotypes are now rarely to be met with. There is, however, one quarter where those interested in these firstlings of our art may still turn to secure one or more specimens of Talbot's handiwork. My object in the present communication is to point out that there must be many of these veritable relics hidden away in libraries and in the dark recesses of the second-hand bookseller's shop. I think an effort should be made to rescue as many of these pictures as we can before they disappear in toto. I write open to correction, but it appears to me that it is not generally known that Talbot furnished to the *Art Union Monthly Journal*, of July, 1846, a very large number of his "patent Talbotype or sun pictures." A single print was issued by way of supplement, and was bound up in the number here specified. To match the large circulation which the *Art Journal* enjoyed, it was evident that not one but several paper negatives would be required to produce the necessary prints; hence we find that the subjects reproduced are not always the same. The three specimens which I have in my own possession are all different, nor have I yet seen in libraries or elsewhere a duplicate of these early prints. The knowledge of this fact should, I think, tend to make our hunt all the more keen. It is unfortunate that in no case is any indication given of the subject represented. Two of the pictures which I have beside me are evidently representations of some cathedral, while a third has been taken on board of a man-of-war. The size of the picture is about that of quarter-plate, and the appearance of all is very similar, presenting a somewhat faded look. The original color of the silver image is completely gone, gold toning in these early days not being practised. The circulation of the *Art Union Monthly Journal* at the period these Talbotypes were supplied to it was one of 7,000, so that an equivalent number of these "sun pictures" must have been produced.

William Lang, Jr., F.C.S.

ALBUMEN PAPER PRINTING.

NOTWITHSTANDING the multitude of published methods for manipulating albumen paper during printing, many operators are continually in trouble with their prints and are at a loss to understand the cause thereof. Most of the published methods are too complicated for general use. Simplicity in photographic methods is as essential for success as in most other business operations.

This is my apology for presenting the following easy and simple, but sure and certain method of albumen printing, which I have had in practical operation in my business during the last twelve years, as my contribution to the ANNUAL.

Twenty-four hours before silvering the paper place the quantity to be sensitized in the bottom of a box large enough to let it lie flat. Let such box be 10 inches deep, with one of its sides hinged to turn down. Five inches above the bottom have a partition made of slats, upon which lay a wet towel, spread out above the albumen paper. Then close the box until ready to sensitize paper.

Make printing bath of nitrate of silver crystals and pure water 60 deg. to ounce by hydrometer. Add three or four small lumps of carbonate of soda (sal soda). Shake the bottle well and let stand until settled clear. It is advisable to have the bulk of the printing bath a gallon or more.

When ready to sensitize decant the clear liquid from the bottle, leaving the sediment in bottom. When through using return the clear liquid from the silvering tray to the bottle and let stand until again wanted for use.

Whenever the bath shows signs of discoloration add a small lump or two of sal soda. Keep the bulk and strength of bath up to standard by fresh additions of silver and water each time after using. Never filter, boil, or otherwise doctor this bath, except as above indicated.

Float from one to two minutes, and fume with strong ammonia one hour.

When through printing wash prints as usual preparatory to toning.

Have ready a large bottle of pure water in which ½ or 1 pound of borax has been placed. Pour out sufficient of this borax solution for the work in hand, and fill the borax stock bottle with water for use next time. Keep plenty of undissolved crystals of borax in the bottom of the stock bottle. Add to the borax solution thus poured out in toning tray sufficient solution of chloride of gold to tone, and add more of the gold solution, as required, as the toning proceeds. Keep the temperature of the toning bath so it feels just comfortable to the touch, by a lamp underneath.

One grain of gold will tone two sheets of paper, if the batch is a large one, and the toning is conducted moderately and not hurried. Fix, wash, and mount as usual.

Jay Densmore.

A HARMLESS METHOD FOR REMOVING SILVER STAINS.

Every photographer, amateur or professional, uses silver nitrate in one or more steps of the picture-making process. Every one knows the ugly black stains left on his fingers and the difficulty in removing same. The old method of cleaning with cyanide of potassium is effective but dangerous, as in handling glass plates the operator is more than likely to cut his fingers, and the cuts, though they be very slight and not noticeable at the time, may yet be large enough to allow some of the cyanide to enter the blood with serious, if not, as has happened, with fatal results.

A new method which is absolutely free from danger cannot but be appreciated. With a tuft of cotton cover the stains with a weak solution of iodine; allow this to remain for three or four minutes, then wash off with strong ammonia. This will leave white, soft, clean hands; and should the skin be cut the stinging of the ammonia need cause no fear, as it is quite harmless, and the pain can be stopped by simply washing the hands in clean water.

L. H. Schubart, M.D.

THREE PRACTICAL HINTS.

A Good Preventive of Blisters is to gently pour into the fixing bath, containing the fixed prints, pure water of the same temperature, stirring all the time, until the fixing solution is very much weakened. Then remove the prints to a weak salt solution, and once more add pure water, until all traces of the salt have disappeared. I have used this method and am very seldom troubled with blisters; but I always take care to have all solutions of about the same temperature.

A Higher Gloss may be obtained on prints if they are not allowed to soak all night in water. Wash them for two or three hours in pure water, and then mount.

To Remove Yellow Stains from Negatives, take:

Alum	1 ounce
Sulphate of iron	1 ounce
Citric acid	1 ounce
Water	24 ounces

and allow negative to soak in the solution for about fifteen minutes. The solution will keep well for a long time.

J. H. Reuvers.

MORE MINOR MATTERS.

In addition to the points to which attention was directed under this heading in the Annual for 1891, there are very many other little and apparently unimportant matters to be attended to between the exposing of the plate and the exhibition of the mounted print.

In development, if pyro-ammonia is used, the practice of making up the various ingredients in 10 per cent. solutions has much to recommend it, not from the fact that there is any particular virtue in a 10 per cent. over a 20 per cent. solution (for so long as we know definitely what quantities of the various constituents of the developer we are using to develop any given plate we may keep them in any form most convenient to ourselves), but the 10 per cent. method has the merit of simplicity, and there is no reason why it should not be universally adopted.

The making up of the developing solutions according to "rule of thumb," and after making equal parts of A and B, trusting to luck for the result, has been exploded long since. At the present time very few who aim at getting regular results adopt this style; the majority suit the composition of the developer to the subject, and the light, having registered each of these items either mentally or otherwise at the time of exposure, it is perhaps safe to assert that with these operators scarcely two negatives are developed with the same developer.

Some subjects require a developer strong in pyro, others are better rendered when the pyro is more sparingly used; with others, the normal quantity of pyro may be used, but the proportion of the ammonia or bromide requires alteration and so on, and in order to do this it is imperative that we have our chemicals in solutions of known strength. The last year or two has witnessed the decline of the fashion of terminating every other article in the ANNUAL with a pet formula, and this is a matter for congratulation. Whether it is attributable to the fact that so many different formulas have been concocted and published, that there is no combination left to discover, or to the tendency of photographers to follow a more rational system, cannot be determined, but I think the latter the probable reason. This is an old song, but the more often it is repeated the better chance there is of grinding it into the fraternity.

Re-clearing Solutions.—Some say that the citric acid and alum clearing solution will not reduce the density of a negative if allowed to act for a considerable time; others assert that it will. Be this as it may, I can testify to the fact that *citric acid* acts as a *very powerful* reducer. Some years ago I had some negatives in a large dish undergoing the tortures of the clearing process, and as my bath was weak in citric acid a few crystals were dropped into the dish while it was rocked slightly in order that the acid should mix with and strengthen the bath; this is undoubtedly accomplished, but one small piece through carelessness found its way on to the center of the sky of one of the negatives and was allowed to lie there unobserved. A few minutes after a rather ugly-shaped hole was discovered at this spot, together with a still undissolved portion of the crystal. Had it been the proper shape it might have come in handy and done duty for the image of a balloon, thus turning the result of an accident into an object of fame—but it wasn't.

(For the sake of warning I am not ashamed to acknowledge the above blunder, although I ought to be, but we cannot all be perfect.)

Moral: Don't mix solutions in the dish while plates are lying therein.

Another piece of advice for the year 1892. *Thoroughly fix all negatives.* It may perhaps be considered old-fashioned to say anything about the sensitizing of paper, especially to amateur readers, commercial sensitized paper being so extensively used.

Though I usually keep a few sheets of ready-sensitized paper on hand for use in an emergency, yet for general and regular work I sensitize the paper myself, as I think that more regular results and better tones may be obtained on the home-prepared article, notwithstanding the fact that in Australia there is a factory which turns out a really excellent material, better than any imported that I have tried.

Preference for home silvering may be the result of prejudice or conceit, but the idea that it gives better results is so firmly seated in my mind that no argument has yet been able to dislodge it.

We all know that the remedies proposed for blistering would fill a fair-sized volume, but the only treatment I have found effective is a combination of two dodges; *first*, have the paper slightly damp before silvering, and *second*, employ methylated spirit in the fixing bath.

With these two operations blisters do not agree, and as a rule are rare, whereas when they have been omitted, some samples of paper are—well—atrocious.

If the edges of prints are roughly trimmed with scissors prior to the first washing, the risk of tearing in the subsequent operations will be greatly reduced; the final trimming may be done more conveniently just before mounting.

Too much stress cannot be laid on the necessity for extra care in the fixing of the prints. We are continually invited to spare neither pains nor water in the final washing, but this gets over only half the difficulty.

For years I have held the opinion that most of those cases of fading with which we become acquainted, that are not due to causes outside the print itself, are the effect of imperfect fixing rather than meager washing, and in this view I am supported by many of the best known writers who are qualified to give an opinion. I have known cases in which the prints to the number of perhaps fifty, half-plate size, have been steeped one by one in a hypo bath of about 20 ounces which contained 4 ounces of hypo; when all were in, the bottom print was transferred to the top, then the next, and so on until the last immersed was reached, the whole operation taking less than ten minutes; the prints were then considered "fixed" and were placed in the washing water at once. This may or may not be sufficient; it is certainly much less than the writer thinks should be given, and he invariably uses a bath from 25 to 30 per cent. stronger than is generally recommended.

The washing should certainly be liberal, though not extravagant.

There is room for much more under the heading of this article, but as the space in the Annual is limited, and I have plenty to occupy my time without counting the words, it is best to be on the side of safety and leave off in time. It is hoped that some will find a small grain or two of gold mingled with the sand of this paper in order to justify its appearance.

J. H. Harvey.

ARTISTIC PHOTOGRAPHS.

A Photograph may possess high artistic merit, and yet the chemical and optical qualities may be somewhat inferior.

On the other hand it is possible to make one with all the chemical and optical qualities good, and yet decidedly wanting in artistic merit.

It should be the aim of all to combine as many good qualities as possible in every kind of photograph, whether portrait, landscape, or even pictures of mercantile subjects.

Good sensitive plates, chemicals and lenses, are at our disposal, requiring only good judgment in their use.

Almost everything is provided for us, except artistic taste in arranging and lighting the subject.

In portraiture, see that the light is so arranged that it will bring out all the fine modeling and not allow the accessories to be as prominent as the face and head.

It is quite possible to make all parts of a picture equally sharp and clearly defined, and so well lighted that they will be an aid to the portrait.

In landscapes be careful in selecting a standpoint for a view. The central point should be most prominent, but the foreground is very important; it should have variety, but should not be obtrusive. If there are strongly-colored objects that cannot be avoided, get them in shadow if possible, either by shading during exposure, or in the printing.

The best time for making views is when the shadows are long.

Nature often looks its best early in the morning; foliage is more likely to be quiet just after sunrise; the wind often rises after an hour or so, and blows until nearly sunset, so that very many of the best moments for artistic photographs are before and after the usual working hours.

In printing in clouds from separate negatives be sure that the lights and shades correspond with the rest of the picture, and above all things, don't make your clouds so strong that they will compete in hardness with the rocks in your foreground.

The darkest part of a cloud is generally lighter than the highest lights in a landscape.

Use orthochromatic plates and you will soon discard extra cloud negatives. Try all the different kinds and stick to those you like best. *Edward Bierstadt.*

PORTRAITURE AT HOME.

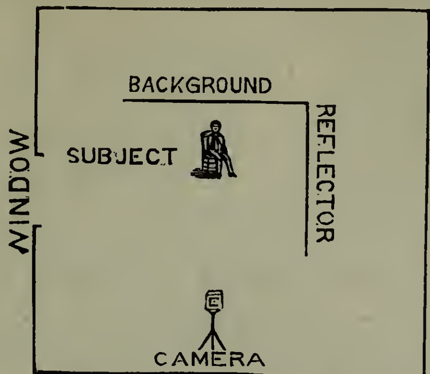
In order to make good portraits it is not necessary to have a regular photographic studio with top and side light, painted backgrounds, papier maché accessories, and an expensive portrait lens and camera. An ordinary side light will answer very well, and the background and reflecting screen may easily be made at home. A common view camera will do very well, even though it be not quite so convenient as a regular portrait box, and a good rapid rectilinear lens of an American make will answer precisely as well as an imported portrait objective which costs twice as mnch.

Such an outfit will enable the amateur to make good, life-like and characteristic portraits of his friends. It will not enable him to open a professional studio, of course; but this he has no desire to do. Let him select a good-sized room with plain white walls, if possible, and go to work.

The window or windows should face the north, if possible, but this is not absolutely essential. If there are windows on two sides of the room, however, those on one side must be obscured so that all the light used for illuminating the subject will fall in one direction.

A serviceable background may be made by stretching some dark woolen material over a clothes-horse, or other suitable frame; or, on a pinch, even plain brown wrapping paper may be used for this purpose. If the clothes-horse is divided and hinged in the middle, as is very often the case, one panel may be covered with the material of neutral color for the background, while over the other panel is stretched white cloth or paper to serve as a reflector. If the wall has not been papered it can be painted a dull gray color, or covered with a paper of a similar solid color, and thus the absolute need of a background may be obviated. A reflector, however, will generally be found necessary when a side light is used.

When a home-made background and reflector is employed, such as we have described, the subject and apparatus is arranged somewhat as shown in the following crude diagram.



Of course no very elaborate effects can be obtained with so simple an outfit, but good portrait busts may be made of one's friends. The lighting facilities are limited, and it is therefore well not to attempt too much in this direction. If the best side of your subject's face happens to be the one away from the light, when posed, it may be brought into prominence by turning everything around so that the camera and background change places.

In posing the subject, and in the arrangement of the drapery and other details, there is ample room for all the artistic taste and judgment which one may possess. The amateur should seek to bring out the characteristic features and the individuality of his friends. This he can do much better than a professional, for he has the advantage of an intimate acquaintance with his subject and knows what is characteristic in attitude and expression, and what is not. Occasionally an accessory, such as a table, may be introduced with good effect, and the real furniture of one's home will be found to photograph quite as well as the papier maché articles of a professional's studio. Family groups may also be photographed in this way very satisfactorily.

Such portrait negatives need not be retouched very much, if at all. The defects may easily be obliterated by the slight use of an ordinary lead pencil. Print by the favorite method, and if vignetting is resorted to at all, let it be very slight, beginning a considerable distance from the head and gradually shading off into whiteness. Mount the prints on plain white cards without gilt edges or anything to detract from the likeness itself, though a plain beveled edge will set off a picture to advantage. *W. I. Lincoln Adams.*

HARMONIOUS COMPOSITION.

Professional photographers are imbued with the idea that their vocation makes artists of them, and amateur photographers labor under the impression that the possession of a camera places them beyond censure or advice in regard to the artistic merit of their work. Surely there are many exceptions, but, after ten years' attention to this idea, I am convinced that the foregoing statements are the rule. It is in "the force of human nature" to take advice only when it is paid for, but I trust that of the many who will read this article there will be some who will profit by it. Last year, at the convention of the Photographers' Assocation of America, a photographer, who was well known in the city from which he came, exhibited a large picture of a Mexican cowboy. The position and lighting were good; the finish was excellent, but the background was a handsome parlor scene, and the cowboy sat on a balustrade in full fighting costume, revolver in hand, ready to shoot. Where was the harmony in this picture? When the photographer pointed to his work and asked me what I thought of it, I took him aside and gave him some advice without charge. I hope he has never committed such a crime against art since.

Another error in composition is a picture of an individual with gloves on and a cane in his left hand, holding his hat in the other hand. The photographer, be he professional or amateur, forgets that when men go out walking they have their hats on their heads, and if they be in a parlor their hats and canes are usually to be found on the hat-rack in the hallway, so that in either case the composition of a picture as just described is erroneous. The majority of men are right-handed, and the minority are either left-handed, or perhaps ambidextrous, so that carrying the cane in the right hand is the rule. There are many photographs extant of men and women in full evening dress, posed before backgrounds of every description except the correct one, which is a drawing or ballroom scene. A man in full-dress relieved by any other scene is as much out of place as a laborer in working clothes occupying a box at the opera.

Amateurs generally make the common error in landscape photography of including too much foreground and too little background. Usually a road-scene will be nearly all road and a few trees sticking up in the top of the picture where the sky ought to be. This is one of the reasons why the majority of an amateur's landscapes appear so unevenly balanced.

There are no rules governing harmony, and artistic sense must dictate concordant surroundings. There are men whose sense of art in colors is so thoroughly cultivated that a false blending of tints is at once apparent to them. This faculty is more often born than acquired, still the knowledge of harmony in surroundings can be studied by a series of natural conclusions. A person does not seek the shade of the verdant woods when he wears an ulster, no more than one is to be found skating with a linen duster on, therefore if such is an institution in nature it must be the same in art, for art is imitation of nature. Photographs of objects should harmonize with their surroundings, and a little forethought will always aid the photographer in producing harmonious pictures.

Maximilian Toch.

THINGS TO DO AND THINGS NOT TO DO.

A HOMELY title and a homely subject, nevertheless it contains many homely truths, which, to disregard, leads to failure. These truths can be taught through the pages of THE AMERICAN ANNUAL; much of photography cannot.

Pre-eminently photography is one of those studies in which success is only reached through failure, or in other words experience; and experience is one of those valuable possessions acquired through "hard knocks." The greater proportion of amateurs fail either because they forget to do as they were told to do, but generally because they become experimenters before they have learned to make a decent negative.

It is quite impossible to teach the uninitiated anything about exposure, development, etc., in a written article, for which reason my aim will be to instruct him or her, what *should* be done, and what should *not* be done.

To Do.

Be sure that your dark room is all that its name implies, and that the light that you work by is fitted to the uses intended.

Be sure that your camera and shutter are light-tight. I have seen shutters that for want of sufficient *lap* allowed light to pass. To test these conditions place in holder a plate, withdraw the slide part way, place in front of dark room light in position occupied by plate when developing for five or more minutes; do the same in camera out in the sunlight, then flow with developer, and "fix:" if the end uncovered by withdrawal of slide is perfectly clear and free of fog, you are all right; if not, you should know where the trouble lies.

Put these plates for the test in the holders in *absolute* darkness. When testing camera, cover the shutter with a cloth, when the shutter, cover camera with a cloth; have each tub stand on its own bottom.

Always cover holder or plate-shield with cloth when you withdraw slide, and keep it covered; give the light no chance except through the lens at the time you want it. Always keep holders free of dust, camera as well, and dust each plate before placing in holder, and before developing. Adhering particles of dust cause transparent spots on negative.

Use as large a diaphragm as is consistent with proper definition; brilliancy of image on the ground glass means brilliancy in the negative, all else being properly done.

Always use a tripod when possible, or rest camera on or against something that is at rest. This "press the button" business is a fallacy in nearly *every* instance; in nearly every such exposure there is an involuntary muscular motion; let those who doubt (their name is legion) try of the same subject, moving foliage, one exposure with camera in hand and the button racket, and another with camera on a tripod and pneumatic release—this will settle the argument if any exists.

Always reduce developer to such strength as to enable you to control it; bring up the detail before you bring up the intensity; intensity before detail means failure. When detail is had add the developer of greater strength, and intensity will follow; if properly done all will grow in strength together.

Always use alum. Many good formulas are published; it is not my purpose to name any.

Always hold hard and fast to the formula given by any plate-maker or friend who knows of what he speaks; master it before you experiment with the unknown that may be recommended by some one who knows less, perhaps, than you do. The amateur experiments too much, or changes too often to know just where he stands.

Always wash thoroughly after the hyposulphite bath, and with a large tuft of cotton pass over the film to remove any foreign matter that may have become attached during the operation of washing.

Always place to dry in place free from dust, and dry thoroughly before placing in sun to print. Any moisture in film will lead to softening, causing the paper to stick, thus spoiling both negative and paper.

Not To Do.

Never dust off plates with brush that contains stiff hair or bristles; use brush with long fine hair.

Never blow on plate to remove dust, especially if you have a mustache. Spots of moisture will too often bother you to render such an act the proper thing to do.

Never put alkaline solutions in bottles having glass stoppers —they stick.

Never sweep or dust your dark room; use wet cloths to remove dust and dirt. Never use trays or dishes for all work; keep to their proper uses those for developing, fixing, toning, etc.

Never pass your fingers from one solution to another without washing, if you would avoid stains, etc.

Never be in a hurry; move with circumspection in all your photographic work. Although it requires but a small fraction of time to impress the sensitive plate, good results can alone be had by study of position and a due regard to light and shade. Development and all the operations of the dark room can only move at proper speed to produce satisfactory results.

Never console yourself with the idea that to simply "touch the button" comprises the whole art of photography, and that when failure follows you can make good your want of success by blaming the maker of the lens and the maker of the plates.

Never forget that a weak, flat negative is probably due either to over-exposure or too weak a developer; that one with too great contrasts is due either to under-exposure or too rapid or too strong a developer.

Never be saving of developer; it costs but a trifle compared to the plates. Use a liberal quantity to fully cover plate.

Never expect success from snap shots in heavy and deep shadows. Photography does wonders in these days, but it will not give you a picture of details found only in dark corners.

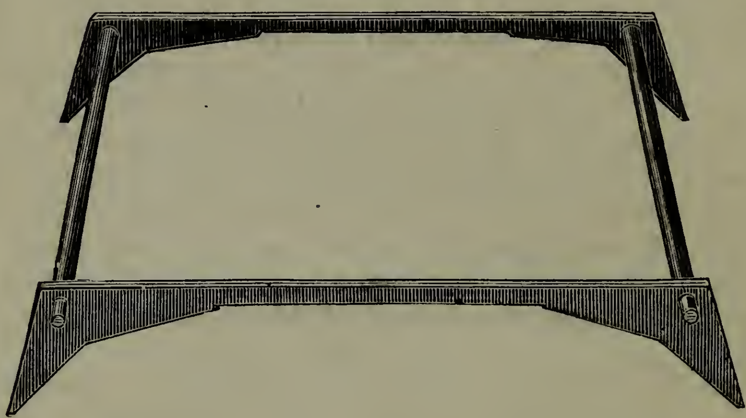
Never expect good results from *old* plates, from which only flat and unsatisfactory results can be expected. Just how old may be old I am scarce able to state; one year is, in my experience, quite enough to lead to suspicion.

Never lose your patience. All things come to those who wait, the writer excepted. May you have better fortune.

Charles Wager Hull.

A RAPID FIXING RACK.

The customary method of placing a negative in a fixing bath, film upward, has long been known to be anything but scientific or conducive to rapid fixing. It is true that *trays* have been made with shelving sides, on which the negative could be lain film downward (the edges of the plate only touching), giving quicker fixing and cleaner work. These, however, are not in the market, and (except in the case of a home-made article) not obtainable and practically unknown. A most convenient substitute whereby the same proceeding can be effected and within the reach of all is one that I have lately devised and daily use with the very greatest satisfaction, viz., a "*fixing rack.*" This can be placed—with the negative placed film downward upon it—in any glass, rubber, or porcelain tray or dish, very rapid fixing and a negative free from all deposit of dirt, sediment, or residue upon its film being in such a way secured.



The accompanying cut illustrates it fully. It should be made in its entirety of hard rubber (wood not answering, and metal being liable to chemical action)—the sides of *flat* hard rubber one-tenth or one-eighth of an inch thick, with a hole drilled through each end; the cross-bars of hard rubber *rod* one-quarter of an inch in diameter with the ends shouldered and fitting into the openings in side-pieces. It is seen that it can easily be taken apart for carriage and as readily assembled for use.

The angles, inclines, lengths of parts, etc., are determined by the use of a glass the same size as the negatives for which it is to be made.

J. J. Higgins, A.M., M.D.

CHLORIDE OF SILVER GELATINE EMULSION PAPER.

When the late J. B. Obernetter presented to the public his chloride of silver gelatine emulsion paper, I predicted that if any printing-out paper would ever supersede the orthodox albumen film no other could do it as effectually as this, and what I said then, more than ten years ago, seems to be realized at the present time.

Emulsion printing papers—those with a gelatine basis or where the chloride of silver is carried by a collodion stratum—offer to the printer so many advantages that it is not to be wondered at they have become very popular in the short time they have been fairly well introduced.

Aristo paper is generally understood to be chloride of silver with a collodion basis, but as the quality of its twin brother, gelatine, is in every way equal and frequently of much superior quality, it is but just that the same name is applied to it—"the best." Different makers of the paper have, however, chosen to give it different names, and we find advertisements referring to Delta, Omicron or Omega, and several other distinct names; they represent, with unimportant modification, only the one article, chloride of silver gelatine.

The paper I have particularly in view is that known as Omega, and with which probably the majority of the readers of this volume are sufficiently well acquainted. From personal experience and observations made in the School of Photography I have the honor to conduct, I think myself competent to describe its working and to recommend it for general adoption.

One of the great advantages offered by this paper is that negatives of a feeble character, hardly strong enough to print from upon albumen or mat surface paper, will produce with it finely detailed and brilliant prints, provided the exposure is made in subdued light or under one or more thicknesses of tissue paper.

The fuming in the vapors of ammonia, absolutely necessary with ready-sensitized albumen paper, is here dispensed with; it can be toned and fixed simultaneously in one solution and within from ten to twelve minutes; the tones attained are generally more agreeable than those on ready-sensitized albumen paper, and entirely at the will of the operator. The elimination of the fixing agent is accomplished in a short time, and the fine enamel resulting from squeegeeing the print upon a glossy surface is highly attractive to almost everybody.

Opponents of the method of toning and fixing in one solu tion assert that the finished print is of but limited durability, and when we examine many of the formulas for these compounds we cannot but condemn them.

It is much safer to tone and fix separately. The tones resulting must necessarily be the same as in the other method, and if fixing is done properly and the print washed well afterwards, there is no reason to doubt its durability any more than that of a well-prepared albumen print.

But the combined bath has become so immensely popular that it seems to be almost impossible to deprive the printer of its use. A compound securing permanent prints, and safe in every other way, has become a necessity, and the efforts made towards obtaining it are quite encouraging.

When chloride of gold or the double salt of hyposulphite of gold and sodium, commonly known as *sel d'or*, is added to a pure hyposulphite of sodium solution of a concentration of 1 : 6 or 1 : 8, we have a toning and fixing bath sufficiently safe for gelatine and albumen prints, as long as the gold is not entirely exhausted; but it takes a long time before the desired tone is attained, for which reason a small quantity of chloride of silver is added to accelerate the process. To add, finally, as many formulas prescribe, a salt of lead, the nitrate generally, whether it be in large or small quantities, is injurious in more than one respect. Without describing the chemical changes produced, let it be enough to say that lead accelerates the process so forcibly that toning may be accomplished before fixing, and undissolved chloride of silver remains in the gelatine film on removal from the bath, or if the print is subjected to its action for a sufficiently long time to be thoroughly fixed, sulphuration takes place, the tone is changed to a positive black, and the whites are of a dirty greenish yellow. For these reasons the admixture of lead should be abandoned, the toning process left to its natural course, and fixing be properly done.

For what reasons sulphocyanate of potassium or ammonium is added to the combined fixing and toning bath is a question not easily answered when we consider that gold and hypo tone and fix as well and perhaps as safely as with the presence of the sulphocyanate. Besides, this body is not always of desired purity, and it has often occurred, when chloride of gold has been added to this solution, the gold has been precipitated in the metallic state after standing several hours.

For chloride of silver gelatine prints the addition of another substance to the combined bath is absolutely necessary. It is that of alum, for it fortifies the film, facilitates washing and mounting, and prevents its slipping in other manipulations. But as alum and hyposulphite of soda decompose each other mutually, evolving at the same time sulphurous acid, the method appears to be dangerous to the durability of the print, were it not that, by long standing of the mixed solution, the decomposition products settle, and that by slight heating the sulphurous acid absorbed is set free. When to such a compound a trifle of chloride of silver is added, we have a stock solution which requires only the admixture of gold to become a perfect and safe fixing and toning bath.

A bath of this description was adopted last summer by the practicing class of the Chautauqua School of Photography, and thousands of prints were toned with it to entire satisfaction, and as the bath is never used twice, the decomposition products generated cannot possibly become perceptibly active. The tones obtained are gold, not sulphur tones; the whites are clear and brilliant, and the print is as durable as can be had with separate baths.

The formula is as follows:

Dissolve 12 ounces of hyposulphite of soda in 48 ounces of water, and 2 ounces of alum in 20 ounces of water. Mix, allow it to stand in an open vessel for three or four days, filter and heat to about 90 deg. Fahr., and dissolve in it 60 grains of chloride of silver. Resting upon the fact that one grain of pure chloride of gold is capable to tone about forty square inches of silvered paper, or from ten to twelve 5 x 8 prints, we add just as much gold to a convenient quantity of the stock solution to tone and fix a certain number of prints, after which the bath is set aside and another mixture made for the next batch of prints.

One hour washing in running water is quite sufficient to eliminate the fixing agent, after which the print is sufficiently drained, squeegeed upon a tintype plate, from which it detaches with a beautiful gloss when perfectly dry. Mounting is done in the usual manner, but the print must be dry when pasted, be laid on the mount carefully without shifting from side to side, and the surplus of the mountant be expelled from between print and mount.

When dry the gloss will be found as perfect as when taken from the ferro plate. A little paste having found its way upon the surface of the print may be wiped off with an alcohol-moistened rag before the print has dried. Prints mounted in this manner do not need to be burnished.

Charles Ehrmann.

PHOTOGRAPHY ON WHEELS.

In the olden days—not so very old either, for they reach up to twelve or thirteen years ago—the *wheelbarrow* formed a not unimportant part of the outfit of a landscape photographer. When wet collodion ruled the photo-world, the equipment was so heavy that it was very commonly stored away in a "barrow;" and on the design and construction of the said barrow no small pains were expended, for it had to carry dark-tent, silver bath, etc.; besides cameras and tripods, one of which would outweigh three of the "featherweight" instruments which we grumble over in these degenerate days!

Going back for a moment to the early part of the present century, we find Joseph Nicephore Nièpce (*first* among the fathers of photography), with his brother Claude, engaged somewhere between 1810 and 1820 in perfecting a curious contrivance called a hobby-horse or dandy-horse. Two wheels were connected by a bar of wood, bearing a saddle, on which the rider sat, propelling himself by pushing his feet against the ground. The connection of the Nièpces with this invention (which attained great popularity for a few years) still remains to be fully investigated.

About the year 1867, some inventive genius in Paris bethought himself of putting cranks to the front wheel of a "hobby-horse," and the modern bicycle then blossomed forth. In the quarter of a century which has since elapsed, enormous improvements have been made, and the cycle of 1891 is quite a work of art. The finishing touch was the *pneumatic tire* invented by an Irish engineer named Dunlop, and now (1891) just coming into general use. It consists of an India rubber tube two inches in diameter, inflated by an air-pump and protected by canvas. This tire encircles each wheel, and thus the modern cyclist literally "rides upon air." It all but annihilates vibration, and enables the roughest roads to be ridden with pleasure.

There are three principal reasons for which we recommend every photographer to become a cyclist.

The first is that much greater distances can be accomplished in a given time upon wheels than upon feet. Careful research has recently shown that the proportion of muscular energy is as 1 to 6. So that we can travel 30 miles upon a cycle as easily as we can walk 5 miles. My own experience fully bears this out. This is an immense benefit in extending the radius of one's work.

The second reason is that a considerable weight can be carried with little exertion. Again appealing to my own personal experience, I am not able to detect any difference in the easy running of my tricycle, whether I carry on it my whole plate outfit (weighing 21 pounds) or not. But the said outfit

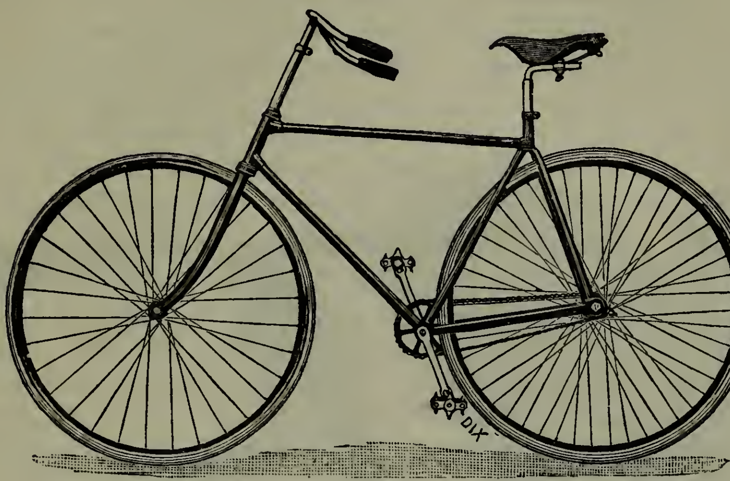


Fig. 1. "Hadley" Bicycle, fitted with Pneumatic Tyres.

becomes a terrible burden when I walk with it on my back for eight or ten miles.

The third reason is not strictly photographic. It refers to the increase of health and strength which accompany the

Fig. 2. "Hadley" Tricycle, fitted with Pneumatic Tyres.

regular use of the cycle. Those interested in this question should study a book recently written by Dr. Jennings, entitled, "Cycling and Health;" and if they also purchase Mecredy's

"Art and Pastime of Cycling,"* they will get a good introduction to the whole subject.

For photographers who are fairly strong and active, and who do not wish to carry a larger photo outfit than the half-plate, I recommend a Safety Bicycle. This should be fitted with Keating's Spring Carrier,† a kind of skeleton frame on springs, mounted in front of the handle-bar, which will carry up to 10 or 15 pounds weight easily. On a "Safety" the distance of 334 miles was ridden on our roads last year in 24 hours by an

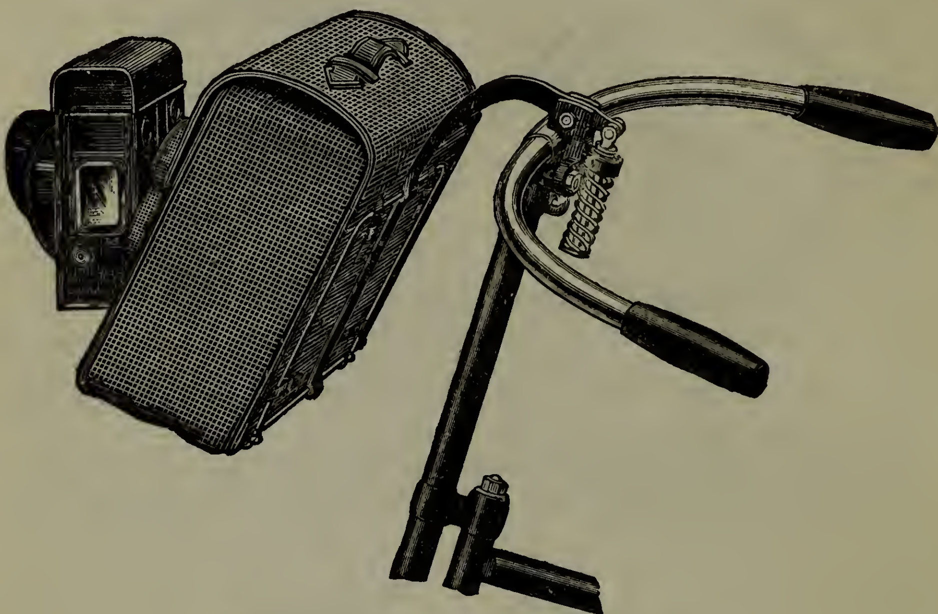


FIG. 3. KEATING'S SPRING CARRIER.

English amateur. Few could equal this, but it is a fact that from 50 to 80 miles per day can be accomplished with ease and pleasure.

For men (like myself) on the wrong side of forty, and who belong to the heavy weight division, the tricycle is the correct thing. Just to show what *can* be done, an amateur has within the last few weeks ridden a tricycle over ordinary English roads 174 miles in twelve hours. I have lately added an exquisite little three-wheeler‡ to my photo equipment. Its wheels are only 28 inches in diameter, and its weight is but

* Both books published by Iliffe & Co., Coventry, England; American Agents: The Wheelman Co., 12 Pearl Street, Boston, Mass.

† Made by W. Carson & Sons, Bachelor's Walk, Dublin.

‡ It is named the "Hadley," and is made by a thoroughly reliable firm—Messrs. Snelling, Begbie & Co., Church Avenue, Kentish Town Road, London.

50 pounds. My whole plate kit is carried on a spring-frame, which rests on the axle of the machine under the seat-pillar.

If a rather heavier make of machine be used, much greater weights can be carried. Mr. E. R. Shipton† habitually carries a 10 x 8 outfit weighing over 100 pounds on his tricycle; and the other day I met a gentleman whose machine was loaded with two youngsters in addition to a half-plate kit, the total weight, himself included, being 370 pounds; yet he was pedalling along quite easily.

The fact is that the art of cycling has been almost revolutionized during the last few years. The machines have been scientifically designed; they have been made safe and easy to ride; weldless steel tubing, pneumatic tires, saddles, and handles; together with the almost total abolition of friction by the introduction of "ball-bearings" to every part of the machine, have combined to place at the service of man an instrument whose value is not yet fully appreciated. And I believe that to no class of the community will these weight-carriers and space-annihilators prove of greater service than to the photographer.

W. Jerome Harrison, F.G.S.

PORTRAITURE BY CALCIUM LIGHT.

Now that the busy season for flash-light work has begun, and we overhaul our apparatus, we come across some of last winter's work, and find a few negatives that are satisfactory, but many more that are not, and the general fault seems to be in the placing of our light.

For a number of winters I have been making flash-light portraits and groups at church fairs, etc., but the results were not always good, and as I could not return the money in case they were not satisfactory, some were disappointed and said "it was a fraud." Then it was that I turned my attention to a new source of light, and tried the calcium.

The results were surprising. I found that I could depend on every exposure and was not troubled by having my subjects close their eyes.

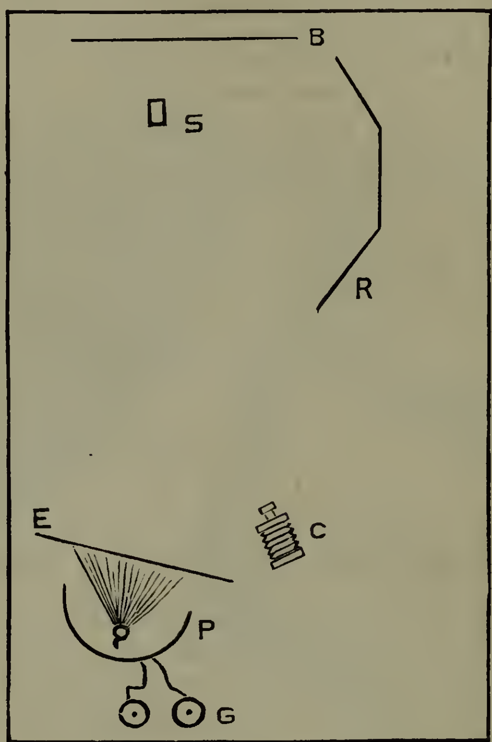
I shall now try and explain how I fixed my studio. Having secured the space alloted to me for my evening's work, I screened it off with dark curtains, and then placing my calcium

† Secretary of the Cyclists' Touring Club, which numbers 22,000 members, and whose headquarters are at 140 Fleet Street, London.

light about fifteen feet from my background and eight feet from the floor, the main part of my studio was completed.

I then hung a piece of white cheese-cloth in front of my light and drew it tight at the corners; this breaks up the glare and also cuts off the heat which is intense; a Japanese screen with a sheet thrown over it acted as a side reflector.

The following cut will explain:



B. Background. R. Reflector. E. Cheese-cloth Screen. G. Gas Cylinders. P. Parabolic Reflector. S. Subject. C. Camera.

I use a 5 x 7 Victoria Camera with a $6\frac{1}{2} \times 8\frac{1}{2}$ Gundlach Lens, and make two cartes-de-visite on one plate, slightly altering the head in the second exposure; of these I print from the best one.

With an aperture of $\frac{f}{11}$ and a rapid plate, the average exposure is about three seconds.

The calcium light has its faults as well as its advantages; for instance, you cannot light a group of more than five persons properly on account of the parabolic mirror used to project the rays forward not evenly illuminating a circle of more than five or six feet in diameter; but for single portraits you can place a cardboard tube in front of your light and

VILLAGE SCENE, IN AUSTRIA.

Engraving, Imperial Court and State Printery of Vienna.

adjust it so as to vignette out any portion not wanted; this saves much time in printing and gives a bold picture on a black background.

This light is rather expensive, but for an evening's work of one hundred exposures it does not cost any more than flash light, and emits no smoke, besides giving you a chance to properly light your subject before exposing, as you keep it burning all the while. The cost for an evening's run here in New York is about $2.50.

I keep a cylinder of gas in my room all the time, for besides being handy to use when a friend comes in, it is also useful to copy or enlarge by, when I am pressed for daylight.

Louis Clarence Bennett.

CHRISTMAS CARDS BY PHOTOGRAPHY.

During the holiday season, when Christmas cards are used so extensively, every camerist should be able to manufacture his own. For the benefit of those readers of the Photographic Times Annual who are at a loss to know how to produce them these instructions are intended.

Last Christmas I mailed a number of my friends and acquaintances a neat little card, which proved to be quite a novelty in its way. I first secured a piece of white paper, size 19 x 26 inches, from a printing office. In the upper left-hand corner of this sheet I cut an opening large enough to admit of a cabinet-size portrait of myself being placed behind it, so the picture would show through. In the lower right-hand corner another opening for the cabinet-size picture of my wife was cut. To the right of the opening in the left-hand corner I drew in large fancy letters the words "Merry Christmas," one word above the other. To the left of the other opening the words "Happy New Year" were placed in the same manner. Across the center of the sheet, in two diagonal lines, were drawn the words "Holiday Greeting," in ornamental letters large enough to almost fill the space—the word "Holiday" beginning at the left edge of the sheet and extending a little over half way across the paper. The first letter of the word "Greeting" was placed under the letter "O" in "Holiday," and the last "G" ran to the extreme right edge of the sheet. The letters were drawn and blackened with a lead pencil. A smooth board was then procured and the sheet was fastened on it by means of four very small tacks at the extreme four corners—the photographs having first been placed on the board with small tacks so as to carefully fit the openings when the paper was placed over them. The board was then fastened against a building and the sheet photographed on a 4 x 5 plate. The camera used was a 5 x 8 Favorite outfit, manufactured by the Scovill Company, and fitted with one of those remarkable Waterbury lenses. The camera was placed as close to the sheet as possible, and the resultant print, when trimmed, was $3\frac{1}{4}$ x 2 inches. It was mounted on a gilt-edged card, size $4\frac{1}{4}$ x $2\frac{1}{2}$ inches. Of course the cards can be made any size the artist may wish, but the size above mentioned gives the best results when a cabinet photo is used. Those who make one of these cards will, I am sure, be pleased with it.

George C. Rhoderick, Jr.

PHOTOGRAPHING LIGHTNING.

This is a very easy thing to do if you can have the lightning to play for you at the right time. Very few have an idea how the thing is done.

The playful "critter" can only be caught in the night, and if the camera, properly "loaded," is pointed at the right direction at the right time it simply takes itself. The only trouble is to be ready at the right time.

My first attempt to take a flash of lightning was on July 4, 1854, at 10 P.M., and was a perfect success. I have never seen it equaled. I used a ($\frac{4}{4}$—) 6^2 x 8^2 daguerreotype plate, placed the camera on top of a tall building, focused on the clouds as the lightning discharged from one cloud to another, then pointed in the direction where the display was the most vivid, until I had twenty or more pass across the lens; then turned in another direction, where there was a brilliant display, and received several discharges.

On developing the plate I had it nearly covered with banks of clouds plainly shown, with the electrical discharges passing from one cloud to another, illuminating the clouds in a very beautiful and distinct manner. In all there were over fifty discharges passing over and through the clouds. All of them proved that in nature there are no sharp zigzag angles, but all rounded more or less.

This plate, and thousands of other rare pictures, was destroyed in the great Chicago fire in 1871. I have been trying for the last fifteen years to get another similar copy of the heavens, but the same conditions have not occurred in the night time. In order to get these displays the storm must have passed you, and be just at the right distance to show in your picture. If you are in the storm, or the clouds too near you, all that can be had is a single flash or streak across the plate, while the rest is all blackness. You must sit up and watch for the conditions and be ready when they occur, and success is yours.

A. Hesler.

HIGH RELIEF CLICHÊS IN HALF-TONE.

Graphic reproductions have never been as popular or brought forward in such enormous numbers as at the present time. Indeed, the world abounds in pictures. Events occurring on the public streets to-day are depicted in the newspapers of to-morrow published in tens of thousands of copies; and when new works of art enjoy public recognition they are speedily reproduced by a variety of reproduction methods.

New methods of intaglio printing from photographic negatives are but of little general interest; the high relief plate, printable upon the ordinary type press is much more so, because we do not only want to print, but we want to print rapidly. Before it was understood how to etch in relief a photograph with all its lighter or darker tone gradation, whether on zinc or copper, a very long time had necessarily to elapse, and before a plate could be prepared for the press the original photograph had to be first reduced into line or stipple. The first attempts to break up the continuous half-tones of the photograph were made by drawing very fine lines upon the asphaltum picture film resting on the metallic plate, by means of a sharp diamond point and the ruling machine.

Much better results were had by interposing between negative and sensitive plate a stripped collodion or gelatine pellicle, the carrier of an extremely fine system of crossed lines; but as this method neither gave entirely satisfactory results, lines were drawn on a large scale on a sheet of paper, reduced photographically, and the negative thus obtained brought in immediate contact with the sensitive film. For full-toned pictures the results were quite satisfactory, but outrunners into the higher lights were impossible to produce by the process.

The most important innovations upon this very wide and promising field were brought forward in 1883 by Meisenbach, who interposed lined plates between diapositive reproductions of the original negative and the sensitive film, copied from them a printable negative, and finally transferred them to the zinc plate preparatory to etching. The most essential feature of the process is that the exposure is interrupted when producing crossed lines.

The Artistic Photographic Institute of Angerer & Göschel, of Vienna, has improved Meissenbach's process very much, for they copy from the original a crossed line negative by one single exposure. Highly interesting experiments have been made with this method under my direction in the Military Geographical Institute, by E. Mariot, then superintendent of the photographic division. They have shown that a good grained plate (Kornplatte), for dissecting the continuous turn of the matrix, is found in the Pucker grain (Runzelkorn) of an exposed Lichtdruck plate; it being however extremely difficult to prepare, on a large scale, perfectly uniform grain plates of this description, small portions of the most possible uniformity were enlarged from six to eight times of their original size, transferred upon lithographic stone, retouched with ink and graver, and as many transfer prints made from it on a large stone as to secure an original plate of dimensions suitable for any kind of reproduction. This seems to be a rather tedious procedure at the first glance, but when it is considered the operations are to be done once only to obtain a plate serviceable for all occasions, its utility becomes certainly apparent. If the black and the white particles of such grain plates of equal value, it is immaterial whether a negative or a positive copy of them is brought into use; but when uniformity does not exist, the most intense parts of the grain should also be the smallest, else the fine details in tone gradation would suffer almost total disintegration.

The application of the grained plate may be described as follows:

A photographic copy of it is stripped from its glass support with collodion or gelatine, the film laid between negative and chrome gelatine paper, or albumenized paper made sensitive with bichromate of potassium and exposed. The exposure must be continued until the grain has totally disappeared in the deepest depths, or respectively becomes visible in the highest lights. Negatives of but moderate density, not excessively opaque in the highest lights, are most adaptable for the method. Harsh matrices of abrupt contrasts and glassy shadows must first be softened, which is best done by applying to their reverse side a light sensitive coating, chrome gelatine for example, exposed in direct light, excluding all light falling laterally upon it, and final fixing or washing out. The exposure should naturally be but moderate, a slight tone in the glassy portions of the matrix visible after development would result in a monotonous cliché. After exposure the plate is inked and washed out. Applying the ink with a velvet roller gives generally better results than by tampooning. At last the picture is transferred upon zinc or copper. Should the lights be too intense, retouch with the needle; the depths strengthen with the brush. Etching is done in the usual manner.

Another method of utilizing the grained plate is to reproduce it photographically upon a glass plate; and to varnish, to place it in absolute contact with the negative and expose chrome-gelatine paper under the diapositive thus obtained, roll in with ink and develop. After making a transfer, the drawing to be etched in relief stands out clear and sharp, when the plate is slightly heated and flowed with a solution of shellac of the following proportions:

7 parts, by weight, of	brown shellac
160 " "	alcohol
40 " "	sulphuric ether

And of fuchsin enough to give the solution a decided dark color.

When dry, the plate must be moistened freely with spirits of turpentine, or bathed in the same for a quarter or half-an-hour, and touched up with a flannel rag. The transfer print is dissolved by the operation, but the shellac, still resting upon the lustrous metallic surface, allows the drawing to retain its original sharpness and definition. It is ready for etching.

Whoever is well acquainted with galvanoplastic work may copperplate the clear and sharp image without resorting to the shellac varnish, and then go at once to etching with very much diluted nitric acid—an operation carried on with remarkably fine results in the Imperial Military Geographical Institution.

I will yet mention a newly devised method of producing grained plates, that of Herr Bartock, with sandblasts, practiced now in the imperial court and state printery of Austria. A very finely polished zinc plate is covered with a thin stratum of varnish, consisting of

200 parts, by weight, of	chloroform
5 " "	mastic
10 " "	asphaltum
300 " "	benzine
2 " "	petroleum

A half tone photographic pigment picture is flowed with the varnish after being transferred to the plate, and bathed in a mixture of

35	parts, by weight, of	glycerine
25	" "	water
2	" "	alum

where it remains for about five minutes; the plate is then taken up and the solution blotted off with bibulous paper. The pigment picture has now the property of being easily destroyed, and when in that condition may be subjected to the action of a moderately strong sandblast. By centrifugal force of the sand the soft and feeble relief picture is gradually and step by step destroyed, and the varnish film beneath similarly attacked. When the photographic film is totally gone the image appears in all possible details and grained upon the varnish stratum, and may at once be etched with weak nitric acid. After about two minutes etching the acid is washed away and the plate brushed with a solution of gum arabic in the proportion of 1:5. When dry, the varnish film is removed with a turpentine-moistened tuft of cotton, rolled in with ink, moistened, and any superfluous color taken off, when the picture stands out clearly and sharply upon the zinc plate, ready for the printing press.

The two reproductions accompanying these remarks were made by the sandblast method. One of them, the portrait of Her Imperial Highness the Archduchess Maria Theresa, protectress of the Vienna Club of Amateurs, and herself an eminent photographer, is made from an original photograph by Charles Scolik.

Ottomar Volkmer.

N. B.—The Portrait plate of the "ARCHDUCHESS MARIA THERESA" *was unfortunately injured on the press by an accident, which is likely to occur even in the best-regulated printing establishments. The* "STAGE BEAUTY" *has therefore been substituted. It is from a negative by Stholl, of Chicago, and is reproduced by the Photo. Engraving Co. of New York.*

ON NEGATIVE RETOUCHING.

How well I remember the pleasure I found in the first photographs I saw from retouched negatives, and how eager I was to secure all I could find.

They were from Loescher and Petsch, of Berlin, and imported by Wilson Hood & Co., of Philadelphia, from whom I got them.

I expected the enterprising photographers of New York would soon introduce this remarkable improvement in their own practice, but they did not.

I became impatient at the delay, and wondered if it would possibly do for Cleveland to precede the American metropolis in the introduction of an improvement in photographic finish. I finally "took steps" by writing an artist friend in Munich to find me the best talent in that department of work that he could, and secure it for me. He found and sent me an excellent man in the fall of 1868. So great was the success of the venture that I soon imported two more artists for that work. At the first Convention Exhibition of the N. P. A., held in Boston, in 1869, I exhibited photographs from retouched negatives, and quite a furor was created.

The retouch craze started from that. I was quite proud of having introduced it.

Now, after a lapse of twenty-three years, and in the light of what we are getting in the name of negative retouching, I feel like apologizing to the fraternity and to an over-retouched people for having brought upon them an affliction I can never atone for.

I maintain that retouching of negatives—skillfully, intelligently and *judiciously* done—is a desired improvement, but the great army of exterminators of lines, wrinkles, dimples, freckles, etc., now devastating the values of photographic faces, whose assumed skill is measured by their thoroughness in wiping out, marbleizing, and bladderizing faces should be turned upon and routed. It has become an outrage upon photography and its patrons. I never feel this more keenly than when is brought to me for a portrait to the size of life one of these photographs with all the strong lines which indicate character, and all the more delicate markings of time's fingers entirely swept away. To ask an artist of ability to take that meaningless thing and from it make a portrait of a man who had something in his face is an absurdity, an impossibility. The man is dead, the photographer discontinued business (no wonder), and that is the only thing from which to work.

Yes, I know our clients dislike to look old, and object to such evidences of age as are shown in the rough proof. I know, too, the operator depends upon the retoucher to make a doubtful negative pass. While I am amply conversant with these facts, I know that lines may be softened without being lost, and the proprietor of a photographic business should have stamina sufficient to judge a bit for himself as well as for his customer, and not permit a daily wrong little by little to degrade him through his work.

J. F. Ryder.

ENLARGING NEGATIVES.

It is a well-known fact that enlarged negatives by the wet process are usually superior to those produced with dry plates. This is so because of the granular structure of the dry plate, and which becomes very apparent when a cabinet negative is enlarged even a few diameters. By the means described below this can be entirely overcome, and the results are very satisfactory.

We will suppose that we have an order to enlarge from a cabinet negative to 20 x 24 inches. The cabinet negative has been produced as usual on a rapid emulsion plate and is consequently of very granular structure. Now, for good results a very slow plate must be used for the transparency, or, better still, a Carbutt gelatino-albumen plate.

We may overcome the granularity of the negative by placing a sheet of transparent gelatine or celluloid between the negative and the transparency plate during exposure.

By exposing to a *stationary* lamp you will get a result practically as sharp as the original negative and with little or no modification of the granular effect; but if you will move the lamp, or the printing-frame in a small circle, the result will be what we desire, a transparency suitable for enlarging. Having obtained the transparency, any of the usual methods may be used for the enlargement, but I prefer to use a daylight bromide enlarging camera, placing outside the transparency a sheet of porcelain or opal glass. This with a slow plate gives time for vignette effects or shading a portion of the negative when such is conducive to a more perfect result.

Often the enlarged negative may be made superior to the original by exercising care in making the transparency, and in the after manipulations of the process of enlargement.

L. G. Bigelow.

FROM PRINTING BATH TO BURNISHER—A FEW HINTS ON THE HANDY WAY TO DO SOME THINGS.

Rub clear round the edge of the mouth of the bottle or jar containing the printing bath with a piece of paraffine and you will never spill a drop in pouring. Once rubbing will last for weeks unless you scrub it off again.

Block up one end of the silvering tray before filtering or pouring the bath in, so the solution, when in it, will come nearly to the upper edge of the tray at the lowest end. Then in skimming it, begin at the highest end; use heavy tissue paper. (I use that in which 10 x 14 ferro plates come packed, cut in strips three or four inches wide, and as long as the tray is wide.) Let as little of the skimming paper as possible touch the silver, but it must touch its whole length.

You finish the "skim" at the lowest end of the tray, and close to the upper edge. Let the skimming paper touch the end of the tray its entire length before leaving the silver, and it will bring with it every particle of dust and scum, without tearing the paper; hang it across a wooden peg and the other edge of it will do for next time. After silvering, if you siphon off your bath you will tilt up the tray in a similar manner for that purpose.

Before printing, clean the backs of all negatives with powdered pumice stone, fine; use it dry with the ball of the finger; at the same time rub on the film side a narrow strip, as near the edge as possible, on which to write the name and number with a pencil. After printing, suppose you want to "tint" or "print in gray" some four or five dozen cabinet vignettes. It looks like a big job, but can be done very handily, and many of your customers will like them much better than the glaring whites of a plain vignette. Let a part of the "furniture" of the printing room consist of a flat board 12½ x 24½ inches, and a clear flat white glass 14 x 26 inches; cover one side of the board with two or three thicknesses of sheet wadding, or "bats," and over that stretch a piece of canton flannel, nap side out, and tack around the edges, thus forming a sort of cushion support. Place twelve cabinets on this board and cover with the glass. If your prints roll up badly (which you should not allow them to do, keep them flat), it will bother you some to get twelve of them under the glass without breaking, but there is a handy way to do that even. Place the board and glass before you, with the edge toward you, and push the glass from you, leaving about three inches of the board (or cloth) exposed; raise the edge of the glass nearest you half-an-inch or more from the board, and block it up with a wedge, push six pictures under the glass, one at a time, using both hands, with the heads toward you, if you please; let the glass down on them, and draw it toward you until three inches of the other edge of the board is exposed; now turn it around, block up the edge as before, and push in six more, forming the lower row. When you see how it works you can put the top row of prints in from the further side. It can all be done very quickly.

Now have a lot of "tinters," opaque papers, cut out the shape of the vignettes, only a little smaller, about five or six sizes will fit all ordinary vignettes; special sizes or shapes can be "made to order" in about a minute. Strip off the *Photo Magazine* covers before you get them bound—they are just the thing to make tinters of; have each size a different color. Fold the thick paper in eight or ten thicknesses and cut all at once with large shears; place these tinters on the glass over the pictures, adjust them so a line of the printed part will show around each. If the tinters are too large they will leave a white halo around the print. Now in strong diffused light (under a skylight is best), they will tint very quickly. Keep the glass moving with a circular motion, to properly blend, just as you would tint a single one. You will find that the prints will slide around on the cloth, and crawl out, and drop on the floor, and get out of place generally when you move the glass over them; unless you previously rub the glass on the under side (both sides as well) with powdered pumice stone. This is most important; once rubbing will do for all time. After they are tinted, if there is a white or light place on any print that should have been tinted more, then you know that your tinter was too large at just that point; if a dark line shows around the print, your tinter was too small, or the "motion" of the glass was not large enough. No one need ever spoil a print in tinting. If you notice a white spot where an air-bubble was in silvering, when you first begin to tint a batch, take it out quick, and save the labor of spotting it out with ink in the finishing, as it may "pass" if not tinted.

For mounting, instead of using a clumsy glass to spread the moist prints on for pasting, use a piece of new oilcloth. Wash it clean, wipe it dry, and roll it up as soon as you are through, and after it has been used ten years it will still be as good as when new.

F. M. Rood.

A FEW WORDS ABOUT THE IRON PROCESSES.

Since the first researches of Sir John Herschel, the behavior of the iron salts under the action of light and of reagents always has been the object of investigation, in order to find out a simple and cheap process to obtain permanent photo impressions. And from time to time we read in the periodicals that some new processes have been discovered, and patented, of course. It has even been announced, a few months ago, that an iron compound of such an exquisite sensitiveness had been discovered, that a negative could be obtained in the camera obscura by a few seconds' exposure. This we doubted *a priori*, and, in fact, we are not more likely to hear again from that process than from the discovery of that instantaneous collodion emulsion rivaling with the rapid gelatino-bromide of silver plates.

Certainly the iron processes deserve our attention. They are most interesting, specially to every one having some knowledge of the science which is the base of all the photographic operations, for the changes effected during the insolation are not hypothetical, as those occurring in a photo silver film. We know what is the result as well as we know the behavior of the reagents employed to obtain the various precipitates which form the image. In a word, every action is well understood, and consequently under absolute control.

For example: In presence of organic matters—a *sine quâ non*—a ferric salt is reduced by light into one of ferrosum, and the organic matters absorb the liberated oxygen: $Fe_2Cl_6 + H_2O = 2FeCl_2 + 2HCl + O$. Now whether we treat the ferrous compound by the reagents of ferrous oxide, or convert it into ferricum and treat it by chemicals acting with ferric oxide, we produce an image consisting of a certain well defined precipitate.

There are many reagents acting with the oxide or salts of iron at the minimum or maximum. They are described in every treatise on chemistry. The best to obtain a black image with the ferrous salts are silver nitrate and other soluble salts of the same metal, and, with ferric oxide, the tannins, gallic acid and pyrogallol.

The manner of operating in all the processes is nearly similar: Float the paper for half-a-minute on a strong solution of ammonio ferric oxalate in preference to any other iron salt; dry; expose; develop with a weak silver nitrate solution, acidified with citric or tartaric acid; wash first in water acidified with citric acid, then in soft water two or three times renewed, and the operation is complete.

Or, wash the proof after exposure, then convert the ferrous oxalate into ferric oxide by an oxidizing agent—potassium permanganate alkalinized with a little aqueous ammonia—and develop with pyrogallol, tannin, etc., then wash in a few changes of water.†

The proof obtained by the first method is formed of metallic silver. If desirable, it can be toned with auric, platinic, or palladious chloride.

The difficulty in the processes in question is the obtaining of pure whites. I found that they were much improved by a preliminary sizing, and compounding the iron solution with a little glucose and a little gum arabic, which prevents the paper being deeply imbued with the liquid, and facilitates the washings for the elimination of the non-acted on iron salt. Besides, certain organic substances—glucose and, generally, the sugars—favor the rapid deoxidation of the ferric salt, and consequently tend to obtaining vigor and brilliancy.

P. C. Duchochois.

A PREVENTATIVE OF BLISTERS.

Some time ago I was unfortunate enough to get a bundle of albumen paper which showed a tendency to blister beyond all remedy, blistering badly before reaching the fixing bath, and, in spite of a strong solution of salt, showing blisters upon leaving the fixing bath as large as hens' eggs. I got a new bundle of paper, and, trying experiments with this, found that 1 ounce of alcohol in 10 ounces of the toning bath is an effectual remedy for blisters. I am now using the same paper, 10 sheets in a batch, without the sign of a blister, simply by using 1 ounce of alcohol in 10 ounces of the toning bath.

The alcohol does not injure the tone of the prints, though a much larger proportion than I mentioned is used. When the toning bath was made in equal proportions, alcohol and water, caution was necessary to avoid uneven tones owing to the difficulty of so strong an alcohol solution penetrating the albumen, but that was all. The case was so bad and the cure so radical, that I consider it worth bringing before the photographic fraternity in The American Annual of Photography.

C. R. Arnold.

† See "Photographic Reproduction Processes." Scovill Photographic Series, No. 38.

A GLASS-CUTTING BOARD.

In looking over a foreign photographic journal some time ago, I came across a lamentation over the unappreciated generosity of plate-makers, who let the sizes of their plates overrun the measurement marked on the boxes. My personal experience with American plates has not brought me any similar grievance, but for all such cases and for a great many other occasions where plate-cutting is to be done, I have long had in use a glass-cutting board constructed on lines indicated at one time by Mr. A. Cowan. The arrangement is simplicity itself and substitutes fixed patterns for the regular sizes in use, in place of reading off the dimensions from a scale of inches as is usually done. By the use of these patterns, of which only a limited stock is required, absolute uniformity is secured, and the apparatus can be used in the dim light of the dark room with perfect assurance of reliable results. The extreme portability is not the least of its recommendations.

The foundation is formed by a board 8 inches square and $\frac{3}{4}$ inch thick. It is now required to nail a strip of wood on one edge of this, which will be the left-hand side of the board when in use. This strip is $1\frac{1}{2}$ inch wide and $\frac{3}{4}$ inch thick, and will therefore make a ridge or stop $\frac{3}{4}$ inch high above the surface of the board. The patterns or templates are made of wood $\frac{3}{8}$ or $\frac{1}{2}$ inch thick and 10 inches long, finished off with their edges parallel.

This board is large enough for cutting an 8 x 10 plate in two and from this downwards. A convenient series of templates would be of these dimensions: 5 inches, $4\frac{1}{4}$, 4, and $3\frac{1}{4}$ wide respectively. These widths must naturally be made somewhat narrower than these dimensions to make allowance for the thickness of the mounting of the diamond or cutting-wheel, whichever is used, and the exact width is to be tested by measurement and trial cuts.

If a glazier's diamond is used, which is often capricious as to the exact angle at which it must be held in cutting, a little alteration will overcome this peculiarity, and will make it a most excellent tool under the dim ruby light. The correct cutting angle must first be found by experiment. After this a hole is drilled and tapped in the center of the flat side of the swiveling "head" or mounting of the diamond. Through this is fastened with a screw a slip of sheet brass, which has a hole also in its center and is fastened to the cutter head with the screw. A few trials will settle the matter of angle, and the screw is then set up tight. By striking lines where the mounting of the diamond and the brass strip meet, the guide can be easily adjusted in position when dislodged. There are more elaborate methods of making a regular carriage for the diamond, but the above arrangement leaves the diamond free for its regular use at short notice. The diamond arranged with its guide as above, and disconnecting the usual long handle, as should have been mentioned before this, gives great accuracy in handling; a sure cut is always certain. It is better to cut the plate, film down, and taking the plate in both hands, also film down; bending both hands down will break the glass, and another quick motion in the other direction will break the film. Some of the modern steel wheel glass cutters also answer very well and are quite cheap.

Ottomar Jarecki.

LIGHTING THE HEAD.

The quality of a photographic portrait depends, so far as the judgment and taste of the photographer goes, mainly on the choice of the view taken of the head, and then, perhaps even more than that, on the manner of lighting it. I have among my photographs of friends some which, from the faulty lighting, are hardly recognizable for the people who sat for them. The fancy lightings, such as the "Rembrandt" and similar, in which the ambition to get a pictorial effect has predominated over the consideration of likeness, are very treacherous, and the photographer who pretends to furnish his clients with what they come for generally—a good likeness—should in common honesty refrain from sacrificing that to some fancied decorative arrangement, in which the ingenuity of the photographer is more evident than the character of the sitter.

If a photograph is a failure as likeness, it is pretty certainly due to the lighting not suiting the face, and bringing out into too strong relief some feature which is not important to its expression, or exaggerating some defect which people do not in general have their attention called to. I remember a young lady whose face struck me at first sight as the living embodiment of a dream. It was a full-moon face, one of those which seem made to express gaiety, almost colorless, but not pallid or unhealthy, only the color toned down to a warm, creamy "toned-white," with a cloud of golden hair that would not lie smooth, but surrounded the face like a halo, and, in the midst of this, eyes of the deepest, softest brown and "lips like coral, red." Now the photographer who would treat a face like that with a concentration of light, putting it in strong light and shade, would falsify the character of it and reduce to absolute commonplaceness a type of the highest beauty. It should be placed in a broad light, low in front and surrounded by reflectors, so that while the modeling should be felt and the head keep all its rotundity, there should be no shadows on the flesh so dark as the eyes, and no strong shadow anywhere in the face. The impression of the face was one of light, radiance, and this depended as much, perhaps, on the depth of the color of the eyes as on the luminous whiteness of the complexion. There was no need for more shadow than sufficient to express the rotundity of the face. In an ordinary studio and without strong reflections, this head would be rendered with deep shadows on one side of the face, even if the photographer, with a not uncommon want of taste, had not given it a Rembrandt pose, under the mistaken notion that as the face had little color, it should have more shadow. More light, yet, but not more shadow!

The laws of good taste regulating these matters are the same in photography as in painting. I went not long ago into the studio of a portrait painter who was at work on a head of a well-known author, in which one of the most marked traits was the depth of the setting of the eyes, and the strength of the markings about the socket. The artist had expressed these facts so strongly that the eyes assumed a wild glare at first glance which suggested madness; and no doubt in the photograph, without great care, the head would have been caricatured. The remedy for the camera would be to diminish the strength of the top-light, and throw a reflection into the recess of the sockets of the eyes, and then give a long exposure, so that the portraits should not become a caricature by exaggerating the most evident accidental feature of the face. In the case, again, of faces which are deeply marked with wrinkles and lines of thought or labor, the common-place photographer mends the matter by touching out the lines of shadow and making the head a pudding. These lines are the record of the face and tell more or less the life of the individual; but as the usual top-light or concentrated light from any direction is sure to exaggerate them to a certain extent, the rational remedy is the reflector, which reduces their sharpness and depth without removing their meaning. Every line is a part of a life history, and the face without them is a lie, but there is no need of making their record more evident and conspicuous than the general character. This is the general tendency of photography, which can only deal with material facts, and renders details with the most mechanical indifference to their relative significance. Retouching, in the hands of any but an artist versed in the study of character and acquainted with that of the original, only makes the matter worse, and probably takes out that which should have been left, and leaves that which might have been removed.

The reflector is a great aid in the direction of giving refinement to the photographic portrait, and may be so managed as to give all the advantages of an all-round, out-of-door light, but without the flatness which that is likely to give if direct sunlight is excluded. In the studio of the Society of Amateurs in Rome, to which I have the pleasure to belong, the lights are arranged with excellent judgment, the result of the presence of some excellent artists in the society, as well as of some of the best amateur photographers I have ever known. The top and north side of the studio are all of glass, with a double set of curtains running on wires so that they can be drawn to shut off, or temper, the light at any point, one set being white and diaphanous and the other dark-colored, and arranged to exclude the light coming from any point or points. The glass extends a few feet back of the point where the sitter is posed, so that in case of purely picturesque effects being wanted, the light may come from behind the head and make a sort of halo around it. When a front light is wanted we have only to run the dark curtains to the sitter's end of the studio and shut off, in the degree required, the top-light or the side-light near the sitter, and bring all the illumination from the distant windows and sky-lights. We have then reflectors of various shapes, sizes and colors, which enable us to throw the light on any portion of the face or figure, and to such an extent that it is possible to make the principal light from the side of the studio opposite the window, if desired. The result of a judicious use of these appliances is that a head is brought out with a subtle and broad modeling which gives perfect roundness, with the faculty of accentuating any part of the face desired, by throwing the shadow on it, the hollow of the eyes, the space under the chin, etc., or of giving any pictorial effect that is required.

But, some one will ask me, Where do you admit a strong and concentrated light? and I reply that there are cases in which it is required to give character to the face, as for instance in children where the forms are round and soft, and the markings of the character not yet apparent. Here we cannot go far wrong in giving all the strength that is consistent with the full bringing out of the forms in the deepest shadows, for any failing in this respect is fatal to the general effect. It is also necessary in the case of certain female heads where the features are not strongly marked, and where the color is full, the hair dark, and the principal attraction that of form. The photographer must have judgment, for without that it is useless to give him indications. If he has a Greek statue to photograph he would use his full range of light and shade within a narrow margin, for he has only to render white form, in which we want all the modeling we can get, avoiding confusion with the background; so he gives the subject an all-round light, with a minimum exposure and a development which gives the high lights of white paper in the print. There are cases where the extreme of intensity in the print is necessary, and others where it is destructive of the beauty of the subject; and the education of taste is the only method by which the distinctions can be made possible to the photographer. For this it is not necessary to be an artist, but it is necessary to have the appreciation of art, which photography simulates.

W. J. Stillman.

THE COLOR QUESTION.

Daguerre and his co-workers aimed at nothing less than to discover a process by which the image of the camera obscura could be caught and fixed in all the varied colors, just as it is transmitted through the lens to the translucent screen.

From their experiments came forth the daguerreotype, which, although considered very wonderful, was looked upon but as the forerunner of the perfect color process, the discovery of which was thought to be just at hand. The public had not been educated to appreciate likeness in monochrome, and the productions of the camera were thought more of as curiosities than as portrait works of art. The following quotation from an English cyclopedia, published as late as 1853, gives some idea of what was thought of the new pictures. The author says: "Various attempts have been made to adopt photogenic drawing to the sketching of miniature portraits from life; but, although likenesses are obtained, they have a dull leaden hue, and the countenance has a death-like unpleasant appearance. Besides, as the slightest movement of the head while sitting, or even the winking of the eyes, cause derangement in the action of the sun's rays, all representations from life have less or more a muzzy or confused appearance. We have seen miniature likenesses taken on paper instead of plates, but they wanted the liveliness and force of likenesses executed with the pencil. To all appearance photogenic drawing will be limited in its utility to the taking of representations of buildings or scenes in still nature, to be afterward copied at leisure; the perfect faithfulness of the delineation being altogether unapproachable by artistic skill."

To improve the "leaden hued" and "death like" daguerrotypes recourse was had to artificial coloring, which, although crude in the extreme, was accepted as a makeshift till the real color process should be discovered.

But the daguerreotype ran its course and fell, and other processes came forward, only to give way in turn to something better, till photography has become what it now is, and although the color question still continues to be agitated with much interest, no practical working process has yet been discovered. As a rule the people have become used to the tone of the silver print, and the want of color in photographs is now rarely commented on. What demand there is for colored photographic portraits being supplied by tinting regular photographs with water colors, which, in these days of true values of light and shadow, can be made to produce very satisfactory results. Indeed it is a question with me, if we were now given a complicated color process, if it would come into general use for portrait work; for no matter how perfect the process might be, we could not hope to have it possess the knack of flattery of a portrait painter, and as the real color of the human face is generally far from the ideal: before we could make our work salable, we would have to go to work on the finished prints with paints and brush, improving nature the same as if we were "real artists." So you see little would be gained over the present method of coloring photographs.

The manipulations of the new process would have to be simple indeed to justify its being adopted, the ideal color process being one by which Mary Jane can be tintyped for 25 cents, in all the glory of rosy cheeks and many-colored costume. Let the niche in the rotunda of the National Museum, opposite to the one now occupied by the Daguerre memorial, be reserved for the monument in the future to be erected to the memory of the man who shall invent such a process.

Although we have failed in directly making color photographs, colored pictures have been made in a most ingenious manner, by taking several negatives through screens of the primary colors, and afterward printing in inks of corresponding colors from photo lithograph plates made from the different negatives. This method, although rather roundabout, is regarded by many as the nearest practical solution of the color problem. Mr. Frederick Ives, in this country, and Mr. A. W. Scott, in England, have each patented instruments by which pictures, taken from nature, can be thrown on the lantern screen in colors. Mr. Ives takes three negatives from the same position, on different parts of the same plate, through films of orange, green and blue, respectively. Positives from these are then projected into the same disk on the lantern screen through films of like colors, which produce the desired effect.

Mr. Scott's process consists of making four negatives on the same plate through films of red, yellow, blue, and violet; the size of the stops used in the four lenses being in inverse ratio to the actinic value of the screens employed; so by exposing all four simultaneously for the same length of time, negatives of the same relative exposure are obtained. The combined images are thrown on the screen, much as in Mr. Ives' process. Mr. Scott has had his "verak" camera and lantern on the market for some time, and predicts a great future for his process.

We hear that Mr. Ives is working on an instrument by which his triple slides can be viewed as one colored picture of microscopic dimensions; and simultaneously comes the news of Edison's wonderful kinetograph. Is it too much to look for a union some day of the principles of the stereoscope, color microscope, and kinetograph in such a way as to show a scene with stereoscopic solidity, in natural colors, in which little figures will move about and talk? Then find a way to send the whole thing by wire, and we will be in position to outdo the uncanny performances of Mr. Haggard's "She" herself.

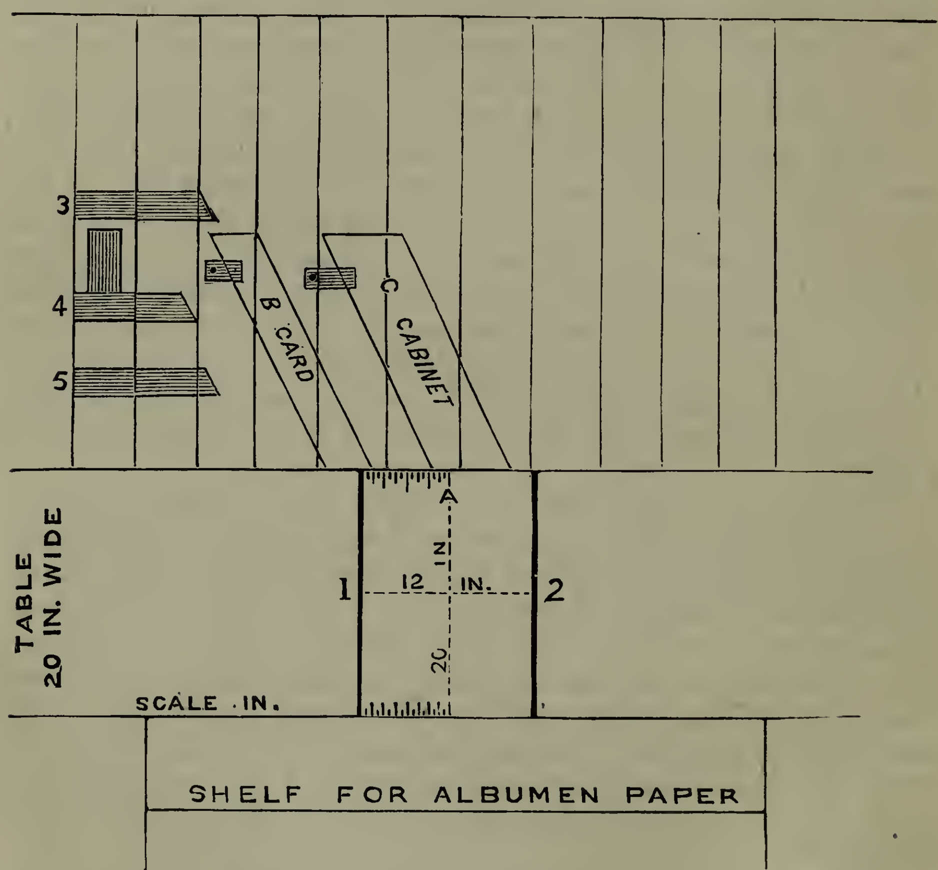
You say it will never be, but who knows? We are still going on, and it may be that the most advanced views, expressed by the ablest writers in this volume, will seem as strange to the readers of the American Annual of Photography and Photographic Times Almanac for 1932, as the words of the cyclopedia published forty years ago do to us to-day.

J. Will Barbour.

ACCURATE TRIMMING.

It is not every village photographer who does a sufficient amount of business to enable him to purchase all of the useful and convenient implements that it would be desirable to possess, so it may be of interest for such to know that print trimming can be neatly and accurately done without a machine. Great care is required in this, as in every other operation of photography.

Many pictures I have seen indicate a lack of thoughtful attention to this part of the work. Pictures otherwise good



are spoiled by careless trimming of the print or cutting the paper, having jagged edges or uneven corners. All this can easily be avoided by the following method, which is offered for a corner in the KING OF ANNUALS.

Have a board or table of sufficient length and suitable height to work on conveniently, and not less than 20 inches wide. Upon this, at the left, nail a strip of lath square across the table. See sketch, 1. This should be about $\frac{1}{2}$ inch thick and have a perfectly straight edge; 12 inches to the right of this, 2, nail another strip of lath. This need not be over $\frac{1}{4}$ inch thick.

Between these strips place a cardboard, A, 12 x 20. Upon the ends of this cardboard, A, mark a scale of inches, divided into $\frac{1}{2}$ and $\frac{1}{4}$ inches. See sketch. Over this cardboard place a glass of the same size, upon which to cut the paper.

Always cut the paper the exact size you want it before printing. Long experience teaches me this is the better way. For cabinet prints, provide a strip of glass $5\frac{1}{2}$ inches wide (the length of cabinet print) and 20 inches long. For cards a strip of glass $3\frac{3}{4}$ inches wide (or a little wider, if you like) and 20 inches long. These can be seen in the sketch, leaning against the wall, *b* and *c*, where they are kept when not in use. Glass of any desired width can be used to accommodate the size wanted, or cut by the scale on the ends of the cardboard. These strips of glass need to be cut very accurately. In the cut 3, 4 and 5 are little shelves, or pockets, in which to put the glass forms, knife, etc.

Lay your silvered paper on the glass, cut $\frac{1}{8}$ inch from one end of the sheet; place this cut end against the left hand lath, over it the glass strip, press up to the lath, then cut with a fairly sharp knife—a small shoe knife is just the thing—thus cutting the sheet into four strips for cabinets, each strip making four prints. For cards, a sheet will cut six strips, each of which will cut seven prints. Now with a glass of proper width—I use one a trifle less than four inches wide and six or seven long—laying this square across one of the strips far enough from the end to cut off the imperfect edge, then place this trimmed end against the lath as before, thus cutting the strip into four pieces.

In this way you can have clean cut edges, square corners, and all your cabinets will be exactly of the same size, and when placed evenly on the mount the pictures will present a neat appearance. I think this way superior to any other that I have seen.

I always have paper silvered on hand, and in the morning cut up enough for the day's print, which takes only a little time when one is accustomed to it.

A. J. Whalen.

DIAPHRAGMS TO SUIT THE SUBJECT.

I ALWAYS make it a point to read all the photographic news that falls in my way; and I have been much interested in the different opinions and theories held by writers in all departments of the art. Among other subjects I have taken considerable notice of is that of focus and the use of the diaphragm.

It often appears that many outdoor workers neglect to take advantage of the power that lies in the diaphragm to control certain effects they may wish to bring out in their finished picture. It seems of such a simple nature, if looked at understandingly, that I hardly see how there is a chance for much theory in the matter, or even of individual taste.

The focusing of a given subject and the determination of the diaphragm to be used may not be governed by hard and fast rules. Still the decision of two individual workers should, I think, be nearly identical. It is a fair supposition that a person makes an exposure only when he has a confirmed reason why he makes it, and the keeping of this reason before his mind will determine the sharpness in breadth and depth in each case. It may be a pretty place by the wayside, a view of the village, or possibly a wealthy neighbor's residence or his prize Jersey. We would hardly expect an intelligent operator to place a certain stop in his lens and then go on and expose on all four of the subjects indiscriminately.

Certainly not; for that would be where he would make a mistake. Still many do this. Perhaps, after a succession of unsatisfactory negatives, they will stumble on a good one. They remember the stop used and the exposure, and go on using that particular diaphragm marked $\frac{f}{32}$, No. 3, or what not, right and left, for the next two seasons.

Now, when he did this, he turned his back upon one of his best friends and greatest helpers in making his work talk, and each picture to tell its story to the examiner and speak the reason for its creation. Now, then, take our first example:

The pretty place by the country road side. We all know these places, have seen them many times in our rambles. Perhaps an old tumbledown pair of bars, set in an equally dilapidated stone wall, overrun with berry bushes and vines; bunches of ferns starting from the foot of the old decayed posts; irregular patches of bronzy green and russet moss spotted all over the old rails and stones; with a dozen different kinds of grasses and wild flowers growing about nodding and waving in the breeze. What single thing is there in the subject that has attracted our attention? Pretty hard to tell! Some morning when the winds are yet still and the dew is on the grass, let us try an exposure and see what we will get. As it was the beauty of the whole scene that pleased us, we will use a stop that will cut sharp to the corners of the plate. The wind being still, we can make a generous exposure without spoiling our grasses and leaves. We return home and develop. What have we got?

As I expected, a negative filled with interest and beauty from corner to corner—one you can examine over and over with increasing admiration. The grain in the weather-beaten old rails and bars, the ferns and grasses, each frond and blade reproduced clear and sharp. The patches of moss, the stones with the vines running helter-skelter over them. Look as often as you will at that negative you will still find new beauties in it. When our friend who is interested in such work takes it up, does it not tell him why that particular spot was selected for an effort? Certainly, there were a hundred words of nature running together into a beautiful picturesque poem. He who used the large stop would have brought the bars into prominence and missed half the features we admire so much, which were as much a part of the picture as those he emphasized.

Then there is the residence, elaborate in its towers, dormers and balconies. The owner wishes it photographed, but not his neighbors' buildings on either side, or the out-houses in the rear. Here then is a chance for a larger diaphragm. We try two or three of the larger sizes, decide, expose, develop, and here we have it. Our friend's residence clear and sharp. All the details of mouldings, carvings, terra-cotta work, etc., he has spent so many hours planning out—all before his eyes; but the buildings next his estate are there in breadth only. You can hardly examine them, for there is little to examine, and we didn't intend you should. It was A's house we were after, not B's or C's.

The prize Jersey will receive about the same treatment. A large stop again, wishing the animal in focus; but the new fence, pump and watering-trough, with their severe angles, in masses of light and shade only. Had we used our smallest stop, giving us great depth of focus, we might, in the resulting picture, have found ourselves trying to decipher the maker's name, stencilled on the pump, rather than admiring the fine points, or gracefully-curved horns, the pride of the farm.

Then there is the view of the town or a portion of it. Here

I should use my very smallest stop; its microscopic definition wanted; every one of the hundred dwellings, churches, etc., sharp as an engraving; those at the edges in focus with those in the center, a pictorial map, as it were. When A examines that picture he will very likely look for his own residence, place of business, or church, and will be disappointed if he finds others clear, while his own is badly blurred and out of focus.

And so on, to our last plate, constantly asking ourselves: "What is there in this subject I wish to call into prominence, and what shall be used as accessories only to fill out and make our resulting picture complete and satisfactory?" remembering that the faculty of rendering details absolutely fine-cut and perfect is one of the greatest beauties of photography. Take every advantage of this, but do not abuse the privilege, and when some writer tells you "there are no sharp lines in nature" do not believe him. I would like to say a few words about our diaphragm in relation to atmosphere and perspective; but find my space already more than taken up.

C. Alvord Washburn.

REVERSING A NEGATIVE.

To print through a negative and avoid the blurring effect from the thickness of the glass, the middle of the day should be selected, and the edge of the frame placed against the shadow of a vertical object, as the side of a window, and moved frequently as the sun's motion makes it necessary. With care the thickest glass may be printed through in this manner without blurring.

If greater accuracy is desired, and especially if it is necessary to print several hours before or after noon, a simple apparatus may be improvised for keeping the printing frame in the proper position, facing the sun. My arrangement is this: I screwed one side of the printing frame to the end of the cover of a starch box, so that the face of the frame would be at right angles with it, facing outwards. A small pin in the cover, near the middle of the frame, served as a center of revolution. I then placed a short, flat board nearly parallel with the earth's equator; that is, with the southern end elevated about 45 or 50 degrees. A small hole was made near the upper end to receive the pin, when the cover with the attached frame was placed upon it. The shadow of the side of the frame being

Louis C. Bennett, Photo.

ROASTING APPLES.
(A Flash-Light Picture).

Photo-Electro Engr. Co., N. Y.

brought parallel with the side of the cover, the frame faced toward the sun, and could be kept so by a slight motion upon the center every two or three minutes during the printing. The frame can be at any time removed to examine the progress of the printing, and replaced, if the board is not disturbed. The sun's declination causes its rays to pass through the glass at a small angle; but this angle remaining unchanged causes no indistinctness. If there are light clouds around the sun, they will cause a blur; otherwise the sharpness will depend upon the care with which the shadow is kept in its proper place.

Henry M. Parkhurst.

NOTES ON PRINTING ON READY-SENSITIZED ALBUMEN PAPER AND ON REDUCING OVER-PRINTS.

Nine-tenths of all photographic printing is done, I suppose, on freshly silvered albumen paper. But as this paper will not keep for longer than a day or two, and the preparing of it is beyond the limit of time and the conveniences of the amateur photographer, its use is confined to the professional photographer. The non-professional has to resort to some ready-sensitized paper, of which the silvered albumen paper is certainly the cheapest and the easiest to manage. The keeping quality of it depends on climate and temperature. In a warm, moist climate and in sultry weather it will keep fresh but a few months, and after fuming with ammonia, but a few days, while in colder seasons, with proper care, it will keep serviceable for a great length of time—six months and even longer. Before printing it will be well to examine the thermometer and the condition of the air. On cold or crisp days the printing may be carried a little farther than the wished-for final result (as is the general practice with printers), but if the thermometer is above 70 deg. Fahr., and the atmosphere sultry, then I would advise to avoid all over-printing. However, with all due care, too dark over-prints cannot be avoided. I often have had the experience of seeing my correct prints darken during an electric storm, while kept in a portfolio of blotting paper, duly prepared with bicarbonate of soda, and even when placed in water, preparatory to toning.

The question arises: How can these prints be reduced and be made serviceable without loosing details and keeping their whites?

In my experience a slight over-print may be reduced by leaving it in a freshly prepared hypo bath for a longer time than usually prescribed; say, for one or two hours, and even longer. Prints that are too far gone—nearly burnt up—may be partially recovered by immersing them into a strong hypo bath (say, 1 x 8) to which a few drops of Belitzky's reducer (see No. 74 in the formulas of the AMERICAN ANNUAL for 1891) have been added. This reducer, being very strong and apt to give a yellow tinge to the whites, has to be carefully watched. As soon as the print has resumed its normal condition, and even before, it has to be washed in several waters, as otherwise the latent power of the reducer would continue its work and ultimately destroy the print.

Karl Klauser.

TO REMOVE THE COATING FROM DRY PLATES, AND A SIMPLE METHOD OF NUMBERING NEGATIVES.

MANY inquiries are made for a simple means to remove the coating from glass-plate negatives—when the glass is desired to use for other purposes. We find that in summer, owing to the warm condition of our developers and wash waters, it is often difficult to keep the film on the plate. Why not utilize this knowledge by placing such plates as we wish the coating removed from, directly into hot water? With the majority of plates the coating will slide off of itself in a very few minutes under such treatment.

Hot water cannot be safely used, however, for the removal of emulsion from the back of negatives intended to be preserved. As this superfluous emulsion detracts from the printing quality of the negative, it should be removed—which may be done easily, and most safely after the plate has been washed and dried, by moistening the back of the plate with diluted ammonia-water, and rubbing off with wads of soft dry paper. For the large lumps sometimes found near the edges, possibly a knife-blade may be found necessary.

Many travelers and others desire an easy method of numbering their plates, so as to keep trace of them at all times. When placing a plate in, or when removing it from, the plate holder, mark a letter or number in one corner of the plate with a soft black-lead pencil, like a Faber No. 1, wetting the lead slightly if very clear marking be desired. The marking may be easily seen before the plate is wet, and will show plainly enough when developed and dried.

C. M. Brockway.

ISOCHROMATIC PLATES.

Since I have been making isochromatic plates, I have received many inquiries as to what are their advantages, which I will here try to explain. Every photographer knows the difficulty of copying paintings and colored drawings with ordinary plates, as those pictures which are painted with a yellow cast appear entirely too dark, flat, without detail, and very coarse; those painted with much blue are rendered too light and full of contra-t on account of the sensitiveness of the ordinary plate to the blue and violet, and its insensitiveness to the yellow and orange. In copying an old engraving or photograph, which has been stained, the ordinary plate will only increase the appearance of the stains. If the engraving is printed on India paper it is almost impossible to get any definition, and the result is a very unsatisfactory one. On the other hand, isochromatic plates, which reproduce the rays of the spectrum in their proper gradations, give a reproduction of a painting in correct monochrome. An engraving printed on white paper, having some yellow stains caused by age or otherwise, will copy far better with the isochromatic than with the ordinary plate, and if printed on India paper there is sufficient difference between the print and the paper to give the required contrast, the paper taking only a shade darker than white.

In landscapes the advantages of a plate that renders the colors in their correct gradations, is quite easily understood when I call attention to the increased sensitiveness of the new plate to yellow and orange, and its decreased sensitiveness to blue, thus giving the advantage of proper time on foliage and foreground without over-exposing the blue sky and the clouds. In marines the same fact is readily noticed, as they will reproduce the sails of a yacht whiter than the sky, and give detail and definition in the clouds and waves.

In portrait photography it does not exaggerate the imperfections of the skin, such as freckles, etc., as the ordinary plate does, and the results are more harmonious and pleasing. You may try to make up for the apparent coarseness of the negative by retouching, and you must retouch to remove the imperfections. The result is in many cases a marble like roundness making the picture flattering, as they call it, but, in reality, taking that life and spirit out of it that every picture should have. It is my idea that the retoucher's pencil and brushes ought only to be used to soften down strong shadows caused by an error in lighting or by the angularity of the face, like prominent cheek bones, or in a lady's portrait, the shadows cast by the cords of the neck, etc., in other words simply to tone down those parts which are too prominent. The advantages of isochromatic plates for portraits will also show in photographing subjects with yellow, auburn or red hair, and with yellow or blue garments.

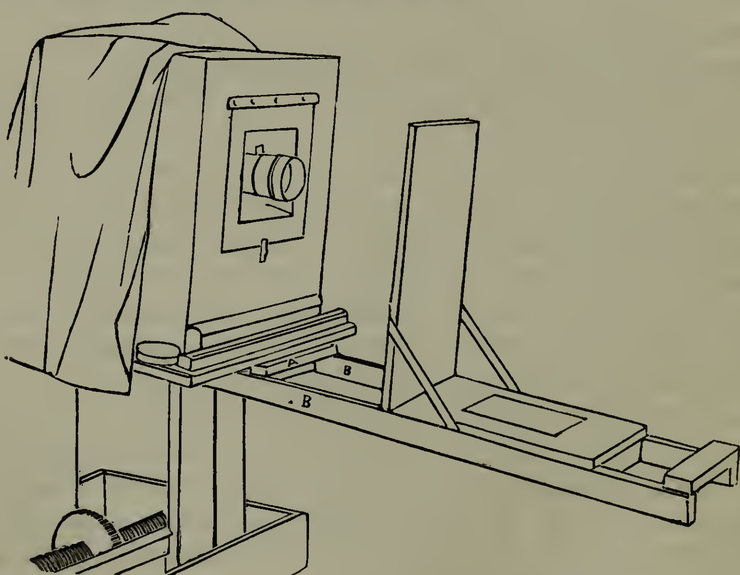
The treatment of isochromatic plates necessarily requires a little more care, as they are especially sensitive to yellow light of any kind; therefore, it is necessary to use only a dull ruby light in developing, and to keep the plates covered as much as possible. Light that is quite safe for a very quick plate of the ordinary kind may be sufficient to fog these plates.

G. Cramer.

A SIMPLE COPYING STAND.

I WILL describe a very simple and inexpensive copying stand which answers every purpose in an ordinary studio.

Every photographer has occasion to copy old tintypes, photographs, etc., and stands for this purpose are frequently awkward and bulky, as well as expensive.



This one (see cut) is simply an extension of the bed—or part that the camera rests on—of any camera stand, and an upright board to slide on it, holding the picture to be copied. It can be instantly removed and put away when not in use.

A piece of hard wood eight inches long—the same kind that the stand is made of—is permanently screwed to the under side of the front of bed, and projecting half-an-inch or more; this supports the extension. It is the only part of the whole arrangement not clearly shown in the cut, and a few dimensions only are required to supplement the description.

It will be seen that the cleat, A, rests on the permanent support, while the long strips, B B, which may be about three feet long, extend under the bed about three inches. However the bed of camera stand is tilted the extension will go in the same direction. The sliding boards should be braced at right angles and may be reversed as the picture is to be near or far from the lens. The picture can be tacked to the board by any convenient means.

E. B. Luce.

EXPERIMENTAL PHOTOGRAPHY.

The course of the amateur photographic fever may be divided into three stages. The first stage or introductory period is when the patient, regardless of cost, shoots right and left at friend or foe, forest or stream, until having been awakened, either by the flatness of his purse or by his increase in knowledge of what does or does not make a picture worthy of the time and trouble, he passes into the second stage. Now he views the scene on the ground glass with a different eye, and studies well the view ere he pulls the slide. He reaps his reward in quality, not in quantity.

The third stage is marked either by complete recovery, by occasional relapses into the second stage, or by a growing love for "experimental photography." It is with the last mentioned division of stage three that we have to deal, and whether the devotion be to the artistic or scientific branch, it well repays its devotees. The leading photographic publications teem with accounts of the latest developments in, and application of, this art science, and if the reader has never reached this third stage, he is not in a condition to appreciate and reap the benefit of the researches of our leading scientific men. The use of this, that, and the other toning bath, developer, etc., is, in a great number of cases, a matter of individual preference, and while the different formulas are inserted from time to time by the editors for the benefit of the beginners, they (the formulas) have become to them (the editors) "chestnuts."

Hoping that they may induce some fellow-amateur to enter this last division of this third stage, the following suggestions are appended:

In the first place, do not let an array of formulas discourage you—their bark is worse than their bite.

For a starter try sensitizing your own paper, then coating paper with a mixture of gelatine and salt and sensitizing that for prints. While you cannot compete with the makers in cost and quality, yet the albumenizing of paper will prove a source of instruction. All that is needed is a dish, Rives or Saxe paper, a few eggs, common salt (sodium chloride) and perhaps sal-ammoniac (ammonic chloride), according to formula. Dry plate making is one of the most interesting and inexpensive experiments an amateur can try. Care should be taken not to try to make the so-called instantaneous plates until you have a good insight into the subject, for with increase in rapidity the chances of failing increase. Nearly all the apparatus necessary is to be found in any well supplied kitchen, and what is lacking can be easily made. "Dry Plate Making for Amateurs,"* by George L. Sinclair, M.D., will give you the needful formulas and instructions.

Among all my views the one I prize the most I made on one of my home-made plates and printed on paper of my own albumenizing and sensitizing.

Many a stormy winter evening can be passed mixing, cooking and washing emulsion, coating plates, etc., with interest and intellectual and financial benefit. The platinotype and carbon processes offer exceptional advantages.

The carbon printing introduces you to the study of the action of light on bichromated gelatine, which is the foundation of many of the photo-mechanical printing processes. Platinotype printing gives you a good example of one mode of obtaining a print consisting of a metal whose salts are not of themselves sufficiently sensitive to light to be directly reduced. Chemically considered the iron salt is first reduced to a lower salt by the action of the light, and this in its turn reduces the platinum salt. For these processes and the making of solutions for blue prints, uranium prints, bromide paper, etc., "Photographic Printing Methods,"† by W. H. Burbank, will supply the needful instruction. A wet plate offers the experimentalist a region rich in photographic lore, and gives him a taste of the trials and tribulations that beset the path of his predecessors. The mention of coffee, tannin,

* † New York: The Scovill & Adams Co., Publishers.

or tea plates is sufficient to open the springs of reminiscence in the minds of the photographic veterans, and they will willingly lend their aid to remove the stumbling blocks. The ordinary book plate-holders may be used and a glass developing tray will do for a dipping bath. Recent improvements in the photo-mechanical printing methods have placed some of them within the reach of the enterprising amateur, and I can say from experience they are interesting. They also give you an insight into lithography. Don't think you must buy all the articles mentioned in a formula. First see to what use the article is to be put, and then look around among your "traps" and see if you have not something that can be made to answer the purpose. Priestley, the discoverer of oxygen, used wash tubs and corresponding apparatus.

Then try, and you will find what appears to be mountains of trouble but mole hills, and that "it is noble to seek truth and it is beautiful to find it."

Milton B. Punnett.

HOW SHALL I DEVELOP THOSE FILMS?

How many times the amateur asks this question is more than doubtful. My experience with the films show me that a combination of eikonogen and hydrochinon, or rather the use of one followed by the other, gives the best results in my hands.

The ordinary mixture of eikonogen and sal tartar is used to start the development, and when the detail shows well this solution is poured off to give place to one of hydrochinon and caustic soda, which I find gives better density than the eiko alone.

From the developer the film is always put through a bath of alum before being "fixed." This I have found necessary with most films to prevent frilling. After washing I soak them five minutes, in glycerine 1 ounce, water 25 ounces, and then pin on a rack to dry; and I have some finer negatives than I ever developed on plates, but perhaps a smaller per cent.

Take plenty of time in developing and don't use too strong developer to start with. Beware of the caustic soda if you would have clear films. Keep developers cool by placing graduates in a tray of cold water.

I have used some film this summer, coated a year ago, and it works finely with above treatment. *E. F. Bacheller.*

RECOVERY OF SILVER AND GOLD FROM PHOTOGRAPHIC WASTES.

"Little wastes in great establishments constantly occurring may defeat the energies of a mighty capital."—*L. Beecher.*

The large amount of precious metals, especially of silver, that may be recovered from photographic wastes, may surprise the inexperienced.

It is well known that but a very small per cent. of silver remains in the finished prints, and, allowing for necessary waste, three-fourths of the silver used may be recovered by careful but simple manipulations.

The clippings of finished prints contain so little silver that it does not pay for the trouble of reduction; therefore the prints should be trimmed before toning.

Keep all silvered paper clippings, misprints, filters, saturated paper, etc., and when a sufficient amount has accumulated, reduce them to ashes. This may be accomplished in a clean stove, or upon a grate in a fire-place, avoiding too strong a draught. I prefer to burn the waste in a corner of a fire-place paved with brick. A row of bricks may be set up on edge to confine the operation to a smaller space. Light a small quantity, and add the balance gradually by handfuls. Loosen the mass from time to time with an iron poker to insure more draught. Toward the end bring all into a loose heap in order to effect complete combustion of all carbonaceous matter. The burning may be done in the evening and the mass left to glimmer through the night, so that by morning there will be left a heap of gray ashes with but a few particles of charcoal. The ashes should be run through a sieve to separate nails, pins and other foreign substances accidentally mixed in. The spangles of silver that may remain on the sieve must, of course, be added to the ashes.

Reduction of the Ashes to Metallic Silver.—The necessary implements are: any stove with a good draught that will hold a sand crucible of from eight ounce capacity to one pint, allowing sufficient space around it for coal; a pair of iron tongs to remove the crucible from the fire; an iron poker; an old iron dish or pan, together with the flux. The old-fashioned sheet-iron stove, with a clay cylinder, or an egg-shaped iron stove, having a good draught through the chimney, answers very well. Numerous fluxes have been recommended and used, but for all purposes there is none better than carbonate of potassium (salt of tartar), because it leaves a very fusible slag. As the carbonate of potassium is very deliquescent it should first be dried in an iron pan before being mixed with the ashes, and the mixture, if not all introduced into the crucible at once, kept near the fire. To one part of ashes, by weight, mix intimately one part and one half of the dried carbonate of potassium, and pack the mixture rather tightly by means of a tapered stick of wood into the sand (Hessian) crucible to nearly the top. In all methods of reduction by heat it is essential for the material to be perfectly dry, or the contents of the crucible will boil over.

In a clean stove, with the ash pan removed to insure better draught, start a fresh fire with chestnut coal or coke, to the depth of about three or four inches; then put a layer of coal over the glowing fire, and on this layer set your crucible in the middle of the stove and pack coal all around it to the top of the crucible. Some place the crucible on a small tile of fire clay, but I think it obstructs heat. The heat should be raised gradually, and kept at a dull red for half an hour, after which it should be raised to a full redness and kept so until bubbling ceases and the contents become uniformly liquid and quiescent. In the beginning of the operation, when the mass begins to liquefy, a vent may be made in the center with a hot poker for the gases to escape, and afterward the crust that is left on the inside scraped down. When no more gas escapes and the mass is liquid throughout, the crucible is removed from the fire with a firm grasp by means of a pair of tongs and placed on a brick for cooling, or the contents poured into a dry iron mortar or other convenient receptacle. The button of silver will be found in the bottom. The crucible is broken when cold and the silver removed with the particles that may be found in the slag, and washed in warm water. When the operation is well conducted there will be but few particles of silver left in the slag. It is hardly safe to use a crucible a second time, but it may be used for roasting sulphide of silver. The reduction of ashes is given first and with considerable fulness, because chloride or sulphide of silver is reduced practically in the same way. If all the mixture cannot be introduced into the crucible at first, the balance, if kept dry and warm, can be gradually added with an iron spoon, or small portions rolled up in tissue paper and thrown in.

Reduction of Chloride of Silver by Heat.—The silver from worn-out silver solutions, containing too much albumen, or old baths of negatives or ferrotypes,* washings from prints, etc.,

* The simplest and quickest way to recover the silver and reconvert it into nitrate from paper or negative baths is to throw it down as a carbonate or oxide, which is explained further on.

should be precipitated as chloride by means of chloride of sodium (table salt). The washings of prints should be poured into a large stoneware crock, or other suitable vessel. It would be convenient to have the vessel provided with a faucet near the bottom to draw off the supernatant liquid, otherwise it has to be drawn off with a rubber tube bent in the form of a syphon. Use only a sufficient amount of table salt to throw down all the silver. If the salt solution is much in excess it dissolves some silver. The process is facilitated by the addition of some muriatic acid. The clear liquid from the top is drawn off from time to time, and fresh portions of washings treated until a sufficient amount of chloride has accumulated, which is placed on a double paper filter in a funnel, and for greater security, a muslin strainer beneath, drained and afterwards thoroughly dried. If the chloride is kept free from foreign substances it can be readily reduced by the wet process, as hereafter given, and in that case must not be dried. The perfectly dry chloride is rubbed to powder and intimately mixed with an equal weight of carbonate of potassium, and reduced by fire exactly as given for ashes.

Recovery of Silver from the Paper or Negative Fixing Baths.—The used fixing baths should be poured into a large stoneware jar, and the silver precipitated with a solution of sulphide of potassium. Whenever the vessel is nearly filled, add solution of the sulphide as long as a brownish-black precipitate of sulphide of silver is thrown down. The clear supernatant liquid, after a day's repose, is then syphoned or poured off. This process is repeated in the same vessel until a considerable amount of sulphide of silver is procured. It is then collected on a double muslin filter, covered with filtering paper, and when drained and dried is roasted in a used crucible, or upon a shovel or iron pan, and fused at a low red heat into a glassy mass. This must be conducted in a fireplace or in the open air. It is powdered and reduced to metallic silver by fusion in a crucible the same as for chloride, only about one-half part more of carbonate of potassium may be used, and the reduction completed with a strong bright heat. The dried sulphide, without roasting, may be burnt along with the waste silver paper.

In galleries where the wet collodion process is used, or ferrotypes made, the spent developer and washings of the plates may be precipitated with muriatic acid, and the precipitate, which consists of chloride of silver and metallic silver mixed with some iron, when dried may be reduced along with the sulphide of silver, as the iron is useful in the reduction of the sulphide.* Never throw down the silver with a sulphide when the solution contains iron.

Reduction of Chloride of Silver by the Wet Process.—The chloride must be reduced while still moist. When not immediately reduced when precipitated it should be kept under water in a dark place in the precipitating vessel. When thoroughly washed by subsidence and decantation, which may be done in a fruit jar or large porcelain evaporating dish, it is covered with pure water to the depth of about an inch; then sulphuric acid added in volume about one-fiftieth that of the bulk of the chloride, to make it acid. Now several pieces of clean, and, if possible, pure zinc are stuck into the mass (heavy, bright iron wire may also be employed, and in place of sulphuric acid, muriatic acid used). The vessel is then set aside in a rather warm place, loosely covered, without being disturbed for twenty-four or forty-eight hours, when the chloride will have been reduced to pure spongy silver. The zinc or iron is then withdrawn from the silver, and the zinc-reduced silver digested with diluted sulphuric acid, or the iron-reduced silver with diluted muriatic acid for a day or two, and then thoroughly washed by subsidence. With a little borax and saltpeter it may be fused into an ingot in a Hessian or black lead crucible, or may be readily converted into nitrate by nitric acid and a little water.†

Reduction of Silver from Old Silver Baths.—When the paper bath becomes overcharged with organic matter, and the negative or ferrotype bath with ether and alcohol, the simplest and quickest plan is to throw down the silver as a carbonate with carbonate of sodium or potassium, or with Natrona bicarbonate of sodium, made from cryolite.

The precipitated carbonate of silver is washed by subsidence and decantation half a dozen times, and then the moist carbonate is readily converted into a solution of nitrate by simply adding gradually pure nitric acid, leaving a trace of the carbonate undissolved, to insure neutrality of the nitrate solution. Metallic silver can be thrown down from the baths with plates of copper or thick copper wire, in a fine crystalline powder,

* If proper precautions are used to avoid the poisonous fumes the cyanide fixing bath may be evaporated and added to the sulphide. The bath contains a considerable amount of silver, and cyanide of potassium is an excellent flux for reducing sulphide of silver.

† Chloride of silver, when dry, can also be reduced by triturating it with a little water into a paste; then boiling it for half an hour with the same weight of glucose (may be got from a manufacturing confectioner) and equal amount of crystallized carbonate of sodium, both dissolved in three parts of water. The reduced silver is digested with dilute muriatic acid, then washed.

which, when well washed, is readily reconverted into nitrate as above, applying a little heat.

Conversion of the Buttons of Metallic Silver into Nitrate.—The buttons of silver may be dissolved at once, or may first be fused with a little borax and saltpeter, and the fused silver poured into a bucket of water. The silver becomes purified, and the smaller particles dissolve more readily. The silver should be put in a rather large porcelain dish, which is best set in a sand bath (an iron pan filled with sand), and placed over a gas or oil stove, or set on an iron ring-tripod with a spirit or oil-lamp beneath, having previously added for every ounce of silver, one ounce and a quarter of pure nitric acid mixed with half-an-ounce of distilled water. The dish should not be more than one-third filled, and covered with an inverted glass funnel resting upon the edge of the dish to prevent the expulsion of liquid. It requires but a very gentle heat to dissolve the silver; at first only about 100 deg. Fahr., and toward the last 140 to 160 deg. Fahr. If not all dissolved more diluted acid may be added, but to insure a neutral solution a small button of silver may be allowed to remain after all action ceases. On account of the acrid vapors escaping, the manipulation should be conducted in a fire-place. The dish is then set aside in a warm, airy place, free from dust, for the silver to crystallize. The first crop may be sufficiently fine, but the mother liquor may be contaminated with copper and contain a black sediment which generally contains an amount of gold. In this case it had better been diluted with water, filtered, the gold recovered, and the silver solution reduced to chloride. If sufficiently pure the mother liquor is further evaporated and another crop of crystals procured. The black precipitate may be digested with muriatic acid, washed and converted into chloride of gold by means of aqua regia.

Recovery of Gold from the Toning Bath.—When several gallons of waste bath have accumulated, precipitate the gold by adding drop by drop, as long as a brownish precipitate takes place, of the following filtered solution: One ounçe of pure sulphate of iron dissolved in 4 ounces of distilled water and ½ fluid ounce of muriatic acid. When no more precipitate is formed, stir the mixture and set it aside for several days; then pour off the supernatant liquid and bring the precipitated gold into a porcelain evaporating dish; pour upon it muriatic acid, and apply a gentle heat to dissolve out any remaining iron. Wash the precipitated gold thoroughly with rain water. The gold may be dried and preserved, or at once, while still moist, converted into chloride by adding a mixture of 1 part pure nitric acid and 3 parts pure muriatic acid (called aqua regia). This may be accomplished in the dish or in a wide-mouth bottle loosely stopped with a cork and set on a brick in the sun. It requires abour 4 parts, by weight, of aqua regia to convert 1 part of metallic gold into the ordinary terchloride. The gold solution may be diluted and kept for toning, or evaporated in a porcelain dish, on a steam or water bath, while stirring, to form a dry mass. When nearly evaporated, if 1 grain of chloride of sodium is added to each 0.65 of a grain of metallic gold employed, the more stable chloride of gold and sodium is formed. I have reduced large amounts of silver wastes by the methods given, with always satisfactory results, and I am sure by following the directions with sufficient care and intelligence, the operator will not be disappointed.

C. L. Lochman.

PHOTOGRAPHIC NOTES FROM CHINA.

In The American Annual of Photography I notice, among the standard formulas, etc., one interesting item giving "the largest and smallest quantities of chemicals admitted to the pyro developer." I have often been surprised at the wonderful combinations now and then proposed as developers, and while I can understand that 1¼ grains of pyro per ounce may make a good developer, I cannot say as much for 10 grains per ounce. Then we find 80 grains of sulphite against 5 grains. It would be much more instructive to know the average composition, not of all the known developers, but of developers used by a considerable number of experienced workers. But this item is interesting as showing how irrationally some formulas are made up.

It will be found by experience with different brands of plates, that slight changes in the quantity of pyro are necessary, but further than that the developer can remain unchanged. For strictly instantaneous work a special developer is required, but ordinary shutter exposures can be developed in the usual manner. In fact most work with the shutter is done with large diaphragms, and the plates are fully exposed.

A gentleman here, speaking of bromide paper, tells me that he makes his bromide prints by daylight admitted through a small opening in the dark room. He claims it is better than lamp-light, because it gives a blacker color. He also maintains that it is more uniform. The first proposition will perhaps find more ready acceptance than the latter. But in North China the light during the winter is remarkably uniform. Day after day my note-book records the intensity as 1, a purely arbitrary standard of my own. This is true of Pekin and Tientsin. I have noticed a gradual increase in intensity within the past month, but there is such a regularity about it that one naturally shortens exposure accordingly. Consequently, I can readily believe that bromide prints can be successfully made here by daylight in the manner described. But I prefer the oil-lamp for my own work, and I have grave doubts about the better color given by daylight.

There is no doubt, however, that the intensity and kind of light used in printing does affect the color of a picture. This we know from common experience with albumen paper. Take a dense negative and make two prints, one on a dull day and the other in sunlight. The difference will be very noticeable. A strong negative with a deep yellow stain from the pyro will never give a print of good color. It is therefore possible that bromide paper will give blacker prints in daylight, and the subject offers itself as worthy of investigation.

There is not much scenery or architecture to photograph in this part of China. At Pekin there is a great deal, but most of the places of interest are absolutely closed to foreigners. Here in Tientsin we have the traffic of the Peiho River, the Bund with its piles of merchandise, the coolies loading and unloading steamers and boats, the lunch stands, tea tables, and barbers shaving heads and combing and braiding queues, interspersed among the piles of bags and boxes.

The visitor to China should not attempt to carry a large camera. I have the Albion, 8 x 10, but I am living in the country for a time, and can choose opportunities which a transient visitor would not likely have. Some form of a hand camera is advisable, and in addition to that a small instrument, which can be quickly set up, before a curious and often very disagreeable crowd of dirty natives can gather around. I have several times set up my camera as quickly as possible, and before I could get a picture been surrounded by curious people who, with pure Chinese obstinacy, persisted in standing in front of the lens. When this occurs one can only walk off as philosophically as possible.

Romyn Hitchcock.

AN EXPERIMENT IN COLORED PORTRAITS.

As much has been said in the last few years about a process for making photographic portraits in color by printing a faint image on paper, which, after being roughly tinted with suitable water colors, is albumenized, sensitized, and subjected to a second printing, it may interest some readers to know how the writer made very similar pictures in an experimental way, as long as fifteen years ago.

At that time I had read nothing about any such process, and, as far as my own experiments went, the idea was original. Owing to a lack of time the experiments were rather crude, and the whole idea was finally abandoned. The process, as will be seen further on, was somewhat laborious, and the whole idea seemed so unartistic that I became a little ashamed of it. At that time I was trying to devise some method by which colored portraits could be made cheaply. The object aimed at was large, rather than small work. After trying the different ways of coloring photographs which had been cemented to glass, and made transparent, it occurred to me that if paper or canvas could be properly colored, and then have a film with the image on it laid over it and cemented to it, the result would be a very good and pleasing colored portrait, at the expense of only a small amount of time and work.

The first experiments were made in this way: A positive was made on a plate prepared with collodion emulsion, and a faint print was made on plain paper from the same negative. This print was roughly colored with water colors. After the colors had dried into the paper thoroughly the picture was floated on a solution of gelatine, to which had been added a very small quantity of chrome alum. It was then placed on the collodion positive and squeegeed down to it, care being taken to keep the register accurate. After drying, the paper and film were carefully peeled off the glass support together. These pictures were quite good-looking for cheap work, but the great trouble with them is that the paper expanded too much for the collodion film.

An experiment, which gave better results, was made with oil colors used in the same way. The writer has now a small half-length figure done in oil after this manner, with a background of diapered gold. It is just as fresh to-day as when it was made, and, with the gold background, is remarkably rich-looking. This success led to experiments in larger work, the object aimed at being to produce life-size oil portraits at a very small cost. In some respects the large work succeeded very much better than the small.

In order to avoid making a large negative, an image was thrown up on paper or canvas in a solar camera, and the outlines sketched in lightly with pencil; it was then colored, little or no care being necessary, as all roughness could be worked out in finishing. The collodion positive was made in the solar camera without the focus having been changed from that which was used for making the sketch. This was transferred to the colored sketch, as in the case of smaller pictures, and finished by touching up a little with oil colors, The work was effective, and in these large portraits the expanding of the paper did not make such a noticeable difference as it did in the small work. The main trouble with them at that time was my inability to get a tone in the over-laying film, which would approach in color the natural shadows of the flesh, and harmonize with the general color of the face. The whole thing was abandoned finally as tending to cheapen art. In these days of new processes and improvements, some one who has more time than the writer may be able to follow up these experiments with greater success.

Harry Platt.

TIMING A DROP-SHUTTER.

What is an instantaneous exposure? How much time is an instant? To answer the second question first, an instant is no time at all. It may be said to hold the same relation to time that a mathematical point holds to a line. It is a point *in* time, but not a portion *of* time. An instantaneous exposure then is no exposure at all. This may seem a little paradoxical, but that is because our ordinary use of the word instantaneous is inaccurate. Strictly speaking, there can be no such thing as an instantaneous exposure. Every exposure takes time. It may be only a hundreth, or perhaps only a thousandth of a second; but if it were only a millionth of a second it would still be time, and immeasurably more than an instant.

The so-called instantaneous exposures differ very greatly from each other in duration. One operator snaps the shutter and makes an exposure in one-tenth of a second. Another operator snaps the shutter and makes an exposure in one-hundredth of a second. In comparing notes, they treat these exposures as if they were just alike, because they call them both instantaneous; but in fact the one is ten times as long as

J. E. Line, Photo. Electro Tint Eng. Co., Phila.

"BYE, BYE, PAPA."

the other just as truly as if the one had been a minute and the other six seconds.

It may be easy to tell the difference between one-tenth and one-hundreth of a second, by the eye or the ear; but it is impossible to distinguish between one-fiftieth and one two-hundredth of a second by these senses. We ought to have more accurate methods of measuring these very short intervals of time. By the use of such methods we would attain two very desirable ends. We would make our exposures more nearly as they should be, and, knowing the time of exposure, we would develop our negatives more intelligently.

Fortunately for the development, our errors in time are likely to be nearly all in one direction. We are not likely to make an over-exposure with a snap-shutter. The thing we are likely to do is to make the exposure too short—even shorter than necessary. For example, we wish to expose a plate on a steamboat moving in front of our camera at the rate of 8 miles an hour. The question is not how much time should this plate have, in order that the image may be properly recorded upon it, but how much time can we afford to give it without any risk of a blurred picture. This question is usually answered by setting the spring at its highest tension, so that the exposure may be as quick as possible. This is done because the operator does not know just how fast his shutter works, but he does know that he gets a blurred picture if the exposure is too slow.

In the above example, let us suppose the distance from the lens to the boat to be 200 feet, and the distance from the lens to the sensitive plate 8 inches. These distances are as 300 to 1. If the boat moves 3 inches during the exposure, the image will move $\frac{1}{100}$ of an inch on the plate. This is hardly enough to produce a perceptible blur in the print. Now if the boat is moving at the rate of 8 miles an hour, or about 12 feet per second, it will move 3 inches in one forty-eighth of a second. We should, therefore, make the exposure one forty-eighth of a second. If we make it more than this, the picture will probably be blurred. If we make it less, we must do it at a sacrifice of detail.

Having decided this question, we would be ready to make the exposure if we could only measure the time; but we do not wish to cut the exposure off at one two-hundredth of a second, when we might just as well have four times that much time.

The object of this article is to propose a method by which the velocity of an ordinary drop-shutter can be measured and controlled. The method is extremely simple. It depends upon the well-known laws of falling bodies.

As an illustrative example is in order, I shall refer to my own drop-shutter, and describe the method as applied to it. My shutter has a 1-inch aperture. The sliding portion is made of thin sheet metal, and is extremely light. It moves very freely in its grooves, except when it is lifted to its highest position. In this position it is held by a delicate spring with just enough friction to keep it from falling. It must be remembered that it is held by a friction spring, not by a catch of any kind; and this spring is carried with the sliding piece, so that the friction is entirely removed as soon as the shutter is released. A lead bullet of sufficient weight to control the movement of the shutter is fastened by a strong silk cord 2 feet long to the lower end of the sliding piece. To release the shutter it is only necessary to drop the bullet: the velocity of the movement depends simply upon the distance the bullet falls.

If the exposure is to be one forty-eighth of a second, the slide must move a distance equal to the diameter of the aperture in one forty-eighth of a second. In the case in question that distance is 1 inch. The slide must, therefore, move 1 inch in one forty-eighth of a second, or at the rate of 4 feet per second. It only remains to find how far a body must fall to gain a velocity of 4 feet per second, and then drop the bullet from such a position that it will fall the required distance before releasing the shutter. By applying the familiar formula $v = gt$, and substituting the known values, we have:

$$4 = 32\,t$$
$$\text{whence } t = \tfrac{1}{8}$$

The bullet must therefore fall one-eighth of a second to gain a velocity of 4 feet per second. The distance it must fall is found by the formula—

$$d = \tfrac{1}{2}\,gt^2$$
$$\text{substituting } d = 16\,(\tfrac{1}{8})^2$$
$$\text{whence } d = \tfrac{1}{4}$$

The bullet must, therefore, fall $\frac{1}{4}$ of a foot, or 3 inches, to make an exposure in one forty-eighth of a second.

By calculations similar to these we find that to make an exposure in one-hundredth of a second, the bullet must be dropped about 12 inches; and to make an exposure in one two-hundredths of a second, about 4 feet. The cord need not be more than 2 feet long to drop the bullet 4 feet, as it may be dropped from a position 2 feet above the shutter and falls to a position 2 feet below it.

It will be well to attach the bullet to the camera box by a second silk cord. This cord should be of such a length as to take the tension from the first cord as soon as the shutter is released. This will prevent shock to the lens and tube.

I have given the measurements for three exposures, worked out for an aperture of 1 inch. All the rest can be worked out in the same way for any aperture. If it is considered desirable, a small chart can accompany your shutter, giving the time of exposure for a drop of any distance from 1 inch to 4 feet. This, however, is hardly necessary, as a few points memorized will be a ready key to all the rest.

A. C. Longden.

INTENSIFICATION WITH MERCURY.

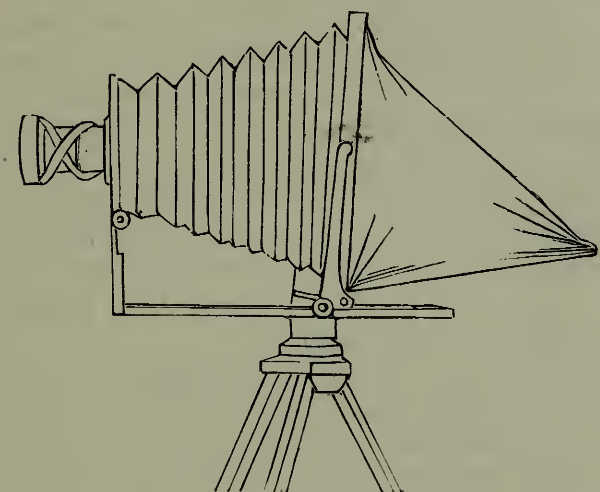
Lately I had some transparent films which I thought rather thin, so tried to intensify them as usual with mercury bichloride, then, after thorough washing, passing them into a strong solution of soda sulphite. In spite of all I could do, I could not make them denser. I was fairly puzzled. In speaking of this to a clever friend, who has much to do with process work, he asked me if I was sure the sulphite was not alkaline? Well! this was the case, so adding enough of sulphurous acid to smell quite strongly, I found all my difficulty was gone, and the negatives intensified beautifully. I found that my old stock of sulphite was quite alkaline, so got some of a common sort and have no trouble, either by adding sulphurous or sulphuric acid. This was a new experience to me—for I seldom need any strengthening of my negatives—but it may be useful to others. The negatives spoken of above were taken on a boating trip last May and June of some 600 miles, between Gaspé on the St. Lawrence, across the bay of Chaleur, round the north coast of New Brunswick, then to Summerside, P. E. I., and the Atlantic coast of Nova Scotia and Halifax; then by land to St. John, New Brunswick, Moosehead Lake, Maine, and home. We had a boat of the Gaspé build, yawl-rigged, with a small cabin in bow, and a tent for use all over in harbor. Our object was to visit the fishing villages and lobster canneries, of which there are hundreds, and in very wild barren places too. I took over 150 negatives with my hand camera, besides some larger ones, and had a most delightful trip of some six weeks. At one place, a wild rocky harbor called Whitehaven, our journey nearly came to an untimely end. We had been driven in for shelter by a sharp gale, and found some twenty-five La Hâve schooners in harbor, some for bait, others windbound—locally they are called "Dutchmen"—and one American schooner. Now, these bank fishermen are all civil while they are not on the outside of a few drinks of St. Pierre or Miquelon whisky—smuggled of course—but in that state they are very "ugly," to use slang. I was sitting one night in the boat, under the tent, at the end of a fishing "room" wharf, with a lad, talking, when I heard footsteps and whispering on the wharf, several feet above, and then, "Let us drop it!" so I went out to see what was going on, when I found two Dutchmen rolling something heavy on the wharf, who at once stopped when they saw me, saying, "Oh, you're there, are you?" I replied, and seeing they were insolent, said no more; but I saw the whisky bottle rising to their mouths in the weak moonlight; then the ruffians disappeared in the dark "room" amongst the fish, whispering again. Luckily I overheard, "Hit him with it!" and considering that "him" must be myself, I went behind the mast and furled sail to watch. A moment after the bottle shot past my ear into the water behind, but they had too much of its contents to throw quite straight. At once I called to the boy to give me my rifle, which caused a stampede, and I saw no more of them. Then on going to see what they had been rolling, I found it was a large stone anchor cased in withs, that the fishermen use for their nets, weighing some 300 pounds; and they had been going to quietly drop this into our boat from the high wharf, thinking no one was on watch. It seemed strange, as we were always so well received everywhere; but we put it down to whisky devilment; and it was only some time after that we understood that we had been taken for government whisky detectives, as we had an ensign flying at the masthead. Of course our boat would have been sunk, and I am glad I did not see sooner what they were doing. As we were leaving the wharf to anchor for the night, a voice called out, "You have a *rifle*, have you?" as much as to say, it was as well, for magazine rifles are not to be trifled with. This cursed whisky is demoralizing that coast badly. A while before, we heard that two men sent by the customs had to take to the woods for their lives, leaving boat and all. I took many "shots" at fishing boats, etc., and also on shore.

Alexander Henderson,
Montreal.

ODDS AND ENDS WORTH KNOWING.

A very good protection for sore fingers when working with chemicals is to take a part of the finger from an old kid glove —or cut the size of one from the body part of the glove and sew it into shape—then, after drawing it smoothly over the afflicted finger or thumb, cover it with a good coating of shellac varnish, which will make it water or chemical-proof. After once using one of these conveniences, no person working in chemicals would be willing to dispense with them.

To prevent losing the cap from a camera tube when viewing, take a heavy rubber band and slip it over the cap and



tube, according to illustration. It will be found to save the photographer much annoyance.

Positive or negative varnish. One of the best varnishes we ever saw, and which we have used almost constantly for over a quarter of a century, is made by the following formula:

Alcohol	2 quarts
Gum sandarac	10 ounces
Chloroform	½ ounce
Oil lavender	6 ounces

R. J. Reese.

PRINTING PROCESS WITH BASIC ANILINE COLORS.

Having read Professor C. H. Bothamley's article in No. 518 of The Photographic Times, entitled "Recent Developments in Printing Processes," I am led to call attention to a process of printing in color, of much older date than that of Dr. A. Freer, or the primuline process.*

These color prints are of marvellous beauty, brilliant in the lights, and of most delicate details in the middle tints. The requisite exposure to light has been made under negative or under diapositive. The method of developing them is based upon entirely different processes.

An obstacle to a direct practical application of this printing method in color is, however, the comparatively long exposure required, an hour and longer in direct sunlight, and the somewhat doubtful permanency of the print.

When to any basic aniline color, as fuchsine, saffranine, methylviolet, methylgreen, chrysoidine, etc., dissolved in a well-filtered solution of resinate soaps, is added gradually an aqueous solution of metallic salts, like those of zinc, lead, copper, aluminium, magnesium sulphate or chloride, a combination of abietic acid with the metallic radical will form, and will be thrown down as a colored precipitate.†

It is soluble in benzole and chloroform, and in the case of magnesium resinate in alcohol even. The dyestuff is here chemically united with the resinate.

When thin strata of these combinations are exposed to light, remarkable changes take place. The dye is separated, and returns to its original condition. Acids, weak alkalies, several oxydizing or bleaching agents, as, for example, hypochlorite of sodium (eau de javelle) have no effect whatever upon the unexposed film, but they discolor the film, or totally destroy the dye after exposure.

When paper coated with a colored resinate has been exposed to light under a *diapositive*, the latent image formed may be developed in all its half-tones or shades by a tolerably strong solution of hypochlorite of sodium. Bleaching proceeds, of course, in proportion to the time of exposure and intensity of light.

Colored resinates share with asphaltum one of its properties. After exposure to light they lose partly or entirely the

*American patents Nos. 358,816 and 358,817, 1887, are both scientifically and technically interesting.

†Photographic Times, Vol. XX., page 340. *Zeitschrift für Angewandte Chemie*, 1890, page 451.

solubility in benzole, etc. Paper prepared with colored resinate and exposed to light under a *negative*, will by treatment with benzole develop a brilliant colored picture. As with asphaltum, the non-exposed portions of the film are washed away by the developer.

It is well understood that any desirable material, paper, cotton, linen or silken fabrics, leather, glass or celluloid plates may be coated or impregnated with colored resinate, and pictures produced upon them by exposure to light and development as above described.

Armand Müller-Jacobs, Ph.D.

A WORLD-WIDE LEAGUE.

PERMIT me to offer a suggestion to be considered by the many thousand readers of the AMERICAN ANNUAL OF PHOTOGRAPHY, which, if generally adopted, would prove a pleasure to many amateur photographers.

We photograph everything at home, in town and the country round about, and have hundreds of prints which may not greatly interest our neighbors, but which have cost us money, and should not be wasted. There are hundreds of amateur photo. clubs spread over the whole globe, having seldom any connection with one another.

One can safely say, that, with the exception of a few dark spots, as yet unpenetrated by civilization, there is not a place where there is not a camera. How many millions of unused prints and negatives there must be scattered about!

May we not bring these into real use and pleasure? With your kind assistance I believe that nothing will be easier.

Your valuable almanac is circulated in every club in every land, which is best shown by the fact that it has found its way to our place, one of the most out-of-the-way places in Europe (Helsingfors, Finland.) If you will print a list of every club or association willing to enter into an exchange alliance,* a great deal of pleasure may be derived.

For a few cents, expended in postage, passage may be booked for many prints, and when a club has noted its willingness to enter into the exchange alliance, and this becomes generally known, we shall, I am sure, here, in Finland, be

* The Chautauqua Photographic Exchange Club is a league similar to the one proposed by Mr. Hamfeldt. Several of its members live in foreign countries. The only requisite for membership is that one shall be a student or graduate of the Chautauqua School of Photography.

exchanging prints with Canton, while you, in America, will be exchanging your likenesses with New Zealand and Siberia. In this way distant countries will be brought into a friendly alliance with one another, in a more common sense way than has ever been tried before. What a difference is there not between the amateur photograph and the sketches of the illustrated journals. The one surely enough gives us views of interest, but not of the same kind as the other. The amateur photographer tries (if he often does not succeed), in sketching nature as it really is in every day life. How he lives, how he builds his house, and what his streets really look like, etc., etc.

I would suggest that international rules be drawn up by the chief clubs in New York, Paris and London, and that these rules should be binding upon every club entering into the league.

Charles Hamfeldt.

EMERGENCY DARK-ROOMS.

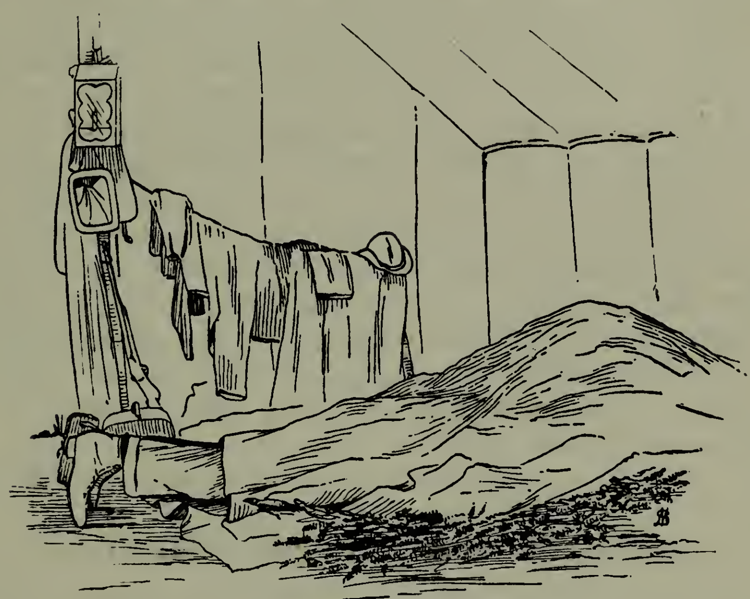
Most photographers have at some time found themselves at a distance from studio or home, and have wanted the facilities of a dark-room. The development of plates can generally wait until the photographer returns to his own quarters (and to the advantage of the resulting negatives), but often he wants to "shift" plates, unless he prefers to encumber himself with a dozen or so of holders.

For use merely in shifting plates, I should never provide myself with a travelling dark-room lantern. Few such lanterns at best are practicable; they all take room, and I have found that, by exercising a proper degree of care, I can shift plates in the dark as well as in any safe dark-room light. My "emergency dark-room" then is simply any region of utter darkness.

A photographer should understand thoroughly every pattern of plate-holder that he has occasion to use. If it is complicated in its mechanism he should study it the more, so that he can fill it and empty it at home without bringing the plates too near the light. Understanding it thoroughly he can fill and empty it properly by sense of feeling, whether in the light of his dark-room or in the darkness of an unilluminated closet. Very little practice will give any one the same faculty of working in the dark which the blind possess. The film side can easily be distinguished from the back of a plate by the sense of feeling, and without injury to the plate if the hands are dry.

I have often shifted plates at night in my room at hotels. I darken the windows and transom as much as possible, and, if necessary, retreat to a closet. When everything is ready I take a sheet of white paper in my hand and extinguish the gas. I allow a minute for my eyes to be accustomed to the darkness, and then, if the paper in my hand is visible, even indistinctly, I investigate to see what measures are necessary to darken the room still more. It may be necessary to draw a rug up to the door to exclude the light admitted where the threshold has been worn by successive travelers, or I may have to ask a friend or a porter of the house to hold a blanket where it will shut out the light at the sides of a loosely-fitting door.

My camera has several times gone with me into camp in the



Maine woods. The first time my only dark-room was formed by lying upon the ground, leaning on my elbows, and being covered with blankets. I didn't suffocate, but it was uncomfortable, and I could sometimes feel the moisture from my breath gather on the plates as I handled them. I was the only artist of the expedition, and was not included in the pictures which I made, but finally I was compelled to promise that I would allow myself to be photographed before breaking camp. In a thoughtless moment one of the party asked to be allowed to photograph me in the act of changing plates. I readily assented, and that picture is the only one in the collection in which my "portrait" appears.

On a subsequent camping trip I shifted my plates at night by arranging two piles of baggage, about 3 feet high and 3 feet apart, and placing poles across the top; then, sitting cross-legged before the open space, I had a companion cover everything with blankets. I had much more breathing space and could do my work more deliberately than before. The plates were not at all affected by chemical fogging as in the previous case.

Before excluding the light I arrange my plate-holders in their numerical order, place the plate-boxes where I can lay my hand on them without chance of mistake, and if I have provided myself with extra separators and a dusting-brush I save a place for them. I plan my campaign with care and do the work deliberately, and I never yet, on reaching home, found myself trying to develop an unexposed plate, and I never made a double exposure by reason of changing plates in the dark. I have sometimes left home with five dozen plates and four or five plate-holders, and returned in a few weeks with all my plates exposed, not having seen one of them. On going into my dark-room, in such cases, I have always been able to pick out any desired plate from any of the boxes simply by consulting my exposure list and keeping track of the numbers. A careless person might come to grief, I am aware, if he attempted to do the same thing; but a careless person is always coming to grief, even in his own dark-room, and the plates exposed by a careless person are not generally worth developing.

Samuel Merrill.

THE USE AND ABUSE OF MODELS.

I TAKE the following list of criticisms on some pictures exhibited at the last convention from one of the American photographic journals: "In the collection of Mr. ——, which took a diploma, the work of the true artist was clearly visible, but the subjects either did not know the story as well as did he, or they were unable to merge themselves wholly into the characters they personated. The lightings, posings and accessories were full of feeling, but the soul of the story was missing." And further on, "The composition shows long, hard study, and careful thought; but the failure came, where it so often comes, in the inability of the artist to infuse into his sitters the thought and inspiration with which he himself may be full, and without which the embodiment of his idea is liable to become weak and vapid."

This is excellent criticism, but if true of the pictures they ought not to have been exhibited. A picture which greatly fails to embody the idea of the artist would be much better suppressed. I have never seen the photographs, and, of course, do not know how true, or otherwise, the criticism may be, but it will afford a text for a few observations on the use of models.

When a photograph from life is unusually successful some people think it the right thing to say: "What a clever model!" Now I have always found that so-called cleverness in a model is fatal. It is, I am aware, usually thought that actors make the best models, but this is a singular delusion. Actors are the worst models in the hands of a competent photographer. The reason is not far to seek. They act, and they show it. They may represent the modesty of nature on the stage—not that they often do—but the action is usually too strained and exaggerated for pictorial purposes. If they do not tear the passion to tatters the nature of their art compels them to be dramatic, and dramatic action when photographed certainly looks stagey, and staginess is not the end for which pictorial artists should strive.

An indifferent photographer, it is true, may make a better picture of a good actor than of an ordinary mortal; the reason being that the good actor makes the picture, not the indifferent photographer, who is only a passive agent; but for great original work—it seems absurd to say it, but it wants impressing on our operators—the picture should be by the photographer and not by the model. All that the photographer should require of the model is physical suitability, to which must be added absolute obedience. For everything else the photographer must depend on himself; he must "do the rest." The thought, the get up, the pose, the lighting, even—nay, in many cases, above all—the expression should be by the photographer, and the artist who cannot take the face of an idiot with the expression of an angel should give it up or try easier subjects. The "soul of the story" must be in the artist; he must express it through his model, and not expect the model to do it for him.

The higher the aim the more woeful the fall if you miss, and I am afraid your convention gives photographers every opportunity to break their artistic necks by offering prizes for subjects which are far out of their reach and unfit for photographic treatment. I will not go fully into the subject here of what our art can do, and what it should not attempt, but I will put as much as I can into a line. Don't attempt a subject in which you cannot hide the art by which a model is made to look natural. To which may be added: When you do succeed don't explain every minute detail by which you have achieved success. By doing so you only let the sawdust out of the doll. Be reticent regarding your mechanical cleverness. Sentiment is a delicate thing and soon evaporates in contact with actuality. The expert will always *know*, but the outside spectator must not have it thrust upon him that, as Alice says in Wonderland: "It is only a pack of cards after all!" It was absolutely impossible to embody the beautiful myth of Hiawatha by aid of the gross material entities of modern men; the same applies to the Arthurian legends, and in only a less degree to Enoch Arden, and I trust I shall not give offense in expressing my opinion that all attempts I have seen to illustrate these subjects by photography have abolished the poems from my mind and left only the impression of actors acting a tableau.

H. P. Robinson.

EFFECTS OF OVER-EXPOSURE, AND THE REMEDY.

How often it happens that from your local dealer you cannot get the dry plate you have been accustomed to, must accept any he may have in stock, and, as is often the case, one you know nothing about as to speed. The sensitometer number on the box is no guide whatever. When will a uniform number be used by the several manufacturers! No matter how expert you may be, if you are unacquainted with the plate and have no one to tell you something about its rapidity, you are quite likely to either over-expose or under-expose. It is like having a practical joker with you who will mark all your plate-holders containing slow plates, extra rapid, and all your plate-holders containing fast plates, extra slow. It is just sheer luck if you get a good picture.

Recently I obtained, from my local dealer, a dozen Cramer, No. 60, dry plates. I had never used plates before as rapid as these for field work, although I had generally used quite rapid plates. I had only a few hours to spare, and had to accept these or none. I fully appreciated the fact that these were very rapid, but I did not know just how rapid they were. I was very much in the dark about it.

Although you may know a plate is very rapid, a sort of feeling, I can't tell what, comes over one, that you must give it just a little more time, especially when you use the last stop in your lens, and have a grape arbor with green leaves on a cloudy day to take. You think of several legends, "Powder the red-headed girl," and "Never take a white horse against a green back-ground," and others.

I made the exposure on the grape-arbor covered very heavily with green leaves, and about sixty feet distant. The stop used was No. 4, U. S. The time given was about as long as it would take to swing my arm with moderate rapidity, from the lens down toward the tripod and back again. Had I merely taken the cap off and put it on again quickly, the exposure would have been about correct. The plate was very much over-exposed.

When I proceeded to develop the plate, nothing I could do would check it in time. I used the developer described on page 323, Photographic Times Annual, 1891, and numbered 35. Though the negative had plenty of detail, it lacked the necessary density. I then added more pyro to the solution and covered up the pan, and then attended to the fixing of some other plates. When I came back to this plate about fifteen or twenty minutes afterward, I found it so opaque I could not see through it. Sure enough, there was plenty of density but apparently nothing else. I was going to throw the thing away, but I thought I would fix it and see if any light would pass through. There was none. I used in this case the acid fixing bath.

Having nothing else on my hands I thought I would reduce with Belitzki's acid reducer,

Water	7 ounces
Potassa ferric oxalate	2½ drachms
Crystallized neutral sulphite sodium	2 drachms
Powdered oxalic acid	30–40 grains
Hyposulphite sodium	1½ ounces,

and see what would come of it.

This bath had been used several times before and had been made up for several months and kept in the dark.

It worked splendidly. I did not wash the plate after fixing and before placing in the reducer, as both contained hypo, and I did not consider it necessary. Before long the details in the grape-arbor appeared, and some houses beyond the arbor began to show themselves. The plate was beginning to get transparent. When the sky began to grow thin I stopped the reduction. The negative still lacked clearness in the shadows and medium half-lights; it looked dirty, as if a long wash would do it good.

Having washed it in running water I placed it in the following clearing bath:

Chrome alum	½ ounce
Citric acid	¼ ounce
Water	36 ounces

In a very few moments, as if by magic, I took the negative out beautifully clear. I was very much surprised myself at the result.

While I do not pretend to say this negative is equal to those more correctly exposed and more carefully watched in the developent, yet I think it pays to doctor a negative when one can't conveniently take it over again. The prints made from this negative, which would not print at all till reduced, if the final finishing is well done, would pass as very fair amateur work.

S. F. H. Hewit.

A COLLODION BACKING FOR DRY PLATES.

The following formula for a collodion backing for dry plates to prevent halation is one that I have used for some time in connection with the collodion emulsion process for lantern slide work.

I find that some kind of a backing is a necessity with these plates in order to insure the best results; especially is this the case when a slow emulsion is used.

In regard to its application to gelatine dry plates, I am not not prepared to say. I use a slow plate almost exclusively for outdoor work, and with these I have never been able to find that a backing of any kind was of special advantage; where the plate and the occasion require one, however, I see no no reason why this should not be thoroughly efficient. It is as follows: Take

Tincture of red saunders	1 fluid ounce
Ether	1 fluid ounce
Pyroxylin	10 grains
Glycerine	10–15 drops

The use of collodion colored with some of the aniline dyes is not new for this purpose, but I have found that in some cases after the film has dried thoroughly on the glass, it is not as easily removed as could be desired, when we wish to develop the plate.

The glycerine is added with the view of obviating this trouble; it makes the resulting film flexible and more easily penetrated by water; its use was suggested by its being employed in the preparation of one form of a *flexible collodion* for surgical purposes.

Red saunders is a wood containing a resinous coloring matter of an orange-red shade, which is freely soluble in alcohol and ether, but practically insoluble in water. I prefer it on this account to any of the aniline dyes; it can be procured in any drug store.

The tincture of red saunders referred to, is prepared by macerating in 8 ounces of alcohol 1 ounce of the wood, in coarse powder, and leaving it stand for several days with frequent shaking; subsequent filtration is not absolutely necessary, as the tincture will settle clear enough if allowed to stand a sufficient length of time.

The proper proportions of the coloring material and glycerine can be added to a plain collodion, if preferred, allowing it to stand for a sufficient length of time before use, but I think the first method the better one. In applying it the back of the plate should be cleaned and the collodion simply flowed over it in the usual manner.

Thomas Kennedy.

ON THE MANIPULATION OF TRANSPARENT FILMS.

The amateur photographer often finds himself confronted with the question: Shall I take plates with me on my outing, or a roll of transparent films? Each possesses its advantages and disadvantages, but, without attempting to discuss this question, I will endeavor to describe a method by which thin films may be handled in development, and their after-treatment, with nearly the same facility as glass plates.

Having been exceedingly annoyed, at times, by the obstinate tendency of thin films to curl up at the edges, and project themselves above the surface of the developer, thereby producing uneven action of the developer, and here and there abnormally thin or dense patches in the negatives, I at last hit upon the following plan for obviating this difficulty:

A sheet of hard rubber is taken, about a $\frac{1}{4}$ of an inch larger all around than the film, the inside portion of which is cut out, making a frame whose exterior dimensions are $\frac{1}{4}$-inch larger than the film to be operated upon, and the interior dimensions $\frac{1}{4}$-inch smaller. The interior corners of the frame are cut round instead of square, to give greater strength.

Upon such a frame the film to be developed is laid face downward, and is attached to it at the corners by means of an adhesive wax made by melting ordinary beeswax and adding Venice turpentine until the proper consistency is obtained. The wax is solid and tolerably hard when cold, but the warmth of the hand is sufficient to render it plastic and quite adhesive. It may be used in the form of small pellets which are laid upon the corners of the film, and flattened out over the edges of the film upon the frame by pressure of the finger or thumb, the warmth of which softens it and causes it to adhere strongly to the film and its support. A better way, however, is to spread the wax after the manner in which an apothecary spreads a plaster, upon the cloth side of a piece of enameled cloth, which is cut up into little pieces about ½-inch square. The film is more readily attached to its support by means of these little plasters, and the annoyance caused by the wax sticking to the fingers is avoided.

When thus mounted, a film may be developed, fixed and washed, and afterwards set in a rack and dried without removal from its support. Before placing it upon the drying rack, the film should be stretched upon its support. This may be done by holding the frame by the corners between the fingers and thumbs, and pressing the wax corners gently with the thumbs towards the edges of the frame. To prevent the edges of the film from adhering to the frame, the latter should be rubbed over with a little powdered talc before attaching the film. When dry, the wax may be scraped from the corners by means of a little piece of hard rubber sharpened at one end like a chisel, and the film detached from its support.

Equipped with several of these frames one may develop a number of films with nearly the same facility as a like number of plates. A little more care is required than in handling plates, in lifting the frame out of the tray in the process of developing and fixing, as well as placing under and removing from the tap in washing.

In developing, a generous quantity of solution should be used, and with films, as well as plates, cleaner negatives will be obtained by brushing them over with a camel-hair brush as soon as the developer is poured over them.

James F. Cowee.

FRIEDRICH MÜLLER, MUNICH. THE ALBERTYPE CO., N. Y.

A Portrait Study.

THE REVIVAL OF STEREOSCOPY.

Why the stereoscope fell so completely into disuse for a number of years is a mystery. It wasn't deserved. A stereoscopic slide even in paper gives a charm of realism no single picture can equal. And when instead of paper a good glass transparency is used the effect is in the highest degree lovely and beautiful. Perhaps the decadence of the instrument was partly due to the blunders made in mounting. The writer had a batch of slides brought the other day. With the exception of three all were by one (American) maker, and not one of the lot could be combined in the stereoscope by any ordinary eyes. The other three, by a different maker, were no better photography or subjects. But they were perfect in the instrument. They answered their purpose in giving stereoscopic relief; the others did not. Permission was asked to cut a piece out of the center of a slide as an experiment. This was done—removing a narrow slice of each picture where they joined. No sooner was this done and the two halves rejoined than perfect stereoscopic relief was obtained; showing that all the trouble of the very clever photographer who produced them had been nullified by improper mounting. It's no use mounting the centers of the pictures wider apart than the average eye. This rule is vital. By the following simple data, for which no originality is claimed, any one may succeed perfectly in producing effective stereoscopic work.

Lenses should be as long in focus as the subject will admit. The writer uses 6-inch singles; of course, theoretically, rectilinear would be better, but in practice the alleged curvature of marginal lines, even in cathedral interiors, has not been troublesome. Of course, it's there to some extent, but often it can be disguised, and the important thing is to reduce it to a minimum and at the same time get the largest possible working aperture by putting the stop as far as can be in front of the lens. This is limited by the amount of field to be covered, but that needn't be large; quarter plate is ample. By using what are called in England Wilsonian singles, after G. W. Wilson, of Aberdeen, who produced such splendid instantaneous work with this form of lens in the wet-collodion days, the photographer will have no need to wish anything quicker or better, and nothing gives equal brilliancy. The writer happens to possess the identical pair of lenses with which Mr. Wilson's fine work of years ago was done, and highly values their excellence. Mount lenses three inches apart and *not more.*

Camera for this work is matter of taste, but perfect parallelism in focusing is important. So is a center-hung swing-back. Mr. Chadwick, of Manchester, has recently introduced a time-appliance in his roller spring center partition, and the saving of time is often the saving of a picture when some fleeting effect is wanted.

Manipulatory details of negative making need not here be gone into further than to say that anything like harshness should be well avoided. Better a trifle of flat tendency than the brilliancy that causes people to ask, when looking into the stereoscope, "if snow was on the ground." The whites are practically exaggerated in the instrument.

Mounting correctly, though of the utmost importance, is very simple. Cut a square of glass true to 3 inches high, and 2⅞ inches wide, for a cutting shape; double the print face outward after making R and L on right and left-hand pictures; lay the shape on the doubled print, and with large scissors clip it round. The shape must not be laid central, but as near as it will go to that side that is creased. Now, mount the marked right picture on the left of the mount and the left on the right, thus reversing prints, and they must be right. Black or chocolate mounts are neater than the old-fashioned yellow ones.

Transparencies on glass are far preferable to paper slides, and are just as easy to produce as contact lantern slides. They are produced on the same emulsion plates, size 6½ x 3¼, but it is necessary to try or make a suitable printing frame. It should be 10½ long and 4¾ wide inside and backed with a board and springs. You want a bit of card to go inside frame 3½ inches wide, and, say, three other pieces this shape

—the wide part 3⅜ inches wide and the strip at bottom of ½ inch, another ¾, and a third 1 inch. To print your transparency with accuracy lay your 3½ inch bit inside frame to the right, and your half plate negative containing the two stereo pictures beside it pushed up to the *right*. Take one of the three L pieces and lay on the negative as far as it will go to the *left*, choosing that width of bottom slip as will cut off the foreground of negative most suitably, sometimes using one and sometimes the other, as required by the height of the best part of picture on the glass plate. Now take your 6½ x 3¼ transparency plate and lay it up to the corner of the cardboard last laid down, pushing it up to the left. You have now one end of transparency superposed on the opposite end of negative. Shut down and expose to light, I find an average negative takes with a Thomas plate about one minute exposure to a large gas burner at 18 inches. This exposure completed open frame. Take all out and *reverse* the right and left arrangement of card, negative and plate, and expose again. Develop, fix, and wash *secundem artem.*

The transparency should be mounted with a piece of finely ground glass and a mat of black paper between. Viewed in the stereoscope it then looks as if the subject in all the realism of relief was seen through an opening in a wall. Those who try will be surprised by the simplicity of the operations, and the certainty and beauty of the result.

Benjamin Wyles.

INSTRUCTIONS FOR CARBON PRINTING.

I HAVE been asked by many for further and more detailed instructions than I gave in my article on carbon printing last year, and am greatly pleased at the interest that is being taken in this, my pet process for positives. I give here my own working formulæ and my method. Many advocate transferring from collodionized glass or zinc plates, but as I obtain as good results by using paper, either single or double transfer, as may be required, I shall not speak of collodion transfer.

The outfit required for carbon work comprises a band of carbon paper of the color you prefer, a little of single and double transfer paper, a deep tray of porcelain or agate, a glossy rubber plate, a squeegee and a set of finger tips.

The formula I use for sensitizer is

Bichromate of potash, C. P.	1½ ounces
Ammonia	1 drachm
Alcohol	4 ounces
Water	50 ounces

The bichromate is all that is really necessary to sensitize, but I add the ammonia for the sake of making the paper pliable and smooth, and the alcohol to facilitate drying. This sensitizer will keep for months, but should be strengthened with bichromate occasionally.

The single transfer paper is made by dipping smooth and well-sized paper in the following, and drawing it over a glass rod to remove all surplus solution ; then hang up to dry.

Nelson's No. 1 gelatine	4 ounces
Water (warm)	25 ounces

Dissolve thoroughly and then add 50 to 70 grains chrome alum dissolved in 5 ounces of water. This will solidify the gelatine, which must be restored to fluidity with as much No. 8 acetic acid as may be necessary.

Double transfer paper is made by dipping smooth but extra heavy paper, the same way as single, in

Yellow beeswax (pure)	1 dram
Resin (powdered)	3½ drachms
Rectified spirits turpentine	10 ounces

Heat in a water bath till completely dissolved. Always have a bucket of water ready when making this, or better yet, *don't* make it. It can be bought all prepared.

To sensitize.—Into a deep agate or porcelain tray, pour enough sensitizer to nearly fill it. Slide a piece of carbon paper, color side down, into this fluid, removing all air bubbles from front and back with a camel's-hair duster wet with the sensitizer. The paper will curl at first, but will soon flatten out. The sensitizer should be at a temperature of 50 deg., and the sensitizing of each sheet should occupy three minutes. Warm sensitizer, in my experience, means absolute failure. After three minutes' soaking, remove the sheet, color side down, to a polished plate of hard rubber, wet with sensitizer, and squeegee it (from the center outwards), to insure a smooth face, remove from the plate and hang in a dark and rather warm room to dry, which will take from four to six hours. If the sensitizing is done at night, the paper will be ready to use next morning. It keeps about three days, but is best fresh. If 50 grains of salicylic acid are added to the sensitizer, and the sensitized paper kept in a tight box, it will keep longer, sometimes two weeks. Under no circumstances must the drying be hastened. Paper dried quickly is hard, slow in printing, and yields a poor print.

To print.—The negatives must be given a border of black paper—lantern slide binders are excellent. This is called a safe edge and facilitates transferring. Place a sheet of sensitized carbon paper, color side down, in the frame against the face of the edged negative, and set it out to print. As no image is visible on this paper, printing can only be judged by comparison. The simplest way is to put a negative of equal density in the same light and make a print on old ready-sensitized silver paper at the same time. I find this answers perfectly, for when the silver print is made, the carbon is also timed properly. As nothing is lost in development it must not be over printed; when the silver print is at just the required depth, the carbon is printed correctly. If the time required to print in the bright sun is noted on the safe edge, no difficulty will be experienced in future. Those who wish to employ a photometer in place of the silver paper will find directions accompanying it for use with carbon tissue.

Development.—If single transfer is used, cut a piece of single transfer paper a trifle larger than the print, and allow it and the print to soak to limpness in water. Lay the transfer paper on a glass plate and dip it under the carbon print in the water, center the print on the paper and squeegee both into intimate contact, then lift the two (which adhere tightly) from the glass and place under pressure between blotters for ten or fifteen minutes. Place them in an agate pan, carbon paper up, and pour warm water on. As soon as the pigment begins to ooze out from the edges the backing can be pulled off, leaving all the pigment on the paper. All that remains to be done is to rock the tray gently, changing the water if necessary, until all the soluble pigment is washed away and the picture stands out clear with perfect whites. Then rinse in water containing a little chrome alum and hang up to dry.

If a positive on opal glass is wanted, the carbon print is squeegeed on the mat surface side and developed as for single transfer. If single transfer or glass is used the picture will be reversed, but in the majority of pictures this makes no difference. If, however, the picture is not wanted reversed, it is squeegeed onto double transfer paper and developed. When dry it is wet and squeegeed onto a piece of single transfer paper and hung up to dry. When dry it can be peeled off the double transfer paper, but will adhere to the single transfer paper.

I would strongly advise the use of rubber finger tips when sensitizing, as bichromate of potash is not a good thing to get on a cut finger or even for the pores of the skin to absorb. If blisters occur, lower the temperature of the water used in developing.

Be sure the negatives are edged.

Don't over-print.

By following the directions one who never made a carbon before will have success, and as the process becomes better mastered the worker in carbon will have ample reward.

Better and more detailed instruction is contained in Boelte's little book, which can be had together with all necessary materials. What I have given, however, is all that is really necessary.

Edward W. Newcomb.

PHOTOGRAPHS OF FIREWORKS.

The American Annual of Photography, for 1891, has an article, by E. Obernetter, on photographing flames, electric phenomena, etc., by means of erythrosine and silver bath plates. The formula in it has generally given very favorable results, but when in Chautauqua during the last summer I conceived the idea of trying the same experiments with Carbutt orthochromatic plates, highly spoken of by the students of the School of Photography of the same place. When examining some of the negatives of foliage and flowers, taken on

these plates, I was satisfied that a plate possessing such extreme color-sensitiveness as the Carbutt would have the properties required in the photographing of flames or the electric spark. The fireworks held in celebration of the Assembly opening gave me an opportunity to try, and I am glad to show the readers of the Annual the result.

The exposure was made with a Waterbury Detective Camera, stop $\frac{f}{20}$, and medium speed of the shutter, the plate developed with eikonogen in the laboratory of the School of Photography. *Frank C. Perkins.*

FOUR-INCH HEADS WITH A FIVE-CENT LENS.

I MAY say at once that I do not recommend cheap lenses; some of them are good, as good as any of the most expensive, but a cheap lens is a pig in a bag unless the buyer has both the opportunity and ability to test it thoroughly.

There are, however, times and circumstances when a photograph is required, for the making of which the photographer has not the suitable appliances, and my object in this article is to tell briefly how some of them may be overcome.

In a moment of weakness I had promised to make for a friend a series of studies of expression; four-inch heads on 7 x 5 plates, and, being far away from headquarters, I had nothing available but a 7½ x 5 camera and a pair of stereo lenses. I had, however, some empty cigar boxes, back boards of picture frames, a nest of spectacle lenses ranging in focus from three to twenty inches; and a lot of paper tubes varying in diameter from that of an ordinary pencil to nearly a stove-pipe. I think I called attention to the advantage of keeping on hand a number of such tubes in a previous ANNUAL, but, for the benefit of those who may have forgotten it or who may not have seen it, I may repeat the recommendation. It is simply to cut old newspapers into strips as broad as the desired length of tube, paste them, and roll them one by one on any round article of the desired diameter. The number of strips on each is, of course, regulated by the strength required, half a dozen being enough for the smaller and two or three times as many for the larger.

The sliding front of the camera, which is 7 inches square, was removed and a substitute made of frame backing. To this was fastened a 6-inch cone of the same material, and into it was placed a telescopic arrangement of three pieces of the paper tubing, the smallest being just large enough to take one of the spectacle lenses, which are about three-quarters of an inch in diameter, finely polished but rough in the edges as they come from the grinder, and cost only two or three cents each. I had thus an available camera, with a stretch of about thirty inches that cost nothing but the labor of a leisure half hour.

A ring cut from a tube a size smaller was pushed about three inches into the inner tube, and on it was dropped a 16-inch spectacle lens, which was kept in position by 2½ inches of the tube from which the ring was cut. On this was laid a card-board stop with an opening of an inch, kept in position by another ring. The cone and tubes were blackened inside with lamp-black and "size," and muffled on the outside by a large focusing-cloth.

The chemical and visual foci were, of course, not co-incident, but to one who photographed before the day of corrected lenses that was no serious obstacle, and was easily overcome by a few experiments in trial and error, which showed that after getting a good visual focus the camera had to be turned in a little less than a thirtieth of the working focal length of the lens; that is of the distance between the lens and the focusing-screen, when the visual focus was at its best.

With this simple arrangement I succeeded in making the studies to the entire satisfaction of my friend, and demonstrated to my own that there is no real difficulty in making really good four-inch heads with a five-cent lens.

John Nicol, Ph. D.

SUMMER TROUBLES.

During the Winter and Spring which have passed, the plate-makers have been seeking to give us plates that would fix quickly, develop quickly, and be free from granulation in the gelatine film. The fact is only too evident that they have been experimenting. As the heated term came on, these plates slid off the glass, frilled, blistered, became very soft, softer than the melting summer girl—she was easily subdued with solutions containing ice, but not so were these plates.

The cause was twofold. Developer too warm, plate too long in developer containing excess of, or strong alkalies. Acid fixing baths only partially remedied the evil, especially if pyro, hydrochinon or eikonogen were the developers used. The plate-makers either used very soft gelatine or very little chrome alum in the emulsion. But why complain more? In practice this was the method used to prevent these troubles: First, the plates were edged with wax, then one or two grains of tannic acid were added to each batch of mixed developer, fixing the plates in the following baths:

Water	1 gallon
Sulphite soda (cryst.)	6 ounces
Tartaric acid	3 ounces
Chloride ammonium	2 drachms
Hypo	3 pounds

Dissolve in the order given.

Again, another warm weather trouble is thin negatives, lacking brilliancy, snap, and cleanliness. Bromide in development is not trusted in by the majority—nevertheless it is the *throttle* of development. It controls everything, especially on quick plates. A few drops of a weak solution put into the developer flattens the image and ruins it for any subsequent exposures to be developed. In developing rapid plates which have the maximum of exposure the plates should be placed, *previous to applying developer*, in a bromide solution one to ten (1 ounce of bromide potassium and 10 ounces of water) for about thirty seconds, and without washing, apply the normal developing solution. Whatever reducing agent may be used, perfect control over the development will be secured, even when the exposure has been twenty times the normal limit, by following the above directions; increasing the strength of the bromide solution and soaking the plate longer in extreme cases.

But enough, if these methods be followed, the readers of this Annual will have no trouble with gelatine plates as at present made, and the writer will more than be pleased if he has inspired new confidence and hope in the summer photographist.

A. Peebles Smith.

PORTRAITS BY FLASH-LIGHT.

Why are not better portraits made by flash-light? Nine-tenths of the photographs made by flash have either the appearance of "cull'd pussuns," or in them the victims look as if they were seeing a ghost.

Any one with a good camera, back focus preferred, and a little common sense, can take a flash-light portrait that cannot be told from the best by daylight.

If you have a regular tripod, make a triangle from ½-inch wood, about 2 feet on all sides, with casters at the corners to facilitate the moving of the camera with ease. Brace your triangle at the corners, so that it will not sag. Put camera and tripod on this triangle, putting the points of the tripod in holes at the corners of the triangle previously made. Now lower the tripod legs, so that the lens is on a line with the top of the sitter's head. After having done this, lower the front leg, so that the chin of your subject is a little below the center of the ground-glass.

I have a Scovill tripod, called the Extension, and find it more desirable than any other, as it allows of quicker adjustment.

As for background, the best that can be secured is a light gray, but any light color without lines or figures will answer. An ordinary room with light walls will be as good as any.

Place your sitter about three feet or more from the background or wall, so that there will be little or no shadow, and the background out of focus, thereby giving a rounded picture and in relief.

Now, by aid of a candle or lamp, focus sharp on the eyelashes. When you have got the focus as sharp as possible, move the ground-glass a little back, in a back focus, or the front forward in a front focus camera, so as not to get that sharpness which shows all the imperfections of the skin and is so painful to the eyes.

It is a good way in focusing to keep the rays of the light and from entering the lens direct. The best method that I know of is to take a book, open it to an angle of 45 deg., and, by placing the light inside, throw the rays of light on the sitter's face.

As to plates, any good fast plate will answer, but I give the Keystone Ortho-chromatic the preference.

The ordinary plate answers very well, but the orthochromatic is best, as the flash-light is more or less of a yellow color, and therefore will give a much better picture.

Have as much light in the room as possible, so that the eyes will be natural and not staring. The gas lights in the room will make no effect on the plate as long as it is not in front of the lens. Use the largest stop in the lens, and I would advise the use of the Scovill magnesium cartridges, so you will not be troubled with closed eyes, as you would be with something which produces a long flash.

Place the cartridge back of the camera from eight to fourteen inches from the center of the plate on the side towards which the person is looking; having it about eight feet from the ground.

Now for the flash. Put the plate-holder in position; cap the lens and draw the slide. Be sure the sitter's eyes are looking the same way the head points. By standing in front of the lens you can see if the pose is satisfactory.

When everything is right uncap the lens, light your fuse, and the deed is done.

Be sure and give enough light, rather over-expose than under.

As to development I would say, "*take your time.*" The following composition makes the best developer I know of. It is:

No. 1.

Water	6 ounces
Sulphite soda crystals	1 ounce
Hydrochinon	40 grains
Eikonogen	80 grains

Dissolve in order named and wait until the one preceding is entirely dissolved before adding the next.

No. 2.

Water	6 ounces
Carbonate of potash	60 grains

Take equal parts of each. Do not carry development too far and get negative too dense.

Francis F. Braillard, Jr.

GOOD LIGHTING WITHOUT A SKYLIGHT.

During the summer months I have done considerable developing for amateurs, and have been consulted by them regarding the printing of negatives which they have made themselves; and, while there is much that is pleasing in the negatives made by the more intelligent of them, yet in all their portrait work, where faces or figures are the principal object of the picture, whether indoors or out, I find a great lack in the lighting. They all claim, of course, that it is their lack of facilities, but I am inclined to believe that it is a lack of attention to that point.

I am of the opinion that if our clever amateurs who give such close attention to good apparatus, fine focus, exact time, and correct development would turn their powers of observation to fine lighting, that their results would be bettered infinitely.

I believe that I am not exaggerating when I say that the eye can be trained to see the lighting of any object that is photographed as readily as it can see a sharp focus. If, on looking at the subject, it is seen that a shadow on a certain part is so heavy that the detail in parts of it is lost, then we know that a correctly-timed plate will give the result we see; if, on the contrary, we see a face without a shadow discernible, a soft light all round it, giving detail everywhere but vigor nowhere, we can put it down that neither plate nor treatment will give a pleasing effect. And so the eye can be trained in seeing one extreme and the other, to avoid both, for the production of brilliant results.

The ordinary broad open light out of doors is certainly too flat for portraiture, and the commonly lighted room is apt to give dense shadows; nevertheless, brilliancy can be attained out of doors and softness can be had indoors, and that by the use of material always at hand.

There has been enough written about *how* to get the latter result; I will dismiss that part of the subject by urging every one to learn to *see* the light on the model and accessories, and the means and muslin will quickly be found which will soften the light *ad libitum.*

But out of doors, muslin is not available, and here the powers of observation and selection will be brought into liveliest play, and the result will be worth the pains. The spot to be selected is an opening in the trees, where the broad diffusion of the outdoor light will be cut off by the green foliage, and enough direct light admitted to give brilliancy. The height of the sun and the condition of the clouds, of course, are important factors and must be reckoned on. Ordinarily, to place the model so that the light comes straight down on it, will give deep eyes and black shadows under the nose and chin, and a generally unpleasing effect; while to place the subject too far under the overhanging branches will give a dimness of result. A very little real *looking* will show the place where the best light is, and then there is play for judgment in selecting the position of the camera, whether to place it in line with the light giving a broad softness, or whether to go around and almost, but not quite, look toward it, getting a broad, soft shadow on the principal side, and a brilliantly illuminated outline on the light side; then there are all the intermediate stages between to suit the various sorts of subjects.

All these require much searching, time and study, you say? Yes, but producing wonderfully natural, and therefore beautiful, results; for what are all our curtains, head-screens, and reflectors in studios, but artificial, and sometimes inefficient means for producing the results which nature, out of doors, for generation after generation, has engrafted into our minds as being beautiful.

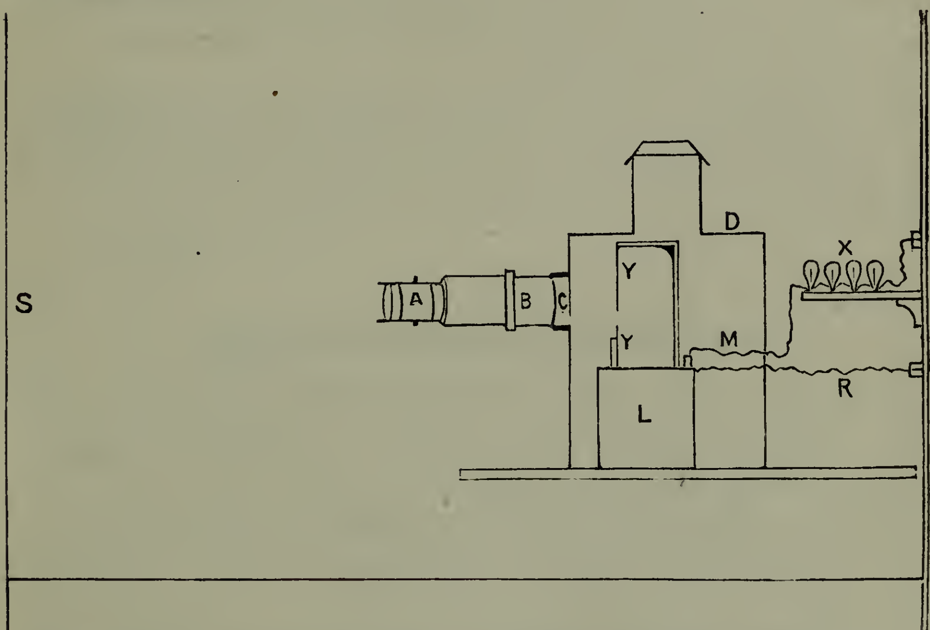
R. W. Harrison.

THE PROJECTION OF DIAPOSITIVES BY THE ARC LAMP.

Several times of late the attention of the writer has been called to the constantly increasing demand in camera and other clubs and societies for some means of using the lantern for projections without the expense and trouble of the oxy-hydrogen lamp, and he is therefore led to give his own experience with electricity.

Some time during the year 1885 the writer assisted in wiring the lecture room of a professor in a college near New York, who constantly required the use of a stereopticon in the illustration of lectures.

As will be seen by the accompanying diagram all the arrangements were very simple, and can easily be duplicated by any electrician.



A lens, B slide, D lantern, C condenser, L arc lamp, double feed, S screw, R return wire, M lead wire, X incandescent lamps as extra resistance, Y carbons.

In the cut as above, L represents a focusing arc lamp, the carbons being fed up and down by clock-work, so as to keep the arc constantly in the center of condensing lens.

Our lamp was so small, and had such light carbons, they being only one-quarter of an inch in diameter, that it was necessary for us, in some measure, to reduce the force of the current supplied us from the street-mains at an intensity of 105 volts, to prevent our lamp from being fused.

This was accomplished by inserting in series in our lead wire from four to six fifty-candle Edison incandescent lamps, thus giving perfect control of current-supplied arc-lamp. Should this number, six, be found too great, one or more could readily be unscrewed from its socket, and a fusible plug of practically no resistance substituted.

This reduction of power would probably not be found necessary in using transformed currents, such as those supplied by the Westinghouse Company and others, for incandescent lighting.

All my work was done with the current from an Edison dynamo, but this arrangement of stereopticon, as illustrated, is adaptable to any low-tension system of electric lights.

By the plan above described, although its component parts were crude, and not originally designed to work together, I successfully illustrated a course of lectures lasting one entire season and, requiring the best results, with satisfaction to both the lecturer and his audience.

Should this short account of my experience in the successful application of electricity to the lantern be of any use to others, my object in writing this article will have been more than fulfilled.

J. A. Vanderpoel.

A PROMISING PRINTING PROCESS.

During the past year much has been said about the kallitype process, it being similar in point of working to the platinotype process but far less expensive. The most successful workers of the kallitype process have coated the paper with the ferric oxalate salt, printed for three or four minutes in the printing frame under a bright sun and developed the image with a solution of nitrate of silver. It is surprising how quickly this operates and is almost an exact counterpart of the way a platinum print develops on the hot oxalate bath. The disadvantage of the silver developing bath is that it stains the fingers, a disagreeable matter for amateurs, hence it is that improvements have been looked for. The inventor of the process, Dr. J. J. Nicol, of Birmingham, Eng., claims to have made a decided improvement by coating the paper with a combined mixture of the iron and silver salts, making it only necessary to print the picture from five to ten minutes, until all the details are well out, and then to develop by immersing in a bath of borax, rochelle salts (sodium potassium tartrate) and bichromate of potash of varying proportions, according to the tone desired, which ordinarily takes from ten to fifteen minutes. If removed too soon the yellow color will not disappear in the fixing bath.

For black tones the following developer is recommended:

Rochelle salts	1 ounce
Borax	1 ounce
Water	10 ounces
Bichromate of potash solution (strength, 20 grains to the ounce)	10 minims

For purple tones:

Rochelle salts	1 ounce
Borax	2 drams to ½ ounce
Water	10 ounces
Bichromate of potash solution (20 grains to the ounce)	10 to 12 ounces

For sepia tones:

Rochelle salts	½ ounce
Borax	1 dram
Strong hydrochloric acid	5 minims
Water	10 ounces
Bichromate of potash solution (20 grains to the ounce)	10 minims

The sepia tone is the most difficult to obtain and requires some practice.

From the developing solution the print is immersed for fifteen minutes in a fixing bath of

Ammonia, 880 deg	½ ounce
Water	32 ounces

It is then washed in several changes of water for a quarter of an hour, and can be dried at once between sheets of blotting paper.

It is advisable to use a fresh developer for each batch of prints in order to ensure the elimination of the yellow color. The prints should be kept in motion, as is done in the toning and fixing of silver prints.

Some of the precautions to be observed are that one or two drops more of hydrochloric acid should be added, as may be needed in the sepia developing bath. Care must be taken to remove air bubbles on the surface of the print. If more contrast is desired add a drop of the bichromate of potash solution. Too much potash will destroy the half-tones.

It will be noticed that it is a very inexpensive process, since sixty or more prints can be treated at one time in one developing and fixing bath. It is also quite simple, because ordinary procurable salts are employed. Lastly the prints are absolutely permanent. Most of the above facts I glean from the practical experience of a worker as related in *Photography.*

So far the exact proportions of the sensitizing solution have not been made known. Dr. Nicol hopes to accomplish the feat of simply fixing the print in the ammonia solution, thereby dispensing with the developer.

The process is full of promise and is sure to be nearly as cheap as that for making blue prints.

F. C. Beach.

PYROGALLIC ACID AND ITS COMPETITORS.

There is displayed more or less conspicuously in the writings and the published prints of photographers, a tendency to retain entirely the use of pyrogallol as a developer, and to claim for it advantages, or rather merits, which its successors, hydrochinon and eikonogen, are said not to possess. I deplore this state of mind, which seems to me retrogressive and unjustified, and beg to submit a few conclusions in reference to this question, which are the result of practical experience and considerable study.

There are two points of view to be considered in discussing any developer—the utilitarian and the artistic. The utilitarian point of view embraces a consideration of the convenience and the economy of a developer and the easy manipulation of the negative; the artistic has regard solely to pictorial results, and these include detail, color, and surface, or brilliancy. I claim that properly used the new hydrocarbon developers in all these respects surpass pyrogallol, and that in the case of eikonogen, to which I am especially addicted, a new importance is to be attached, in its remarkable availability for lantern slides.

A writer, in a recent issue of *The Photographic Times*,* has seen fit to allude with a slight suggestion of contempt to "wet-plate effects." If the new developers have the property of producing "wet-plate effects," then they are recommended by every consideration which veteran photographers respect. For what results in tone, in lucidity, in perfection and harmony of detail have equaled the old wet-plate results? The desire of photography has been simply to secure those results,

---

* *The Photographic Times*, July 31st, 1891.

F. Gutekunst, Photo.

Plate by Levytype Co.

THE LITTLE MAID FROM SCHOOL.

and the dry plate process remained an inferior system so long as it failed to approximate those, and could be recommended as a substitute on no other ground than its convenience and rapidity. If the new developers assist us to produce negatives in any way comparable with "wet-plate," then it has touched the extreme acme of its possible progression and improvement. But to recur to the aspects of this subject indicated above:

The Utilitarian Advantages of Hydrochinon and Eikonogen.—They are both cleaner, they do not soil the fingers, they do not discolor the dark room with disgusting stains and blotches, they are clean and attractive. The negative under their treatment is clear and brilliant, not disfigured with a yellow haze, which destroys proper values, dirties the whites, and adds nothing but a deceptive intensity. They are cheaper, they do more work, they develop longer, resist deterioration better, and properly handled can be depended upon for uniform power more confidently. I have developed with one charge of eikonogen fifty lantern slide plates and discovered only a slight falling off in rapidity at the end of the series. Their utility appears also in this way: plates over-exposed can be saved by them and under-exposed plates urged forward to the last possible degree. They afford by a variety or grade of mixtures every possible chance of producing the result you aim for. They introduce more variation of handling and permit to the operator a large and delightful opportunity for the exercise of judment, skill and discretion. The negative made with eikonogen and hydrochinon prints easily and certainly, the prints tone quickly and surely and there is a gain of time, patience, and a saving of reagents in their use. The range of development is greater than with pyrogallol. Eikonogen is the quickest reducer; hydrochinon next; and, lastly, pyrogallol; whereas their susceptibility to decomposition is exactly in inverse ratio to their reducing intensity.

Their Artistic Advantages.—It seems commonly supposed by the champions of "pyro" that the new reducers fail to give detail. Nothing could be more fallacious. They give detail if you wish it, and if the plate you use is sufficiently silvered to permit it. No trace of the finest element of a picture will disappear if they are intelligently used, but they must be used with discretion, and the development in weak solutions must be pushed to its legitimate limits. In color nothing could be more exquisite than a plate well developed with hydrochinon or eikonogen; the spaces are clear, the half tints laid down, the shadows thinned to the naked glass itself, and a diffused softness pervades the plate, bringing it—and this is its highest praise—to a reasonable approximation of the wet plate with its unapproachable tone and distinctness. Then surface or brilliancy is secured by these developers. The clearness of the film renders this inevitable, no turbidity, no unequal darkening, no suffused yellowness is seen in them. All is sparkling, and yet soft; the effect is fascinating and it is artistic.

Lastly, the admirable qualities of eikonogen as the developer of dry plate lantern slides are remarkable. A clean, sharp-line positive of maps and engravings can be made which is surprising, and which scarcely leaves anything to be desired. To be sure these results are not obtained by a rule of thumb, but they can be obtained, and nothing but eikonogen will produce them. Before the photographic community rush back to the antique slowness and inefficiency of pyrogallic acid, let them test in a complete and dispassionate manner the superior, and, perhaps more or less hidden, capabilities of eikonogen and hydrochinon.

Lucien C. Laudy.

THE PREPARATION OF "COPY" FOR PHOTO-ENGRAVING.

The widespread introduction of the photo-engraving process known as the half-tone method is evident in all the best modern publications, and the advantages possessed by it are undoubted. At the same time the results are so unequal that it is evident there must be some good reason for the differences which are to be seen in the products of the same establishment, or of those of equal reputation. The process was originally intended to furnish a means of making photo-engraved plates direct from the ordinary photograph or silver print, but it has to-day acquired a far wider scope. Without going into details, the method consists in working through a finely-ruled screen or grating, by which the various gradations of the original photograph are replaced by a network of lines practically converting the whole into a mass of dots, which can be etched upon metal and used in an ordinary printing-press in connection with type matter. By inspecting such a picture with a strong magnifier the structure will be plainly seen.

Such a method involves an unavoidable degradation of the fine detail of the photograph, and tends at the same time to reduce contrast and flatten the general effect. The dark shadows become gray and the brilliant high lights are dulled, and the whole effect is often most discouraging. It was soon found that good results were only obtainable from very brilliant prints having almost harsh contrasts, and many soft beautiful photographs lost their best points by this method of reproduction.

The application of the process has been extended most effectively to the reproduction of plates from wash drawings, and in many recent works, mainly of French production, the illustrations are in half tone work from brush drawings in black and white, and the bold impressionist work lends itself admirably to this method. By combining this idea with that of photography, most effective results may be obtained, and the writer has recently obtained in this way a series of plates for the illustration of an important line of machines which are, in the opinion of competent critics, superior to anything which could be made by any process of hand engraving.

The machines in question were a series of cranes and hoisting machines, photographed under numerous disadvantages, and occasionally with objectionable surroundings. The plates were about double the scale of the proposed illustrations, and the "copy" for the photo-engraver was prepared as follows:

A brilliant silver print was made, merely to serve as a guide in the subsequent work. Then a print on plain salted paper was also made, care being taken to secure a rather weak picture, in order that any undesirable point might be left inconspicuous. This print was toned and fixed as usual, and mounted, and was then thoroughly worked up by hand, using Chinese white to heighten the high lights, and lampblack to deepen the shadows. The points about the machine which it was desired to emphasize were made as brilliant as possible, while the background was softened and reduced. Of course this work required a skillful draughtsman, but as the drawing was all there, it only involved a careful hand and the exercise of judgment in the placing of lights and shades, and the art is soon acquired.

The resulting picture, while strictly accurate in all its details, was so highly exaggerated in contrast as to be almost harsh, but this is just the necessary degree to stand the reduction in effect which is produced by the process.

The worked-over photograph was then sent to the photo-engraver, and its appearance was hailed by him with delight. The resulting plate was most brilliantly effective, and was rendered still more so by a very little hand tooling on a few of the high lights, just cutting out a point or two, and running the graver along the brilliant lines of the polished work.

The success which attended the plan caused a number of such plates to be made, and it has since been extended to other subjects with equal satisfaction. By making the originals larger than the finished plates, the sharpness due to the reduction is obtained and the work of the draughtsman is made much easier, as he has broader surfaces to deal with.

The question of cost depends upon the character of the work, but is in all cases much less than that of wood engraving, and the results are vastly more artistic and effective.

Henry Harrison Suplee.

THE PROGRESS OF PHOTO-MICROGRAPHY.

Perhaps no application of the photographic art has made greater or more general advances since the introduction of gelatine dry plates, than that of photo-micrography. Prior to this era, the workers in that direction on both sides of the Atlantic might almost have been counted on the fingers of one's hand. Dr. Maddox, in England, was the best-known European engaged in this branch of photography, and did most to advance it in importance and perfection. But to our own country in the person of the late Col. Dr. J. J. Woodward, U.S.A., must be awarded the high honor of doing the very best work of his day; work which has rarely been excelled, if, indeed, equalled since. Dr. Woodward himself was not a photographer; he employed a professional worker for all the mechanical and technical details, but his unequalled skill as a microscopist, aided by the most perfect instruments and apparatus which a generous government placed at his disposal, enabled him to achieve results far in advance of any predecessor or contemporary. However, the exceptional advantages enjoyed by Dr. Woodward were beyond the reach of most men. The apparatus was bulky and costly, and the results arrived at by tedious aud lengthy approaches uncertain; so that photography as a recorder of microscopical research in regular daily work was scarcely dreamed of. Sunlight, or at the least that of the oxyhydrogen jet, was necessary with the wet plates then in use, and how few students or workers could avail themselves of either.

But the gelatine dry plate revolutionized this branch of photography as it has so many others, and now an efficient outfit for practical work is within the reach of every student at a very moderate cost. Indeed, one little photo-micro camera, occupies with its stand no more space than a moderate sized microscope, so that it can always have a place upon the work table ready for immediate use. It can be applied to any form of microscope, is capable of doing the very highest grade of work, and costs but $10; whilst the dry plates used by it are furnished for 25 cents per dozen. Surely, there is no further need for the student or man of science to spend hours in making elaborate drawings of objects, which can be more correctly illustrated in a few moments by the aid of this little camera. No other light than that used to illuminate the microscopic object is necessary to photograph it, so sensitive are the dry plates now furnished. Most certainly this is progress, and a marvellous one since the old wet collodion days.

No less advance has been made in the microscope, especially in its objectives, since those "good old days." Now, we have homogenous immersion lenses of high numerical aperture, enabling the observer to do better work, and to define more difficult tests with, say a $\frac{1}{12}$th, than could formerly have been done with a $\frac{1}{25}$th, with a vast increase in ease of manipulation and volume of light transmitted by the modern lens. Again, the common form of Huyghenian eye-piece, or ocular, is not well suited to projection, and Dr. Woodward rarely or never used it in his practice, but obtained increase of magnification with a given objective, by removing his focusing-screen and sensitive plate to a greater distance therefrom. In fact, he made a camera of his dark-room, with himself inside the body, as it were. But now, with the projection oculars of Zeiss or Leitz, we have no need to use so bulky a camera. The writer recently spent a day with Dr. Gray in the photographic department of the Army Medical Museum, at Washington, and assisted in photographing a frustule of Surirella gemma, under an amplification of more than 8,000 diameters, which resolved the striæ most beautifully into beads. The objective used was a Leitz $\frac{1}{12}$ homogenous immersion without cover correction, supplemented by a Zeiss projection ocular. The camera was an ordinary portrait-box on iron stand; the plate a Carbutt orthochromatic, 11 x 14. The illumination was by sunlight, directed by the same heliostat that Dr. Woodward used; exposure, *two* seconds; result, a marvellously beautiful and perfect negative, sharp from end to end. The projection eye-piece is additionally valuable in its ability to improve the performance of a defective lens. This was demonstrated during the above-named day several times. The most notable one was with an apochromatic objective of 8 millimeters, by Zeiss. This lens, when used without an eye-piece, gave very perfect definition upon the focusing-card, in the centre; but there was a manifest falling off toward the circumference of the field, increasing greatly as the magnification was enlarged by removing the focusing-card farther from the microscope. On inserting the projection ocular the field was at once flattened, so that the definition was quite as sharp at the circumference as in the centre, with very little loss of light. The demonstration was a most satisfactory proof of the efficacy of the projection ocular, and an evidence of progress in the field of photo-micrography.

Object-teaching, by means of the projecting Optical Lantern, has progressed wonderfully since the introduction of gelatine dry plates, and especially in the illustrations of microscopical subjects in every department of natural science. Animal and vegetable tissues, rock sections, chemicals, in short all substances and structures demanding the aid of the microscope for their study and delineation are now photographed by its aid and exhibited upon the screen in a still more magnified condition for the instruction and edification of whole classes of students. It is fast growing to be a poor kind of school which does not include the use of the microscope and Optical Lantern in its curriculum; and the preparation of its own lantern-slides by the aid of the photo-micrographic camera must soon follow in *every* institution of learning, as it has already done in so many throughout our country. This branch of the art photographic is diligently pursued in most of the government departments at Washington and in many of the agricultural experiment and geological stations, etc., throughout this great country, and the published results cannot fail to be productive of great good; aiding in disseminating useful information among all classes; the many forms of "process" engraving enabling observers to lay the result of their labors before an ever increasing audience of intelligent readers and thinkers.

On the whole, we may well say, there has been decided progress in this direction during the past decade. What, then, may we not look for in the next, now that such an army of workers is enlisted in the good and useful cause?

W. H. Walmsley.

THE COST OF PHOTOGRAPHS.

Some years ago I heard a witness in a court of law state what he considered to be the cost of a dozen pictures. I have forgotten the exact figures, but it was some fractional part of a dollar, barely sufficient to pay for the material which entered into them; and I have often found that such an estimate is not uncommon when photographers turn their inquiries to the cost of their productions. In these days of amateurs the major part of the public are ready to inform you just what it costs to make a dozen cabinets—this sum being the price of one gelatine plate, the silvered paper, and the mounts—and if any further charge is made it is sheer profit. It would seem that the expense of the plates that are rejected, and the prints that turn out badly must not even be included. The practice of photography seems to be quite different in this respect from any other pursuit that is followed by the sons of men. Time and skill are to be well paid for if a person does anything but make photographs. I suppose a manufacturer would hardly allow that the cotton or wollen cloth, which was the product of his mill, cost him just as much per yard as it took of cotton or wool to make it. He would tell you that the interest and taxes on the value of his plant, the wear and tear of machinery, the insurance, the salary of superintendent and agents, and the wages of the work-people all entered into the cost of a yard of woolen or cotton cloth. A physician would be apt to non-concur if you assumed his fee should be the cost of the stationery on which he wrote his prescription; and the attorney would want something more for writing your will than the price of the foolscap he had covered. It may be doubtful if even a photographic amateur would enter a carpenter's shop and order a model of a machine, and expect to pay only for the cost of the lumber out of which it was made. If he did, the error of his conclusions would soon be made plain to him.

In the production of photographs, setting aside the training, study, and experience which one must have had, and considering the work produced from a purely mechanical standpoint, the elements of expense that enter into it are manifold, and the cost of materials will be found to be one of the least. The value of a hod of bricks is greater at the top of the ladder than it was on the ground by the addition of the pay for the fractional part of a day which the Irishman consumed in carrying it up; and the expense of a sitting is not only the cost of the plates used in making it, but a part of the pay of your operator for that day (or if you are your own operator it amounts to the same thing) and a part of the rent of your studio, with something to be added for insurance, advertising, fuel and gas. Then the re-sitting, if one is made, increases the expense still further. The making and showing of proofs is not an inconsiderable item. The time in retouching must now be added; and the cost of filling this order goes on with the silvering of paper, printing, toning and washing, mounting, spotting, burnishing, and delivering the work. The expense of stock, including rejected plates and prints that are spoiled at one stage or another of the work is not to be overlooked, but time and running expenses are what is to be taken into account, after all. Bad weather also increases the cost of our productions, for while the expenses go steadily on there is about one-third of the days in each month when you will have no sittings, and cannot print. And, yet, photographers go on cheapening their rates and vieing with each other in doing the work of amateurs at a price that little more than pays for the cost of material. I do not believe that there is any vocation pursued in this country where time and skill are so little considered or meet with so poor a return.

Gustine L. Hurd.

THE POSITIVE CAMERA OF A PROFESSIONAL PHOTOGRAPHER.

After looking over the catalogues of our leading dealers and reading descriptions of the many methods for producing positive photographic pictures on glass—both for the lantern and window—it has appeared probable that the description of an apparatus, by no means new, but not heretofore seen in print, might be interesting to those who work in this most fascinating field of our profession. The main body of the instrument, or camera proper, was constructed in 1862, and first used for preparing illustrations of army operations in the Southern States; during the next succeeding years a few modifications and additions, which practice suggested, were made, but these were so slight that the instrument has practically remained in its original form, and is so efficient that the writer has no desire to replace it with any other which he has seen in practice or heard described.

The stand and part of the accessory apparatus has been added more recently, as the requirements of a new location and technical work have demanded.

In Fig. 1 the instrument is seen ready for use in producing lantern slides from $6\frac{1}{2} \times 8\frac{1}{2}$ negatives; greater or less reduction from larger or smaller negatives may be made by the use of various pieces of the device seen in Fig. 2, as stored in body of the stand. The elevation of front and back ends of the camera is effected by the removable handle seen projecting from the front end of the stand. When these supports are dropped to their lowest position a flat top can be placed upon the stand, and it becomes quite efficient for carrying any large camera which can be raised or dropped to any desired angle within 45 deg. of the horizontal.

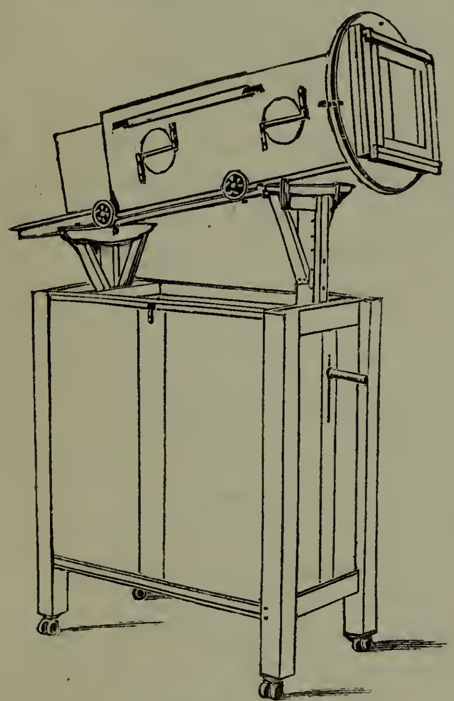


Fig. 1.

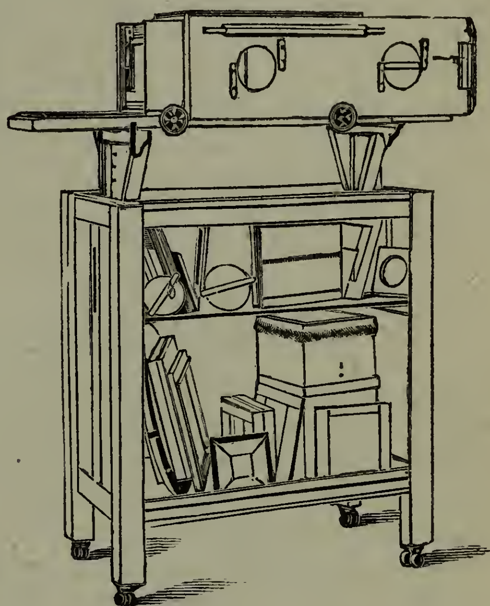


Fig. 2.

The movements of the lens and plate-holder carriages are effected by rack and pinion, and their position is shown by verniers and scales on back end of base of plate-holder carriage and top of lens carriage, the latter being examined by removal of the long narrow cover held in place by a button at each end, as shown. The circular head-piece, as shown in Fig. 1, is so constructed as to admit horizontal, vertical, and circular motion, each motion provided with a scale which enables one to record positions for duplicate work. Fig. 2 shows the camera with a non-rotating head used in making positives of about equal size to negative. The negative carrying-board, or frame, is square and reversible, and is faced with a card-board diaphragm of chosen size and form, to show the part of negative wanted on the glass positive. The negative is held in position on the diaphragmed board, or frame, by a spring brass finger from each corner—such a reversible diaphragmed board is shown on the lower shelf of the stand in Fig. 2. The diaphragms for cutting off any part of larger pictures are placed in *front* of the negatives and held in place by guides, as seen on the rotating head on lower shelf of stand Fig. 2.

The parts for extending the inside or sliding lens and plate holder carriages are all packed by encircling strips of black fur, which stops all light and permits easy movement. The top of the outside case is made to slide forward or back to suit position of plate-holder carriage.

The stand, being mounted on Martin's patent casters, is easily moved about the room for placing before a window, or in an out of the way corner. The top of the stand is fitted with a tray to hold plates or tools being used.

O. G. Mason.

THE HAND CAMERA AND HOW TO USE IT.

Like our country cousins the hand camera has "come to stay." Every one who has watched the progress of so-called amateur photography for the past ten years, has noticed the tendency toward the use of cameras which are at once light and easily managed.

To be light the camera must be small, and to be easily managed, it must have few adjustments. The result of the attempts to meet these requirements is the hand camera, which is to-day so popular, and with which so many thousand plates are spoiled.

"Many and evil are the causes which lead to the ash barrel" would be a good motto for some plate-maker to put on the outside of every box of 4 x 5 and 5 x 7 plates. For these causes the plate-maker and the camera builder is seldom responsible. The fault generally lies with the user. With care nine out of even ten plates should come out well, but after having examined many hundreds of plates made by all grades of "button-pushers," I think the tenth plate seems to be the good one, while nine are fit only for the aforesaid ash barrel.

Now how shall all this be remedied?

1. Be careful to have some thing within the range of your camera before you make the exposure. Green grass and blue sky are beautiful to look upon, but come out very unsatisfactorily on the negative. I have before me a negative made with one of the daintiest cameras I have yet seen (the Triad), in which about three-fifth of the glass is sky, the rest is green lawn, and in the middle is a figure about half-inch long. On the finder, doubtless, this scene looked very beautiful, but in black and white it is about as unsatisfactory as can be. Had the amateur got nearer, and made the figure to cover a larger space, the result would have been much more satisfactory. The same thing should be observed in making marine views. Don't press the button unless the object is near enough.

2. Consider whether the view you are about to make is worth making at all. If you have some doubts in regard to your artistic perception and cannot decide firmly from that standpoint, figure it out in cents. Is the view worth the five cents which the plate costs? If not, look further on.

3. Be sure you have light enough. Groups in deep woods and the baby on the back piazza will be failures unless you can make time exposures. Weigh well your desire to make a good negative, place against it your desire to please your friends who think they know all about it, and don't let the latter get the best of the former.

4. Many negatives are apparently out of focus, when the indistinctness is caused by movement of the camera at the time of exposure. This can only be remedied by a steady hand.

5. The grand caution which includes all others is "go slow." Better expose one box of plates and have ten good negatives, than four or five boxes and all failures, even though it takes a year to do it.

I know of one amateur who has had a hand camera about a year. He has exposed less than a dozen plates in that time, but is satisfied in having every negative thus far a good one, or, as he expresses it, a "sparkler."

Should every amateur follow these suggestions there would be several things which would surely follow:

1. There would be fewer disgusted amateur photographers.
2. More hand cameras would be used.
3. The makers of small plates would make smaller sales.
4. The amateur would be less the butt of ridicule than at present.

L. L. Anderström.

MAGNESIUM FLASH-LIGHT AND ITS APPLICATION IN PHOTOGRAPHIC PRACTICE.

THE greatest facilities have been given to the photographer by utilizing, in conjunction with gelatine emulsion plates, the highly actinic flame produced by burning metallic magnesium. It has made us entirely independent of daylight, and with its aid we can photograph where cimmerian darkness reigns. The wonderful stalactite formations in subteranean caves, of whose grandeur and magnificence we could learn formerly by ocular observation only, can now be photographed with the aid of this new light source.

By magnesium light physicians photograph the progress and locate the seat of diseases. With perseverance and skill most marvelous results have been secured, none more so than those of diseased eyes, by Professor Cohn, of Breslau.

For groups and genre pictures the magnesium light stands unrivaled. Such scenes are of course not necessarily taken in the usual atelier prepared for the emergency, but in the room or locality appropriate to the subject, and for this reason they possess more character, originality and harmonious effect, not surpassed by the composition of the artist's brush and pencil. A momentary flash of light depicts the subject in all the aspects of nature and truthfulness, and what has formerly been thought impossible is attained with magnesium light and a highly sensitive emulsion plate.

The actinic power of the magnesium flame has induced the well-known landscape painter, C. C. Schirm, of Berlin, to make with it extensive experiments in constructing lamps for the combustion of the metal in minimal quantities, but capable of producing flames of enormous light-force. He has established an atelier especially for the purpose of portraiture, and for the continuation of experiments, to make magnesium flash-light available to the public; and for artistic purposes, peculiarly constructed lamps set in activity by electric motors, systematically arranged to produce any desirable light effect, testify to the skill of the inventor and the practicability of the light for general practice.

The significance of magnesium flash-light has been recognized by the highest authorities, artistic and other. His Majesty Emperor Wilhelm II. ordered a series of flash-light pictures to be made, commemorative of the celebrations on the ninetieth birthday of Fieldmarshal Count von Moltke. His majesty, the princes of the realm, and military dignitaries innumerable, were present at the occasion, and fourteen exposures on large plates were made, fixing permanently various incidents, when the venerable marshal was congratulated by his august master, companions in arms, and deputations of the Reichstag, his own regiment, and other organizations. These photographs were made to serve as material for a large oil painting ordered by the emperor. The artist who will be entrusted to paint this historically remarkable picture may not use these photographs in their entirety. Of some he will select some portions, others he may leave out, or change to suit his own conception, but through their accuracy they will serve him materially to build up the *toût ensemble.*

Though the magnesium flash-light has but recently been introduced, we see its general usefulness, and we can well predict for this new method of lighting the brightest future.

E. Kiewning

TRIPOD STAND "SECURER."

A SMALL piece of apparatus for securing the tripod, and rendering it perfectly steady when in use, has just been invented by A. L. Henderson, London. It is such a simple and

ingenious contrivance that it will at once commend itself to your readers as an invaluable help to the out-door worker.

The cut shows, at a glance, how the "securer" works.

The brass securers draw out or move in to any given point, at which they can be screw-tightened, and made as rigid as a solid stand.

For use in interiors, on marble or smooth floors, and other awkward places where the legs have to differ in length—under such circumstances—this apparatus fills a long felt need.

It folds into small compass, and can be carried without trouble. It can be fixed to center at guy rods at once, and when there are no guy rods on the stand, there is an arrangement for fixing them to the wood.

George Mason.

FOGGING, CAUSES AND REMEDIES.

When, in the course of development, the plate becomes uniformly covered with a grayish veil which gradually becomes darker and finally obscures all the details of the picture, such a result is called fog.

A common and familiar cause is the access of light before or during development; but the causes which are of most interest to the emulsion maker are those which arise in the formation of the emulsion. They are chiefly due to over-cooking, inferior quality of gelatine, or excess of alkali. All these factors produce a change in the silver bromide, reducing it to a sub-bromide, which latter always darkens under development, even when light has not acted upon it. This may be called chemical fog. An emulsion having this fault may be remedied in some degree, but can never be made to work perfectly clear.

The green fog belongs to the chemical variety. It is less disastrous in its results than the black and gray fog. According to my own observations it only appears in ammonia-pyro development. It never appears in slow emulsions, *i. e.*, emulsions which have been prepared with a large proportion of iodide of silver, and cooked but ten or fifteen minutes, and not forced with alkali. A very rapid emulsion is most likely to show green fog, under the conditions above spoken of. It is probably due to an excess of dissolved silver bromide arising from prolonged digestion, with excess of ammonia, in an emulsion containing a small percentage of gelatine.

Acid emulsions, and those having a full percentage of gelatine, say five to seven per cent., seldom or never show this form of fog under any conditions of development.

In certain cases the emulsion is perfect, entirely free from chemical fog, and yet fog appears. In such cases the development is responsible for the result. There is either an excess of ammonia and pyro, or the sulphite of soda in the soda developer, has been oxidized by long standing into sodium sulphate. Before condemning a plate as chemically fogged, it is but fair to the maker to develop absolutely according to the given directions, in clean vessels, and with freshly made developer. Green fog is always dichromatic, being green by reflected light, and faintly red by transmitted light. It can usually be removed by oxidixing substances such as peroxide of hydrogen, or by hydrochloric acid and alum; a bath of three to five parts hydrochloric acid to one thousand parts saturated alum solution usually clears the plate sufficiently to allow printing, but such plates even when cleared always print much slower than a normal plate and requires strong sunlight. Yellow or red fog with iron development arises from insufficient washing of the plate before fixing, or when the iron solution has become old. In the latter case a few drops of dilute sulphuric acid to the iron oxalate solution is the efficient remedy. Similar discolorations take place when the same fixing bath is used for both iron oxalate and pyro development; the acid and alum both removes them, but the proper remedy is a separate fixing bath for each kind of development. A red fog it sometimes seen in iron oxalate development, when an excess of sodium hyposulphite has been used as an accelerator. It shows especially in the shades and very faintly in the high lights.

A gray fog is occasionally seen with hydrochinon development, especially when the developer has been recently prepared. It is usually superficial, and disappears almost entirely in the fixing bath. The use of an old developer, or the addition of a few drops of acetic acid to the freshly mixed one, is an efficient remedy. The most of these latter varieties of fog may be termed accidental, due to an improper entrance of light, or the use of wrong methods of development, want of cleanliness, or insufficient washing, and the remedies are obvious. The second and most serious kind of fog occurs in the preparation of the emulsion, and can only be partially cured. In the article, "Safe Limits for Rapid Emulsions," in last year's Annual, it was stated that all methods used for the preparation of highly sensitive emulsions produce, when carried beyond certain points, foggy emulsions; or, in other words, a reduction of the silver bromide to a sub-salt, and according to the amount of such reduction will be the degree of fog under normal development. A slightly acid emulsion can be kept at 85 deg. to 100 deg. Fahr., from five to seven days before chemical fog sets in; with each day sensitiveness increases, but we constantly approach the borders of fog-land, and soon the good ship "Emulsion" is enveleped in a dense haze and becomes a chemical wreck. By increasing the temperature we may reach the fog point in from forty-five minutes to two hours, much depending upon the kind of gelatine employed.

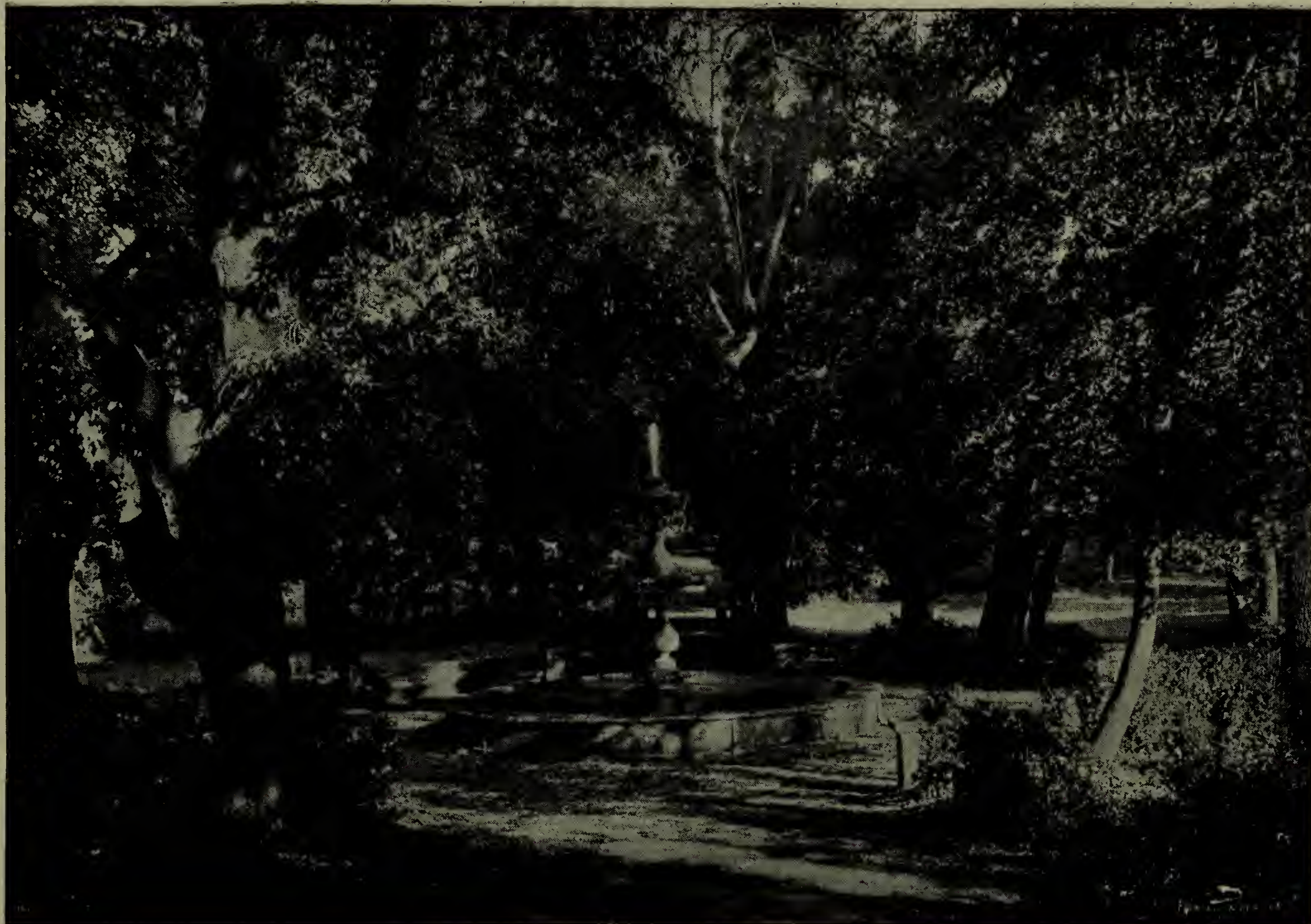
In a neutral emulsion fogging takes place much more rapidly. A mere trace of acid is sufficient to keep the emulsion clear and extends the time limit. It is for this reason that nearly all formulas for boiled emulsions contain more or less acid, but an excess of acid is also injurious, delaying sensitiveness to such a degree that the emulsion is practically useless.

All alkaline substances cause emulsions to attain higher degrees of sensitiveness, but, beyond certain limits, they as rapidly produce fog. Many formulas contain an excess of alkali, and the amateur usually obtains as the result a foggy plate in spite of the utmost care in following out the details of the directions. The following limits will enable one to judge as to the proper amount. With ordinary temperatures, 55 deg. Fahr., 1 to 2 per cent. ammonia (Sp. G. 0.90) will not produce fog even in eight days, but at 87 to 105 deg. it may appear even in an hour, usually in four hours, and certainly in twenty-four hours. At 110 deg. to 125 deg. Fahr., the emulsion is totally destroyed in five or six hours. At 212 deg. Fahr. the destruction is almost immediate. It follows that any formula giving more than 2 per cent. of ammonia must be worked with great caution. A *trace* of fixed alkali, caustic potassa, at ordinary temperatures produces no fog, but at 212 deg. Fahr. even this trace acts very energetically and reduces the silver bromide to metallic silver.

The carbonates of the alkalies act much more mildly. An emulsion may even be boiled for ten or fiften minutes with $\frac{1}{4}$ of a per cent. of ammonium carbonate without fear of fog. Carbonate of soda acts more quickly, but even 1 per cent. can be used at a temperature of 100 deg. Fahr. for an hour without giving fog.

It is evident from the foregoing that all gelatines should be tested for alkali. The interchangeable factors in the production of fog are time, heat, alkali; and it is only by a harmonious adjustment of each one to the other that the dangerous chemical fog can be prevented.

R. E. Van Gieson, M.D.



W. J. Stillman, Photo.

AN OLD ROMAN GARDEN.

The Crosscup & West Eng. Co., Phila.

DIAPHRAGMS, SENSITOMETER NUMBERS, AND EXPOSURES.

It is seldom easy to estimate the exact exposure requisite for an interior, and the difficulty is much increased when the operator is obliged to use unfamiliar lenses and untried plates. It is therefore hoped that the following account of the method pursued in determining the proper exposures for certain recent photographs of the large astronomical instruments at the United States Naval Observatory may not be without interest.

The plates used measured 5 x 8 inches, and the lenses available were a Dallmeyer 1AA wide angle rectilinear of 4.44 inches equivalent focus, capable of covering the entire plate; and a pair of Dallmeyer rectilinear stereoscopics of 3.28 inches equivalent focus, each capable of covering half the plate.

The first step was to determine the intensity ratios obtainable with these lenses, or, in other words, the series of quotients $1:m$, where $m = f:d$; f being the equivalent focal distance of the lens, and d the working aperture given by any one of its diaphragms. In all Dallmeyer lenses having Waterhouse diaphragms, the largest diaphragm has stamped upon it *the number of the lens*, while in those having revolving diaphragms the number corresponding to the largest aperture is *the denominator of the intensity ratio for that aperture;* and in either case the remaining diaphragms are marked ×, 2, 3, 4, 5, in the order of decreasing apertures. The significations of these numbers with respect to length of exposure and intensity ratio are as follows:

Diaphragm.	Length of Exposure.	Intensity Ratio.
Largest	T	1 : M
×	1½T	1 : 1.225 M
2	2T	1 : 1.414 M
3	4T	1 : 2.000 M
4	8T	1 : 2.828 M
5	16T	1 : 4.000 M

The quantities in the last column of the table were computed from the formula

$$\text{Intensity ratio} = \frac{1}{M \sqrt{2^{(n-1)}}}$$

where 1 : M is the intensity ratio for the largest diaphragm, and n is the number of the diaphragm actually employed; the mark × being taken to mean 1½. The table is applicable to any lens having its diaphragms proportioned in the same way as Dallmeyer's. For example, in the case of a portrait lens with an intensity ratio of 1 : 3, M would be 3, and by multiplying the quantities in the last column of the table by that number we should find for the intensity ratios corresponding to the several diaphragms, 1 : 3, 1 : 3.67, 1 : 4.24, 1 : 6, 1 : 8.48, 1 : 12. Similarly, for a lens having an intensity ratio of 1 : 8 we would multiply by 8, and find 1 : 8, 1 : 9.80, 1 : 11.3, 1 : 16, 1 : 22.6, 1 : 32.

The value of M stamped upon the wide-angle lens 1AA was 15, and that stamped upon the rectilinear stereoscopic lenses was 10.

For the first instrument photographed Carbutt's keystone dry plates were employed, of brand B, and sensitometer No. 20, which, according to the maker, require an exposure of about three-and-a-half seconds for out-door work in bright light, with stop f: 32. By the rule on page 41 of this Annual for 1889, the exposure co-efficient which these data give is $3.5^s(\frac{1}{32})^2 = 0.0034$, while on page 42 of the same article the corresponding exposure co-efficient for wet collodion plates is said to be from 0.026 to 0.030. It was therefore concluded that these plates were eight or ten times more sensitive than wet collodion; and as the appearance of the image upon the ground glass of the camera seemed to indicate that an exposure of thirty or forty minutes would be necessary for wet collodion, it was inferred that the B 20 plates should be exposed from three to five minutes. As a matter of precaution, two of them were given considerably more time, but upon development four minutes proved long enough.

As the lens used was the wide-angle 1AA, with diaphragm No. 3, and M = 15, we have from the last column of the table above, intensity ratio = 1 : 2M = 1 : 30, and then by the rule previously cited, exposure co-efficient $= 240^s(\frac{1}{30})^2 = 0.267$.

To obtain negatives of the instruments in some of the smaller rooms of the observatory, it was necessary to have recourse to the rectilinear stereoscopic lenses of 3.28 inches equivalent focus; and instead of the B 20 plates, Carbutt's orthochromatic plates of sensitometer No. 23 were employed. According to the maker, an exposure of two-and-a-half seconds with these plates is equivalent to three-and-a-half seconds with the B 20 plates; and consequently it was inferred that the exposure co-efficient of the orthochromatic No. 23 plates, would be $0.267 \frac{2.5s}{3.5s} = 0.191$.

The diaphragm to be used with the rectilinear stereoscopic lenses was No. 4, and as M = 10, the table above gave for the intensity ratio, 1 : 2.828M = 1 : 28.3, and then, by the rule on page 41 of this ANNUAL for 1889,

$$\text{Time of exposure} = 0.191\ (28.3)^2 = 153^s = 2^m 33^s.$$

As the light in the smaller rooms was not quite so good as in the room where the 1AA lens had been used, an exposure of three minutes was given, and the resulting negatives showed it to be correct.

To those who are constantly engaged in photography the process above described will be of little interest, but to others who, like myself, only make an occasional negative, it affords a degree of certainty not otherwise attainable in estimating the proper lengths of exposures. The description may seem long, but the computations can easily be made in less time than would be required for developing a single negative.

William Harkness.

MY SUMMER EXPERIENCE.

DURING the summer I have been using a brand of plates that gave exceptionally fine results, but they were very soft, and I lost quite a number by melting until I began to use chrome alum in the developer.

I found neither ice used during development nor alum used after development safe, so I tried the following and did not lose another plate:

Shake up chrome alum in water until the latter is of a rich clear purple color. Of this add ½ an ounce to each 8 ounces of developer, using moderately cold water, and following with alum in the hypo bath.

I applied the same treatment to some large Carbutt films and found it satisfactory in every way. To anyone who has never used orthochromatic plates I would say: try them, compare them with the ordinary, and the results will surpass the latter so much that I doubt if you would return to the ordinary.

I have made several hundred large negatives on Carbutt orthochromatic plates, and I think they are as fine in quality as any wet plates, and render distances better either with or without a color-screen than the ordinary dry plate.

William H. Rau.

MORE ABOUT LANTERN SLIDES.

I CAN imagine no more pleasant branch of camera work than making lantern slides. With proper instruments and a good negative there is really no excuse for failure. The main requisite is a fine lens, and that is absolutely needed, but any camerist of ordinary ability can put together a suitable box. In contact slide work this is, of course, not required. The battle wages hot between the advocates of wet and dry plates. with their several modifications of each process, any one being good if given enough time and thought. There is special need for them in slide work, as now, more than ever, lantern exhibitions are in favor. Those who take up this branch can easily fill all their spare time, and they will find out that, instinctively, they are making all their negatives with this ultimate purpose in view. Not every negative is suitable for a slide, though I have heard people talk, sometimes, as if any one could be used to advantage. A good, clear, crisp negative will make a fine slide every time, and a poor one will not. My own instrument is an 8 x 10 enlarging and reducing camera, as my negatives vary greatly in size, and, besides, I dislike contact work, and it has two cones, one 12 inches long and the other over 4 feet, the latter for 11 x 14 negatives.

I found it necessary, recently, to reduce from a 14 x 17 negative, and will show how it was done, the matter was so simple. The negative was put in a printing frame and securely fastened by strips of wood. The frame was then raised to a level with the front of the cone, braced by books and soft cloth, and held at the proper angle to the camera by the cord of the window shade. The short distance between the cone and the frame was covered by black lace, as cloth would have dragged down the frail structure. It was intended, as Susan Nipper would have said, for a "temporary" and not a "permanency." A long focus lens was used with a medium stop.

My camera faces a north window, and the lower sash is covered by a ground glass which is removable. Ordinarily, I use a wide angle lens, but do not like it for large negatives. After carefully adjusting the focus and deciding on the size the picture is to appear on the plate, I make one exposure to test the light. Every subsequent exposure is also specially cared for beforehand by examination of the image on the ground glass. It is thought by some a great waste of time to do this, but one is so apt to jar the camera by a careless movement, throwing things out of position, and it is a great benefit many times to raise, lower, or move the negative to one side, so as to place it more artistically on the slide. As much art can be shown, also, by matting out a part of the picture as by using it in its entirety, and great taste shown in the choice of the mat.

Like the majority of slide-makers, I began work with ferrous oxalate developer, but an expert friend suggested eikonogen, and one trial decided me to transfer my allegiance, which, since then, has never wavered. My formula is a simple one. It is 1 ounce of eiko, 2 of sulphite of soda, and 40 of water for one solution, with a second of 1 ounce of carbonate of potash to 4 of water, or make the solution mark 10 by hydrometer. After several trials, I have returned to my first custom of slightly over-timing and putting the plates in a dilute bromide bath for a few seconds before development. It is well to remember the rule to develop slowly, very much so, thus obtaining both detail and density. With some negatives I stop development as soon as detail is well out, fix, wash, and then intensify with some good process, generally with what is called silver intensifier. After the hypo bath I dip the plate in a bath of saturated alum and a few drops of sulphuric acid, than which I have found nothing better for clearing the shadows. One is usually considered safe to use the freshest emulsion to be obtained, but a late experience of mine may prove interesting. A certain make of plates had always served me well until, one day, it was necessary to make some slides for foreign exhibition and my time was limited. Wishing to have them particularly good, I laid aside the plates on hand and bought a later emulsion, but after spending the greater part of a day I met only failures, as every plate showed a different color. If I was searching for color photography, that would have been encouraging, but I wanted a plain ordinary slide. Various experiments in timing, developing, and intensification gave the same result, and I went back to my rejected plates to reap perfect success. It is too much to ask of plate makers to personally see that every plate that leaves the factory is good, but I wish some photographic Pasteur might arise to inoculate the workmen with something like a conscience, when it comes to slipping poor plates among the good. It may be well to dust off plates before packing them for sale, but a very soft brush should be used, as the brush marks can be plainly seen on the plates sometimes after development.

System, from beginning to end, is the secret of good slide-making, whether one uses wet or dry plates, as, also, a realizing sense that whatever is worth doing at all is worth doing well. If a better way of working is suggested to you, do not reject or welcome it only because it is new. It is possible for one worker to use a certain plate or developer where another would fail with it, and every camerist must work out his or her own salvation. Those who are anxious to learn will find ways to do so and not stand around claiming, like Mrs. Gummidge, that "everythink goes contrairy with them," and therefore others get ahead of them. Now, when so many hands are held out to the earnest worker, there is very little reason for grumbling against fate. Do not, like Micawber, wait for something to turn up, but go to work and turn up something for yourself. You will find no part of camera work which will repay your efforts more richly than slide-making.

Catharine Weed Barnes.

MARKING NEGATIVES.

It not unfrequently happens that the amateur desires to make a print from a negative which will give the name of the subject, or the name of the photographer, and at the same time does not wish to make any permanent writing or printing on the negative itself. Of course, writing with India ink on the back of a varnished negative can be removed at pleasure, but it is rather awkward for most persons to write backwards, and quite impossible to give the free, natural signature of the writer. I have found that an excellent and simple way of doing this is to put the title or name on the thin celluloid used for the transparent films. This takes ink about as well as ordinary paper, and the writing may be in the printed form, or in the natural hand of the writer. It is better to use India ink, which is now obtainable in fluid form, as this will not print through, and gives clear, white letters. The celluloid is so thin that it makes no difference which side is placed next to the paper in the printing-frame If the edge of the slip of celluloid is left ragged, it will show very little, if at all, in the print; or a very narrow strip can be used. Of course this end of the printing-frame cannot be opened during the printing. If it is desirable to do this, the slip of celluloid can be slightly gummed to the negative, so that it will retain its place when the print is examined. Mica works equally well, and is even more transparent than the other, if a very thin piece is used.

S. W. Burnham.

HAND CAMERAS.

The hand camera, or, perhaps as it is more widely misnamed, the "detective" camera, has given to the intelligent photographer a new interest, and invested his life with a new and inexhaustible charm. To many it is a delusion and a snare, because too much is attempted with it, but still there is hope that with study will come the intelligence and awakening that will make the little camera an inseparable companion, as loved and respected as it was, after successive failures, regarded with dismay and distrust.

Its introduction has increased the number of photographers beyond count, and unfortunately it is the first camera they take up. Without experience of any kind, and misled too often by the ingenious advertisement of the ease with which photographs may be taken, a spring or button is pressed without regard to anything else, and the large proportion of absolute failures is the result. Beautiful results *are* attained by the hand camera, so beautiful, that they are simply wonderful whether regarded by the experienced or inexperienced. Nor is this owing entirely to the lens or the plate, but to the judgment observed in their use.

What to avoid may first be pointed out to the inexperienced.

Very quick acting shutters used at their highest tension, regardless alike of the actinic quality of the light, the lighting of the subject, and the sensitiveness of the plate, are responsible for much bad work, the negatives as a consequence being greatly underexposed. Seldom, very seldom, is the greatest speed of the shutter necessary, even in taking objects in motion. Absolute arrest of motion is neither artistic nor truthful in ordinary photography. In photographing still life or slow-moving objects, the use of the shutter may nearly always approximate the "cap off and on" of a stand camera. I have taken ocean steamers, even when passing them in the lower bay from the opposite direction, with the nearly slowest speed of the shutter of the ordinary Scovill detective camera, and obtained most excellent results. Of course the right moment for the exposure had to be judged, and if these ocean steamer views were not so sharp that they seemed petrified, the gain was in the sense of motion conveyed, and the suggestion of the rolling of the water.

The result will be the same, no matter what the object photographed, granted good lighting, a fairly sensitive plate, a medium diaphragm, and a slow shutter.

This calls attention to another error too frequently made in the common disregard of the lighting. The same diaphragm, the same speed of shutter will be used all day on objects in broad sunlight, equally with those in deep shadow. With hand cameras, dark masses in shadow have no affinity. Small parts in shadow not of value in the picture, but of value as balance in composition with the well-lighted parts, are of course, all right, but the hand camera has no business attempting what the stand camera can only accomplish by long exposure.

For general work, adapt the means employed to the conditions, and expose only under the most perfect conditions. If the conditions are not perfect, don't expose.

If you *must* take a "bit" that is badly lighted, it is easy and simple, with a little trouble, to make a time exposure. A stone wall, trunk of a tree, a few pieces of wood and stone piled up, will give sufficient rest while the lens is opened and shut. Very often, by slowing the shutter to its lowest speed and using the lens wide open with a very quick plate, a very fair result can be obtained with careful development if the time and means will not permit the time exposure.

Another error in the use of the hand camera is its *disconnected* use. Taking all sorts of disjointed pictures without any reason for their being soon palls upon the photographer. Lack of interest in the subject beyond the mere taking, because one *has* a camera, destroys all intelligence in its use.

I have spoken of its becoming a loved companion. It will, when regarded as the author or creator of such views as had an interest in their taking, and thus become household treasures.

To instance one case of many, as a hint to others, I will give a fragment of my own experience. Some years ago, accompanying a friend, I made the round trip to Bermuda; two days and a half each way on the steamer, and five days on the Islands. I had my Scovill "4 x 5," and four dozen Seed sens. No. 21, plates. The box held six double plate-holders. As we reached the steamer's pier the first photograph was made of her bow with the name "Orinoco" on it. The next was the crowd on the pier waving goodbye as we swung out in the river, and succeeding ones the last glimpse of the city and bay and the Bartholdi Statue. Early next morning, the sailors swabbing the decks, and through the day groups of the passengers. As we neared Bermuda, the sailors heaving the lead, and the first views of the Islands. Then the landing at the Bermuda pier and the hotel we stayed at. From my window there a bird's-eye-view of the beautiful scene from it over house-tops and across the bay to the low hills beyond: Each day every nook and point of interest visited. The plate-holders were changed at night in a closet of the room by a small ruby lamp, and made ready for the next day. When we left, the last view was the queer little pilot boat tossed on a huge roller as the pilot left us. Out of forty-eight plates I had forty-six of average good quality that made for my friend and myself, printed in duplicate, an imperishable souvenir of our trip. They made a full and complete diary of the entire outing, giving, without a word, its history from beginning to end, and illustrating the Bermudas, its people, buildings, palms, lily fields, coral quarries, boats, everything of a type. Mounted in album form its value to me is beyond price. The photographs were made under every varying condition of the weather, and in Bermuda while driving about from the seat of the carriage, but the means were always adapted to the conditions. The lens was nearly always used full open, the shutter often at its slowest speed. The plates were developed by me *very slowly* and carefully. Many came out thin, but careful printing remedied that, so that all of the forty-six were valuable.

This use of a hand camera will endear it to the user, and I sincerely trust, conveys the moral.

H. Edwards-Ficken.

FOUNDED ON FACT.

She was a small woman, with a straight bang, dark hair and eyes. Her garments seemed as if she might have made them herself. She stepped quickly and with spirit. When she spoke, her voice had the soft, sweet, English drawl.

"Have you pictures of 'Bishop Gorrigan?'" she inquired of the proprietor, who happened to be in waiting.

"Yes, madam."

"Is this of the bishop? Have you not his full face?"

"No, madam, I have not."

"Well, when you were taking him, why did not you take a full face? I should like the full face."

"I am sorry, madam, not to have been able to anticipate your wishes, but these pictures were taken three years ago, and I presume you were not in this country then."

The mild sarcasm was unheeded, and the petite brunette made, with English frankness, the statement that she had indeed only been in the country a month, and was going back as soon as ever she could, "the climate is so '*nawsty*,' you know. But why did you not take the full face?" she persisted with that feminine insistency which is not limited by nationality or race. "I want to see both eyes."

Now even a worm will turn, and this proprietor, though accustomed to be sat on by the public generally, and at present feeling keenly the pressure of low prices, and competition of the "pencil-them-smooth and burnish-gloss" galleries, began to have the spirit of a man stir within him, albeit softened by the glances of the bright eyes before him.

"Well, the fact is that the good bishop's face is not adapted for a front view. The two sides are not at all alike, and that would show badly. I took him according to my best judgment, and these are all I have."

As there was no alternative, a cabinet was selected and paid for. Still the lady lingered, examining her purchase. Evidently she was not satisfied.

"I don't think this looks like him. Why, he is like an old man of eighty. His hair is all white."

"His health has begun to fail lately. This was taken just before," the proprietor responded in what may have been artificially affable tones.

"Yes; but wasn't he old enough to have wrinkles then? Where are the wrinkles? Now, there is Cardinal Manning; his face is a perfect network of wrinkles, and he was taken lately, and there isn't a wrinkle in his face. It is all smooth and round."

Of course the proprietor, dealing much with women and children, was able to resolve this rather ambiguous information, and did not understand that the photographic process had literally renewed the youth of the Cardinal. But he pondered, was this one of those rare occasions in trade, when the truth would be more advantageous than a polite lie? Like the historic Irishman he ventured an equivocal reply:

"Madam, it is all on account of the silly vanity of the public."

"I don't understand you. Can't photographers take lines? When I had my photograph taken it didn't look like me, and the photographer told me he could not take lines—they come out too black."

"Madam," said the proprietor, inspired by a burst of heroism not unworthy of the martyrs, "I will tell you the truth. It may well be in your case that there were no lines to take. You have youth, and (with a deep obeisance) beauty; but photographers naturally take lines, wrinkles, and spots of all kinds. The method of removing these is mechanical. It is not artistic, as some represent. It destroys likeness, character, and expression. It turns the photograph into a beastly abomination. The manufacture of such articles is contemptible and degrading. But what can be done about it? The public have discovered that photographs can be made smooth. They like them so. The man who smooths them the smoothest, and shines them the shiniest, gets the patronage. We feel that we must live, though your distinguished fellow-countryman, Dr. Johnson, might not, if alive, be able to perceive this as a necessity, and no doubt would have regarded us, as we know ourselves to be, shameless impostors. You seem to be a lady of sense and perceptions. Perhaps you are an artist, or a—— photographer?" (Here the lady hastily put in a denial in a soft undertone). "But if you should want me to take you and let you have the photographs without this pernicious retouching, and we were both agreed that they were best that way, I would not dare let you have them so. Why? Because nine hundred and ninety-nine in a thousand of those who saw them would say (having the popular artificial standard in their minds) that 'Mr. Truetake does not finish his photographs well;' some competitor, acknowledging the same false standard, or seeking to make capital for himself, might make the same remark. So against my feelings and knowledge, I am forced to pile on the pencil to protect my reputation. My real position in the matter is that the plain photograph is too crude, and some penciling is allowable, and I try to do just as little as will give satisfaction; but that is almost always too much. Here is the photograph of an old man that has all——"

Just then the enthused speaker discovered that he was holding forth to a different audience. The gentle Englishwoman had vanished, and a young lady with red hair and freckles was before him in her stead. It was as mysterious as the chemistry of substitution compounds. Another young lady was entering the room.

Suppressing his confusion as well as possible, the proprietor, in response to inquiries from the copper blonde, handed her some photographs. She scrutinized them anxiously.

"I don't know but that these are pretty good. But do you think, Mr. Truetake, that you have done quite justice to my complexion? There was sister Clara, she had some taken by Plumbago & Goldedge. The face was just like marble, and her hair was very fair indeed. Well, if my friends like them I may want another half dozen."

And her cupric brightness vanished from the room. The third young woman was a "rattler."

"Say, Mr. Toothache, I want an appointment, and if you flatter me up as you did that red-haired Miss ——, I will have a bushel of them. Her 'complexion'—it is just horrid, and you made her real pretty. I don't care if they ain't a bit like me. Just make me handsome, now, won't you?"

"Certainly, Miss ——. Your name, please? I see—you want a *good* likeness. Yes—one week from to day at 10 A.M. Please come a little before, so as to be ready by ten. Good evening."

Being alone, the proprietor fell into deep thought. Why did that women vanish so mysteriously? Who can she be? What did she want of the wrinkles? Did Patchem & Matchem, who are making that "Great Composition Photograph of All the Catholic Bishops," send her to me?

W. J. Baker.

HOW TO MAKE A LANTERNSCOPE.

The magic-lantern, or stereopticon, is an indispensable piece of club furniture, and displays of lantern-slides a most entertaining feature of club meetings. To the individual, however, the lantern is an expensive addition to a photographic outfit, and but a limited number of the elect feel disposed to expend the amount necessary, to exhibit the comparatively few slides made annually. The club lantern is seldom loaned, and so the amateur, unable to exhibit the slides he makes, except at club meetings, loses his interest in the work, and that branch is sadly neglected. The lanternscope is, to most slide-makers, an unknown quantity. Few have heard of them, I find, and a still more limited number had the opportunity to use one. For my part, having both the lanternscope and lantern, I am inclined to believe that were it necessary to discard one, I would relinquish the lantern. The latter requires a dark-room, stretched screen, and lime or other good illuminant, not to mention the space necessary for screen and audience. The former can be easily held in the hand, and is always ready for use by night or day. It has but one disadvantage; the picture can be exhibited to but one spectator at a time. Its advantages are numerous. The lanternscope and box of slides can be placed, ready for use at any time, upon a side table in the reception-room, where formerly the stereoscope held full sway. There will then be an incentive to make slides, and lantern committees of the various clubs will find less cause of complaint in the lack of interest manifested in the work by members. For the information of those who desire to make an instrument of the kind, I append a few words of instruction, illustrated by a diagram, which will convey the idea of construction. The best wood for the purpose is second growth mahogany, or bay wood, owing to its disinclination to warp. The other necessary articles are a single lens or reading glass about 5 inches diameter, and 5 or 6 inches focus, a small can of glue, a few wire brads half-inch long, a piece of ground glass 3¼ inches square, a foot rule, and a sharp penknife. Of course, a plane for rabbeting and a good coarse file are still better added to the list, but are not absolutely necessary. The first thing advised is a plan on paper of the work to be done,

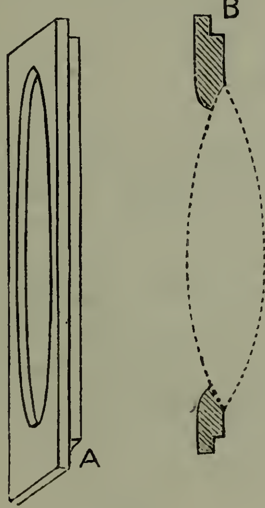


Fig. 1.

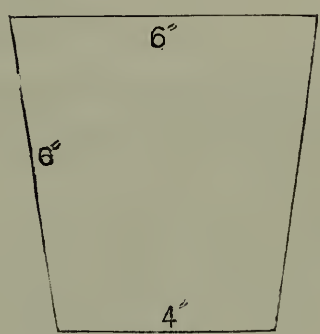


Fig. 2.

made full size and accurately laid off, so that no part will be required to be done a second time. Cut a piece of wood (¼-inch thick) 6 inches square, and rabbet it on the inside all around (see A, Fig. 1, in diagram) half the thickness of the material. Then with a string and pencil lay out a circle in the center of the piece ¼-inch in diameter less than the outside dimension of the lens or objective. Cut this out accurately, carefully beveling the inside (see section B, Fig. 1) for the reception of the glass. Now cut out four pieces similar to Fig. 2, and carefully rabbet them all around. Supposing the lens to be 6-inch focus, two of the pieces should be cut of the same dimensions as given, but the two sides should be $\frac{1}{4}$-inch narrower to make them fit the rabbet. Having previously fastened the glass in the front with two cleats of wood glued in place, rub some glue around the rabbets of the pieces cut out, and put them all in place, driving a few brads in the edges to hold them, in addition to the glue. The box will now appear thus:

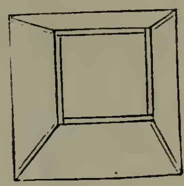
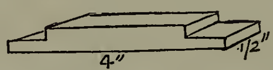


FIG. 3.

For the reception of the slides cut eight pieces or strips $\frac{1}{2}$-inch wide by 4 long, with a wide rabbet at each end similar to this:



Make these into two square frames, glueing them carefully, and drying under a heavy flat iron over night. Connect the two frames with a strip between, at top and bottom, $\frac{1}{4}$-inch wide and three-sixteenth inch thick, fastening with brads. Now carefully rabbit the outside of one side of the frames to fit the box previously made, and the inside of the other to hold the ground glass. When this is attached to the box, the ground-glass fitted, and the whole rubbed down carefully with sand-

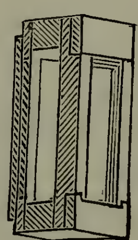
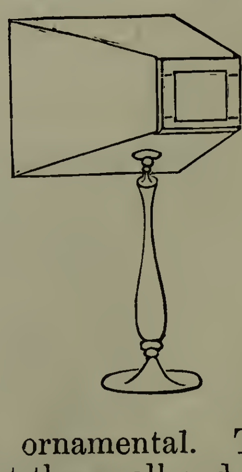


FIG. 4.



paper and varnished, it is quite ornamental. To use the lanternscope place the slide in slot at the small end, and look at it through the lens, holding it 6 or 8 inches distant from the eyes. Have a good light on the ground-glass and the effect is beautiful. For greater convenience a stand similar to the stereoscope stand may be constructed, which will obviate the necessity of holding the lanternscope in the hand. It is more easily made than described, and when well constructed will be greatly appreciated by those who have had to depend heretofore on the "club lantern."

Robert E. M. Bain.

THE PHOTOGRAPHER IN A SCULPTOR'S STUDIO.

The most pleasant stage of the sculptor's work is when the model is completed in clay. The clay age dates back to the creation of man. From the most remote period of time the evidences are positive that clay was the fruitful medium for the interpretation of the sculptor's ideas, and from it the photographer can generally obtain the best results.

Praxiteles remarked, "Clay is the life, plaster the death, and marble the resurrection of sculpture."

The color of clay, varying as it does in all shades of browns and blue grays, is in harmony with the photographic process, although sometimes excellent results are produced from plaster or marble, especially when the latter is toned by smoke and age.

A sculptor's studio is arranged with shades on the skylight working from above and below, so as to throw a variety of lights on his work; top lights, side and under lights; no part of the modeling can be slighted, which is to be exposed to the searching light of outdoors, or to the uncertainty of any light in which the work will be placed after it leaves the studio.

A background—a sheet or screen—is generally necessary, not only to relieve the bust or statue, but to cut it off from the multitudinous surrounding objects which encumber a sculptor's studio. Stands, easels, pedestals; a lay figure enveloped in classic drapery smiles inanely in one corner, while an austere Puritan with matchlock on shoulder looks down with iconoclastic contempt on the surrounding multitude of plaster images. "Vanity, all is vanity." A bust of Barrett as *Cassius* sternly confronts Booth as *Brutus*, John Gilbert as the irascible *Sir Peter Teazle*, with a humorous smile illuminating his countenance, seems good-naturedly to make allowances for the nineteenth century ideas of Susan B. Anthony on the woman question; while the fascinating Ada Rehan as *The Shrew* asserts the right of the drama to educate and enlighten.

Psyche looms up ghost-like in another corner, hobnobbing with an athlete, while a gentle mother is bathing her boy in the foreground. A heterogeneous collection of legs, arms, casts of Indian heads, skulls, all kinds and varieties of studies from life models, sketches for statues and groups, and shelves loaded with plaster busts and casts of all descriptions still more numerous. and covered with the gray atmosphere of dust, the accumulation of years, all of which must be excluded from the camera.

The one great advantage a sculptor has is that everything he does is subject to his own sweet will. In portraits he can elongate or snub his patients' noses, refine, caricature and otherwise take advantage of his victim. But variations from the truth of nature are generally unconscious on the artist's part, and are usually governed by his physical peculiarities. A square-headed sculptor has a tendency to square his subject, while a long-headed one will reverse the process.

This idiosyncrasy is especially marked in the production of full-length figures, ideal or otherwise. The features will be influenced in a similar manner, although the portrait, bust or statue may be pronounced by the unbiased critic a speaking likeness.

But as the artist grows he rises above his physical—his prison house. The power of his imagination develops, and gives him a substantially increasing capability of disassociating himself from the physical that environs and anchors down his higher perceptions. He can then produce a better portrait as well. In ideal work necessarily he must materialize his thoughts, however evanescent or intangible they may be, and they must more or less be governed and partake of his own physical understanding.

The operator has now everything ready. The light justly arranged so as to give the best expression to his subject. He proceeds to obtain the focus. It is not necessary for his sitter to be possessed of patience, nor is it required that he shall gaze with concentrated determination at a nail or spot on the wall; and, let the photographer say what he likes, the expression of his subject will not change. The operator can take his time, descant on the last base-ball match, or pass a few remarks on the weather. When he is ready he exposes, packs up, and remarks that he will send proofs around the day after tomorrow; and woe betide him if he retouches or otherwise maltreats or beautifies the negatives. The prints will expose him.

Lieut. Karl Hiller, Photo. AT PLAY. Kurtz, N. Y., Eng.

Photography is frequently of direct use to the sculptor in his work. In obtaining arrangements of drapery on the living model—the folds of which will change and are destroyed when the model takes a rest and in the study of momentary actions from living subjects, photographs are also of invaluable assistance in modeling post-mortem portraits. If only ideas could be caught and materialized on a negative, what a blessing it would be to suffering and lazy humanity! How science would rejoice if a molecule could be photographed! Even Nirvana or Utopia negatives would be desirable. Alas! it requires something positive before a negative can be taken.

The moon has been successfully invaded, but photography has still a few more worlds to conquer.

J. Scott Hartley, Sc.

A COSMOPOLITAN GALLERY OF PORTRAITS.

I LATELY formed one of a small party of the London press, who were invited to a social meeting presided over by the Duke of Teck. The object of the meeting was to inaugurate, in a public manner, the formation of a British Museum of Portraits of Men of Mark of this country who had rendered themselves famous by achievements in fields of science, art, literature, politics, travel, commerce, and in naval and military walks. The idea was conceived over a quarter of a century since, but it had only been recently given full effect to.

As I listened to a recital of what was being done, and intended to be done, I thought of the desirableness of the application of the idea to photography. How numerous are those who have achieved this lesser reknown, to whom our art science is indebted for not alone its inception but its practical carrying out in detail, whose linaments ought to be preserved for the coming race by the agency of the art to which they so greatly contributed!

Who is insensible to the value of the family album in which are enshrined the relatives of a past time, still loved and remembered but "gone before?"

What I desire to see established is that larger cosmopolitan album or gallery, in which will be found an accredited likeness of every man who has deserved well of his photographic brethren. It is not to our credit that the names and record only of such men are, in so many instances, all that we have ready access to or that can be handed down to posterity. What is everybody's business is nobody's business. The duty of making such a collection, one which shall be open to the world at large, must be undertaken by some public body, for the task is too herculean for a private individual, as I myself found when endeavoring lately to collect only two or three score of such portraits which, when made into lantern slides, were intended to give point to a lecture descriptive of the part taken by each in furthering our art. In that lecture, so far as at present prepared, I give a very brief synopsis of the photographic record of the particular man whose portrait is being projected on the screen, and having them arranged in something like historic order, the description goes on in sequence.

Our cosmopolitan gallery should be got up by nationalities, although I very well recognize the fact that, like science, photography has or should have no nationality. If America, Germany, Belgium, Great Britain, and the other European and Asiatic nations would each collect the portraits and records of the individuals to whom I refer, and then effect an interchange with their brethren, this might be easily attained. Already, I possess a fair collection of such portraits, and I can only say that they will most heartily be placed at the disposal of any public body who will take this matter up, for, as I have said, the task is too onerous to be taken effectively in hand by a private individual.

J. Traill Taylor.

THE LIMITATIONS OF PHOTOGRAPHY.

There is a well-worn story of how a lady brought back her proofs to the veteran photographer, Sarony, complaining that, though the photographs were of course very good, the likeness was very bad and that the mouth especially was large and coarse. "But," said Sarony, "God made the mouth, I only made the photographs."

The fault may have been with the maker of the mouth, or it may have been with the maker of the photographs, but it is certain—though photography is generally deemed to be a pretty faithful servant—it may be easily made unfaithful and its limits of exactness are pretty soon reached.

Take, for instance, the limits of lenses. When I read, in the catalogues of certain opticians that their lenses (and their lenses only) will work with the full opening, generally $\frac{f}{8}$, perfectly sharp to the extreme corners of the plate, *I wonder*—for they know as well as I do—and I know as well as they do—that this is an optical impossibility. A wide-angle lens of universal focus is even a greater monstrosity. Witness the many marvellous perspective results that are produced by the universal-focus cameras, *et id genus omne.*

A lens at best can be but an imperfect instrument, its limit of capacity is quickly reached, and everything should be done to favor it in its use. There is no lens of universal application, and it seems to me the intelligent photographer will provide himself with different lenses for different purposes, using by preference the longer focus lens to avoid distortion of perspective, a rectilinear lens to avoid distortion of lines, and the largest aperture that will give tolerable sharpness to the principal object, with reasonable sharpness to the rest of the picture. Never use wide-angled lenses and small stops unless compelled to do so by the force of circumstances. Can there be any doubt that a lens of 11-inch focus on a 5 x 7 plate with an opening of $\frac{f}{12}$ to $\frac{f}{16}$ will give an infinitely more correct and plastic result than when a lens of 5-inch focus is used with an opening of $\frac{f}{43}$?

Or take dry plates. I am filled with amazement when I read of plates that are equally good for about all classes of work, that always produce perfect negatives no matter what the subject, no matter what the exposure, simply by being left just so many minutes in a one-solution developer. If there is any part of the process photography in which the limit is sooner reached than in others, it is in development. Then why still further contract its limits? Rather should we adapt the lens, the plate, the development *to the subject*, and, above all, *develop for ourselves*—who else can find for us that subtle something we tried to secure when we made our exposure? And, at the best, what can more forcibly show the limits of photography than a comparison of our pictures with that colored miniature of nature we see on our focusing screen?

Then in the matter of cameras: I am not sure but that the advent of the "you press the button, we do the rest" horde of cameras has not been a serious blow to the advancement of photography. After an experience of some thirty years in all sorts and conditions of photographing, I vow that I find the hand camera of to-day the hardest of all to work. It is said in battle only one bullet in I don't know how many thousands, hits the mark. I honestly believe that with hand cameras not one shot in a hundred—no, nor in a thousand—really succeeds. For myself, I am content with one of the many well-made adjustable cameras that are in the market, where I can see what I am trying to secure, and where I confess I am glad to have a tripod to help me out.

In a general way I always try to impress on myself the limits of photography, and not to expect too much from its appliances. I use lenses only for the class of work for which they are best suited, and I do not expect to find a lens with an opening of $\frac{f}{8}$ that will give a picture sharp to the corners of either an interior, a portrait, a landscape, or a horse going at full speed.

I use my best judgment in suiting plate and developer to the subject, and I never expect to find a developer or plate that will do this for me.

For the present, I am satisfied with a camera on a tripod, and I only find a hand camera useful for making an occasional memorandum of a very limited class of subjects.

Ernest Edwards.

THE CROSS-LINE HALF-TONE PROCESS.

Remarks on the Relation of Black and White on the Screen.

The great variety of effects that may be obtained in screen negatives from the same subject leads every investigator to try, or desire to try, every possible relation of black to white lines and spaces in the screen. The best relation for all purposes is indeed a very difficult and well-nigh impossible point to determine, because, firstly, the best texture in the negative depends largely on the requirements of the subsequent procedure; and, secondly, because there is so great a variety of taste and opinion regarding the desired effect in the reproduction. To arrive at any valid conclusion in the matter it is necessary to review the phenomenon which takes place in making a negative through a screen.

It is obvious that if a lined or cross-lined screen be placed in *immediate* contact with a sensitive plate in the camera, and an object photographed through it, the result will be a transfer of the lines of the screen in reverse, and in the transparent parts of the screen there will be a deposit of silver proportional to the action of light, to the same degree as there would be with the same action of light had no screen been interposed. Now, if this same screen be moved from the sensitive plate toward the lens, a distance say of $\frac{1}{4}$-inch or more, and the same subject exposed for the same length of time, the result will be a very fair picture, with very little, if any, indication of the presence of the interposed screen. The latter has been brought, so to speak, out of focus, but, of course, not in the sense that a picture is said to be out of focus, as the rays passed the plane occupied by the screen in as direct a manner as in the first instance. The attribute of light known as diffraction has come into play, and has affected the direction of the light sufficiently to completely eliminate the fine lines of the screen from the resulting picture.

What we desire to obtain is an amount of diffraction of the light that shall be just sufficient in the high lights to act around the lines between the junctions, and at the same time to leave the point of actual crossing quite unaffected and clear. This can be effected with a screen having *any* relation whatever of black to white, simply by adjusting the distance between the sensitive plate and the screen,* and consequently, so far as regards that one particular requirement of yielding transparent dots in the high lights, the relation of black to white in the screen is not of paramount importance. The difference, then, which will result from a different proportion of black and white in the screen must be sought elsewhere than in the ability to produce high lights with fine black dots, or a "brilliant" result, and practice indicates that this is true. If, on the one hand, we had a screen with very thick black lines, then, in order to obtain the desired result, we must bring about sufficient diffraction to close up the high lights into dots, and this amount will necessarily render the edges of the lines hazy and round, that is to say, lacking in sharpness, and yield a dim picture, with the fine detail more or less "fogged over" or "ironed out."

On the other hand, if the black line be very thin, a very small amount of diffraction will be sufficient to carry the action of light around the junctions of the lines as well as around the lines between the junctions. Hence the diffraction in such a case would have to be cut down to the minimum, resulting in a tendency to show *lines* in the lighter middle tints, where there should be dots, but larger dots than those in the highest lights. This kind of a screen yields the best detail.

As in all human effort, we are obliged to balance advantages, so, also, in this particular instance, and I find that with a sharp, opaque black line, and a sharp and transparent space, where the diffraction is normal, and no extra refraction or diffraction

* With a fixed distance between screen and sensitive plate sufficient to admit the diffraction the same effect may be brought about by varying the size of the lens aperture.

is introduced by the presence of a collodion film or other amorphous body that tends to disperse the light unduly, a screen having the white or transparent spaces about twice as thick as the opaque lines will yield the most satisfactory results all around. In that case the diffraction necessary to produce the desired results in the highest lights need not be such as to interfere with the sharpness of the lines necessary to produce good detail, and the junction points are sufficiently broad to admit of several gradations of dots before the continuous cross-lines manifest themselves.

Where a cross-lined screen has both sets of black lines equal in width, there is necessarily a point in the resulting picture where the dots cease and the lines commence, and in such a case the lines are at once crossed. Where one set of lines is slightly heavier than the other, or somewhat closer together, there will be a point between the darkest dots and lightest *cross* lines composed of a single set of lines, and, consequently, such a screen yields a more gradual gradation of tone from the middle tints to the shadows.

From the results of a long experience with screens of almost every variety, I give the following condensed conclusions on the general subject of screen-work:

Greater contrast and roundness can be obtained with coarse than with fine-lined screens.

Finer detail can be obtained with fine than with coarse-lined screens.

Sharper detail can be obtained with single ruling and double exposure than with double ruling and single exposure.

Far better modulation can be obtained with double than with single lined screens.

Sharper contrasts can be obtained with single than with double ruled screens.

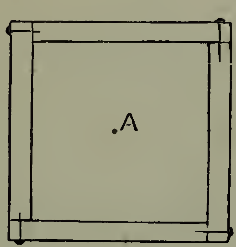
A cross-lined screen must be more perfect than a single ruling, because in the single ruling any small scratches in the glass or opaque spots in the screen will be partially neutralized by the two exposures acting alternately on the parts, while, in the double ruling, a small scratch or opaque spot remains in one place throughout the entire length of the exposure.

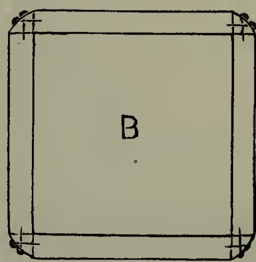
Max Levy.

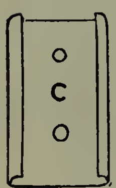
A SHOW-CASE.

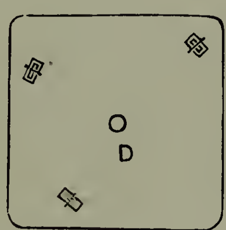
While not advocating the home manufacture of apparatus or furniture as the most profitable in the long run, it may have occurred to some of our own fraternity that an inexpensive outside show-case would be desirable until a more elaborate affair could be afforded. To such is offered the following plan, which has served me well:

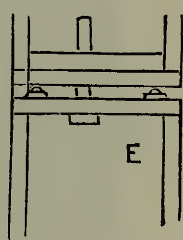
Get as many plain antique oak frames as you desire sides to your case. We will say four. The frames fitted with a good quality of glass can be had, 10 x 24, for about 75 cents each. This size is convenient and will accommodate six cabinets or three 8 x 10 panels to the side without crowding. You can











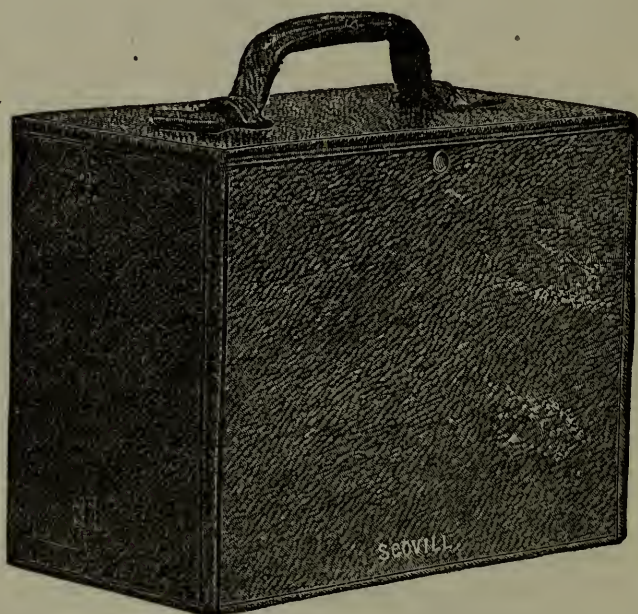
fasten the frames together, as per diagram A, or by mouldings, as per diagram B. Put in a solid bottom with a $\frac{1}{2}$-inch hole in the exact center. Make a removable cover. Make a box without ends 9 inches square and 24 inches high. Cover with canton flannel, or more expensive material, if you wish, for a background to the photos. Get bits of tin plate bent, as per diagram C, as long and a trifle narrower than a cabinet card. Arrange on the canton flannel ground and secure by two screws. This makes it easy to change your exhibit often without much trouble.

For mounting the case have a solid stand as high as desired, with a $\frac{1}{2}$-inch bolt secured in the center of the top in a perpendicular position. Arrange thereon in as large a triangle as possible, as shown at D, three small trunk rollers upside down, and fasten them with screws. Now set your case so that the bolt passes through the hole in the bottom, resting on the trunk rollers. Arrange the photos on the bottomless box; place inside the case; put on the top, and there you are. You will be surprised at the number of people who will take a "turn."

T. E. Huston.

A STEREOSCOPIC HAND CAMERA.

It is commonly known that of all pictures, those which are arranged to give the stereoscopic effect when viewed in a stereoscope, convey the true impression of perspective and solidity. It seems strange, indeed, that of the myriads of instantaneous pictures made, so few are taken with reference to

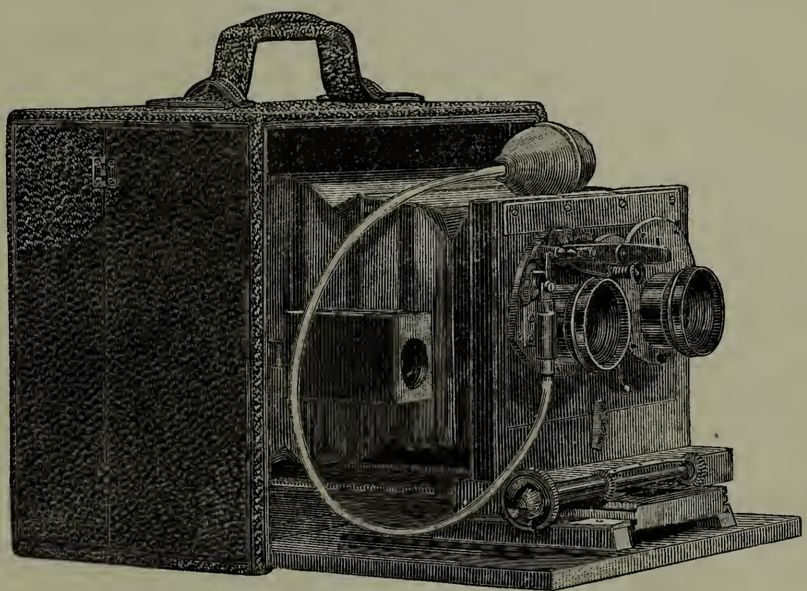


their future use in connection with the stereoscope, *for it is only by that means that the idea of animated life can be conveyed.* I can only assign as the reason the present almost universal use of hand cameras, and that none of them have, up to this time, been arranged for stereoscopic pictures.

There is a much over-worked phrase—"the long felt want," but I think that just that, literally, will be met by the new hand camera which the American Optical Company have just finished.

The first illustration shows one of these cameras closed, and you will observe there is no external opening for finder, lens or anything to indicate that the leather covered case contains the appliances which go to make up an instantaneous camera.

The second illustration conveys the idea of the appearance of the camera when open. The pair of lenses is fitted with a triplex stereoscopic shutter, made by the Prosch Manufacturing Company. The septum which divides the camera inside is here not visible, but it is arranged so that it may easily be taken out when the possessor of the camera wishes to make pictures equal in size to the ground-glass (5 x 7 inches).



The lenses are mounted on a removable front, which is displaced when a single picture is to be taken with a larger lens. This camera measures eight inches high, nine inches long, and five inches wide. It has a screw plate underneath, so that it may be used with a tripod. The reversible finder, focussing scale and shutter, with pneumatic release, go to make up a complete instrument.

The stereo. negatives when cut in two are exactly of the size suitable for making lantern-slides; that is, each half will make a lantern-slide. Now that such a light, portable camera as this has been constructed, I cannot but think that stereoscopic photography will be popular again, and that many will learn of the beauties of stereoscopic transparencies.

Henry Clay Price.

PHOTOGRAMMETRY.

Probably none of the different purposes to which photography is applied is so imperfectly understood as photogrammetry, and I cannot but feel that an attempt to make it intelligible will not seem out of place in your widely-circulated Annual.

Photogrammetry is photography applied to surveying. We produce by the aid of surveying those graphic delineations known as maps and plans. Photography is used to produce other graphic productions, commonly spoken of as pictures. Both of them are projections of the object represented upon a plane surface, and are made in accordance with certain definite rules, so that every point of the object is represented on that plane of the surface to which the ray of vision is concentrated.

How different these projections may appear becomes evident when we assume the picture-surface to be a plane, in other cases a curved surface, and that the eye remains fixed upon one point while either of these surfaces is moved about to form various angles with the ray of vision, or that we move about and view the plane surfaces from different standpoints.

Of these numerous possibilities, two are of special importance; the parallel or geometrical, and the central or perspective representations. In either of them the picture-surface is a plane, and, as exigencies may require, assumed to be diaphanous, like a plate-glass for example. In the one case all rays of vision are parallel with each other and vertical to the surface of the picture, in the other they meet at a distant point and form a pyramidal or conical bundle of rays; of these but one ray (*hauptstrahl*) strikes the picture vertically, and eventually passes through it. The distortions and variations of the real proportions of the objects seen perspectively are well-known facts, and a certain education or training of the eye is necessary to enable us to judge correctly of the actual form and dimensions of a body by merely looking toward it; still, notwithstanding our experience, errors frequently occur. The Chinese declare perspective-seeing to be the result of a defective function of the eye, and demand of idealistic art corrections of these alleged errors. Being fully aware of the cause of the discrepancy between the actual and the seen, we do not indorse such naive conceptions. We should not demand strictly perspective drawing in artistic representations, nor those appealing wholly to the imagination, for both yield unsatisfactory results.

When perspective drawings are designed to aid in the carrying out of practical work, they should be made solely with a view to working out the ideas into practical shape; or methods better adapted to the purposes, like the geometrical, should be employed.

In geometrical drawings a limited number of plans or outlines are generally sufficient to show the construction or design of even quite complicated objects. It is not impossible to make fac simile copies of the objects represented by the aid of perspective drawings, but this method is attended with much difficulty.

From a sufficient number of pictures of one object made independently of each other and combined, a geometrical drawing may be changed into a perspective one, or *vice versa*. The methods employed seem quite tedious in execution, but in principle they are extremely simple. In practice, the geometrical drawings are frequently required; as, for example, in architectural designs where the views must be made to embrace both the perspective and the picturesque, just as they would be seen from an imaginary point. The other method is but rarely employed. In the first place with the exception of directly-taken photographs, there are no reliable means for obtaining accurately-detailed perspective views, while accuracy is a necessity in geometrical drawings. In the second place on account of the diminution in size of distant objects, perspective drawings are not of as uniform and absolute sharpness as geometrical ones, and errors in them are less easily discernible than in the geometrical drawings. Imagine, for instance, the quadratic ground plan of a small monument. Even the sharpest and best trained eye is incapable of detecting a too forcible foreshortening of but two or three degrees on one side of the square, but with a geometrical ground plan, the variation of one degree on the side of a square is at once perceptible.

It is not very easy to make correct geometrical drawings for the object is not seen as we think it should be. No one can direct the eye to more than one point at a time, and one must rely either upon direct measurements or correct calculations of the angles, having fixed a point to work from only after locating the same with reference to other points. Adding to this the scrupulous accuracy required in that class of work it becomes obvious that surveying for the purpose of making geometrical drawings is too roundabout and tedious when an easier method is available.

In considering these circumstances, notwithstanding the difficulties to be overcome, it is quite natural to seek in photography the means for obtaining reliable, accurate and sharp perspective pictures. We cannot date the attempts for obtaining these results further back than about twenty-five years.

When making photographs, it often happens that quite important portions are obscured, as shrubs many times hide part of the front of a church, or as in the case of a tall chimney in a landscape, which conceals from view portions of an object most wanted. These obstructions may be taken out of a negative by retouching, or the view may be taken from another point, and it is possible also to supplement the photographic work by drawings, on which accurate measurements have been noted. In making photogrammetric pictures one should always observe care and accuracy, noting down various circumstances, such as the gauging of the theodolite, the point of view, etc.

Two essential portions of the object should be photographed; not only to take them in, but also to indicate their relative positions each to the other. Characteristic points should be marked with rods, and at least two of them should be visible in each of the different pictures. At the same time the length of draw of the camera should be carefully indicated, so that the angles at which these rods become visible may be accurately calculated. Other rods should be placed, not too near to each other, so that lines may be drawn to indicate the main points. When this is done correct measurements of all dimensions can be determined. The camera must be set up with more than the usual care so that the lens and platform will both be in a vertical position toward the point to be photographed, within which is the point of sight of the whole perspective picture. The front of the camera and the focusing-screen must be parallel to each other, and vertical toward the bed of the camera, which latter should be horizontal, or in a distinctly measured, angular position toward the horizon. The angles may be measured with sufficient accuracy with a protractor, and a plumbline with very fine thread; or, instead of this, use a universal spirit level. · Finally the point of sight should be carefully noted, and it is well to observe the portion of the object which is mirrored on the ground-glass where diagonal lines from the opposite corners cross each other; that is, in the center of the ground glass.

The most essential points only have been given, but, by these improvised means, one not equipped with a complete photogrammetric outfit may make serviceable photogrammetric pictures. The practice of photogrammetry can be recommended to amateur photographers, for they, as well as other tourists, are usually interested in architectural monuments. But were photogrammetry to be practiced seriously and for its own sake, and were the results obtained to equal in accuracy those of the surveyor, more elaborate apparatus would be required. In any event, it is necessary to have means for measuring lengths and angles.

Of modern and well-known photogrammetric apparatus, that of Koppe and Meydenbauer deserve special mention because they are types of their kind. Dr. A. Meydenbauer, of Berlin, is universally considered the oldest and most experienced advocate and practitioner of photogrammetry. He has been in the employ of the Prussian Government for a number of years, and has devoted himself mainly to the photographing of architectural monuments. Dr. Meydenbauer's attention was and still is directed toward the making of very large photographs. He works upon plates 40 x 40 centimeters with an unusually large pantoscopic objective made expressly for him. Instead of using a theodolate he gets his results by means of artificial horizon and spirit level. Negatives made with this apparatus are subsequently enlarged through a Steinheil wide-angle aplanat to 90 x 90 centimeters and then copied, for use in German high schools. His work has had the most beneficial influence upon photography.

The importance of his recent efforts to develop with an extremely dilute solution of pyrogallol and potash (1½ Gm. of pyrogallol in 9 litres of solution, having excluded the air from the developing dish) is not yet estimated and generally understood. The merit of his photogrammetric work is recognized through the large photographs rather than through maps and plans which he has made.

Dr. Koppe proceeds from a different standpoint: The photo-theodolite survey-work is by him considered as of the most importance. He superintended the construction of a theodolite arranged to insert, in place of the telescope for the determination of single points, a small camera 10 x 10 centimeters with rigid metallic case, and by means of which the photogrammetric picture is made. * * * He has with it a packing-case which serves also as a changing-box. All of the apparatus is made as light, and to fold as compactly, as possible. About two years ago Dr. Koppe published "Die Photorammetrie oder Bildueess Kunst," which is the most reliable source of information on photogrammetry.

Since the date of its publication no essential change has been made in photogrammetrical methods. It is thought that owing to the introduction of Carl Zeiss (Jena) objectives that difficulties formerly believed to be insuperable will be overcome. These wide-angle lenses are notable for their extreme angle of view and uniform illuminating power.

The occasional practice of photogrammetry is recommended to amateur photographers. Its province is by no means confined to the making of ground or architectural surveys; meteorological and terrestrial phenomena are also within its scope. Better results will undoubtedly be secured by several photographers uniting for action and the recording of observation. The height, shape, formation and motion of clouds, the northern lights, lightning, shooting stars, etc., are excellent subjects for photogrammetrical practice. Let us not forget that science, thankfully and profitably, receives all data gained through well-conducted observation.

Bruno Meyer.

CELLULOID FOCUSSING SCREENS.

Several years ago I suggested the use of celluloid in photography, and in *The Photographic Times* I called atten-

tion to the use of this material instead of ground glass. Constant use of such a focussing screen having proved its great superiority to glass, I am surprised that the latter is ever used. The only way I can explain this is that there is great difficulty in obtaining celluloid thick enough to keep flat. However, this celluloid can now be obtained in thin sheets of almost any size up to 24 x 36 inches, and is much better for the purpose when properly adjusted, as it saves so much weight. I arrange my celluloid focussing screens as shown in the cut, around the edge I punch holes about an inch apart. Into each of these holes a little string made of fine steel piano wire is fastened. The tension of the individual springs is very slight, but many of them serve to keep the celluloid perfectly flat under all conditions of temperature.

William Herbert Rollins.

ARE WE PROGRESSING?

When we think that even the gloss of the extra brilliant albumen print is insufficient, and that the glare of the collodio-chloride picture seems likely to invade all ranks, we are apt to conclude that, artistically, we are not improving. But this is a surface indication. A keen observer at the late Buffalo Convention would have seen that the class of workers, to whom we look for advancement in this direction, were not looking upon this new candidate with any favor.

A little inquiry would have disclosed the fact that they strongly condemn it.

The work most admired was the prints in platinum, and one exhibitor showed that, even in cabinet sizes, rich, plucky prints could be had by this process. For the larger sizes platinum is simply unapproachable, Why it is not more used is hard to say. It requires accurate manipulation, but is not so difficult but that any expert printer can readily master it. The excellent results shown will gain it many friends, and, doubtless, give it a still better showing at the next Convention.

A careful comparison of the two last exhibits of the P. A. of A. will show a decided gain in artistic merit for '91. A loss in one or two classes, but an encouraging gain on the average.

It is to be hoped that either the poem prize will be discontinued, or better methods adopted. Word pictures of the times of which "Idyls of the King" and such poems treat may be very effective, and the unreality of the subject add beauty to the sentiment, but to bring them under the skylight can never result in anything more than a caricature. I have no disposition to question the decision of the judges in the late award, nor do I, for a moment, entertain any doubts of their integrity in the matter, but it is manifestly absurd to expect one to adequately judge of the merits of such a composition by studying the poem after his appointment at the Convention.

It is not to be expected that men will study it beforehand with the expectation of being appointed. By all means let such judges be selected months in advance.

With "Hiawatha" the new idea started out well. The prize picture, in particular, was a decided step in advance of anything previously shown. That we cannot say the same for the late efforts, is to be attributed not so much to the exhibitors as to the injudicious selections. While it is true that "Hiawatha" belongs, in a measure, to this same class of unrealism, it is an unreality that is appreciated and thoroughly understood in this country, but the last selection has landed us in a mediæval mist, beautiful indeed under the effective coloring of the poet, but not capable of more practical treatment. Why cannot we have some simple, home poem, such a one as "Maud Muller." Possibly this might not give so good an opportunity for technical treatment as "Evangeline" or "Elaine," but it would give a far better opportunity for poetic treatment.

Let a part of the pictures be landscape compositions. This might bar some of us who haven't time to go out in the fields and practice, but the association is supposed to be for the advancement of photography, and not for the aggrandisement of individuals, and, if the amateur will take up this matter and give us something that approaches the magnificent studies of of H. P. Robinson, there would indeed be a gain. Such a series properly handled and printed in platinum might give us results that all would be proud to acknowledge as photographic products.

George Sperry.

John C. Hemment, Photo. AN ATHLETIC PHOTOGRAPHER (S. J. DIXON). W. Kurtz, Eng., N. Y.

RAPID PHOTOGRAPHY.

The American Annual of Photography must circulate everywhere. During the past year I have been called upon, many times, for practical information in regard to my methods of making rapid exposures, and, I am sorry to say, my time has been so taken up that it has been impossible for me to reply to these numerous inquiries, which were, undoubtedly, addressed to me because of the article which I wrote for last year's Annual. The description which I will now give, may, in part, atone for this seeming neglect.

The photograph of Mr. S. J. Dixon walking on a wire rope stretched across the river below Niagara Falls, was made with a plate that I had never before tried. What sort of a plate it proved to be will be determined by looking at the reproduction. While in Buffalo at the late P. A. of A. Convention, Mr. Carbutt gave me samples of his orthochromatic plates. I had exposed all of the plates which I took with me to Buffalo, so when he asked me to try a dozen of his orthochromatic plates, I was very glad to do so. I filled my holders with them, and exposed all of them at or near the Falls with the very best of results. I used the 5 x 7 camera which the American Optical Company made for my rapid work. The lens in it is fitted with a Triplex Extra-Rapid Shutter. The day was a beautiful one; the light good and clear, so that everything was favorable for picture-making.

When the lion of the day made his appearance I was on the spot, ready "to do unto him as he has done to many others." When I told him what I wanted, he instantly consented, and posed without a word of instruction. Before you could say "Peter" I had him in my box. The exposure was made with the lens wide open and the shutter set at slow instantaneous speed. I then changed the tension of the shutter to work in about the fiftieth part of a second, and was ready to shoot him on the rope. I used the lens with open stop, as I always do when making rapid shots.

When I came to develop with eikonogen, I found that the plates had been fully exposed and that their general appearance was as brilliant as I had ever seen. I have yet to see the plate that will give me the gradation in tone, the perfect rendering of the distances, and the exquisite brilliant printing qualities of the Keystone orthochromatic. The first plate, with Dixon balanced on the wire, was shown to an old photographer, who looked at it very critically for some time, and remarked: "Yes, that is a pretty good plate. You took lots of pains to develop that; used a very weak pyro to bring out those half-tones and to get your shadows as clear as that." I told him that I never used pyro in my life, and he gave me a look that I still remember; but when I explained what plate I had used, he remarked: "That saves a lot of trouble, don't it?"

For different work you want other tools, but when you get what you find works satisfactorily, stick to it. As regards shutters, I am satisfied that I can do as much to catch an express train going sixty miles an hour, or to photograph, broad side on, an athlete striding through the air at the rate of 100 yards in nine and four-fifth seconds, with the Triplex shutter as with any other; in fact, I have not yet seen that this has been done with any other form of shutter; but, as we all know, a speedy shutter is of no account if you have not got a rapid lens and rapid plates. I tell you candidly, gentle readers, I would not go through the trial of choosing lenses and shutters again for the glorious honors of a prince. It is experience alone that will tell a man what is right or wrong. Someone may say I cannot use a fast plate. I say give me the fastest. Then another will say, I cannot develop my plates quickly enough. I have worked three hours to bring up four plates of rapid exposures made when it was raining, but it was necessary to have them to know the positions of racing horses at the finish, and I got them. There is a time when development should be rapid, but this is only to prevent plates from frilling. My advice is to get the best of everything, and, when you have it, get thoroughly acquainted with it; watch it closely in action, and it will serve you faithfully.

John C. Hemment.

ALBUMEN PRINTING.

There is no part of photographic work in which failure is so frequent as in albumen printing. Volumes have been written upon the subject, but much of a truly practical nature can yet be said. In most establishments the printing is left to inferior help, and while the proprietor may be a first-class printer himself, he does not find time to keep a critical watch upon all the details of the work, and sometimes he will find that the prints are bad and hardly fit to deliver. Upon investigation the silver bath is found to be too weak and slightly acid; perhaps it is full of albumen, which shows itself by forming a thin scum on the surface of the freshly-filtered bath while filtering; even the best of paper will often be found covered with metallic spots. Remedy: Keep the bath always on the alkali side, which is easily accomplished by using the ammonio-nitrate bath, by the use of a few drops of ammonia, or by a small amount of carbonate of silver (silver precipitated by carbonate of soda), which latter will keep the bath always just neutral so long as any of it remains in the bottle undissolved.

Keep the bath always of such strength that your paper will print with a bronzed effect in the deepest shadows. An addition of a small amount of alcohol will prevent the albumen on very freshly albumenized paper from dissolving and getting into the bath. Metallic spots are caused by dust on floors and tables being stirred up by the rapid movements of the person silvering the paper, by particles of metallic crystals of silver which have not been filtered out, or from particles of carbon thrown off by gas and other heat sources employed in drying the paper. The length of time of silvering is best judged of by the paper itself. Place the sheet upon the bath in a manner to avoid air bells, and quickly breathe upon the long edges of the sheet to keep them from rolling back; then rock your tray gently and watch the paper closely, and just as soon as it becomes flat and limp draw it over a glass rod or the edge of the tray and hang it up carefully to dry. Proper length of fuming is of the greatest importance—paper fumed from ten to twenty minutes may look brilliant and strong while printing, but tones up muddy and measly; but if fumed longer it will tone rich and smooth. With the present favorite brand of paper thirty minutes fuming will be found about right.

Any one of the many known toning baths will produce good tones, providing the paper has been properly sensitized, fumed and printed, but many printers print too dark, and look to the toning bath to bleach the prints back to the proper shade. A greater mistake cannot be made. A good print should possess all the fine details which the negative has, printing only a trifle beyond that point to allow for washing and fixing. Tone your prints until the high lights assume a pearly clearness and stop. One of the very best toning baths is made by neutralizing the gold with bicarbonate of soda, afterward adding a few drops of a strong solution of sal soda, the latter keeping the prints from toning too fast and the albumen from being attacked as it often is when bicarbonate alone is used. Use one grain of gold to each sheet of paper and eight ounces of water. The bath can be used over and over again, but one must be careful not to overcharge it with sal soda, as in that case the prints refuse to tone. Neutralize always with bicarbonate. If bothered by the paper blistering, passing the prints after toning and before fixing through a bath of one part alcohol to two parts water is a well-known remedy. Fix, in hypo one pound, to water one gallon, for fifteen minutes, keeping the prints in motion; use salt water afterward if you think it of any benefit. Wash rapidly and thoroughly, and mount.

O. M. Pausch.

PHOTOGRAPHIC EQUIPMENTS IN MUSEUMS, LIBRARIES, AND THE HIGHER INSTITUTIONS OF LEARNING.

The importance of photography as an aid to the study of, and investigations in, natural science is thoroughly recognized; nevertheless, but very few institutes devoted to the cultivation of these sciences are furnished with facilities for photographing, and, wherever arrangements for that purpose have been made, usually they are poorly equipped. In my capacity as attaché of one of the most extensive museums of natural history, I have had ample opportunity to become aware of the manifold advantages and the various applications of photography in the pursuit of scientific studies. It is my object to speak in the following pages on the more important points of this subject.

If we begin with museums, the importance of having correct photographic reproductions of rare original specimens becomes evident at once. In many instances, but principally in the different classes of zoology, a photographic copy of requisite dimensions when accurately made compensates perfectly for the absence of the original. To show, however, to perfection all the characteristic details of the original, it will be necessary to make several photographs taken from different points of view; to render color-values as nearly correct as possible by employing color-sensitive plates, and to photograph simultaneously with the object a graduated scale or ruler, in order to show distinctly the relative proportions of the object in either enlarged or reduced views.

Occasionally macroscopic photographs are made of natural history objects; but, in far more numerous cases, they are microscopic, and thanks to the perfect condition of some of the photographic equipments of the public museums, it is possible to exchange photographic reproduction of very rare specimens. Had naturalists always been able to procure correct photographs of rare originals, many erroneous synonyms, confusing and embarrassing to the student of natural history, might have been altogether avoided and better information have been obtained of objects, especially of those described in older books, and of which either none or but very imperfect pictures exist.

But there are many other not less important advantages to be gained from photographs, and particularly from photomicrograms. Whoever has had opportunity to compare microscopic objects very much alike in appearance and their distinguishing character but slightly expressed, is aware of the fact that to do so properly necessitates the employment of two microscopes of exactly the same power and the same focal length, or that drawings must be made of the objects by means of the camera lucida and then the comparison be made. How much greater are the facilities for making such comparisons accurately when a good photographic apparatus is at hand.

Photographs of that description might be arranged in the shape and form of catalogues, or copies of them be directly attached to each of the microscopic preparations of the collection. In either case the facility is given for comparing newly-acquired specimens with those already in possession, like those belonging, for example, to the classes of hydroides or bryozooans.

It is better not to devote oneself entirely to the photographing of microscopic objects. To work within more limited precincts, and especially upon the field of systematics, will prove eventually to be more profitable and interesting. Select tables from microscopic literature, photograph and make paper prints from them, divide them appropriately if several specimens are upon one table, and mount them separately upon one card if of uniform size.*

Of rare books it is advisable to copy the letter text and to mount it upon the reverse side of the card carrying the photograph of the object. With text reproductions and occasionally with that of the picture, considerable reduction of size is permissible; in fact, two octavo pages allow reducing to the size of a cabinet card, or 12 x 18 C.c. If a complete and special catalogue of all the classes and species photographed does not exist, reference should at once be made to the literary sources of

* Provided these tables are printed upon one side of the paper only, they may be copied by lichtpaus methods (blue printing).

information. The writer of this has photographed all accessible information on that point, and has found the work by no means as tedious as one would suppose. Exposures for from ten to twelve pages of a book may be well made in from three to four hours, and several plates be developed simultaneously in one tray, and similarly fixed.

Photographic reproductions of illustrated works, or if possible, photo-micrographic pictures form frequently very interesting and instructive displays for the general public, if descriptive text is attached to each individual photograph, or to the photo-microgram.

In one of our largest museums of natural history there is not one protozooan group publicly exhibited. The animal kingdom begins there with its second types, the colloterates. At least a hundred, if not more, photographs of these very smallest and most wonderfully formed animalcules, like specimens radiolaria and foramenifera should be displayed.

Next to zoology the science of botany will derive the most benefit from photography. Besides photo-microscopic pictures of diatoms or the reproductions of illustrated works on the subject, habitus pictures of single plants taken from the flora of foreign countries will be of interest to the systematist.

In mineralogy and petrography photo-micrograms of thinly-ground slices of minerals made by ordinary or by polarized light are of high interest. Photo-micrograms of meteorites of rare minerals and of characteristic mining constructions are quite important to the student.

For the study of zoologic paleontology, a photographic outfit is of incalculable importance. I refer simply to the strata and deposits of rock formations produced by erosive and volcanic action; and the application of photography in zoo as well as phyto-paleontology, of which numerous photographs, multiplied by mechanical printing process, illustrate many valuable works.

Photography will only be applied to public libraries as a means of making reproductions. There are important documents or rare manuscripts and autographs in possession of private parties, or other libraries which it is desirable to reproduce in natural size (true copies of the original), and, when printed upon platinum or arrow-root paper are often quite equal to the originals. Very rare or costly books may be copied photographically, and missing fragments of defective works be supplemented by copies from perfect ones. Editions out of print might be duplicated and made accessible to libraries not possessing originals. By reducing them in size, and printing by photo-mechanical processes, the cost of very rare books will be reduced materially.

The higher schools of learning will depend upon photography to the same extent as do museums and libraries, but its application for special purposes, as, for example, in bacteriology and the making of photo-micrograms, the printing of them on glass and their use for projection by means of the sciopticon offer an enormous wide field for schools of instruction.

It will be seen from the above that an *instrumentarium* for our purposes is not a very expensive matter. A tourists' camera with plates of 12 x 18 C.c. or 18 x 24 C.c. would be quite sufficient for all microscopic work and the photographing of animals in public parks and zoological gardens. The optical part of the outfit should at least consist of one or more objectives of the rectilinear type, and one wide-angle lens. A quick-working instantaneous shutter cannot be dispensed with.

For the making of reproductions a solid camera for plates of 40 x 50 C.c., with a rubber bellows of from 1 to 1½ meters, and a wide-angle lens of corresponding focal length, should be selected.

An arrangement for holding the object to be copied is the next necessity; it should be movable, horizontally, and vertically, and run on rails, to allow either a backward or forward motion. This holder must be of sufficient width to allow large bound books, for example, to rest firmly upon a solid support.

The photo-micrographic apparatus consists of a photo-micrographic camera, an optical stage with Abbe illuminator, or a system of achromatic condensers. I can recommend no better objective than the apochromatic lens made by Zeiss, of Jena, and, as an eye-piece, his projection ocular. The use of Zircon or electric arc lights is desirable. A heliostat, or, at least, a movable plane mirror should be at hand.* Libraries will only require, for reproduction purposes, a wide-angle lens of sufficient focal length, and the arrangement for holding the object to be copied.

In regard to selecting a place where reproduction and microscopic photographs are best made, I would recommend a mansard room with top-light, or, still better, with top and side-light combined. The light admitted by the top window

* Die Micro-photographie als Hilfsmittel der Natur wissenschaftlichen Forschung. Gottlieb Marktanner-Turneretscher. Publ, W. Knapp, Halle, a s, 1890.

is intense and more uniform, and is well adapted for reproductions and rapid exposures. With appropriately arranged curtains the light can be controlled, and quadrupeds, birds, and reptiles be properly illuminated.

Very large objects not easily moved should be photographed at their permanent places, but, as invariably these subjects are but scantily illuminated, one should resort to the magnesium light.

For photo-micrographic work no atelier is wanted. I recommend keeping the apparatus separated from others, and its use in a room exposed to direct sun-light, and with a window that can be closed perfectly light-tight, to serve, if possible, as a dark chamber.

Finally, I will call the attention of my readers to an error very frequently made in the establishing of photographic plants in museums and other scientific institutions. Different departments are generally furnished with separate outfits, to each of which lenses of inferior quality are attached. Had the sum of the money expended been applied to the purchase of the best apparatus, to be used in all of the departments for the pursuit of scientific research, they would have been much better served, the working photographer would be better pleased, and would be enabled to do superior work.

Gottlieb Marktanner-Turneretscher.

PRACTICAL SUGGESTIONS.

When the amateur buys his first outfit and receives instructions how to use it, his ideas as to what he can accomplish with it are generally as superficial as his instructions.

How many there are who give up in disgust, because, through lack of a little practical teaching, they never get a fair start. How many more who never get beyond mediocrity. How few who achieve that success which is the most precious return for money, time, and labor expended.

The fault in many instances lies with the amateur, for not every one is endowed with the artistic sense, the patience, and the willingness to do good, hard work, which are absolutely essential to make satisfactory results possible. But in many, perhaps in most cases, failure results from faulty methods, or from the lack of a sound foundation upon which the student of photography is enabled to rear for himself the imposing structure of brilliant results.

Volumes have been written upon exposure, development, printing—in short, upon all the processes involved in the production of the finished picture, and it would be idle to presume to cover the ground in a short essay. A few general suggestions may, however, be of value.

Even the most experienced can benefit by the study of the methods of others. Frequent discussion with those who make good pictures, a willingness to learn from their successes and to profit by their failures, inspection of their work, and how they did it, watching them while at work—all these are of superlative value, greater by far than theoretical teaching and experimenting with every new brand of plates and with every new developing formula.

It is a wise principle to adopt that but few exposures be made at a time. The photographer should not feel that it is encumbent on him, every time he takes out his camera, to expose every plate in every plate-holder he can carry. Such practice invariably results in a large per centage of plates improperly timed, and of little value as to subject. We should strive rather to deliberately find a subject worth taking, to carefully study the best aspect of the subject when found, to introduce such groupings and accessories as may be available, to consider all the elements determining the proper duration of exposure. If all this is conscientiously done, a good negative is sure to result, and truly it cannot be done many times in one day.

An outing with a camera in a spot favored by nature often offers great temptations to take numerous shots, and the necessary deliberation is forgotten. The best way to remain on the conservative side is to take but few plate-holders with you. Better far to be able to show two or three first-class plates as the result of a day's work than a dozen negatives none of which has your full approval.

The value to the amateur of an active society of photographers cannot be over-estimated. The opportunity for discussion and for comparing work, and the stimulus of artistic results accomplished by others cannot but promote success.

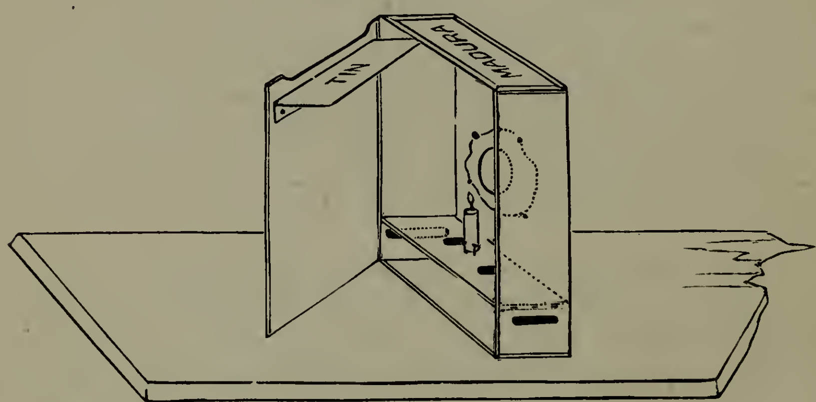
Work for exhibition! The successful photographer, the artist in oil or marble, belong to the same class. If their productions are works of art, the public is entitled to admire them and the artist is entitled to the applause of the public. There can be no greater incentive to the production of fine photographic work than the ambition to earn the appreciation of lovers of art. *Louis B. Schram.*

AN IMPROVISED DARK-ROOM LANTERN.

THE necessity for a ruby light often arises when none is at hand, and no sort of lamp can be converted for the purpose. I was lately caught, when leaving for the summer's vacation, without a red lamp or globe which I could carry, so, after rummaging about, I found a bit of ruby glass, which I put carefully among the clothing in my valise, trusting to invent a way out of the difficulty in due time. And I did—from two cigar boxes, a small piece of tin, and a few tacks.

Cigar boxes are almost as plentiful as tomato cans; so I had no difficulty in obtaining a half-hundred box (one of the long, flat kind), and another which was knocked apart for the nails and wood. An old pair of shears was used to cut out the required tin from the thin end of a sardine box.

The piece upon which the candle is supported by three nails should be fitted carefully, and the ventilation openings



cut just large enough to prevent the candle from smoking. The outside openings are mere slits, slanted downward, like a letter-drop.

The tin piece should not reach the front side of the box by half an inch; the ends ought to fit as closely as will permit the opening and closing of the door. If the inside of the lantern is blackened (with shoe blacking) it will be improved.

The hard stearine candle only can be used as the heat is considerable and any other kind would melt.

It would be better to interpose a sheet of manila or other colored paper between the lantern and the work for safety.

The making of this contrivance occupied part of a rainy day, and, being inexpensive, it was left at the boarding-place for future use or for the benefit of another chance amateur.

Being simple and within the capabilities of anyone, I would recommend the arrangement to fellow amateurs under like circumstances.

C. D. Cheney.

THE ACIDIFIED "HYPO" BATH.

For so many years photographers have been warned against the danger of acid in their "hypo" bath, that the mention, at no distant date, of an "acid fixing bath" would have excited derision only. In many ways this dread of acid is a desirable fright to cultivate, for acid hypo was one of the causes of the fading in old silver prints on paper, and, so many artists' work by "rule of thumb" only, that, unless the fear of acid in their "fixing solution" were constantly held before their eyes, there would be danger of an era of economical experimenting and fading.

A bath of hypo rendered acid by mere addition of acid, such as tartaric, citric, etc., it is not advisable to use. Several unstable sulphur acids result from the mixture, and the inevitable result would be deposition of sulphur, and salts of silver, within the film—be it of albumen on paper, or gelatine upon glass. It has, however, been shown that an acid sulphite may be added to the hypo without any apparent reaction whatever taking place; and this is the form in which the fixing bath is made acid when required.

At this stage some of my readers may ask, "What does all this tend to—why make the bath acid?" The answer is (first letting it be understood that only the hypo bath for negatives is now in question) that, when the bath is rendered acid, it keeps in very good condition much longer than when made in the ordinary way, and it prevents to a great extent the yellowing of the negatives that is brought about when they are fixed day after day in an old bath. Negatives fixed in an acid bath have a crisper, cleaner appearance, are usually free from yellowness, and, in consequence, "print much quicker." It may be safely said that no one who has given the method a fair trial will go back to the old plan.

But it will be well to point out certain governing conditions in the use of fixing baths generally. A given weight of hypo can only take up a certain amount of bromide of silver, and, if the bath approach saturation-point, the result of using it may be the production of insoluble salts of silver within the film, which eventually decompose and lead to the destruction of the quality of the negative, or, perhaps, cause a so-called fading. Hence, it should be a rule of working always to use a large overplus of the salt to be on the safe side as regards permanency.

Then as to the yellowing, the real cause of which is not by any means well understood: When there is no sulphite in the developer, the discoloration always occurs through the products of decomposition of pyrogallol staining the film; with sulphite in the developer this is minimized to a greater or less extent, but not always prevented entirely.

Singularly enough, another cause (for years well-known to me and very likely to others) had not been publicly mentioned till Mr. Cowan, at the London and Provincial Photographical Society (England), pointed out that the employment of hypo after being previously used for fixing would cause the yellowing. This is perfectly correct, and it is strange that no one before called attention to the fact. I would, however, add here that very much depends upon the character of the film as to the extent it will discolor. A thin film will, in ordinary hypo, remain uncolored when a thick one would be a dark yellow. The same will be observed when using acid hypo: if working with one kind of plate the bath may be used for days, while another kind will begin to discolor after comparatively brief use. It is such unnoticed variations of conditions as these that cause the discordant verdict we so often peruse when novel modes of treatment are written about.

In conclusion, I may say I have, since I first used acid in the "hypo" bath, developed it with many hundred-weights of hypo without any evil results, and with great benefit to the appearance of my negatives.

It is said that the best plan is to use the bisulphite of soda of the shops. But this is not so readily obtained as ordinary sulphite, and it does not keep well. Hence, I use, for the sake of uniformity, re-crystallized neutral sulphite, and I acidify it with sulphuric acid, as being cheaper and just as good as any of the crystallized acids, tartaric, etc., more usually recommended. Here is my formula:

Sulphite of soda	2 pounds
Strong sulphuric acid	2 ounces
Water	1 gallon

Mix the acid with a pint of the water; dissolve the sulphite in the remainder; add the two liquids together.

Of the solution so made, add half a pint to each pound weight of hypo when dissolved to the required strength.

G. Watmough Webster, F.C.S.

A PLEA FOR THE STEREOSCOPE.

The present limited popularity of the stereoscope seems to be due to several causes. First of which is probably the great number of cheap and miserably-made pictures and stereoscopes which have been offered to buyers, only to give disappointment to and strain the eyes of those attempting to use them.

Next, we may mention the choice of unsuitable subjects, or rather not selecting suitable ones. For instance, a large building, or any subject composed of straight lines, will be nearly as well rendered by a single view, but when we want a picture of some view or object comprising curved lines or complicated structure, such as many beautiful little bits in woods and rocks, there is nothing to lead the eye to vanishing points. The perspective given by the binocular view of the stereoscope photograph is the only thing that will really bring out the beauty of the scene as can be easily proved by comparing one of the pictures with the combined view of both.

Those photographers who limit themselves to the hand camera need not forego stereoscopic work on that account, as all that is necessary is to make two consecutive exposures with the same view in the finder, only taking the precaution to move the level camera about three inches either to right or left of its first position when making the second exposure.

When these are developed and printed in the usual way they may be mounted side by side in the same relation to one another that they were taken, of course making the centers correspond or on the same horizontal line.

To be sure of the amount to move the camera a small upright stick or little tree may be used as a guide.

Instantaneous views of *moving* objects cannot be made in this way, but many other pleasing pictures can be made for the stereoscope, and while there may be difficulties it is well known that the photographers delight is to overcome all such obstacles.

Theodore H. Lüders.

MAKE YOUR OWN CONTRIVANCES.

Several years ago, considering myself entitled to graduate from the "cramped quarters" assigned to me by domestic authority, for the practice of amateur photography, I concluded to build a suitable laboratory and dark-room. I selected a spot, distant some two hundred yards from my dwelling-house, and erected thereon my present quarters.

After carefully planning the lower story into laboratory, dark-room, printing and store-room, I found that my first intention of having only one story would give me a building too low, so, devised a second story to use as a carpenter and tinkering-shop. Scarcely a day passes that I do not thank my stars that I so decided.

I have a large cabinet-makers' work-bench, jig-saw, lathe, vise, bench, drawing-table, and so much light that it must be a dark day, indeed, that I cannot see to work.

The pleasure that I take in repairing plate-holders, making possible, and, I am sorry to say, impossible snap-shutters, fitting brass-work, and the hundred-and-one things about and belonging to the pursuit of our fascinating hobby is beyond expression.

My lathe is fitted with a mandrel that takes an 8-inch circular saw, which, with its tilting-table arranged to tilt in two ways, enables me to make miters, rabbets, and grooving so quickly and easily, that making plate-holders of every kind is but play. That all my experiments in this line are not the "holder of the future" may go without saying—but, then, I have lots of fun at it.

I fit bayonet-joints, adapters, drill diaphragms, turn screws, make focusing-gears—in fact, all the brass-work in and around the camera, thus making a dark, rainy or snowy day as much of a busy one as were the sun shining ever so bright.

My dark-room, owing to the shop overhead, is fitted up—so many of my friends say (and my visitors, of both the professional and amateurs, are numerous in summer)—with more real serviceable and practical conveniences than any dark-room they have ever seen.

Well, I think a large percentage of amateurs are handy with plane, saw, and lathe, but I am much astonished to find in my rambles that the number who really tinker out their ideas is infinitely small. I labor and argue with them, and, I am happy to say, with great success in several instances. I have implanted the fondness for carpentery and lathe-work among my amateur friends to such an extent that I often meet them with home-made appliances that are very ingenuous and thoroughly practical, which they show with an immense amount of pride. So my advice to all my brother amateurs is to take out their jack-knives and whittle away. Read "Dicks and Spons' Capital Workshop Wrinkles," which, with the photographic annuals, monthlies, and weeklies, should so fill their minds with ideas that it must needs be an extraordinary emergency that will not find them equipped to meet.

Apropos of this, I think the most useful thing I have in both shop and dark-room is my *scrap-book.* I try never to let a receipt or formula escape me, but snip it out and paste it in. Said-scrap book is now in three volumes, duly indexed, and, I assure you, much more handy than a "pocket in a shirt."

Nowadays the wonderful excellence of all camera-work turned out of our supply houses renders it extremely rare to find many defects, but they do exist, and then, I think, when distances are great and time short a shop *just under your eye* is a godsend. Therefore, I say, have one, by all means, and the more you work the more joy there is in doing it.

C. H. Poor.

TESTS FOR HYPO.

As the permanency of the finished prints depends, to a great extent, upon the thorough elimination of every trace of hypo in the final washing, it is well to have some reliable tests to determine the same. The iodide of starch test is reliable, but not in general use among photographers. It is prepared by adding tincture of iodine to starch dissolved in boiling water. Add water till it is of a pale blue color. To test, add some of this solution to the last wash water. If hypo is present, the blue will be dispelled.

Another test, and one given by Wall, in his "Dictionary of Photography," is made by dissolving

Potassium permanganate	2 grains
Potassium carbonate	20 grains
In distilled water	40 ounces

A few drops of this purple liquid added to the last wash water. If hypo be present, the purple will be changed to a greenish tint.

A few drops of the printing bath may be added to the last wash water, and if hypo be present a yellow cloudiness will make its appearance.

But the most simple test, and one thoroughly reliable, is made with iodide of starch paper. It can be procured of any stock dealer, and comes in small books. A piece of this paper is put in the last wash water. If hypo is present it will bleach out white; if no hypo is present the paper will turn purple and remain so.

Cards, blotters, etc., can be tested by soaking them in water and then testing, the same as for prints.

J. R. Swain.

STICK TO ONE DEVELOPER.

Last year I endeavored to point out to the amateur a smooth road, if pursued with a little common sense, for the exposure of bromide gelatine-coated plates, and a topic for this year was suggested to me the other evening by an artist friend telling what success he had through "mixing." This is very indefinite to the uninitiated, but means simply hydroquinone and eikonogen.

There has been no year in the history of photography, perhaps, since the one of Daguerre, that has developed as much as the one just past. It has had a newly discovered "developer" every month; some of them, in fact almost all the result of amateur experimenting and research, but to the beginner it is dangerous and discouraging work, for if he is not complete master of a developer, it is foolishness to endeavor to get better results by trying another. If you succeed with the old style of developing with pyro, continue its use until you feel master of its qualities. Then take up hydroquinone, eikonogen, para-amidophenol, or any new one, but do not think that to be successful in the art, you must have your developing-shelf covered with all the latest developers, and your mantel-shelf crowded with miserable results, illustrating the tangle pyro and its competitors will get you into.

Nearly every amateur of experience will endeavor to persuade you to use his developer, claiming he has such fine results, etc., which may be so; but upon inquiry, you will find in nine cases out of ten he does not know anything about your developer. All of the developers and formulas have a similarity, a drachm of this and an ounce of that, and one naturally thinks that they must be easier than their own to

Harry L. Ide, Photo. "GRACE IDEAL." Electro Light Eng. Co., Engrs., New York.

manipulate, and it is here that the mistake is made. In the manipulation one requires bromide, another ammonia, and another something else, and so on down the list, each one of the requirements demanding a study of their effects before success is attained in either experiment, and while we are all ambitious, it is far the best to go slow and know "why" and "what" as we strive for a perfect negative, and a finished photograph.

George E. Merry.

STELLAR PHOTOGRAPHY.

The study of astronomy has been of late very extensively assisted by stellar photography as an auxiliary.

It has been generally assumed till quite recently, that when the time of exposure of a photographic plate is extended two and one-half times, stars of the next following magnitude may be photographed. Were we, for example, able to photograph, in one minute, stars of tenth magnitude (which can be done very well with a modern instrument constructed for the purpose), stars of eleventh magnitude could be taken in two and one-half minutes; stars of twelth magnitude in six minutes, fifteen seconds, etc.

The very smallest stars, those of fifteenth magnitude, seen only by the aid of the most powerful telescopes, could then be photographed in one hour and fifteen seconds, and by further multiplying the time of exposure, we would be able to penetrate the deepest depths of an infinite universe.

Investigations made by Dr. Scheiner, of Potsdam, have, however, shown the assumption to be ill-founded, and that with an exposure prolonged two and one-half, but a fractional part, half to three-fourths, of magnitude difference can be reached, and that, even under most favorable circumstances, an exposure of eight hours is necessary to photograph stars of the fifteenth magnitude.

The achievements of stellar photography, nevertheless, are enormous. With the recently-constructed telescopes, intended for photographing of and mapping out the new chart of the heavens, all the stars of Argeland's "Complete Review" (Durchmusterung), 324,188 in number, can be photographed in half a minute, and, reckoning 22,000 plates for the whole extent of the heavens, the work can be done in 183 hours. Formerly an age would have been required to do it.

Very long exposures are not so objectionable after all. It is true, that it is very tedious work to expose a plate for three or four hours, keeping the telescope properly directed towards the object. This requires undivided attention, but one is richly compensated for all the effort when the plate is developed and shows the pictures of thousands upon thousands of stars. It is furthermore possible to interrupt exposure, and to continue at the next favorable night. Max Wolf, of Heidelberg, has made very interesting discoveries by the latter method, and I proceed similarly when studying celestial objects with but limited light. After one exposure of from three to four hours, star-light appears generally as but a feeble vail, and very long exposures becomes thus impracticable.

One is inclined to think only very large instruments; lenses of an aperture of from ten to twelve and more inches, are serviceable in celestial photography, but Max Wolf has found ordinary photographic objectives quite sufficient in power to make highly-interesting investigations, inasmuch as they offer a very large field of vision, and with it the possibility of pursuing the study of the larger nebulæ, or portions of the "Milky Way," far better than with large lenses.

It is really astonishing to see what can be done in stellar photography with a small lense (I use one 34 mm. aperture); photographing with it, and, by an exposure of at least three hours, many thousands of stars of certain regions of the "Milky Way" will be taken on a plate of 6 Cm. in diameter. These stars appear in closest proximity to each other, and may be compared with beaded fabric.

All large refractors should be furnished with small photographic cameras and objectives of high luminous power (portrait or antiplanet), even when of such small aperture as 48 m.m. Much more interesting investigations can be made with them than with large lenses, unless specially constructed for the purpose.

As far as the scientific application of stellar photography is concerned, it is well understood that with it most perfect accuracy is attainable, because of the great convenience of effecting measurements from sharply-defined and immovable pictures. The uniform axial rotation of the earth, a standard measure in ocular observations, is out of the question here, of course; nevertheless, photographs can be most accurately measured in all directions, and in all co-ordinates with unvarying sharpness.

Changes occurring in star nebulæ, or from the individual motion of stars, may be correctly determined when negatives of these objects taken in considerable intervals of time are superposed upon each other; even the slightest variations are seen.

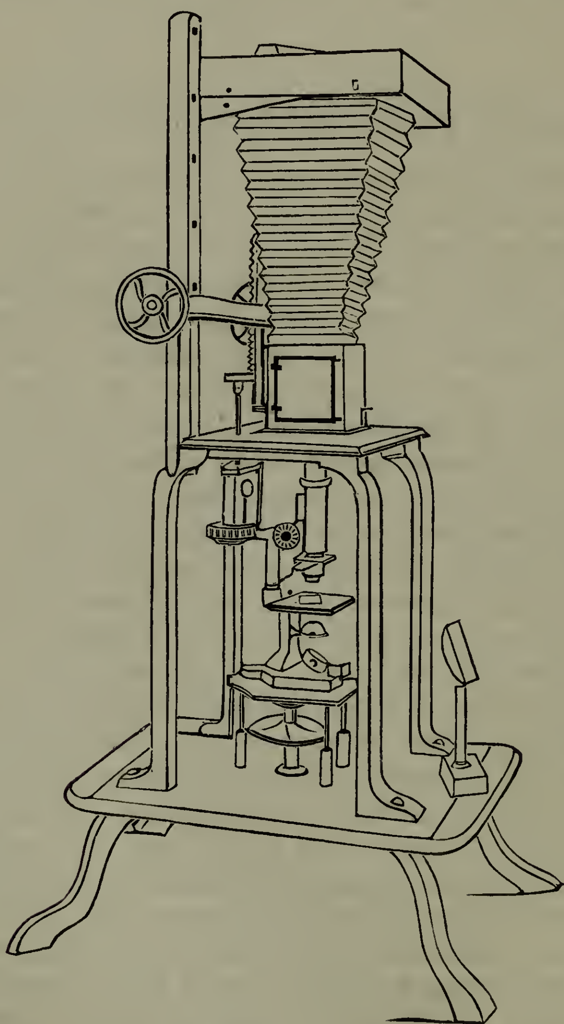
The value of stellar photography in astronomical observations will be proved in time, because of the discoveries and means for recording them, which it is quite impossible to obtain by other methods.

Eugene von Gotthard.

AN IMPROVED PHOTO-MICROGRAPHIC APPARATUS.

Photography is the auxiliary of science. The accuracy of the design, the rapidity with which it is obtained, and, above all, the certainty that the work has been done without any preconceived idea, without one taking any part in it, has made it the indispensable accessory of all discussions based on microscopical observations. When the observer looks at infinitely small subjects, he is alone in presence of what he sees, and very often his imagination plays a very important part in describing his observations; but, with photography, there is no imagination, no interpretation—only solid facts, and, as the reproduction is exact beyond a doubt, it becomes possible for several savants to co-operate, while, without it, they could never be certain of having seen the same facts, the same phenomena, and the same details of the object; therefore, since the early days of photography, efforts have been made to clear the field, yet mysterious, of microscopical observations, and from 1840 we find MM. Douné and Foucault engaged in this work, and presenting to the Academy of Sciences the results of their investigations. This first impulse did not slacken its course, and every year we meet with new publications and new apparatus. America has held a distinguished place in this scientific tournament, and any one who has taken any interest in photo-micrography knows the name of Woodward, whose work has never been excelled in beauty. But the means employed by this American savant are not within the reach of all—and it is by multiplying the number of operators that the number of discoveries will be multiplied.

This is well understood by the manufacturers of microscopes, and many kinds of apparatus have been devised for the photographic reproduction of microscopical objects, especially since the discovery of Pasteur brought bacteriology forward as one of the principal fields of medical research. But bacterias are prepared in resinous compositions, as also many histologic preparations, and even diatomaceœ, which for a long time held the first rank among microscopical subjects, are equally prepared dry or in solid media; hence, the horizontal position of the apparatus—but many interesting microscopical subjects are made by means of liquids—and very often the observer



would like to keep traces of facts which he may meet in an extemporaneous preparation. This cannot be done with the horizontal apparatus, and, besides, it would necessitate the use of a microscope with an inclined body—always a high-priced instrument. This difficulty has been obviated with the instrument which we wish to describe, invented by the successors of the well-known house of Prazmowski, Messrs. Bezu Hausser & Co. The apparatus is simple, strong, easy to handle, not cumbersome, and as may be seen by the accompanying cut it is vertical and can therefore be used with dry and liquid preparations. A recent improvement makes it possible to use it with an ordinary photographic lens of short focus; which presents the advantage that quite large subjects can be photographed, even when it is necessary to keep them in a shallow tray under a coating of liquids. It is therefore suitable for all the operations which take place in the laboratory.

It consists of a stool, 20 C.m. high, with a nicely-polished walnut table, 99 C.m. in length, 49 C.m. wide, supported by four legs.

On the center of this table is placed a brass tripod which may be raised or lowered at will by means of a flying-screw between the legs. This tripod is to hold the microscope, which may be of any make whatever, and, as it is used vertically, the most simple and least expensive instruments can be used. The model of microscope used by the manufacturer is their own bacteriologic microscope, combining all the improvements made in late years on those wonderful instruments which have revolutionized modern science, but, as we have said, any instrument may be employed even to the simplest and cheapest.

The microscope is fastened on the table of the tripod by means of cleats and pressing-screws, which firmly hold its legs. It thus becomes solidly fixed on its support, and can only be raised or lowered with the latter.

This camera rests on a second table made of finely-polished walnut, which stands on four very rigid legs. On the center of the camera is cut a hole through which passes a brass tube lined with black velvet, into which the microscope is introduced. It has a draw of about a meter, and the focus is obtained with a double rack and pinion movement, very accurately and finely adjusted on two upright posts, which are only the continuation of two of the legs which hold the table on which the camera rests.

It is not always easy to focus microscopical objects on the ground glass, therefore Messrs. Bezu, Hausser & Co. had the good idea of placing between the camera and the microscope a kind of square, small box, in which there is a looking-glass which may be given an inclination of 45 deg. It receives the image produced by the microscope and reflects it on a finely-ground glass placed on the side of this box. Hence, owing to the bright light which lights the object, one can adjust the preparation with the greatest facility, place any part in the center of the glass and take an approximate focus. This done, the looking-glass is shifted on its pivot until it rests against the side of the small box and allows the luminous rays to pass through freely, defining the image on the ground glass of the camera. The mirror is manipulated on the outside of the box with a lever.

All those who have tried microscopic photography know that it often happens that the focus taken with the microscope needs rectification on the ground glass. It may be necessary to modify it slightly if the lens of the microscope has a chemical focus, and this presents a difficulty as much greater as the focus is longer. The makers of horizontal apparatus have had recourse to copper shanks working a pulley on which twists around an endless thread, passing over the head of the micrometric screw, which produces the slow movement of the microscope, and thus allowing the operator to watch the focusing on the ground glass. This device has many disadvantages—the thread is apt to slide over the pulley, and a great deal of time is wasted and patience exhausted. With the apparatus which I now describe this does not happen. As can be seen by the cut, behind the small box attached to the camera, there is a shank with an indented head. This shank has, at the lower part, a small copper wheel lined all around with rubber, in the style of a velocipede wheel. The head of the screw which works the slow movement of the microscope is also covered with rubber; these two pieces when brought in contact acquire a certain adherence, and the least movement imparted to the shank is instantly transmitted to the slow movement, and focusing becomes as easy and exact as by working directly the micrometric screw of the microscope.

In addition to these advantages I will mention that all the modes of lighting are applicable to this apparatus, and that one can obtain images of 18 C.m. in diameter, which is more than sufficient for micrographic studies. This apparatus has been adopted in many laboratories. I think that owing to its simplicity and the ease with which it can be employed, a great number of amateurs will be able to devote their attention to this branch of photography, and that many useful discoveries will be the result of their investigations.

L. Perrot de Chaumeux.

THE MOST RAPID DEVELOPER.

Professional photographers find two defects in the hydroquinone developing bath: 1st, It produces harsh images without details in the shadows; 2d, the development is slower than when using any other re-agent. These defects are noticed, especially when the hydroquinone bath contains sulphite and carbonate of soda—a type of the bath introduced in the practice of photography since 1883 by Pocklington.

It is, however, quite easy to remedy this real inconvenience, and to produce with hydroquinone and the gelatino-bromide plates negatives possessing qualities similar to those which were in former times obtained with wet collodion and the iron sulphate developer. The following formula permits us to reach that end:

Water	1000 C.c.
Sulphite of soda, crystallized	100 Gm.
Hydroquinone	10 Gm.
Yellow prussiate of potash	5 Gm.
Caustic soda	20 Gm.

This solution keeps for a very long time.

In studios where a great number of plates are used, one can rapidly prepare the developing solution necessary for the work of the day in mixing by equal volumes the following solutions, which we call solutions of reserve (stock solutions):

A.

Water	1000 C.c.
Sulphite of soda	200 Gm.
Yellow prussiate of potash	10 Gm.
Hydroquinone	20 Gm.

B.

Water	1000 C.c.
Caustic soda	40 Gm.

The two solutions A and B are kept separately in well-stoppered vials. To develop a plate 13x18 centimeters, one takes 30 cubic centimeters of A and 30 cubic centimeters of B, and mixes in a graduated glass. With good commercial plates the image is developed in from twenty-five to sixty seconds by the use of this mixture at the temperature of 15 deg. Celsius, and does not show any trace of fog if there is not an excess of exposure.

An excellent developer for instantaneous images, to which it is seldom necessary to add any bromide, is made by using

500 cubic centimeters of water in lieu of 1,000 in the solutions A and B.

On its removal from the developing bath, and *without washing it*, the plate is immersed in the solution following:

Water	1000 C.c.
Bisulphite of soda in conc. solution	15 Gm.
Sulphuric acid	4 Gm.

In this the plate is left for a minute, during which period the tray is kept in constant motion, then placed in the fixing bath, *always without washing it:*

Water	1000 C.c.
Hyposulphite of soda	200 C.c.
Bisulphite of soda, sat. sol	50 C.c.

This method of operating produces very brilliant negative images of a good color, and in period much shorter than that required by the other processes.

The last washings are done in the usual manner.

C. Favre.

THE REVIEW OF THE YEAR.

The foregoing articles in this volume of the American Annual of Photography and Photographic Times Almanac, written as they are by the most eminent photographers in this country and abroad, are, in themselves, the most adequate review of the advances made in photography during the past twelve months. Adding to these articles the list of photographic societies, revised to date, and embracing all the new photographic associations organized in various parts of the world during the year; the list of new books on photographic subjects published in every language of the globe; the record of photographic patents which have been issued during the year; the new tables which have been added to the standard formulas and useful receipts; the various illustrations, pictorial and scientific in character, which embellish the book, showing as they do at the same time the representative reproduction processes now in use and the improvements which have been made in the various departments of actual photographic practice, we have the most complete record of photographic progress which it is possible to obtain. But it may be desirable to emphasize some of the more significant advances, in this necessarily brief review of the year, by calling attention especially to them.

In the early part of the year there was a great deal of interest excited in color-photography by the announcement that the secret had been discovered in France by Professor Gabriel Lippmann; but when the results of Professor Lippmann's experiments were compared with those of Edmund Bequerel, which were made more than twenty-five years ago, it was found that he had progressed no further towards solving the great problem than his predecessors. There is much more to be hoped from the investigations of Dr. M. Carey Lea, of Philadelphia, who has probably reached a point nearer the desired end than any one else. He has not only shown us the various colors of his so-called photo salts, but his latest observations have led to the hope that the silver existing in allotropic conditions may lead to explanations of several phenomena.

All these experiments have increased the interest in orthochromatic photography, and, as a result, orthochromatic plates are much more widely used now both by professional and amateur workers than ever before. They alone are employed in celestial photography, the photographing of electric phenomena and in all experiments to determine the light force of various sources of light. Microscopists prefer them for all their photographic work, and they are being more widely used every day in the professional's studio for portrait making.

In the manufacture of dry plates no particular advance can be recorded, though they are probably made more sensitive now than ever before. Gaedicke, of Berlin, has announced the invention of a collodion emulsion, equal in sensitiveness to the most sensitive gelatine emulsion, which is easy to manipulate, and is capable of producing results rivalling those by any other method. The details of the process have not as yet been made public, but the old wet plate workers are looking forward to Gaedicke's invention with confident expectation.

As in previous years much attention has been given to the development of the latent image. New agents and old ones with new names have been brought forward and highly recommended. Most of these agents have been found to be compound bodies of substances heretofore known, and which do not show material advantage over the simpler forms hitherto used. But an entirely new substance, the "para-amidophenol," has been lately brought to our notice. It is a coal tar derivative, a powerful developer, and one of its properties—that it does not stain the gelatine film yellow under any circumstances, even after having been repeatedly used—yields an advantage not offered by any other organic developer.

The reversal of the image by thiocarbamide in conjunction with eikonogen continues to attract attention to the ingenious experiments made by Colonel Waterhouse some months ago; but although efforts to make his method practical are continually being put forth, the desired result has not yet been attained.

Eikonogen has almost entirely superseded ferrous-oxalate in the development of lantern-slides and other glass positives on gelatine emulsion plates.

Extensive experiments have also been made in this country in printing with diazo combinations, and in primuline printing on fabrics and paper. By applying different developers, such as resorcin, naphthylamin, eikonogen, upon primuline-stained material, many different colors of great brilliancy may be obtained; but the ground invariably retains a decided yellow tinge which prevents the process from becoming popular. An old process of printing in colors—that with metallic resinates in combination with aniline dyes—has been revived, and the beautiful products obtained with it speak very encouragingly in its favor.

Another printing process has been brought forward during the past year which promises to become a rival of the so-called Lichtpaus methods; it is printing with the salts of iron, commonly known as kallitypy. The process has been worked by Americans with a good deal of enthusiasm, and many improvements on the original process have been made in this country. It has been simplified by the employment of an organic double salt of iron, developed with acidified silver nitrate.

While the old albumen silver process still holds its own, the various methods employing chloride of silver, emulsified with gelatine or collodion, are becoming its serious rivals. The method of toning and fixing in one bath simultaneously, the absence of fuming in ammonia and the ability to make a brilliant print from a feeble negative, are some of the advantages which these methods possess. Platinum printing has not grown in general use so much as might have been expected from its popularity one year ago, probably on account of the increased cost of the precious metal employed. Bromide paper is now manufactured in which warm tones may be obtained without discoloring the whites in any degree.

The establishments in which the photo-mechanical reproduction processes are worked have been largely increased in numbers during the past year, and all seem to be busily employed. These methods of illustration are driving wood cuts and the older methods almost entirely from the field of newspaper and book illustration. Photography is every day widening its sphere of usefulness. Several new methods have been introduced as interesting as they are ingenious; that by which relief plates are prepared by means of sand blasts being represented in this volume of The Annual. In color printing from original photographic negatives several important improvements have been made by Mr. Ives, of Philadelphia, and others.

In the manufacture of lenses the most important advance is probably that made by Carl Zeiss, who has adopted Jena glass for the construction of photographic lenses, and obtains thereby objectives perfectly free from spherical aberration and astigmatism. These new anti-astigmatic lenses, as they have been called, have already found their way to this country.

In the manufacture of photographic cameras and other apparatus considerable progress can be reported, in the construction of hand cameras especially great ingenuity having been manifested. Perhaps the most convenient hand camera, all things considered, possessing more advantages than any other, is the "Henry Clay," manufactured by the American Optical Company. Other improved forms of cameras which have been made during the year are the convenient "Triad" hand camera and the useful little "Knack."

Photographic literature has been more largely augmented by new and valuable instruction books this year than ever before. A glance at the list of new books will show the progress which has been made in this direction. In practical instruction in photography the Chautauqua School of Photography still stands at the head in this country, if not in the world. In its classes more students have been practically taught the art and science of photography than in any similar institution in the world.

Photography as a business has not been all that could be desired, though good work now, as always, commands good prices, and the most successful photographers are those who are doing the best work and getting the highest prices for it. The average of artistic excellence, both in portraiture and landscape photography, is undoubtedly higher now than ever before, and the probabilities are that 1892 will be a more prosperous year for the professional than the twelve months which have just passed.

As usual at the end of the year, it is necessary to record the honored names of men well known in the photographic fraternity who are no longer with us. Some of these names are:

The renowned John A. Whipple, of Boston, probably the first one who made negatives on glass in America; R. A. Lewis, a pioneer in American photography; James Forbes, well known as an experienced operator; Walter C. North, a prominent and old-time proprietor of a well-known photographic studio; Dr. H. D. Garrison, of Chicago; Edmund Becquerel, the photographic investigator; and E. J. Partridge, the photographer and photographic merchant of Portland, Oregon.

THE PICTURES.

Before speaking particularly and individually of each of the pictorial illustrations which embellish this volume of The American Annual of Photography, the editors wish to express their appreciation of the high standard of photographic art which has been attained not only by those who have made the negatives which illustrate this book, but also by those who have reproduced the negatives and printed them for these pages.

Never has a photographic publication been brought out, we feel safe in asserting, with so many illustrations of an equally uniform standard of artistic and other excellence, and so variously, while at the same time excellently, reproduced by the different printing methods.

Our circulation has grown much too large, of course, to admit of illustrations by those processes which depend solely upon the sun's light; but the other, and by far more numerous, printing methods commonly spoken of as "photomechanical," in the perfection of which most attention is being paid by experimenters in these days, have been adequately represented in this volume of the Annual.

The subjects which have been selected for illustration were chosen from a large number of photographs submitted with a view to present, in a single volume, characteristic specimens of the progress which has been made in the various fields of photographic practice. Some were selected for artistic excellence alone; others, for the interest which attaches to the subject depicted; while still others were accepted because of their great "technical" merit, as photographers speak of certain excellencies of the negative.

Both professionals and amateurs have assisted the editors in this matter by contributing of their best, and we wish to extend our hearty thanks to all who have sent us specimens of their work, both those who are represented in this volume, and those who showed the same interest in our ANNUAL by submitting their prints.

We invite ALL to "try again." However gratified those may feel who have assisted in making this issue of the AMERICAN ANNUAL OF PHOTOGRAPHY the success which it is, we all desire to make the volume for 1893—The World's Fair Year—a still greater success. *All* who read these pages are cordially invited to co-operate. Choose your own subject and send in your results promptly. To those who are in any doubt as to the most suitable subject for illustration, we commend the article in this volume by H. P. Robinson ("The Use and Abuse of Models," page 144). And this volume itself, as well as those which have preceded it, suggests the kind of pictures wanted by those it contains.

We should like to make THE AMERICAN ANNUAL OF PHOTOGRAPHY AND PHOTOGRAHIC TIMES ALMANAC FOR 1893 a truly UNIVERSAL ALMANAC, as suggested by *Mr. Hamfeldt*, of Finland, in his article on page 141. Let us all unite in making the Seventh Volume of THE AMERICAN ANNUAL OF PHOTOGRAPHY a fitting exponent of the photographic achievements of The World.

"FLIRTATION."

Our photogravure entitled "Flirtation" is from a negative by H. McMichael, of Buffalo, who has distinguished himself by so many notable products of the camera. "Flirtation" is one of the best. It was exhibited at the late Buffalo Convention of the P. A. of A., and elicited wide-spread praise at that time. It has won Mr. McMichael favorable comment in many other fields as well, and is therefore entitled by every right to the prominent position which has been awarded it in this volume of the American Annual of Photography. The copper-plate engraving was made by the New York Photogravure Co., and is an unusually fine speciman of their artistic method.

"A Baden Highland Peasant."

This is the interesting photograph reminding one forcibly of a scene in Charlotte Birchpfeifer's "Dorf und Stadt," when *'s Lorle* is reading the letter of her absent lover.

The negative from which this cut was made is a contribution of Herr Oscar Suck, a famous German photographer, and the proprietor of an establishment in Karlsruhe, which is unrivaled in elegance of appointments and working facilities.

Herr Suck justly enjoys the reputation of being an artist-photographer of the very first rank. The reproduction was made by the Electro Light Engraving Company, of New York.

"A Village Scene in Austria."

This plate and that of Her Imperial Highness, the Archduchess Maria Theresia of Austria, were made by the sand-blast method described on page

Lieutenant-Colonel and Imperial Councilor Herr Ottomar Volkmer, under whose direct supervision the plates were prepared, is a highly distinguished photographer, well versed in all, and the inventor of several, reproduction processes. He is the director of the Vienna military geographic institute, so celebrated for its attainments in cartography.

The Lieutenant-Colonel is not unknown to our readers, for he is a frequent contributor to the American Annual of Photography, and the *Photographic Times.*

"Portrait of Her Imperial Highness the Archduchess Maria Theresia of Austria."

The august lady whose portrait accompanies the description of a new process of photo-engraving is, herself, a distinguished photographer. She is the patroness of the Vienna Club of Amateurs, and the recipient of many premiums, awarded for excellence in her own photographic productions.

Her Imperial Highness is a reader of these volumes, and of the Photographic Times, and has, on several occasions, displayed a lively interest in American photographic matters. We take especial pleasure in presenting so excellent a portrait of this royal photographer to our readers.

"Bye Bye, Papa."

Our pretty child picture, accompanying, was made by Dr. J. Edward Line, of Rochester, N. Y. "The lens was a Gundlach $6\frac{1}{2} \times 8\frac{1}{2}$," writes Dr. Line, "with Iris diaphragm shutter, the opening being full, and the exposure instantaneous. I held a bunch of keys just 'out of harm's way,' and at the right moment shot him off." The little boy is caught in the act of calling "Bye Bye" to his father as he leaves home in the morning for the daily toil. The negative is reproduced by the Electro Tint Engraving Company, of Philadelphia.

"Grace-Ideal."

The pretty cow portrait is from a negative by Mr. Harry L. Ide, an amateur of Springfield, Ill., and was made with a Voigtlander extra rapid lens, on a Carbutt special plate, the exposure being made as quick as the lens could be uncapped and recapped again. "Of course I made a number of failures before I obtained a satisfactory negative," writes Mr. Ide. "I had to watch for a day with light floating clouds, and in order to get the background I wanted, I had to place the cow on the crest of a hill. The animal is a pure blooded Jersey, owned by my father, and named 'Grace-Ideal.' She had to be bribed in order to make a pretty pose, by feeding her some oats." Mr. Ide has certainly succeeded in making an attractive animal portrait, a feat which all who have attempted understand just how difficult it is to accomplish. The reproduction is made by the Electro Light Engraving Company, of New York.

"Herr Nesper as 'Wallenstein.'"

This is an excellent illustration of *Wallenstein's* soliloquy in Schiller's immortal tragedy. The stern countenance of Herzog Friedland is in harmony with his thoughts and his expression, reinforced by the attitude of his body.

> "Da steh' ich ein entlaubter stamm
> Doch Innen, im Marke wohut die schaffende Gewalt"

is the sentiment of the poet, and the *motif* of the picture, which is so well executed.

Herr Heinrich Riffarth, of Berlin, to whom we are indebted for this plate, is one of Germany's foremost photographers.

In photo-mechanical printing he has attained to highest perfection his autotypes and photogravures, enjoying world-wide reputation.

"A German Bourgeoise,"

of the mediæval age, is by our old friend Frederick Müller, of Munich, whose name is represented by instructive and interesting essays in every one of the six volumes of The American Annual of Photography.

The negative from which this "lichtdruck" plate made was developed with ferrous oxalate and is of unusually fine qualities.

Herr Müller is well known to American photographers, at least his productions are, for they have been repeatedly exhibited in this country and suitably rewarded.

This excellent picture was reproduced for our Annual by the Albertype Company, of New York.

"A Torpedo Well."

The picture of the torpedo well which Mr. Erastus P. Roberts, of Titusville, Pa., has contributed to this volume of the Annual, is an unusually interesting one, not only for the subject which it depicts, but also for the additional reason that it is the first photograph of such a subject which has yet been published. The well itself is within a stone's throw of the historic "Drake" well, the first well ever drilled for oil, and was torpedoed, almost to a day, thirty years after that well made its first flow. No reproduction, of course, can do full justice to a negative of this kind. There is an amount of detail in the spray which it is impossible to preserve. It is moreover a very difficult matter to make the negative without special apparatus, for, as Mr. Roberts writes us, there is great danger in photographing a well undergoing the process of torpedoing, not only to the camera, but also to the operators if they approach too near the flying stones.

Erastus T. Roberts, Photo. A TORPEDO WELL W. Kurtz, N. Y., Eng.

"Engaged."

The ring and the facial expression of the fair interrogatee tells the story of this picture.

The excellent reproduction is a specimen of the "Ives" method of photo-engraving in half-tones, etching in zinc, and printing on the ordinary type-press, by the Crosscup & West Company, of Philadelphia.

"At Play."

We are happy to present to the readers of the Annual another of Herr Lieut. Müller's inimitable instantaneous photographs.

The negative was taken with a Steinheil aplanate and a "Thuré & Ancy" shutter, instruments the lieutenant uses for all his instantaneous pictures.

The specimen before us is by no means an exception to his general work. Cavalry charges, batteries of artillery in the act of firing, gymnastic exercises, and a variety of other very difficult subjects have been photographed by him with equal precision and details. The plate was made by Kurtz, of New York.

"A Little Maid from School."

This pretty child-picture is made from a negative by Mr. F. Gutekunst, of Philadelphia, who is so successful in portraying child-life, and is reproduced by the Levytype Co., of Philadelphia, by their half-tone relief process, with Max Levy's engraved grating. This grating includes 133 lines per inch, and, as will be seen in the picture, gives a very satisfactory result.

"Who 's Afraid?"

This charming child-picture is from a negative by an amateur, Gustav Leupelt. The children are his own, and they were playing in the garden dressed as represented, when they looked so interesting that he posed them as they were for the picture. The negative was made in an ordinary room by the light coming from an ordinary window, and white sheets were used as reflectors. The title of the picture was suggested by the expression of the larger boy's face, which indicates, as plainly as anything can, that he is saying to his young companion, "Who's Afraid."

"What a 'Waterbury' Lens Can Do."

Is there anything a Waterbury lens cannot do?

The series of these unexcelled photographic objectives (single achromatic lenses), have stood unrivaled for work requiring timed exposure; but, of late—thanks to the high sensitiveness of American gelatine emulsion plates—these lenses have entered into competition with instantaneous instruments, and with what success is well shown by this illustration. The plate was made by the New York Engraving and Printing Company.

"Roasting Apples."

This illustration is a flash-light picture by Louis Clarence Bennett, "Mercantile Photographer," at 69 Centre Street, New York City. The exposure was made with a Prosch lamp, using Scovill Magnesium Powder, on an Eagle plate, and with a Gundlach lens. The picture was taken in a deserted farm-house in the interior of New York State. The plate was reproduced by the Photo-Electrotype Engraving Company, of New York City.

"An Old Roman Garden."

Mr. W. J. Stillman, who made the negative of "An Old Roman Garden," writes as follows in regard to his picture:

"The negative was taken in the grounds of the Villa Borghese, an extensive park lying just outside the walls of Rome, one of the relics of the splendor of the great days of Papal Rome, and the property of the Borghese family, one of which was Pope, a couple of centuries ago, and another of which married a sister of Napoleon I. Prince Borghese, the present head of the family, is also the owner of the famous Borghese Gallery, which contains the 'Sacred and Profane Love,' of Titian, which is considered by most people his master-piece, and the 'Entombment,' of Raphael, also one of that master's principal pictures, with many others of the works of their contemporaries, bought from the painters for this gallery and never since removed from it.

"The villa which gives its name to the park contains a collection of antique statuary, with the famous nude, full-length portrait of the Princess Pauline Bonaparte Borghese, by Canova. A provision of one of the ancestors of the present prince, that the grounds should be kept open under certain conditions for the public, was decided by the courts of the kingdom of Italy to give a right in them to the public in perpetuity, and has prevented them from being converted into building lots, like the still more beautiful Ludovisi Gardens, which lay just beyond the Villa Borghese. They are full of picturesque bits and are a favorite resort of the landscape painters of Rome. There are, here and there, imitation ruins in the taste of the 17th century, temples, etc., etc., with an artificial lake and fountains, of which that in the photograph is, to my mind, one of the most picturesque. The alleys of huge and ancient ilexes and the great sycamores and stone pines are, taken as a whole, unrivalled in Italy, so far as I know, but the artist who seeks for effect among them must omit the sunset, for the malaria of that hour is dangerous, especially in the autumn. Portions of the grounds are utterly wild, and there the children go for the early spring flowers. Photographers and painters are only admitted by special permission of the prince, given to the former on condition of receiving two proofs of every negative taken."

This reproduction was made by Crosscup & West, of Philadelphia.

"Dere's no Mo' Work for Old Uncle Ned."

"When my leisure time was spent in the fields with dog and gun," writes R. Eickemeyer, Jr., "I visited, a few years ago, a friend whose plantation was on the Tallapoosa, just above where that river and the Coosa join and flow toward the Gulf of Mexico.

"The plantation was historic ground. In 1540 De Soto and his band of cavaliers followed the river banks over the ground where the plantation now stands. De Soto's chroniclers tell how the Indians lived here at that time; how they erected a huge mound where the chief resided, and how the rude tepees of the warriors were grouped about the base of this mound. Many of these earthworks still remain to tell of the energy of the red men of that time.

"Last fall I returned to my former hunting ground. Things were but little changed from the last time I had been there. No 'button pusher' had yet found the place, and to the negroes I, with my camera and tripod, was a constant source of wonderment and surprise. They finally settled it among themselves that I was a surveyor. I found them excellent models, as they had no idea when I was posing them or what it all meant.

"The plantation was large, and in no other place have I seen so many excellent subjects. The river and its banks, with moss-covered trees and negro cabins; the cypress swamps; the cane brakes; the corn and cotton fields; while the negroes themselves were all excellent models.

"Old 'Uncle Ned,' the subject of the engraving, was 94 years old, and one of the attractions of the plantation. His cabin stood on one of the mounds where, centuries before, had stood the home of some Indian chief. Here Uncle Ned's son cultivated just enough ground to raise what would supply the old man's daily needs. In the picture we find him taking the path to the woods, where negro like, unbeknown save to a very few, he had quail traps set. I might have had an opportunity had I waited to photograph him returning with a few fat quail stuffed in the bosom of his shirt."

The excellent reproduction of Mr. Eickemeyer's negative was made by G. M. Allen & Co., of New York.

Standard Formulas

and

Useful Recipes.

PRELIMINARY NOTES.

1. Unless otherwise directed, solids are to be weighed, and liquids to be measured.

2. Unless specially directed otherwise, the *ounce* in the case of solids is understood to be the Troy ounce (= 8 drachms, or = 480 grains). And in the case of liquids, the ounce is understood to be the fluid-ounce, U. S. measure (1 gallon = 8 pints; 1 pint = 16 fl. oz.; 1 fl. oz. = 480 minims).

3. When Acetic Acid is mentioned, that of ·36 per cent. strength, spec. gr. 1.048 (U. S. Ph.), is understood.

4. Glacial Acetic Acid is intended to be an acid containing about 85 per cent. of the absolute acid.

5. In accordance with the custom now more and more coming into use, the chemical names of salts are given preferably so that the name of the base is the name of the element itself, and not an oxide of the element. For instance: carbonate of sodium, instead of carbonate of soda; bicarbonate of potassium, instead of bicarbonate of potassa (or potash); sulphite of calcium, instead of sulphite of lime, etc.

6. Instead of giving the strength of certain solutions by the heretofore customary but very confusing method of using two figures with a colon between, for instance, 1:5, which is variously interpreted as meaning either 1 *in* 5, or as 1 *to* 5 (this being then actually 1 in 6), we use in all cases the former expression (1 in 5, 1 in 10, etc.).

Abbreviations.—gr. stands for grains.
Gm. " " gramme.
C.c. " " cubic centimeter.

STANDARD FORMULAS AND USEFUL RECIPES.

THE WET COLLODION PROCESS.

1.—NEGATIVE COLLODION.

Ether	½ fluid ounce
Absolute alcohol	½ fluid ounce
Pyroxyline	5 gr.
Iodide of ammonium	5 gr.
Bromide of cadmium	2 gr.

2.—FERROTYPE COLLODION (ESTABROOKE'S).

Iodide of ammonium	30 gr.
Iodide of sodium	10 gr.
Iodide of cadmium	20 gr.
Bromide of cadmium	20 gr.
Ether and alcohol (of each)	5 ounces
Pyroxyline, sufficient quantity, say	25 gr.

3.—COLLODION FOR THE REPRODUCTION OF LINE WORK (VOLKMER'S).

Plain Collodion.

Ether	700 C.c.
Alcohol	490 C.c.
Pyroxyline	16 Gm.

Sensitizer.

Chloride of calcium	1.6 Gm.
Iodide of ammonium	4.7 Gm.
Iodide cadmium	7.8 Gm.
Absolute alcohol	123 C.c.

After being perfectly dissolved, mix.

4.—SILVER BATH FOR WET-PLATES.

Nitrate of silver	1 ounce
Distilled water	10 ounces

Iodize and acidulate with nitric acid.

5.—SILVER BATH FOR WET-PLATES (LIESEGANG'S).

Nitrate of silver	10 Gm.
Distilled water	150 C.c.

If the bath fogs add a few drops of iodine solution (1 part iodine to 10 parts of alcohol).

6.—SILVER BATH FOR FERROTYPES (ESTABROOKE'S).

Nitrate of silver	4 ounces
Water	64 ounces
Iodide potassium	2 gr.

Dissolve, sun for three or four hours, filter and acidulate.

7.—DEVELOPER FOR FERROTYPES, BY E. P. GRISHOLD.

Protosulphate of iron and ammonia	4 ounces
Water	64 ounces
Acetic acid, 1.048 (U. S. Ph.)	4 ounces
Yellow rock candy	½ ounce

8.—DEVELOPER FOR WET-PLATES.

Sulphate of iron and ammonia	1 ounce
Acetic acid, 1.048 (U. S. Ph.)	1½ ounce
Water	16 ounces

9.—DEVELOPER FOR HARD NEGATIVES (LINE WORK) WET-PLATES.

Protosulphate of iron	5 Gm.
Water	100 C.c.
Tartaric acid	1 Gm.

10.—DEVELOPER FOR WET-PLATES (VERY INTENSE).

Protosulphate of iron	36 Gm.
Sulphate of copper	12 Gm.
Water	1000 C.c.
Glacial acetic acid, 85 per cent	50 C.c.
Alcohol	40 C.c.

11.—INTENSIFIER FOR WET-PLATES.

Saturated solution of protosulphate of iron	20 C.c.
Acetic acid, 1.048 (U. S. Ph.)	10 C.c.
Citric acid	5 Gm.
Water	200 Gm.

And silver solution to suit.

12.—INTENSIFIER FOR WET-PLATES.

Pyrogallic acid	1 Gm.
Citric acid	3 Gm.
Water	80 C.c.

And silver solution to suit.

13.—INTENSIFIER FOR LINE WORK, WET-PLATES.

A.—Bromide of potassium	½ ounce
Water	4 ounces
B.—Sulphate of copper	½ ounce
Water	4 ounces

Mix equal parts of A and B and pour on the film. When perfectly whitened, blacken with solution of nitrate of silver, 30 grains to the ounce.

For greater intensity. use hydrosulphate of ammonia solution 1 part in 4 parts of water, after the bromide of copper, and thorough washing.

14.—INTENSIFIER FOR WET-PLATES.

Red prussiate of potash	2 drams
Nitrate of lead	3 drams
Water	12 ounces

Immerse the fixed negative till thoroughly whitened ; wash, and flood with solution of hydrosulphate of ammonia.

15.—TO STRIP COLLODION NEGATIVES.

The best way to do this is to coat the negative, when dry, with a solution of pure rubber in benzole, and afterwards with leather collodion. When perfectly dry, the edges of the negatives may be cut in, and the plate immersed in a diluted acetic acid solution 1:10. After a short time the film loosens, and may easily be detached from the plate, and turned.

16.—TO RECTIFY A NEGATIVE SILVER BATH.

Dissolve one part of permanganate of potassium in 100 parts of water and add drop by drop so much of this solution to the bath impregnated with organic matter, till after vigorously shaking a slight pinkish color remains.

Sun for several hours, filter and test for neutrality. Acidify with nitric acid.

DRY COLLODION PROCESSES.

17.—COLLODIO-BROMIDE EMULSION.

Ether, sp. g. 0.720	5 fluid ounces
Alcohol, sp. g. 0.820	3 fluid ounces
Pyroxyline	50 gr.
Bromide of cadmium and ammonium	80 gr.
(or bromide of zinc ... 76 gr.)	

Sensitize by adding to each ounce 15 grains of nitrate of silver, dissolved in one drachm of boiling alcohol mixed with a few drops of water. This is suitable for slow landscape work or transparencies.

18.—WASHED EMULSION FOR TRANSPARENCIES.

Ether, sp. g., 0.720	5 fluid ounces
Alcohol, sp. g., 0.820	3 fluid ounces
Pyroxyline	60 gr.
Bromide of cadmium and ammonium	100 gr.
(or bromide of zinc 90 gr.)	
Hydrochloric acid, sp. g. 1.2	8 minims

Sensitize with 20 grains of nitrate of silver to the ounce, dissolved in 2 drachms of boiling alcohol, mixed with just enough water to effect solution. Allow to stand for two or three days.

The emulsion, after being allowed to ripen, should be poured into a dish and set aside to become thoroughly dry. The mass of dry emulsion is then washed, to remove all soluble salts, and is then again dried and re-dissolved in equal parts of ether and alcohol, at the rate of from 20 to 24 grains to the ounce of the solvents.

19.—DEVELOPER FOR COLLODION EMULSION.

A.—Pyrogallol	96 gr.
Alcohol	1 fluid ounce
B.—Bromide of potassium	10 gr.
Water	1 fluid ounce
C.—Stronger ammonia, sp. g., 0.900	1 fluid drachm
Water	15 fluid drachms
or,	
D.—Carbonate of ammonium	2 gr.
Water	1 fluid ounce

For each drachm of developer take for a normal exposure 5 minims of A, 1 or 2 minims of B, and 1 or 2 minims of C, or if D be used, add the above quantities of A, B and C to 1 drachm of D. When the details of the image are out, add double the quantity of B and C.

ALBUMEN PROCESSES.

20.—GOBERT'S ALBUMEN PROCESS.

Albumen from fresh eggs	26 drachms
Iodide of ammonium	15 gr.
Bromide of potassium	4 gr.
Iodine	4 gr.

Sensitize in

Nitrate of silver	155 grains
Distilled water	4 ounces
Glacial acetic acid	150 gr.

Albumen plates are developed with saturated solution of gallic acid with a few drops of aceto-nitrate of silver solution (1 in 30).

21.—WHIPPLE & BLACK'S ALBUMEN HONEY PROCESS.

Albumen	8 ounces
Honey	7 ounces
Iodide of potassium	3 drachms
Bromide of potassium	20 gr.
Chloride of sodium	10 gr.
Water	2 ounces

Sensitize in bath of the following proportions:

Nitrate of silver	1 ounce
Water	10 ounces
Acetic acid	8 to 10 drachms

For development, see above (No. 20).

GELATINE DRY-PLATE PROCESSES.

22.—W. K. BURTON'S GELATINE EMULSION.

A.—Bromide of ammonium	260 gr.
Iodide of potassium	20 gr.
Gelatine (Nelson, No. 1)	80 gr.
Distilled water	10 ounces
B.—Silver nitrate	200 gr.
C.—Silver nitrate	200 gr.
Distilled water	1 ounce

Converted to ammonio-nitrate.

D.—Gelatine, hard (dry)	600 gr.

For detailed directions for making the emulsion, see PHOTOGRAPHIC TIMES, Vol. XVII, page 285.

23.—BURBANK'S GELATINE EMULSION.

Bromide of ammonium	15 to 20 gr.
Water	1 ounce

or,

Bromide of potassium	18 to 25 gr.
Nitrate of silver, proportioned to the amount of bromide	25 to 30 gr.
Gelatine	30 to 40 gr.

See Burbank's "The Photographic Negative," pages 87—109.

24.—HENDERSON'S GELATINE EMULSION BY AMMONIA METHOD.

Dissolve

Bromide of ammonium	308 gr.
Gelatine	50 gr.

Previously swelled

In distilled water	8½ ounces

When cold add

Water	1¾ ounces
Alcohol	1¾ ounces
Stronger ammonia (0.900)	½ ounce

Next dissolve by heat

Nitrate of silver	462 gr.
In distilled water	3¾ ounces

and add gradually to the gelatine solution. Ripening for twenty-four hours gives sensitiveness to the emulsion. Add, finally, 220 grains of swelled gelatine.

25.—DR. J. M. EDER'S GELATINE EMULSION WITH AMMONIO-NITRATE OF SILVER.

In distilled water, 10 ounces, dissolve bromide of potassium, 370 grains; add gelatine, 617 grains, previously swelled in water. In distilled water, 10 ounces, dissolve nitrate of silver, 462 grains.

To this solution, cold, add stronger ammonia, drop by drop, until the precipitate first formed is re-dissolved. Add this gradually to the first solution, and place in a water bath at a temperature of 105 deg. Fahr., for 30 to 45 minutes. Then remove the source of heat, and allow the emulsion to cool down gradually to about 75 deg. Fahr., then pour out to set, and proceed as usual.

DEVELOPMENT OF GELATINE EMULSION PLATES.

26.—CARBUTT'S.*

No. 1. *Pyro Stock Solution.*

Distilled water	10 ounces
Sulphuric acid	1 drachm
Sulphite of sodium, crystals	4 ounces

Then add Schering's pyro 1 ounce, and water to make 16 fluid ounces.

* Mr. Carbutt uses avoirdupois ounces in all his formulas.—[EDITORS.]

No. 2. Stock Soda Solution.

Water	10 ounces
Sodium sulphite crystals	2 ounces
Sodium carb. cryst. (or dry gran. 1 ounce)	2 ounces
Potassium carbonate	1 ounce

Dissolve, and add water to make measure 16 fluid ounces.

No. 3. Bromide Solution.

Bromide of sodium or potassium	½ ounce
Water	5 ounces

Pyro Developer.—Dilute 1 ounce of stock No. 2 with 7 ounces of water for cold weather, and 10 to 12 of water in summer. To three ounces of dilute No. 2 add 1½ to 2½ drams of No. 1. The more pyro the denser the negative, and *vice versa.* No yellowing or fogging need be apprehended if our directions are followed. Development should be continued until the image seems almost buried, then wash and place in the following.

27.—CARBUTT'S NEW ACID FIXING AND CLEARING BATH.

Hyphosulpite of sodium	16 ounces
Sulphite of sodium crystals	2 ounces
Sulphuric acid	1 fluid drachm
* Chrome alum	1 ounce
Warm water	64 ounces

Dissolve the hyposulphite of sodium in 48 ounces of water, the sulphite of sodium in 6 ounces of water, mix the sulphuric acid with 2 ounces of water, and pour slowly into the sulphite sodium solution, and add to the hyposulphite, then dissolve the chrome alum in 8 ounces of water, and add to the bulk of solution and the bath is ready. This fixing bath will not discolor until after long usage, and both clears up the shadows of the negative and hardens the film at the same time.

Let remain two or three minutes after negative is cleared of all appearance of silver bromide. Then wash in running water for not less than half an hour to free from any trace of hypo solution. Swab the surface with a wad of wet cotton, rinse, and place in rack to dry spontaneously.

28.—CARBUTT'S HYDROCHINON DEVELOPER.

A.

Warm distilled water	20 ounces
Sulphite of sodium crystals	4 ounces
Sulphuric acid	1 drachm
Hydrochinon	360 gr.
Bromide potassium	30 gr.
Water to make up to	32 ounces

B.

Carbonate potassium	2 ounces
Carbonate sodium crystals	2 ounces
Water to make	32 ounces

C.—*Accelerator.*

Caustic soda (hydr. ox. of sodium)	1 ounce
Water to make	10 ounces

For under exposure add a few drops of above to developer.

D.—*Restrainer.*

Bromide potassium	½ ounce
Water	5 ounces

Hydro Developer.—Take of A 1 ounce, B 1 ounce, water 2 to 4 ounces—the first for instantaneous and short exposures on our Eclipse and special plates, and the latter for time exposures, portraits, and views on our B Landscape and Ortho Plates. For lantern transparencies, 1 ounce A, 1 ounce B, water 4 ounces, 15 to 30 drops of a 10 per cent. solution bromide potassium. After using, filter into bottle for future use, and for starting development on time exposed plates and films.

* N. B.—During cold weather use only ½ ounce of chrome alum in above.

29.—EIKONOGEN AND HYDROCHINON DEVELOPER (FOR CARBUTT'S ORTHOCHROMATIC PLATES, "CELLULOID" FILMS AND TRANSPARENCIES).

A.

Distilled water	20 ounces
Sulphite of soda crystals	4 ounces
Eikonogen	330 gr.
Hydrochinon	160 gr.
Water to make up to	32 ounces

B.

Distilled water	20 ounces
Carbonate of potash	2 ounces
Carbonate soda crystals	2 ounces
Water to make up to	32 ounces

Developer.—For instantaneous exposures, take 1 ounce A, 1 ounce B, 3 ounces water; for portraits, take 1 ounce A, 1 ounce B, 4 ounces water; for landscapes, full exposures (sen. 20–27), take 1 ounce A, ½ ounce B, 3 ounces water; for landscapes, full exposures (sen. 16-20), take 1 ounce A, ¾ ounce B, 4 ounces water; for lantern slides, full exposures, take 1 ounce A, ¾ ounce B, 4 ounces water, and 2 drops 10 per cent. bromo. potass. to each ounce developer.

NOTE.—More of A will increase density, more of B will increase detail and softness. Temperature of developer should not vary much below 65 deg. nor above 75 deg. The after treatment is same as with any other developer.

The mixed developer after using can be kept in a bottle for future use.

30.—THE CRAMER PLATE.

PYRO DEVELOPMENT.

Prepare the following solutions.

No. 1. Alkaline Solution.

U. S. Measures. Troy Weight.		Metric Weights and Measures.
60 ounces	Water	1,800 C.c.
2½ ounces	Carbonate of sodium crystal (sal soda)	75 Gm.
4 to 6 "	Sulphite of sodium crystals	120 to 180 Gm.

(For winter use 4 ounces sulphite, for summer 6 ounces.)

A smaller quantity of sulphite will produce a warmer tone, a larger quantity a gray or bluish black tone.

The alkaline solution must be kept in well stoppered bottles.

If the negatives show yellow stain, make a fresh solution, or try another lot of sulphite of sodium.

(See note below.*)

No. 2. Pyro Solution.

6 ounces	Distilled or pure ice water	180 C.c.
15 minims	Sulphuric acid	1 C.c.
1 drachm	Sulphite of sodium crystals	4 Gm.
1 ounce	Pyrogallic acid	30 Gm.

All pyro solutions work best while fresh.

8 grains dry pyro may be substituted for 1 dram of this solution.

No. 3. Bromide Solution.

1 ounce	Bromide of potassium	30 Gm.
10 ounces	Water	300 C.c.

* The alkaline solution can be made with the hydrometer by mixing equal parts of the following solutions:
Carbonate of sodium solution (hydrometer test 20 deg.)
Sulphite of sodium solution (hydrometer test for winter 36 deg. for summer 54 deg.)

Developer.

8 ounces	Alkaline solution..................	250 C.c.
3 drachms	Pyro solution......................	12 C.c.
4 to 8 ounces	Tepid water (for winter use).......	126 to 250 C.c.
	or	
8 to 16 ounces	Cold water (for summer use).......	250 to 500 C.c.
	When the developer is quite new, the addition of from 10 to 40 minims bromide solution....	½ to 3 C.c.
	may be necessary to make it work perfectly clear.	

By modifying the strength and temperature of the developer, dense or thin negatives can be made on plates of the same emulsion.

If dense negatives and quick development are desired, use the developer less diluted and moderately warm (about 70 deg. Fahrenheit), taking care to add sufficient bromide solution to prevent fog. An increase in the quantity of pyro in connection with this treatment will produce the greatest possible contrast and clearness, suitable for copying line drawings, etc.

To obtain thinner negatives full of detail, use the developer more diluted.

Over-exposed plates restrain by adding a sufficient quantity of bromide solution to the developer.

An under-exposed plate should be treated with diluted developer, without addition of bromide in order to obtain more detail and less contrast, or it may be developed with the full strength of alkaline solution and half the quantity of pyro, provided the developer is kept at a very low temperature all the time to prevent fog. It can be improved after development, by throwing off the solution, and without rinsing the negative, leaving it in the dish, pour water upon it and allow to stand for some time well guarded against light before fixing it.

Develop until the intensity is fully sufficient.

31.—EIKONOGEN DEVELOPER.

No. I.

U. S. Measures. Troy Weight.		Metric Weights and Measures.
40 ounces	Distilled water............	1,200 C.c.
2 ounces	Sulphite of sodium crystals	60 Gm.
1 ounce	Eikonogen, finely powdered..................	30 Gm.

Keep the solution in a well stoppered bottle.

No. II.

10 ounces	Water....................................	300 C.c.
1 ounce	Carbonate of potassium......	30 Gm.

No. III.

10 ounces	Water....................................	300 C.c.
1 ounce	Bromide of potassium.............	30 Gm.

FOR USE.

3 ounces	Solution No. I.................	90 C.c.
1 ounce	Solution No. II.......................	30 C.c.
	When the developer is quite new, it may be found necessary to add	
6 to 12 minims (or drops)	Solution No. III.	½ to 1 C.c.
	in order to make it work perfectly clear.	

The developer can be used repeatedly by occasionally adding more of Solutions Nos. I and II, omitting the bromide. It produces plenty of intensity by simply leaving the plate in it long enough. Any degree of softness can be obtained by diluting with more or less water, which is also recommended during hot weather and for under-exposures.

Over-exposed plates, restrain by adding more Solution No. III.

Fixing Bath.

After developing and rinsing, the negatives may be fixed in a plain hypo bath, 1 part hyposulphite of sodium to 4 parts of water, but the following bath is especially recommended.

Prepare two solutions.

No. 1.

32 ounces	Hyposulphite of sodium	1 kilo
3 quarts	Water	3 liters

No. 2.

1 quart	Water	1 liter
¼ ounce	Sulphuric acid	15 C.c.
4 ounces	Sulpnite of sodium crystals	120 Gm.
3 ounces	Chrome alum, powdered	90 Gm.

(The chrome alum may be omitted during the cold season.)

After the ingredients are completely dissolved, pour No. 2 solution into No. 1 and allow it to settle before using.

This bath combines the following advantages: It remains clear after frequent use; it does not discolor the negatives and forms no precipitate upon them. The chrome alum hardens the gelatine to such a degree that the negatives can be washed in warm water, provided they have been left in the bath a sufficient time.

32.—HARVARD DRY PLATES.

PYRO DEVELOPER.

No. 1.

Sulphite sodium, cryst	6 ounces
Pyrogallic acid	1 ounce
Water (ice or distilled)	16 ounces

No. 2.

Carbonate sodium, cryst	4 ounces
Water	16 ounces

To develop take 1 ounce of No. 1, 1 ounce of No. 2, and 6 to 8 ounces of water.

PYRO DEVELOPER.—BY HYDROMETER TEST.

Make solution sulphite of sodium at 70 deg.

Make solution carbonate of sodium at 45 deg.

No. 1.

Sulphite sodium solution	16 ounces
Pyrogallic acid	1 ounce

No. 2.

Carbonate sodium solution	16 ounces

Use 1 ounce of each and 6 ounces of water.

For more intensity, use more of No. 1.

For more detail, use more of No. 2.

Should a grayer negative be desired, increase the sulphite of soda until the color is satisfactory.

In hot weather use less of the alkaline solution and keep the developer cool (below 60 deg. Fahr.), as, if the developer is too warm or contains too much of the alkaline solution, it will work foggy.

A good *eikonogen* developer is as follows:

Sulphite sodium, cryst	1 ounce
Carbonate potassium	1 ounce
Eikonogen	1 ounce
Water	40 ounces

Use repeatedly, adding new as required.

For under-exposed negatives, dilute and keep separate.

After development, and before fixing, it is well to flow the negative with a saturate solution of alum. Rinse and fix in the following solution:

Hyposulphite of sodium	1 pound
Water	2 quarts.

Many prefer to add alum to the fixing solution (about 1 ounce to the above), to which there is no serious objection, provided, always, it is filtered occasionally.

In hot weather add ½ pound powdered alum to the fixing bath.

SEED'S PYRO AND EIKONOGEN FORMULAS.

33.—Pyro Developer.

No. 1.

Pyrogallic acid	1 ounce
Sulphite of sodium (crystals)	4 ounces
Water (distilled or good well water)	16 ounces

No. 2.

Carbonate sodium crystals	4 ounces
Water	16 ounces

To develop take

No. 1	1 ounce
No. 2	1 ounce
Water	8 ounces

In warm weather use more water, in cold weather, less.

34.—Eikonogen Developer.

No. 1.

Sulphite of sodium (crystals)	3 ounces
Hot water	45 ounces

Thoroughly dissolve, then add:

Eikonogen	1 ounce

No. 2.

Carbonate sodium crystals	4 ounces
(or carbonate of potassium, 1¼ ounce)	
Water	15 ounces

To develop take of

No. 1	3 ounces
No. 2	1 ounce

If more contrast is required, increase the amount of No. 1; if less, more of No. 2. The developer can be used repeatedly by adding each time a little of each of fresh solutions Nos. 1 and 2, according to above proportions. For developing a number of negatives at once, take 9 ounces of No. 1; 3 ounces of No. 2, and water 12 ounces.

35.—For Producing Black and White Negatives.

No. 1.

Iodine	4 gr.
Alcohol	1½ ounces

No. 2.

Bromide of potassium	60 gr.
Water	25 ounces

Add together Nos. 1 and 2, and to develop add one ounce to every 8 or 10 ounces of developer.

To harden the film during development in hot climates, take sulphate of magnesium 1 ounce, water 8 ounces; add of this one-half ounce to each 16 ounces of developer.

Hypo Solution.

32 ounces sulphite of sodium solution (hydrometer degrees 60), add to this 1 ounce sulphuric acid very slowly, and 24 ounces saturated solution of chrome alum, then add the whole to 1½ gallons saturated solution of hypo, and it is ready for use.

36.—Potash Developer for Gelatine Dry-Plates (Beach's Formula).

A.—*Pyro Solution.*

Sulphite of sodium, cryst	2 ounces
Warm distilled water	2 ounces

Dissolve, and when cold add

Sulphurous acid	2 ounces
Pyrogallol	¼ ounce

B.—*Potash Solution.*

1.—Carbonate potassium	3 ounces
Water	4 ounces
2.—Sulphite sodium, cryst	2 ounces
Water	3 ounces

Combine 1 and 2 into one solution.

For a shutter exposure take 3 ounces water, half ounce A, and 3 drams B, increasing the latter to 5 drams if the image hangs back.

For over-exposure, 3 ounces water, 3 drams A, 1 dram B, adding more if necessary.

37.—Potash Developer for Gelatine Dry-Plates (Dr. Stolze's).

Modified by Dr. Eder.

A.—Carbonate of potasssium	90 Gm.
Sulphite of sodium, cryst	25 Gm.
Water	200 C.c.
B.—Water	100 C.c.
Sulphite of sodium, cryst	25 Gm.
Pyrogallol	12 Gm.

Mix 40 minims of A with 50 minims of B and 100 c.cm. of water.

Bromide of potassium should be used only in minimal quantities, 1 to 3 minims (of a 10 per cent. solution); with more, the general sensitiveness is much reduced.

An alum bath mixed with an equal volume of saturated sulphate of iron solution increases the density, and gives the plate a good printing quality.

38.—Soda-Potash Developer for Gelatine Dry-Plates (New York Amateur Club).

Ferrocyanide of potassium	1¼ ounces
Carbonate of potassium	1¼ ounces
Gran. carbon. of sodium	1 ounce
Cryst. sulphite sodium	2 ounces
Hot distilled water	10 ounces

39.—Soda Developer in one Solution for Gelatine Dry-Plates (Eder's Formula).

Crystallized sulphite of sodium	5 drachms
Carbonate of sodium	2¼ drachms

Dissolve in 2 ounces of boiled distilled water, and after having cooled down add 46 grains of pyro. Keep in well stoppered bottles, and for use dilute with five times its bulk of water.

40.—Ferrous-Oxalate Developer for Gelatine Dry-Plates (Dr. Eder's).

A.—Neutral oxalate potassium	200 Gm.
Distilled water	800 C.c.

Acidulate with oxalic acid.

B.—Proto sulphate of iron, cryst	100 Gm.
Distilled water	300 C.c.
Sulphuric acid	5 minims
C.—Bromide of potassium	10 Gm.
Distilled water	100 C.c.
D.—Hyposulphite of sodium	2 Gm.
Distilled water	200 C.c.

Mix immediately before use three volumes of A with one volume of B, and develop. Restrain with a few drops of C.

For over-exposure take less of the iron solution, and add gradually in small portions, as required, To give the negative body use C.

To make soft negatives with fine detail, take of

A	250 C.c.
B	50 C.c.
C	40 minims
D	16 minims

Plates giving with ordinary developer hard and glassy negatives, give with this modification very satisfactory results.

41.—HYDROCHINON DEVELOPER, CRAMER'S.

A.—Sulphite of sodium crystals	480 gr.
Phosphate of sodium	160 gr.
Water	8 ounces

Dissolve, filter and add

B.—Hydrochinon	100 gr.
Carbonate of sodium	480 gr.
Phosphate of sodium	160 gr.
Water	8 ounces

Mix equal parts of A and B.

42.—"CHAUTAUQUA" DEVELOPER, WITH AMMONIA, FOR GELATINE DRY-PLATES.

A.—Bromide ammonium	½ ounce
Water	8 ounces
B.—Stronger ammonia (0.900)	1 ounce
Water	7 ounces
C.—Pyrogallol	1 drachm
Nitric acid	5 minims
Water	12 ounces

Take for correct exposure of A 40 minims, of B 20 minims, of C ½ ounce, and 2 ounces of water.

43.—"CHAUTAUQUA" DEVELOPER, WITH CARBONATE OF SODIUM, FOR GELATINE DRY PLATES.

A.—Dissolve 3 ounces of granulated sulphite of sodium, and ¼ ounce of meta-bisulphite of potassium in 32 ounces of distilled water, and add 1 ounce of pyrogallic acid.

Keep in well stoppered bottles.

B.—Dissolve 8 ounces of granulated, or 16 ounces of crystallized carbonate of sodium (common washing soda) in water enough to make a bulk of 32 ounces.

Mix 1 ounce of water with 1 dram of A, add a few drops of B, and increase gradually till development proceeds regularly. If necessary, restrain with 10 per cent. solution of bromide of potassium.

44.—"CHAUTAUQUA" DEVELOPER, WITH CARBONATE OF POTASSIUM, FOR GELATINE DRY-PLATES.

A.—Pyro	1 ounce
Sulphite of sodium, granulated	2 ounces
Bromide of potassium	80 gr.
Citric acid	60 gr.
Water	12 ounces
B.—Water	12 ounces
Sulphite of sodium, granulated	1 ounce
Carbonate of potash	3 ounces

1 dram of each, A and B, to 1 ounce of water, make the developing solution.

45.—"CHAUTAUQUA" DEVELOPER, WITH HYDROCHINON, FOR GELATINE DRY-PLATES.

A.—Hydrochinon	½ ounce
Sulphite of sodium, granulated	1 ounce
Meta-bisulphite of potassium	30 gr.
Water	16 ounces
B.—Carbonate of potassium	1½ ounces
Water	16 ounces

R. EICKEMEYER, JR., YONKERS, N. Y. GEO. M. ALLEN & CO. N. Y.

"UNCLE NED"

Take equal parts for normal exposures. For over or under exposures proceed as with pyro. Bromides do not restrain the action of hydrochinon.

46.—"CHAUTAUQUA" DEVELOPER WITH EIKONOGEN IN TWO SOLUTIONS.

A.—Eikonogen	128	gr.
Crystallized sulphite of sodium	1	ounce
Dissolve in warm water	16	ounces
B.—Crystallized carbonate of sodium	1¼	ounce
Water	10	ounces

For normal exposures take 3 parts of A and 1 part of B. To promote intensity add a few drops of a 10 per cent. solution of bromide of potassium.

47.—"CHAUTAUQUA" DEVELOPER WITH EIKONOGEN. (In one solution for instantaneous work.)

Eikonogen	120	gr.
Crystallized sulphite of sodium	1¼	ounce

Dissolve in 8 ounces of hot water and add carbonate of potassium 120 grains.

For use dilute with an equal bulk of water, and add a few drops of a 10 per cent. solution of bromide of potassium.

48.—FERROUS OXALATE. See 40.

49.—"CHAUTAUQUA" DEVELOPER, WITH HYDROCHINON, FOR GELATINE DRY-PLATES.

A.—Hydrochinon	120	gr.
Sulphite of sodium, granulated	1	ounce
Meta-bisulphite of potassium	30	gr.
Water	16	ounces
B.—Carbonate potassium	1½	ounce
Water	16	ounces

Take equal parts for normal exposures. For over or under-exposures proceed as with pyro.

50.—THE ACID FIXING AND CLEARING BATH.

Add 2 ounces of S. P. C. Clarifier (acid bisulphite of sodium) to 1 quart of hypo solution 1 in 5.

51.—COMBINED ALUM AND HYPO BATH.

Add saturated solution of sulphite of sodium to saturated solution of alum till the white precipitate formed remains undissolved, and when the odor of sulphurous acid becomes perceptible.

Mix this solution with an equal bulk of freshly prepared hypo solution 1 in 5 and filter.

This bath will remain clear.

52.—CLEARING SOLUTION (EDWARD'S).

Alum	1	ounce
Citric acid	1	ounce
Sulphate of iron, crystals	3	ounces
Water	20	ounces

This should be freshly mixed.

53.—CLEARING SOLUTION ("CHAUTAUQUA").

Alum	1	ounce
Citric acid	½	ounce
Water	15	ounces

54.—BELITZKI'S METHOD FOR REMOVING THE LAST TRACES OF HYPO.

Chloride of lime	20 Gm.
Water	1 liter

Add to the milky liquid

Sulphate of zinc	40 Gm.

dissolved in from 80 to 100 C.c. of water, shake well and decant.

The clear, supernatant solution of hypochlorite of zinc is kept in well-closed bottles; one part of it mixed with sixty parts of water will remove the last traces of fixing soda.

The solution remains active as long as it smells of hypochlorous acid.

55.—TO REMOVE HYPO FROM FILMS.

A solution of bromine in water, about 1 in 30, destroys the hypo in a gelatine film.

56.—CARBUTT'S INTENSIFIER.

No. 1.

Bichloride of mercury	240 gr.
Chloride of ammonium	240 gr.
Distilled water	20 ounces

No. 2.

Chloride of ammonium	480 gr.
Water	20 ounces

No. 3.

Sulphite of sodium (cryst.)	1 ounce
Water	9 ounces

Let the plate to be intensified wash for at least half an hour, then lay in alum solution for ten minutes, and again wash thoroughly; this is to insure the perfect elimination of the hypo. The least trace of yellowness after intensifying shows that the washing was not sufficient.

Flow sufficient of No. 1 over the negative to cover it, and allow to either partially or entirely whiten; *the longer it is allowed to act* the *more intense* will be the result; pour off into the sink, then flow over No. 2, and allow to act one minute; wash off, and pour over or immerse in No. 3 until changed entirely to a dark brown or black. No. 3 can be returned to its bottle, but Nos. 1 and 2 had better be thrown away. Wash thoroughly and dry.

57.—INTENSIFIER, WITH MERCURY AND AMMONIA, FOR GELATINE DRY-PLATES.

Pour over the well-washed negative a saturated solution of mercuric chloride (bichloride of mercury); do not keep it on too long, unless the negative is very thin. Wash well, and immerse in bath of

Water	10 ounces
Ammonia	10 minims

Leave the plate in this solution until the black color goes quite through the film. Wash well.

58.—INTENSIFIER (MERCURIC) WITH SODIUM SULPHITE, FOR GELATINE DRY-PLATES.

Whiten the negative in the saturated solution of mercuric chloride, wash and blacken with a solution of sulphite of sodium 1 in 5. Wash well.

The reduction is perfect, with a positive black tone.

59.—INTENSIFIER WITH IODIDE OF MERCURY.

Dissolve 1 drachm of bichloride of mercury in 10 ounces of water and 3 drachms of iodide of potassium in 2 ounces of water, and pour the iodide solution into the mercury till the red precipitate formed is completely dissolved.

For use, dilute with water, flow over the negative till the proper density is reached and wash, when the deposit will turn yellow. Remove the yellow color by flowing a 5 per cent. solution of hypo over the plate, and give it the final washing.

60.—Intensifier for Gelatine Dry-Plates with Mercuric Chloride and Hydrochinon (Dr. Mallman).

After whitening in the saturated solution of mercuric chloride, as usual, treat with an old hydrochinon developer; the result is a bluish-black intensification, which is applicable to positives as well as negatives.

61.—Intensifier, with Cyanide of Silver, for Gelatine Dry-Plates.

Mr. J. E. Thompson gives the following: After fixing and washing the plate well, place it in a solution of

Bichloride of mercury	10 gr.
Chloride of ammonium	10 gr.
Water	1 ounce

for a few seconds, until it bleaches. Then wash and place in a bath of cyanide of silver until it blackens, made as follows:

Cyanide of potassium	2 ounces
Distilled water	48 ounces
Nitrate of silver	1 ounce
Distilled water	6 ounces

Pour the silver solution gradually into that of the cyanide, stirring with a glass rod. The quantities given are about right to form a precipitate which will re-dissolve afterwards. To be used when a few days old.

62.—Reducer for Gelatine Dry-Plate Negatives (Farmer's).

Sat. sol. of ferricyanide of potassium	1 part
Hyposulphite of sodium solution, 1 in 10	10 parts

63.—Reducer for Gelatine Dry-Plates.

Perchloride of iron	30 gr.
Citric acid	60 gr.
Water	1 pint

64.—Belitski's Acid Ferri-Oxalate Reducer for Gelatine Plates.

Water	7 ounces
Potassium ferric oxalate	2¼ drachms
Crystallized neutral sulphite of sodium	2 drachms
Powdered oxalic acid, from	30 to 45 gr.
Hyposulphite of soda	1½ ounce

The solution must be made in this order, filtered, and be kept in tightly-closed bottles; and as under the influence of light the ferric salt is reduced to ferrous, the preparation must be kept in subdued light.

65.—To Reduce Intensity of Negatives.

Rub the parts to be reduced with a soft rag moistened with alcohol, till the density is softened down. For sharply defined outlines use a pointed stick of soft wood dipped in alcohol.

The method may be well applied for the brightening up of flare spots and halation marks.

ORTHOCHROMATIC METHODS BY BATHING.

66.—Orthochromatic Dry-Plates—F. Ives' Chlorophyll and Eosine Process.

Use any good bromide collodion emulsion that contains no free nitrate of silver. Flow plate as usual, and as soon as the emulsion film sets, flow several times with strong alcoholic solution of chlorophyll from blue myrtle, or plantain leaves, then immerse in water strongly tinted with blue shade eosine, and keep in motion until smooth.

Sensitizes for all colors, including deep ruby red; a very light-yellow screen is sufficient to secure correct rendering of color-tone.

67.—ORTHOCHROMATIC DRY-PLATES—V. SCHUMANN'S CYANINE BATH.

Soak the plate in 200 C.c. of water and 2 to 4 C.c. of stronger ammonia for two or three minutes, then immerse in

Distilled water	200 C.c.
Alcohol	10 C.c.
Stronger ammonia (0.900)	4 C.c.
Alcoholic solution of cyanine, 1 in 500	10 C.c.

68.—ORTHOCHROMATIC DRY-PLATES—THE CHAUTAUQUA ERYTHROSINE BATH.

Preliminary Bath.

A.—Water	200 C.c.
Stronger ammonia	2 C.c.

Soak the plate for two minutes.

Color Bath.

Erythrosine solution, 1 in 1000	25 C.c.
Stronger ammonia (0.900)	4 C.c.
Water	175 C.c.

The plate should not remain longer in this bath than one and a quarter minutes.

69.—OBERNETTER'S METHOD WITH NITRATE OF SILVER.

Distilled water	480 C.c.=16 fluid ounces
Nitrate of silver	1.25 Gr.=20 gr.
Ammonium carbonate	5 Gr.=75 gr.
Erythrosine solution (1 in 500)	35 C.c.=1⅛ fluid ounce
Stronger ammonia (0.900)	4 C.c.=1 drachm

Bathe the plate in the preliminary solution (see No. 67) for 150 seconds. Without washing flow the sensitizing solution over the plate twice, and dry in the dark closet.

70.—TO PREPARE YELLOW GLASS SCREENS.

Take of crushed (not powdered) curcuma root, 2 ounces, and macerate in 10 ounces of alcohol for three days. After filtering the tincture, mix with an equal bulk of ether, and add to each ounce of the mixture 6 grains of gun cotton.

With this collodion coat a plane parallel glass plate, which must be perfectly white, thin, and without any curvature.

VARNISHES.

71.—NEGATIVE VARNISH.

Sandarac	4 ounces
Alcohol	24 ounces
Oil of lavender	3 ounces
Chloroform	5 drachms

72.—NEGATIVE VARNISH.

White hard varnish (see No. 73)	15 ounces
Alcohol	25 ounces

This will be found a good and cheap varnish if durability is not required, as it is easily rubbed up for retouching upon and easily cleaned off. Very suitable for enlarged negatives that are not to be retained.

73.—NEGATIVE VARNISH.

Tough, hard and durable.

Shellac	1½ ounce
Mastic	½ ounce
Oil of turpentine	½ ounce
Sandarac	2½ ounces
Venice turpentine	½ ounce
Camphor	20 grains
Alcohol	20 fluid ounces

74.—NEGATIVE VARNISH.

Sandarac	90 ounces
Venice turpentine	36 ounces
Oil of lavender	10 ounces
Alcohol	500 fluid ounces

75.—STANDARD PHOTOGRAPHIC VARNISH.

White Shellac	8 ounces
Orange shellac	4 ounces
Sandarac	1 ounce
Alcohol	60 fluid ounces

76.—RETOUCHING MEDIUM.

Dammar	70 gr.
Yellow resin	6 drachms
Oil of turpentine	4 ounces

77.—NEGATIVE RETOUCHING VARNISH.

Sandarac	1 ounce
Castor oil	80 gr
Alcohol	6 ounces

First dissolve the sandarac in the alcohol, and then add the oil.

78.—GROUND-GLASS VARNISH.

Sandarac	90 gr.
Mastic	20 gr.
Ether	2 fluid ounces
Benzol	½ to 1½ fluid ounces

The proportion of the benzole added determines the nature of the mat obtained.

79.—ENCAUSTIC PASTE.

Pure white wax	500 parts
Elemi	10 parts
Benzol	200 parts
Oil of lavender	300 parts
Oil of spike	15 parts

PRINTING AND TONING ON ALBUMENIZED OR PLAIN PAPER.

80.—THE SILVER PRINTING BATH.

Silver nitrate	50 gr.
Water	1 ounce

81.—MODIFIED SILVER BATH.

Silver nitrate	50 gr.
Ammonium nitrate or magnesium nitrate	50 gr.

To secure a neutral state of the bath a little carbonate of silver should be kept at the bottom of the stock bottle.

82.—THE PRICE TONING FORMULA.

Into 7½ ounces of water dissolve 15 grains chloride of gold and sodium, then add to it 300 grains of acetate of soda and 7 drops of a saturated solution of chloride of lime.

This stock solution should be prepared at least twenty-four hours before being used. Take ½ ounce of it and mix with 5 ounces of water.

83.—THE PHOTOGRAPHIC TIMES TONING BATH.

Into 7½ ounces of water put 7½ grains chloride of gold and sodium. Label the bottle containing the mixture: *Chloride of gold solution.* Combine 6 ounces of water with 1 ounce *of French azotate*, to which add 1½ ounce of the chloride of gold solution.

84.—THE CHAUTAUQUA TONING BATH.

Dissolve 15 grains of chloride of gold and sodium in 15 ounces of water. Take of this solution 3 ounces, pour it in the toning tray, test for acidity with litmus paper, and *neutralize* with bicarbonate of soda, and add 30 grains of acetate of sodium and 30 ounces of water. Prepare the solution an hour before using it.

If warm tones are wanted add a little acetic acid to the last washing water.

For this bath the sensitizing silver should be neutral, for which purpose a small portion of carbonate of silver should be kept in the silver stock bottle.

85.—CHARLES W. HEARN'S TONING BATHS.

With Sal Soda.

Distilled water	64 ounces
Acid sol. of chloride of gold (4 grains to 1 ounce)	1 ounce
Saturated solution of carbonate of sodium cryst.	½ ounce

Should be prepared half an hour before use.

With Chloride of Lime.

Water	40 ounces
Chloride of lime	5 gr.
Chloride of gold	4 gr.

86.—ABNEY AND ROBINSON'S TONING BATHS.

Chloride of gold	1 gr.
Sodium carbonate	10 gr.
Water	10 ounces

Should be used immediately after mixing. This bath gives purple and black tones.

87.—WITH CHALK AND CHLORIDE OF LIME.

Chloride of gold	2 gr.
Saturated sol. of chloride of lime	2 drops
Chalk	1 pinch
Water	16 ounces

The bath should be prepared with hot water, and be kept for one day before using it.

88.—DR. LIESEGANG'S TONING BATH.—*With Tungstate of Sodium.*

Tungstate of sodium	20 Gm.
Boiling water	1 liter
Chloride of gold	1 Gm.

89.—DR. LIESEGANG'S TONING BATH.—*With Phosphate of Sodium.*

Phosphate of sodium	15 Gm.
Chloride of gold	1 Gm.
Water	1 liter

90.—Dr. Liesegang's Toning Bath.—*With Carbonate of Lime (Chalk).*

Chloride of gold	1 Gm.
Carbonate of sodium	15 Gm.
Chalk	5 Gm.
Water	1 liter

After twelve hours the bath is perfectly clear and colorless, when it is ready for use. It is very durable, and gives fine tones.

91.—Toning Bath for Ready Sensitized Paper.

A.—Chloride of gold	1 Gm.
Water	1 liter
B.—Borax	10 Gm.
Tungsate of sodium	40 Gm.
Water	1 liter

92.—Printing on Plain Paper.

Prepare the plain paper with

Ammonium chloride	60 to 80 gr.
Sodium citrate	100 gr.
Sodium chloride	20 to 30 gr.
Gelatine	10 gr.
Distilled water	10 ounces

or,

Ammonium chloride	100 gr.
Gelatine	10 gr.
Water	10 ounces

The gelatine is first swelled in cold water and then dissolved in hot water, and the remaining components of the formula are added. The solution is filtered, and when still warm the paper floated upon it for three minutes.

The salted paper is sensitized upon a neutral forty-five grain silver bath.

93.—Red Prints for Photo-Engravers.

Citric acid	100 gr.
Ammonium chloride	100 gr
Gelatine	10 gr.
Water	10 ounces

Dissolve the citric acid in a small portion of water, and exactly neutralize with carbonate of soda (228 grains of common washing soda are required).

Float the paper on this bath for one to two minutes, and sensitize upon a fifty-grain nitrate of silver solution. Fix in fresh hypo, without toning.

ARISTOTYPE OR CHLORIDE OF SILVER COLLODION AND CHLORIDE OF SILVER GELATINE PRINTING.

94.—Aristotype, or Chloride of Silver Collodion.

A.—Nitrate of silver	8 Gm.
Alcohol	100 C.c.
B.—Chloride of strontium	2 Gm.
Alcohol	100 C.c.
C.—Citric acid	5 Gm.
Water	100 C.c.
D.—Ether	100 C c.
Gun cotton	4 Gm.
Alcohol	100 C.c.

To 100 C.c. collodion (D) add first, by constant agitation, 10 C.c. of B and 10 C.c. of C; finally add 5 C.c. of A by vigorously shaking the mixture. The resulting emulsion is allowed to settle for twenty-four hours, and is then used for coating paper.

95.—CHLORIDE OF SILVER COLLODION (GELDMACHER'S).

Solution 1.

Gun cotton	6¼ fluid drachms
Ether	15 fluid ounces
Alcohol	15 fluid ounces
Castor oil	1 drachm

Solution 2.

Nitrate of silver	5 drachms 8 gr.
Water	6 drachms
Alcohol	1½ ounces

Dissolve in a warm water bath.

Solution 3.

Citric acid	1 drachm 15 grains
dissolved in	
Alcohol	2½ ounces
and	
Chloride of strontium	1 drachm 15 grains
dissolved in	
Alcohol	2½ ounces

Make the wo solutions separately and mix.

After all the solutions have been made add No. 3 to No. 1, shake vigorously, and by subdued light add gradually, and in small portions at a time, the No. 2 solution by constant agitating.

After an hour's ripening the collodion emulsion is ready for use.

The paper to be coated must be furnished with a substratum of sulphate of barium and gelatine.

96.—LIESEGANG'S TONING BATH FOR ARISTOTYPES.

A.—Water	20 ounces
Sulphocyanate of ammonium	1 ounce
Alum	1 ounce
Saturated solution of carbonate of ammonium	20 drops
B.—Water	50 ounces
Chloride of gold	15 gr.

97.—A. STIEGLITZ'S TONING BATH FOR ARISTOTYPES.

1. Phosphate of sodium	3 drachms
Water	32 ounces
2. Chloride of gold	15 gr.
Water	16 ounces

Mix. Allow to stand for twenty-four hours.

98.—LIESEGANG'S COMBINED TONING BATH.

Water	32 ounces
Hyposulphite of sodium	8 ounces
Sulphocyanate of ammonium	1 ounce
Acetate of sodium	¼ ounce
Saturated solution of alum	2 ounces
and	
Water	8 ounces
Chloride of gold	15 gr.
Chloride of ammonium	30 gr.

Pour the gold solution into the hypo solution, then add 30 grains of freshly prepared chloride of silver.

99.—COMBINED FIXING AND TONING BATH FOR CHLORIDE OF SILVER GELATINE PAPER.—DR. F. STOLZE'S.

Hyposulphite of sodium	35 Gm.
Common salt	9 Gm.
Alum	4 Gm.
Sulphocyanate of ammonium	2 Gm.
Water	150 to 200 C.c.

The compound will have matured for use in four to eight days.

Decant the clear solution from the deposit formed and filter. Immediately before use, add to above quantity, 2 C.c. chloride of gold solution 1 in 100. If the solution does not act with sufficient energy, a few C.c. of saturated alum solution may be added.

100.—The Omega Toning Bath.

Stock Solution.

Water	32 ounces
Hypo	6 ounces
Powdered alum	3 ounces

Let this mixture stand to clear, and decant. For toning about fifty cabinets take 8 ounces of this stock solution, and add to it, just before use, 4 grains chloride of gold, dissolved in ½ ounce of water, 10 grains nitrate of lead, dissolved in 1 ounce of water; and 80 grains sulpho-cyanate ammonium (imported), in crystals, shaking well after each addition. This bath can be used repeatedly if kept cool, but will not yield as clear results as when freshly prepared. The stock solution should be put up in a larger quantity, and as much as is needed for each batch of prints mixed from it. Prints should be washed after toning and fixing for about two hours in running water. They are then treated like albumen or aristo prints, mounted and burnished, or squeegeed, face down, on a ferrotype plate, thus obtaining a glacé finish.

PRINTING ON SUBSTANCES OTHER THAN PAPER.

101.—Collodion for Porcelain Pictures.

Fennemore's Method.

A.—Negative gun cotton	60 gr.
Alcohol	2 ounces
Ether	3 ounces

Dissolve 120 grains nitrate of silver in 3 ounces of hot alcohol, and add by constant stirring to the above collodion.

B.—Chloride of strontium	32 gr.
Citric acid	24 gr.

Reduce to a fine powder and dissolve in four ounces of alcohol, add

Ether	4 ounces
Gun cotton	60 gr.

The two collodions are to be mixed in equal proportions.

102. *Hern's Method.*

A.—Alcohol	7 ounces
Ether	9 ounces
Gun cotton	112 gr.
B.—Nitrate of silver	486 gr.
Distilled water	1 ounce
C.—Chloride of calcium	128 gr.
Alcohol	4 ounces
D.—Citric acid	128 gr.
Alcohol	4 ounces

Decant 8 ounces of A, add 64 drops of B in small portions, stirring up well after every addition, and 4 drams of C in the same way. Finally 4 drachms of D must be added in the same manner as the calcium solution.

103.—Printing on Silk.

Boiling water	80 ounces
Chloride of ammonium	100 gr.
Iceland moss	60 gr.

When nearly cold, filter and immerse the silk for fifteen minutes. Sensitize for fifteen minutes in an acid 20-grain silver bath, and when dry stretch the fabric over cardboard. Print deeper than usual and tone in

Water	20 ounces
Acetate of sodium	2 drachms
Chloride of gold	3 gr.
Common whiting	a few gr.

104.—Making Silver Prints on Wood.

Gelatine	45 gr.
White soap	45 gr.
Water	5¼ fluid ounces.

Soak the gelatine in water for five or six hours, then dissolve it with the aid of a water bath. Cut the soap into small pieces, and add to the gelatine solution, stirring the whole with a glass rod to insure a perfect mixture, then add powdered alum until the froth disappears, and strain through muslin. Cover the block with this mixture and a little zinc white, then wipe off so that a very thin film will be left, rubbing it gently, so that the film may be of as even a thickness as possible. After drying, apply with a badger's-hair brush a coating of the following composition:

Albumen	3½ fluid ounces
Water	2¼ fluid ounces
Chloride of ammonium	67½ gr.
Citric acid	18¾ gr.

Whip the albumen to a froth, and allow it to settle; to the limpid portion add the water, then the sal ammonia, and carefully stir with a glass rod, then add the citric acid. When the block is dry, sensitize with a solution of

Nitrate of silver	187½ gr.
Water	3½ fluid ounces

Pour this upon the surface of the block, spread it evenly with a glass rod, and pour off the excess. When the block is dry, expose it under a negative in the usual manner, until it is printed the exact shade desired. When printed, immerse the printed surface in a very strong solution of salt for about three minutes. Then wash it under a stream of water for a short time, and fix it by placing it face downward in a saturated solution of hyposulphite of soda. After fixing, wash under a stream of water for about ten minutes; when dry, it is finished, and ready for the engraver.

105.—To Transfer Photographs upon Wood for Engraving.

Float the reverse side of sensitized albumen paper for fifteen minutes upon a 4 per cent. solution of bichromate of potassium, dry well, expose to light till the picture is fairly visible, place the print upon a glass plate under water until the unacted-on bichromate is dissolved out; after removal from the water, roll in with fatty ink.

When the picture is sufficiently blackened, and nearly dry, it can be transferred upon the engraver's block by rubbing it on carefully.

PRINTING WITH THE SALTS OF IRON.

106.—Cyanotypes or Blue Prints.

A.—	Citrate of iron and ammonium	1¾ ounces
	Water	8 ounces
B.—	Ferricyanide of potassium	1¼ ounce
	Water	8 ounces

Mix equal parts immediately before use and float the paper, Rives plain, upon it for three minutes; hang up to dry.

107.—DEVELOPER FOR "STAR" BROMIDE OF SILVER PAPER.

No. 1.

Neutral potassium oxalate	8 ounces
Water	24 ounces
Oxalic acid	1 dram

No. 2

Protosulphate of iron	8 ounces
Water	24 ounces
Sulphuric acid	15 minims

The developer is composed of six volumes of No. 1 and one volume of No. 2. For the development of a 5 x 8 print about 2 ounces is sufficient, and the mixture may be made by adding ¼ of an ounce of No. 2 to 6 quarter ounces, or 1½ ounces of No. 1.

After the print is thoroughly developed, without washing remove it to the clearing solution, consisting of 2 drachms acetic acid and 20 ounces of water, or 1 drachm of citric acid in the same quantity of water.

When thoroughly cleared and washed remove the print to the fixing bath; a solution of 5 ounces sodium hypo sulphite in 30 ounces of water. Immerse the print in this solution, face down, and let it remain there for six or eight minutes, and in absolute contact with the bath. Owing to the absence of silver iodide and the extremely thin gelatine film, fixing is done rapidly.

Finally wash in repeated changes of water.

108.—THE KALLITYPE.

Coat stout but fine grained paper with a solution of

Sodium ferric-oxalate	6 drachms
Water	2½ ounces

Dry quickly without the application of heat, and print till the deeper shadow portions of the picture become visible. On removal of the print from the frame immerse into a 1½ per cent. solution of nitrate of silver acidified slightly with citric acid, when the picture will develop brilliantly and with all detail.

Finally wash in pure water. A yellow tinge may be washed away with a 5 per cent. solution of oxalic acid.

109.—CONVERTING BLUE PRINTS INTO BROWN PRINTS.

Blue ferro-prussiate photographic prints may be converted into brown prints by the following process:

The positive blue print, thoroughly washed and dried, is plunged into a solution of ammonia, in which it is kept until it has nearly or entirely lost its color. (The operation lasts from two to four minutes.) The print is rinsed and plunged into a bath of tannic acid, the operation being stopped as soon as the desired sharpness and tone are obtained.

This last operation requires about ten minutes. If at the end of this time the color be not dark enough, it is intensified by adding to the bath a few drops of ammonia. After a lapse of one or two minutes, rinse in abundant water.

1. Solution for preparing the sensitized paper:

Tartrate of iron and potassium	15 Gm.
Red prussiate of potash	12 Gm.
Rain water	250 C.c.

2. Solution to remove the color of the print:

Stronger ammonia (0.900)	100 C.c.
Rain water	800 C.c.

5. Solution to give the brown tone:

Tannic acid	10 Gm.
Rain water	500 C.c.

Dissolve and filter.

110.—TONING BLUE PRINTS.

Blue prints may be given the black tone by plunging them into a solution of 4 parts of potash in 100 parts of water; then, when the blue color has entirely disappeared under the action of the potash, and a yellowish color has taken its place, they are immersed in a solution of 4 parts of tannin in 100 parts of water; then washing them again we obtain prints whose tone may be assimilated to that of pale writing ink.

111.—PELLETT'S METHOD FOR MAKING BLUE LINES UPON WHITE GROUND.

The formula is composed as follows:

Gum arabic	385 gr.
Sodium chloride	46 gr.
Tartaric acid	62 gr.
Perchloride of iron	123 gr.
Water	3½ ounces

Highly sized and smooth paper is evenly coated with this mixture, dried in the dark, and exposed under a negative.

Develop with a saturated solution of ferrocyanide of potassium. Fix in a 1 to 20 solution of hydrochloric acid.

112.—BLACK LINES UPON WHITE GROUND.

Water	9 ounces
Gelatine	3 drachms
Solution of perchloride of iron (U. S. Ph.)	6 drachms
Tartaric acid	3 drachms
Ferric sulphate	3 drachms

Dissolve, filter and apply to the surface of stout paper (Steinbach medium roll).

After exposure to light, under a diapositive or drawing, immerse the print in

Gallic acid	6 drachms
Alcohol	6½ ounces
Water	32 ounces

when the greenish-yellow print will turn to inky black.

Finally wash in pure water.

USEFUL RECEIPTS.

113.—TO FIND THE FOCAL LENGTH OF A LENS.—W. H. SHERMAN'S RULE.

Make two images of any object of convenient length, so that the *difference* between the images will be equal to some part of the object, making the position of the ground glass on the base of the camera where each image is in focus. The distance between the two positions of the ground glass thus found will be the same part of the focal length that the difference of the two images is of the object.

Example: With two images of a foot-rule; let one image be 8 inches long and the other 4 inches. The difference being one-third the length of the object, the distance between the two positions of the ground glass will be one-third of the focal length of the lens.

114.—TO CALCULATE THE FOCAL FRACTION OF STOPS FOR LENSES.

Divide the focal length obtained by the above method expressed in inches and hundredths, by the diameter of stop opening expressed in hundredths of an inch.

115.—LABARRAQUE'S SOLUTION.

Chloride of lime	2 ounces
Carbonate of sodium, cryst	4 ounces
Water	40 ounces

Mix the chloride of lime with 30 ounces of the water, and dissolve the carbonate of soda in the remainder. Mix, boil and filter.

116.—EAU DE JAVELLE.

Dry chloride of lime	2 ounces
Carbonate of potash	4 ounces
Water	40 ounces

Mix the chloride of lime with half of the water; dissolve the carbonate of potash in the remainder. Mix, boil and filter.

117.—A FEW REMEDIES AGAINST BLISTERING OF ALBUMEN PAPER.

Do not dry the paper by excessive heat.
Avoid acidity in solutions.
Moisten the print before washing with a sponge saturated in alcohol.
Immerse the print before fixing in a weak alum
Add a trace of aqua ammonia to the fixing bath.

118.—MAT BLACK VARNISH.

A tolerably strong solution of sandarac in alcohol, mixed with fine lampblack, dries without gloss, becomes hard without being brittle, and may be applied with a fine brush upon almost any substance.

119.—INVISIBLE INK.

Chloride of cobalt	50 gr.
Distilled water	1 fluid ounce
Glycerine	10 minims

Dissolve the chloride of cobalt in the distilled water, and add the glycerine.

Writing executed with this ink is invisible on paper, but on warming the writing turns blue. On exposure to damp air it becomes invisible again.

120.—SOLUTION FOR MAKING PAPER ADHERE TO METAL.

Tragacanth	30 Gm.
Gum Arabic	120 Gm.
Water	500 c.c.

121.—TO PRECIPITATE GOLD FROM SPENT SULPHOCYANATE TONING BATHS.

Add sulphuric acid and heat, when the gold will separate.

122.—TO KEEP UNMOUNTED ALBUMEN PRINTS FLAT.

Soak them in equal parts of alcohol, glycerine and water; dry between blotting paper under slight pressure.

123.—MAGIC PHOTOGRAPHS.

Fix an albumen print in perfectly fresh hypo solution and wash well, and soak it in a solution of 1 part bichloride of mercury, ¼ of a part of chloride of ammonium in 60 parts of water, till the photograph is bleached out.

The picture will appear again when brought into contact with hypo solution, or moistened blotting paper previously prepared with the fixing soda.

124.—SOLUTION FOR MOUNTING PRINTS WITHOUT THEIR COCKLING.

Nelson's No. 1 photographic gelatine	4 ounces
Water	16 ounces
Glycerine	1 ounce
Alcohol	5 ounces

Dissolve the gelatine in the water, then add the glycerine, and lastly the alcohol.

125.—PERMANENT PASTE.

Arrowroot	10 Gm.
Water	100 Gm.

in which 1 gram of gelatine has been soaked, and boil. After cooling add 10 grams of alcohol and a few drops of carbolic acid.

126.—LEATHER COLLODION.

2 p. c. Collodion	100 parts
Castor oil	4 parts

127.—LUBRICATOR FOR HOT BURNISHING.

Spermaceti	10 Gm.
Castile soap	10 Gm.
Alcohol	1 liter

128.—TO REMOVE SILVER STAINS FROM THE HANDS.

Sulphate of sodium (Glauber's salt)	½ ounce
Chloride of lime	½ ounce
Water	1 ounce

Mix thoroughly, and apply with an old toothbrush.

129.—TO FROST A SKYLIGHT.

Very thin starch paste, to which unboiled starch has been added. Must be free from lumps, and be daubed on with a large bristle brush.

130.—TO KEEP THE HANDS SOFT AND WHITE.

Apply before retiring:

Glycerine	2 ounces
Bay rum	6 ounces
Oil cajeput	1 dram
Oil bergamot	1 dram

Mix well.

131.—TO REMOVE NITRIC ACID STAINS FROM HANDS OR GARMENTS.

Touch the stains with solution of permanganate of potassium; wash, rinse in dilute hydrochloride acid, and wash again.

132.—TO REMOVE YELLOW STAINS FROM BROMIDE PRINTS.

Soak for one or two hours in

Acetic acid	2 ounces
Sat. oxalate of potassium solution	4 ounces

133.—TO REMOVE PYRO STAINS FROM FINGERS.

Wash with a 10 per cent. solution of oxalic acid, or sulphuric acid, diluted with water, 1 : 20.

134.—TO REMOVE YELLOW STAINS FROM PYRO-DEVELOPED NEGATIVES.

Bathe them in sulphurous acid water or in a 10 per cent. solution of sulphite of soda, to which a few drops of sulphuric acid has been added.

135.—TO REMOVE THE ODOR OF HYDROSULPHATE OF AMMONIUM FROM THE DARK ROOM.

Sprinkle the floor with a solution of nitrate of lead.

136.—To Avoid Halation.

A quick drying coating, which is applied to the back of the plate, consists of collodion, with which any dark red or brown pigment is mixed. Spanish brown or rouge answers well.

137.—To Recover Silver Bromide from Waste Emulsion.

Let the emulsion be melted, and then add a small quantity of hydrochloric acid, following by boiling for two or three minutes. The silver bromide precipitates, and the destroyed gelatine is then poured off. The bromide is then placed among the other residues for reduction.

138.—Toning Bath for Gelatine Lantern Slides.

Chloride of platinum	1 gr.
Hydrochloric acid	1 minim
Water	32 ounces

139.—Compound for Blocking out Large Portions of a Negative.

Mix alphaltum varnish with fine lamp-black and apply with a camel's-hair brush.

Should be kept in well-stoppered bottles.

140.—Flash-Light Powder for Orthochromatic Plates.

Pure metallic magnesium powder	10 gr.
Nitrate of sodium (finely powdered)	from 50 to 70 gr.

141.—Largest and Smallest Quantities of Chemicals Admitted to the Pyro Developer.

	Largest.	Smallest.
Pyro, per ounce	10 gr.	1¼ gr.
Sulphite of sodium	80 gr.	5 gr.
Carb. of sodium	40 gr.	1 1-5 gr.
Carb. of potassium	21 2-10 gr.	5 gr.

142.—Consumption of Chemicals in Silver Printing on Albumenized Paper.

Of 100 parts of silver used in the albumen printing process will be found

In the finished print	3 per cent
In filters, blotters and cuttings	7 per cent
In the wash water before toning	50 to 55 per cent
In the fixing bath	30 to 35 per cent
In the wash water after fixing	5 per cent

90 per cent. of the silver used may be recovered.

One sheet of paper, 18 x 22, will take from the silver bath from 30 to 45 grains of nitrate of silver.

One sheet of paper, 18 x 22, requires to tone 1½ grains of gold (1 decigram).

About 80 to 90 grains of hyposulphite of sodium are necessary to fix one sheet of paper, 18 x 22.

143.—Directions for Removing White Spots from Silicate Material.

At any time you find the white spots or mineral appearing on the surface put a few drops of sweet (sewing machine) oil on a rag, *rub it into the rag* and then over the surface, and they will always be clear and free from spots.

TABLE OF THE SYMBOLS, ATOMICITY, ATOMIC AND EQUIVALENT WEIGHTS OF THE ELEMENTS.

	Symbol and Atomicity.	Atomic Weight.	Equivalent Weight.
Aluminium	Al^{iv}	27.5	9.13
Antimony (Stibium)	Sb^{v}	120.0	40.66
Arsenic	As^{v}	75.0	25.0
Barium	Ba^{ii}	137.0	68.5
Beryllium, or Glucinum	Be^{ii}	9.4	4.7
Bismuth	Bi^{v}	208.0	69.33
Boron	B^{iii}	11.0	3.66
Bromine	Br^{i}	80.0	80.0
Cadmium	Cd^{ii}	112.0	56.0
Cæsium	Cs^{i}	133.0	133.0
Calcium	Ca^{ii}	40.0	20.0
Carbon	C^{iv}	12.0	3.0
Cerium	Ce^{iv}	138.0	46.0
Chlorine	Cl^{i}	35.5	35.5
Chromium	Cr^{vi}	52.5	26.1
Cobalt	Co^{vi}	59.0	29.4
Copper (Cuprum) { Cuprosum	Cu^{i}	63.4	63.4
Copper (Cuprum) { Cupricum	Cu^{ii}	63.4	31.7
Columbium (Niobium)	Cb^{v}	94.0	18 8
Didymium	D^{iv}	145.0	47.5
Erbium	Eb^{ii}	112.6	56.3
Fluorine	Fl^{i}	19.0	19.0
Gallium	—	—	—
Germanium	Gr^{iv}	72.31	—
Gold (Aurum)	Au^{iii}	196.7	65.33
Hydrogen	H^{i}	1.0	1.0
Indium	In^{iii}	113.4	37.8
Iodine	I^{i}	127.0	127.0
Iridium	Ir^{i}	193.0	49.5
Iron (Ferrum) { Ferrosum	Fe^{ii}	56	28
Iron (Ferrum) { Ferricum	Fe^{iii}	56	18.67
Lanthanium	La^{ii}	92.8	46.4
Lead (Plumbum)	Pb^{iv}	207.0	103.5
Lithium	L^{i}	7.0	7.C
Magnesium	Mg^{ii}	24.0	12.0
Manganese	Mn^{ii}	55.0	27.5
Mercury (Hydrargyrum) { Mercurosum	Hg^{i}	200.0	200.0
Mercury (Hydrargyrum) { Mercuricum	Hg^{ii}	200.0	100.0
Molybdenum	Mo^{ii}	92	46.0

Oscar Suck, Photo. A BADEN HIGHLAND PEASANT. Electro Light Eng. Co., N. Y.

TABLE OF SYMBOLS, ETC.—(*Continued.*)

	Symbol and Atomicity.	Atomic Weight.	Equivalent Weight.
Nickel	Ni^{ii}	58.8	29.4
Nitrogen	N^{iii}	14	4.66
Osmium	Os^{iv}	199	49.75
Oxygen	O^{ii}	16	8.0
Palladium	Pd^{ii}	106.5	53.25
Phosphorus	P^{iii}	31.0	10.33
Platinum { Platinosum	Pt^{ii}	197.4	98.7
Platinum { Platinicum	Pt^{iv}	197.4	49.35
Potassium (Kalium)	K^{i}	39.0	39.0
Rhodium	Rh^{ii}	104.3	52.2
Rubidium	Rb^{i}	85.4	85.4
Ruthenium	Ru^{iv}	104.2	26.0
Selenium	Se^{ii}	79.4	39.7
Silicon (Silicium)	Si^{iv}	28.0	7.0
Silver (Argentum)	Ag^{i}	108.0	108.0
Sodium (Natrium)	Na^{i}	23.0	23.0
Strontium	Sr^{ii}	87.5	43.75
Sulphur	S^{ii}	32.0	16.0
Tantalum	Ta^{v}	182.0	36.4
Tellurium	Te^{ii}	128.0	64.0
Thallium	Tl^{i}	204.0	204.0
Thorinum (Thorium)	Th^{iv}	231.5	57.87
Tin (Stannum) { Stannosum	Sn^{ii}	118.0	59.0
Tin (Stannum) { Stannicum	Sn^{iv}	118.0	29.5
Titanium	Ti^{iv}	50.0	12.5
Tungsten (Wolfram)	W^{iv}	184.0	46.0
Uranium	U^{ii}	120.0	60.0
Vanadium	V^{iii}	51.3	17.1
Yttrium	Y^{ii}	61.7	30.85
Zinc	Zn^{ii}	65.2	32.6
Zirconium	Zr^{iv}	89.6	22 4

TABLE OF SYMBOLS, MOLECULAR WEIGHT AND SOLUBILITIES OF THE PRINCIPAL CHEMICALS USED IN PHOTOGRAPHY.

Abbreviations.—s., soluble; v. s , very soluble; sp. s., sparingly soluble; n. s., not soluble; dec., decomposed; del., deliquescent.

Name.	Symbol.	Mol. Weight.	One Part is Soluble in Cold Water.	One Part is Soluble in Hot Water.	Alcohol.
Acid, Acetic, Glacial	$H,C_2H_3O_2$	60	s.	s.	s.
" Boracic or Boric	H_3BO_3	62	25	3	1 in 6
" Carbolic (see Phenol)	C_6H_5OH	94	16.6	s.	s.
" Chlorhydric (see Hydrochloric)	....	....	....	....	....
" Citric	$C_6H_5O_7 + H_2O$	210	.75	.5	n. s.
" Digallic (see Tannic Acid)	....	....	....	....	....
" Formic	H,CHO_2	46	....	....	....
" Gallic	$H,C_7H_5O_5 + H_2O$	170	100	3	1 in 8
" Hydrobromic	HBr	81	s.	s.	s.
" Hydriodic	HI	128	s.	s.	s.
" Hydrochloric	HCl	36.5	s.	s.	s.
" Hydrocyanic	HCy	27	s.	s.	s.
" Hydrosulphuric	H_2S	34	....	....	....
" Muriatic (see Hydrochloric)	....	....	....	....	....
" Nitric	HNO_3	63	s.	s.	s.
" Nitrous	HNO_2	47	s.	s.	s.
" Oxalic	$H_2C_2O_4,2H_2O$	126	9	dec.	dec.
" Pyrogallic (see Pyrogallol)	$H_3C_6H_3O_3$	126	3.5	8	v.s.& ether
" Salicylic	$HC_7H_5O_3$	138	7.60	9	v.s.& ether
" Sulphuric	H_2SO_4	98	....	....	....
" Sulphurous	H_2SO_3	82	s.	s. also	in ether
" Tannic (see Digallic Acid)	$H_4C_{27}H_{18}O_{17}$	618	.8	.5	10 in 8
" Tartaric	$H_4C_4H_2O_6$	150	.8	.5	1 in 5
Alcohol, Ethyl	C_2H_5OH	46	in all	proportions.	

Alcohol, Methyl (see Wood Alcohol)	CH_3HO	32	in	all propor	tions.
Alum (see Potassium Aluminium Sulphate)					
Alum Chrome (see Potassium Chromic Sulph.)					
Ammonia, Gaseous	H_3N	17	v. s.		
Ammonium, Bichromate	$(NH_4)_2Cr._2O_7$	253	v. s.	v. s.	
" Bromide	NH_4Br	98	1.5.	v. s.	1 in 13
" Carbonate (see Sal volatile)	$(NH^4)_2CO_3+(NH^4)HCO_3$	175	4	dec.	sp. s.
" Chloride (see Sal ammoniac)	NH_4Cl	53.5	3	1	sp. s.
" Fluoride	NH_4Fl	37	v. s.	v. s.	sp. s.
" Iodide	NH_4I	145	1	.5	s.
" Nitrate	NH_4NO_3	80	2	1	s.
" Oxalate	$(NH_4)_2C_2O_4$	124	5	v. s.	n. s.
" Sulphide	NH_4HS	51	v. s.	v. s.	1:2
" Sulpho cyanate	NH_4CNS	76	1	5	s.
Barium, Bromide	$BaBr_2$	297	.90	.75	s.
" Chloride	$BaCl_2,2H_2O$	244	2.18	1.5	sp. s.
" Iodide	BaI_2	391	.48	.35	v. s.
" Per-oxide	BaO_2	169	n. s.	n. s.	in hdchl. acid
Bicarbonate of Potassa (see Potassium Bicarb).					
Bicarbonate of Soda (see Sodium Bicarbonate).					
Bichloride of Mercury (see Mercuric Chloride).					
Bromine	Br	79.8	s.	s.	s.
Borax (see Sodium Biborate)					
Cadmium, Bromide	$CdBr_2,4H_4O$	344	1.5	1	sp. s.
" Chloride	$CdCl_22H_2O$	219	.71	.67	sp. s.
" Iodide	CdI_2	294	1.5	1	1 in 2
Calcium, Bromide	$CaBr_2,4H_2O$	272	1	.75	s.
" Carbonate (see Chalk)	$CaCO_3$	100	n. s.	n. s.	n. s.
" Chloride	$CaCl_2$	111	.75	.5	1 in 10
" Hypochlorite (see Chloride of Lime).	$CaCl_2O_2CaCl_2$	254	sp. s.	sp.	dec.
" Iodide	CaI_2	294	.75	.5	1 in 10
Calomel (see Mercurous Chloride)					
Carbonate of Ammonia (see Ammonium Carb)					
" Potash (see Potassium Carbonate)					
" Soda (see Sodium Carbonate)					

TABLE OF SYMBOLS, MOLECULAR WEIGHT AND SOLUBILITIES OF THE PRINCIPAL CHEMICALS USED IN PHOTOGRAPHY.

Abbreviations.—s., soluble; v. s., very soluble; sp. s., sparingly soluble; n. s., not soluble; dec., decomposed; del., deliquescent.

NAME.	SYMBOL.	MOL. WEIGHT.	ONE PART IS SOLUBLE IN COLD WATER.	ONE PART IS SOLUBLE IN HOT WATER	ALCOHOL.
Caustic Potash (see Potassium Hydrate)					
" Soda (see Sodium Hydrate)					
Chalk (see Calcium Carbonate)					
Chloride of Lime (see Calcium Hypochlorite)					
Chlorine	Cl	35 5	1:2 5	Volumes.	
Chrome, Alum (see Potassium Chromic Sulph.)					
Copper Acetate (see Verdigris)	$Cu(C_3H_3O_2)_2,H_2O$	199	14	5	1 in 14
" Bromide	$CuBr_2$	223.4	1	.75	s.
" Chloride	$CuCl_2,H_2O$	170.5	1	.75	v. s.
" Sulphate (see Blue Vitriol)	$CuSO_4,5H_2O$	249.2	3	1	n. s.
" " and Ammonia	$CuSO_4,4NH_3+H_2O$	245.5	s.	v. s.	n. s.
Corrosive sublimate (see Mercuric Chloride)					
Epsom Salts (see Magesium Sulphate)					
Glaubers Salt (see Sodium Sulphate)					
Glycerine	$C_3H_5(HO)_3$	92	s.	s.	s.
Gold, Perchloride	$AuCl_3+H_2O$	339.2	1	.75	also in ether
Green Vitriol (see Iron Sulphate)					
Hydroquinone	C_6H_42HO	110	3	s.	also in ether
Hydroxylamine Chloride	NH_2OHCl	69.5	v. s.	v. s.	n. s.
Iodine	I	127	sp. s.	sp. s.	v. s.
Iron, Ammonium Sulphate	$FeSO_4(NH_4)_2SO_4+6H_2O$	392	v. s.	dec.	n. s.
" Chloride (Ferric)	Fe_2Cl_6	325	.75	.5	1 in 1
" Chloride (Ferrous)	$FeCl_2$	127	2	1	1 in 1
" Citrate	$Fe_2(C_6H_5O_7)_2$	598	s.	s.	n. s.

Iron, Iodide	FeI_2	310	v. s.	v. s.	v. s.
" Nitrate	$Fe(NO_3)_2.6H_2O$	288	v. s.	dec.	dec.
" Oxalate (Ferric)	$Fe_2(C_2O_4)_3$	376	s.	s.	n. s.
" " (Ferrous)	FeC_2O_4	144	In potas	sium oxal.	n. s.
" Sulphate (Ferric)	$Fe_2(SO_4)_3$	400	s.	dec.	s.
" " (Ferrous)	$FeSO_4,7H_2O$	278	1.5	1	n. s.
Lead, Acetate (see Sugar of Lead)	$Pb.(C_2H_3O_2)_2.3H_2O$	378	2.5	2	1 in 12.5
" Carbonate	$PbCO_4$	366	n. s.	sp. s.	n. s.
" Iodide	PbI_2	460	s.	s.	n. s.
" Nitrate	$Pb(NO_3)_2$	330	7.7	7	s.
" Oxide	PbO	222.4	n. s	n. s	Alkalis.
Lithium, Bromide	$LiBr$	87	.66	.5	v. s.
" Chloride	$LiCl+H_2O$	60.5	1.3	1	s.
" Iodide	LiI	134	.61	.5	s.
Magnesium, Bromide	$MgBr_2$	184	1	.75	s.
" Chloride	$MgCl_2$	95	2	1.5	s.
" Iodide	MgI_2	246.3	1	.75	v. s.
" Sulphate (see Epsom Salt)	$MgSO_4,7H_2O$	246	1.3	1	sp. s.
Mercury, Chloride (Mercuric) (see Corros. Subl.)	$HgCl_2$	271	19	3	5
" " (Mercurous) (see Calomel)	Hg_2Cl	235.5	n. s.	n. s.	n. s.
" Cyanide	$HgCy_2$	252	8	2	1 in 20
" Iodide (Mercuric)	HgI_2	454	sp. s.	sp. s.	sp. s.
" " (Mercurous)	Hg_2I	654	n. s.	n. s.	n. s.
Phenol (see Carbolic Acid)	....	....	....	....	....
Platinum Chloride	$PtCl_4+8H_2O$	479.5	1	.5	s.
Potassa (see Potassium Hydrate)	....	....	....	....	....
Potassium, Aluminium Sulphate (see Alum)	$Al_2(SO_4)_3,K_2SO_4,24H_2O$	948	10	8	n. s.
" Bicarbonate	$KHCO_3$	100	3	2	n. s.
" Bichromate	$K_2Cr_2O_7$	295	10	7	n. s.
" Bromide	KBr	119	2	1	1 in 90
" Carbonate	$KO_2C_3+2H_2O$	174	.75	.5	n. s.
" Chlorate	$KClO_3$	122.5	16	2	n. s.
" Chloride	KCl	74.5	3	2	sp. s.
" Chromic Sulph. (see Chrome Alum	$Cr_2(SO_4)_3,K_2SO_4,24H_2O$	999	10	dec.	n. s.
" Citrate	$K_3C_6H_5O_7H_2O$	324.3	6.6	.3	n. s.

TABLE OF SYMBOLS, MOLECULAR WEIGHT AND SOLUBILITIES OF THE PRINCIPAL CHEMICALS USED IN PHOTOGRAPHY.

Abbreviations.—s., soluble; v. s., very soluble; sp. s., sparingly soluble; n. s., not soluble; dec., decomposed; del., deliquescent.

Name.	Symbol.	Mol. Weight.	One Part is Soluble in Cold Water	One Part is Sol'ble in Hot Water.	Alcohol.
Potassium, Cyanide	KCy	65.1	1	.5	sp. s.
" Ferric Sulphate	$K_2SO_4.Fe_2(SO_4)_3,24H_2O$	100.6	s.	s.	n. s.
" Ferri-cyanide (see Red Prussiate)	$K_6Fe_2Cy_{12}$	658.6	2.5	1.2	n. s.
" Ferro-cyanide (see Yellow Pruss.)	K_4FeCy_6	368.4	3	1	n. s.
" Fluoride	$KFl+2H_2O$	94	v. s.	v. s.	v. s.
" Hydrate	KOH	56	.5	.25	sp. s.
" Iodide	KI	166	.75	.5	1 in 16
" Nitrate (see Saltpetre)	KNO_3	101	4	1	n. s.
" Oxalate	$KC_2O_4H_2O$	235	3	2	sp. s.
" Permanganate	$KMnO_4$	158	16	10	n. s.
" Platino-chloride	K_2PtCl_6	414.9	10	1	s.
" Sulpho-cyanate	$KCyS$	97	2	1	sp. s.
Prussiate of Potash, red (see Potassium Ferri-cyanide)	....	....	....	....	....
Prussiate of Potash, yellow (see Potassium Ferro-cyanide)	....	....	....	....	....
Pyrogallol (see Pyrogallic acid)	....	....	....	....	....
Sal ammoniac (see Ammonium Chloride)	....	....	....	....	....
Sal soda (see Sodium Carbonate)	....	....	....	....	....
Sal tartar (see Potassium Carbonate)	....	....	....	....	....
Saleratus (see Potassium Bicarbonate)	....	....	....	....	....
Sal volatile (see Ammonium Carbonate)	....	....	....	....	....
Salt, common (see Sodium Chloride)	....	....	....	....	....
Saltpetre (see Potassium Nitrate)	....	....	....	....	....

Saltpetre of Chili (see Sodium Nitrate)					
Sesqui-Carbonate of Soda (see Sodium Carb.)					
Silver, Acetate	$AgC_2H_3O_2$	167	sp. s.	sp. s.	n. s.
" Bromide	$AgBr$	188	n. s.	n. s.	in HCl and HBr.
" Carbonate	Ag_2CO_3	276	n. s.	n. s.	n. s.
" Chloride	$AgCl$	143.5	n. s.	n. s.	Ammonia, cyan. potass. hyposulphite of soda.
" Citrate	$Ag_3C_6H_5O_7$	513	sp. s.	sp. s.	
" Fluoride	$AgFl$	127	v. s.	v. s.	v. s.
" Iodide	AgI	235	n. s.	n. s.	same as Chloride.
" Nitrate	$AgNO_3$	170	1	.5	sp s.
" Nitrite	$AgNO_2$	154	300	dec.	n. s.
" Oxalate	$Ag_2C_2O_4$	304	sp. s.	s.	n. s.
" Oxide	Ag_2O	232	n. s.	n. s.	n. s.
" Sulphide	Ag_2S	248	n. s.	n. s.	n. s.
Soda, Caustic (see Sodium Hydrate)					
Sodium Acetate	$NaC_2H_3O_2,6H_2O$	190	3	.66	n. s.
" Biborate (Borax)	$Na_2B_4O_7,10H_2O$	382	12.5	2	n. s.
" Bromide	$NaBr$	103	1.25	1	1:16
" Bicarbonate	$NaHCO_3$	84	12	dec.	n. s.
" Carbonate	$Na_2CO_3,10H_2O$	286	2	1	n. s.
" Chloride	$NaCl$	58.5	2.75	2.75	n. s.
" Citrate	$Na_3C_6H_5O_7$	258	1	.5	sp. s.
" Hydrate	$NaHO$	40	1 5	.5	sp. s.
" Hypo-sulphite	$Na_2S_2O_35H_2O$	248	1.5	1	sp. s.
" Iodide	NaI	150	.5	.3	sp. s.
" Nitrate (see Chili Saltpetre)	$NaNO_3$	85	1.36	1	1 in 37
" Sulph-antimoniate	$NaSbS_3$	241	s.	s.	n. s.
" Sulphate	$Na_2SO_4,10H_2O$	322	2	4	s.
" Sulphide	$Na_2S.9H_2O$	240	s.	s.	sp. s.

TABLE OF SYMBOLS, MOLECULAR WEIGHT AND SOLUBILITIES OF THE PRINCIPAL CHEMICALS USED IN PHOTOGRAPHY.

Abbreviations.—s., soluble; v. s., very soluble; sp. s., sparingly soluble; n. s , not soluble; dec., decomposed; del., deliquescent.

Name.	Symbol.	Mol. Weight.	One Part is Soluble in Cold Water.	One Part is Soluble in Hot Water.	Alcohol.
Sodium Sulphite	$Na_2SO_3,7H_2O$	252	4	2	sp. s.
" Thio-sulphate (see Hypo-sulphite)	....	....	....	....	....
Strontium, Bromide	$SrBr_2,6H_2O$	355.5	1	.75	sp. s.
" Chloride	$SrCl_2,6H_2O$	266.5	1.8	1	sp. s.
" Nitrate	$Sr(NO_3)_2$	211.5	5	2	sp. s.
Sugar of Lead (see Lead Acetate	....	....	....	....	....
Sulphate Soda (see Sodium Sulphate)	....	....	....	....	....
Tannin (see Digallic Acid)	....	....	....	....	....
Thymol	$C_6H_3(CH_3(C_3H_7)COO$	177	sp.	....	& in ether.
Tin, Chloride (Stannic)	$SnCl_4$	260	dec.	in much	water.
" Chloride (Stannous)	$SnCl_2.2H_2O$	225	135:100	655:100	v. s.
Uranium, Bromide	$UBr_2.4H_2O$	352	1	.5	sp. s.
" Nitrate	$UO_2(NO_3)_2, 6H_2O$	384	.5	.25	v. s.
" Sulphate	$UO_2(SO_4),3H_2O$	302	.5	.25	v. s.
Verdigris (see Copper Acetate)	....	....	....	....	....
Vitriol, Blue (see Copper Sulphate)	....	....	....	....	....
" Green (see Iron Sulphate)	....	....	....	....	....
" White (see Zinc Sulphate)	....	....	....	....	....
Washing Soda (see Sodium Carbonate)	....	....	....	....	....
Wood Alcohol (see Alcohol Methyl)	....	....	....	....	....
Zinc, Bromide	$ZnBr_2$	225	del.	and e. s.	s.
" Chloride	$ZnCl_2$	136	.33	....	s.
" Iodide	ZnI_2	319	.33	dec.	v. s.
" Nitrate	$Zn(NO_3)_2,6H_2O$	296	del.	del.	del.
" Sulphate (see White Vitriol)	$ZnSO_4,7H_2O$	287	135:100	655:100	n. s.

TABLE SHOWING COMPARATIVE VALUE OF ALKALINE CARBONATES IN DEVELOPERS.

O. G. MASON.

Commercial Name.	Chemical Symbol.	Molecular Weight.	The Commercial Salt contains of the pure Salt about	100 parts of 36 per cent Acetic Acid Require for Saturation.	Solubility in Water (approximate).
Soda, Caustic	NaHO	40	80 to 92%	26.66 p'rts of 90% Soda	1 part in 2
Sodium Carbonate, Carbonate of Soda, Sal Soda, Crystals	$Na_2CO_3.10H_2O$	286	96 to 98%	89.38 " 96% "	1 " 2
The same, anhydrous or in dry powder	Na_2CO_3	106	About 98 to 99%	89.38 of 98 to 99% dry Sal Soda.	1 " 6
Sodium Bicarbonate, Bicarbonate of Soda, "Sesqui-carbonate of Soda,"	$NaHCO_3$	84	98 to 100%	5 .91 of 99% Bicarb. Soda.	1 " 12

Equal work is done by 80 parts of Caustic Soda, 286 parts of Sal Soda (crystals), 106 parts of Sal Soda (dry), 168 parts of Bicarbonate of Soda These quantities must be increased to make up for any impurity contained in the sample being used; for this purpose the usual percentage of impurity given in the above table may be assumed for all ordinary photographical uses.

Potassa (Caustic Potash)	KHO	56	80 to 95%	37.33 parts of 90% Potassa.	1 part in 1
Potassium Carbonate, Carbonate of Potassa, Sal Tartar, Saleratus,	$K_2CO_3.1\frac{1}{2}H_2O$	165	76 to 96% Usually about 81%	51.11 parts of 81% Carb. Potassa.	1 " 1
Potassium, Carbonate, dry	K_2CO_3	140	About 95%	122.74 parts of 95% Carb. Potassa.	1 " 1
Potassium Bicarbonate, Bicarbonate of Potassa,	$KHCO_3$	100	100%	60 parts of 100% Bicarb. Potassa.	1 " 4

Equal work is done by 112 parts Caustic Potassa, 165 parts (about) ordinary Carbonate Potassa, 200 parts of Bicarbonate Potassa. These quantities must be increased in proportion to impurities, as noted in case of Soda These two alkalies are interchangeable for doing the same amount of work when *pure*, and when the one named in a given formula can not be obtained the table may assist in choosing a substitute of proper strength and solubility.

Dry or anhydrous Carbonate of Potassium is not usually found in the market.

IMPURITIES IN PHOTOGRAPHIC CHEMICALS AND TESTS FOR THEM.

Substance.	Impurities Possibly Present.	Tests.
Ammonia	Carbonic Acid.	Renders lime-water milky.
	Dissolved solid matter	Residue left on evaporation.
	Chlorides.	After acidulating with nitric acid, it gives a precipitate with silver nitrate, which, after washing, is readily soluble in ammonia, and re-precipitated by nitric acid.
	Sulphates.	After acidulating with nitric acid, it gives a precipitate with barium nitrate.
	Lime.	A white precipitate with oxalate of ammonium.
	Lead is often present, derived from the action upon flint glass bottles.	Black precipitate with sulphuretted hydrogen.
Nitric Acid	Traces of sulphuric acid.	After dilution it gives a precipitate with barium nitrate.
	Chlorides.	After dilution it gives a precipitate with silver nitrate.
	Peroxide of nitrogen.	The acid is yellow.
	Iodine may be present if the acid be prepared from sodium nitrate.	After dilution and cooling it gives a blue color with starch paste or mucilage.
Hydrochloric Acid	Free chlorine.	Liberates iodine from solution of potassium iodide. See also chlorides, nitric acid.
	Sulphuric acid.	As above for nitric acid.
	Perchloride of iron.	Yellow color. Brown precipitate with ammonia added till it smells slightly.
Hydrochloric Acid	Arsenic.	Marsh's test.
	Some yellow samples contain no iron, but an organic salt, and give an alkaline ash on ignition of the residue after evaporation.	Reinsh's test; a small piece of copper foil becomes coated on boiling in dilute acid.
Sulphuric Acid	Bisulphate of potassium.	Residue on evaporation.
	Sulphate of lead.	Milkiness on dilution. May be completely freed from lead by diluting with three or four times as much water, and allowing to settle.
	When sold as pure, it invariably contains a trace of iron. Common acid is also liable to contain arsenic, selenium, thallium, and many other substances.	No easy test can be given, as the substances are so numerous; some of them volatile, and most require separation from the acid before detection.
	Organic matter, as a piece of straw in a carboy of acid.	Gives a brown color to the acid.
Acetic Acid	Water.	Does not solidify when cooled to 17° C, (53° F.)
	Sulphurous and hydrochloric acids.	White precipitate with silver nitrate.
	Aldehyde, or volatile tarry matter.	Blackens in the light after adding silver nitrate.
	Organic sulphuric acid.	Smell of garlic.
Citric Acid	Tartaric acid.	Strong solution of potassium acetate added to a strong solution of the acid will deposit white crystalline bitartrate.
Pyrogallic Acid	Metagallic acid.	Black residue insoluble in water.
Silver Nitrate	Free nitric acid.	Reddens litmus paper (neutral silver nitrate does not affect litmus).
Potassium Carbonate	Chlorides and sulphates.	Same as for ammonia.
Potassium Iodide	Potassium carbonate.	A strong solution is alkaline to test paper.
	Sulphates and chlorides.	Same as for ammonia.
	Potassium iodate.	A pretty strong solution becomes yellow from liberation of iodine on addition of dilute sulphuric acid, or better, a strong solution of citric acid.

IMPURITIES IN PHOTOGRAPHIC CHEMICALS AND TESTS FOR THEM.—*Continued.*

SUBSTANCE.	IMPURITIES POSSIBLY PRESENT.	TEST.
Potassium Bromide	Similar to potassium iodide.	See potassium iodide.
Sodium Carbonate	Chlorides and sulphates.	Same as for ammonia.
Sodium Chloride	Chloride of calcium. Chloride of magnesium.	Oxalate of ammonium (after addition of a little acetic acid) gives a milkiness or precipitate, indicating calcium; filter this out, and add ammonia, chloride of ammonium, and phosphate of sodium (clear solutions). A precipitate indicates magnesium. Both the above cause dampness in wet weather.
	Sodium sulphate.	As for sulphates in ammonia.
Potassium Cyanide Potassium Hydrate	Potassium carbonate nearly always present.	Effervescence with dilute acids, giving off a gas carbonic anhydride, which renders lime water turbid.
Kaolin	Chalk.	Effervescence with dilute acids.
Water	Sulphates and chlorides.	Same as for ammonia.
	Calcium carbonate, temporary hardness.	Deposited by boiling.
	Ammonia, almost always present in distilled and rain water.	Test as for calcium chloride, see sodium chloride. Brown coloration, or precipitate with Nessler's re-agent.
Gelatine	Alum.	Ash, sometimes as much as 10 per cent.
	Fatty matter.	Separated by precipitation with alcohol. Dissolved out by ether or benzine, and left as a residue on evaporation of the solvent.
Ammonium Bromide	Potassium bromide, or other non-volatile bodies.	Leaves a residue when heated.
	Ammonium chloride.	Same as for chlorides in ammonia.
Pyrogallic Acid	Powdered glass.	Left behind on solution.
Potassium Iodide	Potassium bromide.	The crystals of bromide are usually more transparent than those of iodide, but no reliance can be placed on this.
Silver Nitrate	Potassium nitrate, sometimes present in the fused sticks, not in the crystals.	Will not yield the full quantity of chloride on precipitation with HCl. Gives a purple color to flame.
Calcium Chloride	Calcium hydrate.	The clear filtered solution made with distilled water is alkaline to test paper, and gives a precipitate on breathing into it through a tube.
Pure Chemicals generally.	Broken glass, bits of straw, wood, paper, &c.	These impurities either float or sink on the solution, and may easily be seen.

COMPARISON OF EIKONOGEN DEVELOPERS FOR RAPID EXPOSURES.

REDUCED TO ONE OUNCE OF PREPARED DEVELOPER.

BY C. W. GRANT.

No.	Water.	Eiko.	Sulph. Sodium.	Carb. Pot.	Remarks.
	1 oz.	Grs.	Grs.	Grs.	
1	480 m.	7.3	43.7	10.9	*American Amateur Photographer*, Aug. 1890, p. 303.
					By Seed Dry Plate Co. *
2	"	8.3	22	11	" Cramer Dry Plate Co. *
3	"	5.5	11	11	" Harvard " " *
4	"	16	64	16	" Gottheil. AM. ANN., 1890, p. 269.‡‡
5	"	16	32	16	" W. H. Rau.† AM. ANN., 1890, p. 225.
6	"	6	30	12A	" Allen & Rowell.††
7	"	12	32	12	" Eagle D. P. Works.
8	"	6	24	16	" U. S. Supply Co.
9	"	6	12	9B	" John Nicol.** AM. ANN., 1890, p. 41.
10	"	12	24	8	" F. C. Beach.‡
11	"	6	28	9C	" *Photo. Times.****
12	"	5	30	5	" Chautauqua School.
Totals.	5760	106.1	352.7	135.9	Divide by 12—Equals Average.
No. 1	480 m.	8.8	29.4	11.3	Average.
No. 2	480 m.	9.5	29.4	12.2	Average, Nos. 1 to 10 inclusive.
.....	480 m.	12	32	12	Recommended.

Allen & Rowell furnished the following formula for use with their slide plates, and can attest its efficiency, and I use it exclusively for slides and bromide prints, but substitute carb. pot. for c. soda.

Water to make	1 ounce
Sulph. Soda (cryst.)	18 grains
Eiko	3 grains
Quinol	3 grains
Carb. Soda	18 grains
Carb. Lithium	3 grains

* These were taken from an article by Mr. F. C. Beach.
‡‡ Herr Gottheil gives Carb. Pot. (as above) for rapid exposures.
† Mr. Rau considers Eiko. with Carb. *Soda*, inferior to Pyro.
‡ Mr. Beach considers Carb. Pot. more powerful than Carb. Soda, and less liable to cause stains. Confirmed by Gottheil, Rau, Nos. 1, 2, 3, 4, 5, 7, 8, 10, 12, and by compiler.
††—A. Given as 24 grs. Carb. Soda.
***—C. Given as 17 grs. Carb. Soda. Not stated if for rapid exposures.
**—B. Given as 9 grs. Carb. Soda.

TABLE OF EQUIVALENT QUANTITIES OF SOME CHLORIDES USED IN PHOTOGRAPHY.

CALCULATED FOR THE ANHYDROUS AND DRY SALTS.

By A. B. AUBERT, Professor of Chemistry, Maine State College, Orono, Me.

Sodium Chloride.	Potassium Chloride.	Ammonium Chloride.	Lithium Chloride.	Cadmium Chloride.
1	1.275	0.914	0.726	1.564
0.784	1	0.717	0.569	1 226
1.093	1.394	1	0.794	1.710
1.376	1.755	1.258	1	2.152
0.639	0 818	0.584	0.464	1

† EQUIVALENT QUANTITIES OF VARIOUS BROMIDES USED IN PHOTOGRAPHY.

Bromine.	Ammonium Bromide.	Potassium Bromide.	Sodium Bromide.	Cadmium Bromide + 4 Equi. Water.	Zinc Bromide.
1	1.225	1.488	1.287	2.150	1.406
0.816	1	1.214	1.055	1.754	1.147
0.672	0.823	1	0.865	1.445	0.945
0.777	0.952	1.156	1	1.671	1.092
0.465	0.570	0.692	0.599	1	0.651
0.711	0.871	1 058	0.915	1.529	1

† EQUIVALENT QUANTITIES OF VARIOUS IODIDES USED IN PHOTOGRAPHY.

Iodine.	Ammonium Iodide.	Potassium Iodide.	Sodium Iodide.	Cadmium Iodide.	Zinc Iodide.
1	1.142	1.307	1.181	1.441	1.255
0.876	1	1.145	1.035	1.262	1.099
0.765	0.874	1	0.9[illegible]3	1.102	0.960
0.847	0.967	1.107	1	1.220	1.063
0.694	0.793	0.907	0.820	1	0.871
0.797	0.910	1.042	0.941	1.148	1

† EQUIVALENT QUANTITIES OF VARIOUS SILVER SALTS USED IN PHOTOGRAPHY.

Silver (Metallic).	Nitrate.	Chloride.	Bromide.	Iodide.
1	1.574	1.328	1.741	2.176
0.6353	1	0.844	1.106	1.382
0.7523	1.184	1	1.310	1.638
0.5741	0.904	0.763	1	1.250
0.4595	0.723	0.610	0.800	1

† EQUIVALENT QUANTITES OF VARIOUS GOLD SALTS USED IN PHOTOGRAPHY.

Gold (Metallic).	Chloride.	Double Chloride of Gold and Potassium.	Double Chloride of Gold and Sodium.
1	1.542	2.1048	2.0229
0.6485	1	1.3645	1.3119
0.4751	0.7326	1	0.9611
0.4943	0.7623	1.0405	1

† Translated and partly recalculated from the "Agenda du Chimiste."

ACKLAND'S TABLES FOR THE SIMPLIFICATION OF EMULSION CALCULATIONS.

No. 1.

	Equivalent weights.	Weight of $AgNO_3$ required to convert one grain of soluble haloid.	Weight of soluble haloid required to convert one grain $AgNO_3$.	Weight of silver haloid produced by one grain of soluble haloid.	Weight of soluble haloid required to produce one grain of silver haloid.	Weight of silver haloid produced from one grain $AgNO_3$.
Ammonium bromide.......	98	1.734	.576	1.918	.521	1.106
Potassium "	119.1	1.427	.700	1.578	.633	
Sodium "	103	1.650	.606	1.825	.548	
Cadmium " com. ..	172	.988	1.012	1.093	.915	
" " anh....	136	1.25	.800	1.382	.723	
Zinc "	112.1	1.509	.663	1.670	.600	
Ammonium chloride.......	53.5	3.177	.315	2.682	.373	.844
Sodium "	58.5	2.906	.344	2.453	.408	
Ammonium iodide.........	145	1.172	.853	1.620	.617	1.382
Potassium "	166.1	1.023	.977	1.415	.707	
Sodium "	150	1.133	.882	1.566	.638	
Cadmium "	183	.929	1.076	1.284	.778	

Table No. 1 presents the actual weights of haloid or silver, as the case may be, required to convert or combine with one grain of another.

In order to make (say) ten ounces of emulsion by a new formula, which, for the sake of showing the working of the table, we will write down as follows :

Bromide of potassium.......................................150	grains.
Iodide of potassium.. 10	"
Chloride of ammonium.. 10	"
Gelatine..200	"

we want to know how much silver nitrate should be employed in sensitizing this mixture. For this purpose we use the first column, in which we find against each haloid the exact quantity of silver nitrate required to fully decompose one grain. Taking, then, the figures we find in column No. 1 against the three salts in the above formula, and multiplying them by the number of grains of each used, we have the following sum :

Potassium bromide......................	150 × 1.427 = 214	Weight silver nitrate required.
" iodide.......	10 × 1.023 = 10.23	
Chloride of ammonium.....	10 × 3.177 = 31.77	

or the total quantity of silver nitrate required for full conversion, 256.00 grains.

ELSDEN'S TABLE OF POISONS AND ANTIDOTES.

	Poisons.	Remarks.	Characteristic Symptoms.	Antidote.
Vegetable Acids.	Oxalic Acid. including Potassium Oxalate.	1 dram is the smallest fatal dose known.	Hot, burning sensation in throat and stomach; vomiting, cramps, and numbness.	Chalk, whiting or magnesia, suspended in water. Plaster or mortar can be used in emergency.
Caustic Alkalies.	Ammonia. Potash. Soda.	Vapor of ammonia may cause inflammation of the lungs.	Swelling of tongue, mouth, and fauces; often followed by stricture of the œsophagus.	Vinegar and water.
Metallic Salts.	Mercuric Chloride.	3 grains the smallest known fatal dose.	Acrid, metallic taste, constriction and burning in throat and stomach, followed by nausea and vomiting.	White and yolk of raw eggs with milk. In emergency, flour paste may be used.
	Acetate of Lead.	The sub-acetate is still more poisonous.	Constriction in the throat and at pit of stomach; crampy pains and stiffness of abdomen; blue line round the gums.	Sulphates of soda or magnesia. Emetic of sulphate of zinc.
	Cyanide of Potassium.	*a.* Taken internally, 3 grs. fatal.	Insensibility, slow, gasping respiration, dilated pupils, and spasmodic closure of the jaws.	No certain remedy; cold affusion over the head and neck most efficacious.
		b. Applied to wounds and abrasures of the skin.	Smarting sensation.	Sulphate of iron should be applied immediately.
	Bichromate of Potassium	*a.* Taken internally.	Irritant pain in stomach, and vomiting.	Emetics and magnesia, or chalk.
		b. Applied to slight abrasions of the skin.	Produces troublesome sores and ulcers.	
	Nitrate of Silver.		Powerful irritant.	Common salt to be given immediately, followed by emetics.
Concentrated Mineral Acids.	Nitric Acid.	2 drams have been fatal. Inhalation of the fumes has also been fatal.	Corrosion of windpipe and violent inflammation.	Bicarbonate of soda, or carbonate of magnesia or chalk, plaster of the apartment beaten up in water.
	Hydrochloric Acid.	½ ounce has caused death.		
	Sulphuric Acid.	1 dram has been fatal.		
	Acetic Acid, concentrated, has as powerful an effect as the mineral acids.			
	Iodine.	Variable in its action; 3 grains have been fatal.	Acrid taste, tightness about the throat, vomiting.	Vomiting should be encouraged, and gruel, arrowroot and starch given freely.
	Ether.	When inhaled.	Effects similar to chloroform.	Cold affusion and artificial respiration.
	Pyrogallol.	2 grains sufficient to kill a dog.	Resemble phosphorus poisoning.	No certain remedy. Speedy emetic desirable.

UNITED STATES WEIGHTS AND MEASURES.

ACCORDING TO EXISTING STANDARDS.

LINEAL.

12 inches = 1 foot.
3 feet = 1 yard.
5.5 yards = 1 rod.
40 rods = 1 furlong.
8 furlongs = 1 mile.

Inches.		Feet.		Yards.		Rods.		Fur's.		Mile.
12	=	1								
36	=	3	=	1						
198	=	16.5	=	5.5	=	1				
7,920	=	660	=	220	=	40	=	1		
63,360	=	5,280	=	1,760	=	320	=	8	=	1

SURFACE—LAND.

144 sq. ins. = 1 sq ft.
9 sq. ft. = 1 sq. yard.
30.25 sq. yds. = 1 sq. rod.
40 sq. rods = 1 sq. rood.
4 sq. roods = 1 acre.
640 acres = 1 sq. mile.

Feet.		Yards.		Rods.		Roods.		Acres.
9	=	1						
272.25	=	30.25	=	1				
10,890	=	1,210	=	40	=	1		
43,560	=	4,840	=	160	=	4	=	1
27,878,400	=	3,097,600	=	102,400	=	2,560	=	640

VOLUME—LIQUID.

4 gills = 1 pint.
2 pints = 1 quart.
4 quarts = 1 gallon.

Gills.		Pints.		Gallon.		Cub. In.
32	=	8	=	1	=	231

FLUID.

Gallon.		Pints.		Ounces.		Drams.		Minims.		Cubic Centimetres.
1	=	8	=	128	=	1,024	=	61,440	≐	3,785,435
		1	=	16	=	128	=	7,680	=	473,179
				1	=	8	=	480	=	29,574
						1	=	60	=	3,697

16 ounces, or a pint, is sometimes called a fluid pound.

TROY WEIGHT.

Pound.		Ounces.		Pennyweights.		Grains.		Grams.
1	=	12	=	240	=	5,760	=	373.24
		1	=	20	=	480	=	31.10
				1	=	24	=	1.56

APOTHECARIES' WEIGHT.

lb. Pound.		℥ Ounces.		ʒ Drams.		℈ Scruples.		gr. Grains.		Grams.
1	=	12	=	96	=	288	=	5,760	=	373.24
		1	=	8	=	24	=	480	=	31.10
				1	=	3	=	60	=	3.89
						1	=	20	=	1.30
								1	=	.06

The pound, ounce, and grain are the same as in Troy weight.

AVOIRDUPOIS WEIGHT.

Pound.		Ounces.		Drams.		Grains (Troy).		Grams.
1	=	16	=	256	=	7,000	=	453.60
		1	=	16	=	437.5	=	28.35
				1	=	27.34	=	1.77

ENGLISH WEIGHTS AND MEASURES.

APOTHECARIES' WEIGHT.

20 Grains	= 1 Scruple	=	20 Grains.
3 Scruples	= 1 Dram	=	60 Grains.
8 Drams	= 1 Ounce	=	480 Grains.
12 Ounces	= 1 Pound	=	5760 Grains.

FLUID MEASURE.

60 Minims	= 1 Fluid Dram.
8 Drams	= 1 Fluid Ounce.
20 Ounces	= 1 Pint.
8 Pints	= 1 Gallon.

The above weights are usually adopted in formulas.

All Chemicals are usually sold by

AVOIRDUPOIS WEIGHT.

$27\frac{11}{32}$ Grains	= 1 Dram	=	$27\frac{11}{32}$ Grains.
16 Drams	= 1 Ounce	=	$437\frac{1}{2}$ Grains.
16 Ounces	= 1 Pound	=	7000 Grains.

Precious Metals are usually sold by

TROY WEIGHT.

24 Grains	= 1 Pennyweight	=	24 Grains.
20 Pennyweights	= 1 Ounce	=	480 Grains.
12 Ounces	= 1 Pound	=	5760 Grains.

NOTE.—An ounce of metallic silver contains 480 grains, but an ounce of nitrate of silver contains only $437\frac{1}{2}$ grains.

UNITED STATES FLUID MEASURE.

Gal.	Pints.	Ounces.	Drams.	Mins.	Cub. In.	Grains.	Cub. C.M.
1 =	8 =	128 =	1,024 =	61,440 =	231. =	58,328.886 =	3,785.44
	1 =	16 =	128 =	7,680 =	28.875 =	7,291.1107 =	473.18
		1 =	8 =	480 =	1.8047 =	455.6944 =	29.57
			1 =	60 =	0.2256 =	56.9618 =	3.70

IMPERIAL BRITISH FLUID MEASURE.

Gal.	Pints.	Ounces.	Drams.	Mins.	Cub. In.	Grains.	Cub. C.M.
1 =	8 =	160 =	1,280 =	76,800 =	277.27384 =	70,000 =	4,543.732
	1 =	20 =	160 =	9,600 =	34.65923 =	8,750 =	567.966
		1 =	8 =	480 =	1.73296 =	437.5 =	28.398
			1 =	60 =	0.21662 =	54.69 =	3.550

THE METRIC SYSTEM OF WEIGHTS AND MEASURES.

THE meter is a measure of length equal to 39.370 English or American inches, a standard of linear measure supposed to be the ten-millionth part of the distance from the equator to the north pole, as ascertained by actual measurement of an arc of the meridian.

This system, formed on the meter as the unit of length, has four other leading units, all connected with and dependent upon this. Hence, we have:

1. The meter, which is the unit of measures of length.

2. The are, which is the unit of surface, and is the square of the meter.

3. The liter, which is the unit of measures of capacity, and is the cube of a tenth part of the meter.

4. The stere, which is the unit of measures of solidity, having the capacity of a cubic meter.

5. The gram, which is the unit of measures of weight, and is the weight of that quantity of distilled water at its maximum density, fills the cube of a hundredth part of the meter.

Each unit has its decimal multiples and sub-multiples, that is weights and measures ten times larger, or ten times smaller, than the principal units. The prefixes denoting multiples are derived from the Greek, and are: Deka, ten; hecto, hundred; kilo, thousand; and myria, ten thousand. Those denoting sub-multiples are taken from the Latin, and are: Deci, ten; centi, hundred (as in centigram or centimeter); and milli, thousand.

The metric system has been adopted by many nations, the English excepted. In America its use has been made optional, but is legalized by Congress. All photographic formulas received from the continent of Europe express values and quantities with metrical weights and measures. To utilize them directly without translating into the expressions of the English system, the student is advised to procure gram weights and cubic centimeter graduates, and substitute them for those denoting quantities according to the old plan.

As an assistance to those who cannot acquire these aids, we annex tables, which convert grams and cubic centimeters into English grains, drams, and ounces sufficiently correct for practical purposes.

METRIC FLUID MEASURES.

The cubic centimeter, usually represented by "c.c.," is the unit of the metric measurement for liquids. It contains nearly 17 minims of water; in reality, it contains 16.90 minims. The weight of this quantity of water is 1 gram. The following table will prove to be sufficiently accurate for photographic purposes:

METRIC SYSTEM OF WEIGHTS AND MEASURES.

MEASURES OF LENGTH.

Denominations and Values.		Equivalents in Use.	
Myriameter	10,000 meters.	6.2137	miles.
Kilometer	1,000 meters.	.62137	mile, or 3,280 ft. 10 ins.
Hectometer	100 meters.	328.	feet and 1 inch.
Dekameter	10 meters.	393.7	inches.
Meter	1 meter.	39.37	inches.
Decimeter	1-10th of a meter.	3.937	inches.
Centimeter	1-100th of a meter.	.3937	inch.
Millimeter	1-1000th of a meter.	.0394	inch.

MEASURES OF SURFACE.

Denominations and Values.		Equivalents in Use.	
Hectare	10,000 square meters.	2.471	acres.
Are	100 square meters.	119.6	square yards.
Centare	1 square meter.	1,550.	square inches.

MEASURES OF VOLUME.

Denominations and Values.			Equivalents in Use.	
Names.	No. of Liters.	Cubic Measures.	Dry Measure.	Wine Measure.
Kiloliter or stere	1,000	1 cubic meter.	1.308 cubic yards.	264.17 gallons.
Hectoliter	100	1-10th cubic meter.	2 bu. and 3.35 pecks.	26.417 gallons.
Dekaliter	10	10 cubic decimeters.	9.08 quarts.	2.6417 gallons.
Liter	1	1 cubic decimeter.	.908 quart.	1.0567 quarts.
Deciliter	1-10	1-10th cubic decimeter.	6.1023 cubic inches.	.845 gill.
Centiliter	1-100	10 cubic centimeters.	.6102 cubic inch.	.338 fluid oz.
Milliliter	1-1000	1 cubic centimeter.	.061 cubic inch.	.27 fl. drm.

WEIGHTS.

Denominations and Values.			Equivalents in Use.
Names.	Number of Grams.	Weight of Volume of Water at its Maximum Density.	Avoirdupois Weight.
Millier or Tonneau	1,000,000	1 cubic meter.	2204.6 pounds.
Quintal	100,000	1 hectoliter.	220.46 pounds.
Myriagram	10,000	10 liters.	22.046 pounds.
Kilogram or Kilo	1,000	1 liter.	2.2046 pounds.
Hectogram	100	1 deciliter.	3.5274 ounces.
Dekagram	10	10 cubic centimeters.	.3527 ounce.
Gram	1	1 cubic centimeter.	15.432 grains.
Decigram	1-10	1-10th of a cubic centimeter.	1.5432 grain.
Centigram	1-100	10 cubic millimeters.	.1543 grain.
Milligram	1-1000	1 cubic millimeter.	.0154 grain.

For measuring surfaces, the square dekameter is used under the term of ARE; the hectare, or 100 ares, is equal to about 2½ acres. *The unit of capacity* is the cubic decimeter or LITER, and the series of measures is formed in the same way as in the case of the table of lengths. The cubic meter is the unit of measure for solid bodies, and is termed STERE. *The unit of weight* is the GRAM, which is the weight of one cubic centimeter of pure water weighed in a vacuum at the temperature of 4 deg. Cent. or 39.2 deg. Fahr., which is about its temperature of maximum density. In practice, the term cubic centimeter, abbreviated c.c., is generally used instead of milliliter, and cubic meter instead of kiloliter.

THE CONVERSION OF METRIC INTO AMERICAN MEASURE.

By Nelson B. Sizer, B.Sc., M.D.

[From *The Photographic Times*, August 14, 1891.]

The following table is computed true to the nearest half grain or minim, as the case may be, so it will prove a sufficiently near approximation to the required metric equivalents.

U. S. P. Standard.

Gram, or c.cm.	Grains.	Minims.	Gram, or c.cm.	Grains.	Minims.
1	15½	16¼	15	231½	244
2	31	32½	16	247	260
3	46	49	17	262	276
4	62	65	18	278	292½
5	77	81	19	293	309
6	93	97½	20	308½	325
7	108	114	30	463	487½
8	123½	130	40	617	650
9	139	146	50	771½	813
10	154	162½	60	926	975½
11	170	179	70	1,080	1,138
12	185	194	80	1,234½	1,300½
13	201	211	90	1,389	1,463
14	216	227½	100	1,543	1,625½
..	....	....	1,000	15,432⅓	16,256⅓
..	....	....	....	1 kilo.	liter.

The "kilo" or kilogram, the 1,000 gram weight, is equal to 32 ounces $72\frac{2}{10}$ grains "Troy or Apothecaries" weight, or 2 pounds 3 ounces $119\frac{7}{10}$ grains Avoirdupois.

The "liter" or 1,000 cubic centimeters, or bulk of water that weighs 1 kilo, is equal to 2 pints 1 fluid ounce and $415\frac{3}{10}$ minims, U. S. P. Standard, or our glass graduates as commonly sold by reliable houses.

The grains and minims are easily reduced to fluid drams and fluid ounces, or drams and ounces Troy by my readers, if they will only remember that 60 grains or minims go to the solid or fluid dram, and 480 grains or minims, or 8 drams solid or fluid, go to each U. S. P. ounce, solid or fluid.

Thus the table gives the value of 90 grams as 1,389 grains, of 90 cubic centimeters as 1,463 minims. How many ounces in each?

Dividing 1,389 by 60 for drams, we have 23 drams 9 grains. As 8 drams go to the ounce, there are 2 ounces in the 23 drams and 7 drams over, so we have—in 1,389 grains there are 2 ounces 7 drams 9 grains. In the same way we find 3 fluid ounces and 23 minims over, to be the value of 90 cubic centimeters or 1,463 minims.

THE CONVERSION OF FRENCH (METRIC) INTO ENGLISH MEASURE.

1 cubic centimeter	=	17 minims.					
1 cubic centimeters	=	34 "					
3 "	=	51 "					
4 "	=	68 "	or 1 dram	8 minims.			
5 "	=	85 "	" 1 "	25 "			
6 "	=	101 "	" 1 "	41 "			
7 "	=	118 "	" 1 "	58 "			
8 "	=	135 "	" 2 drams	15 "			
9 "	=	152 "	" 2 "	32 "			
10 "	=	169 "	" 2 "	49 "			
20 "	=	338 "	" 5 "	38 "			
30 "	=	507 "	" 1 ounce	0 dram	27 minims		
40 "	=	676 "	" 1 "	3 drams	16 "		
50 "	=	845 "	" 1 "	6 "	5 "		
60 "	=	1014 "	" 2 ounces	0 "	54 "		
70 "	=	1183 "	" 2 "	3 "	43 "		
80 "	=	1352 "	" 2 "	6 "	32 "		
90 "	=	1521 "	" 3 "	1 "	21 "		
100 "	=	1690 "	" 3 "	4 "	10 "		
1000 "	=	1 liter = 34 fluid ounces nearly, or 2⅛ pints.					

THE CONVERSION OF FRENCH (METRIC) INTO ENGLISH WEIGHT.

THE following table, which contains no error greater than one-tenth of a grain, will suffice for most practical purposes:

1 gram	=	15⅖ grains.		
2 grams	=	30⅘ "		
3 "	=	46⅕ "		
4 "	=	61⅘ "	.... or 1 dram	1⅘ grain.
5 "	=	77⅕ "	.... " 1 "	17⅕ grains.
6 "	=	92⅗ "	.... " 1 "	32⅗ "
7 "	=	108 "	.... " 1 "	48 "
8 "	=	123⅖ "	.... " 2 drams	3⅖ "
9 "	=	138⅘ "	.... " 2 "	18⅘ "
10 "	=	154⅖ "	.... " 2 "	34⅖ "
11 "	=	169⅘ "	.... " 2 "	49⅘ "
12 "	=	185⅕ "	.... " 3 "	5⅕ "
13 "	=	200⅗ "	.... " 3 "	20⅗ "
14 "	=	216 "	.... " 3 "	36 "
15 "	=	231⅖ "	.... " 3 "	51⅖ "
16 "	=	247 "	.... " 4 "	7 "
17 "	=	262⅖ "	.... " 4 "	22⅖ "
18 "	=	277⅘ "	.... " 4 "	37⅘ "
19 "	=	293⅕ "	.... " 4 "	53⅕ "
20 "	=	308⅗ "	.... " 5 "	8⅗ "
30 "	=	463 "	.... " 7 "	43 "
40 "	=	617⅕ "	.... " 10 "	17⅕ "
50 "	=	771⅗ "	.... " 12 "	51⅗ "
60 "	=	926 "	.... " 15 "	26 "
70 "	=	1080⅕ "	.... " 18 "	0⅕ "
80 "	=	1234⅗ "	.... " 20 "	34⅗ "
90 "	=	1389 "	.... " 23 "	9 "
100 "	=	1543⅕ "	.... " 25 "	43⅕ "
1000 "	=	1 kilogram = 32 oz., 1 dr., 12⅖ gr.		

TABLE SHOWING THE COMPARISON OF THE READINGS OF THERMOMETERS.

Celsius, or Centigrade (C). Réaumur (R). Fahrenheit (F).

C.	R.	F.	C.	R.	F.
—30	—24.0	—22.0	23	18.4	73.4
—25	—20.0	—13.0	24	19.2	75.2
—20	—16.0	— 4.0	25	20.0	77.0
—15	—12.0	+ 5 0	26	20.8	78.8
—10	— 8.0	14.0	27	21.6	80.6
— 5	— 4.0	23.0	28	22.4	82 4
— 4	— 3.2	24.8	29	23 2	84.2
— 3	— 2.4	26.6	30	24.0	86.0
— 2	— 1.6	28.4	31	24.8	87.8
— 1	— 0.8	30.2	32	25.6	89.6
			33	26.4	91.4
Freezing point of water.			34	27.2	93.2
			35	28.0	95.0
0	0.0	32.0	36	28.8	96.8
1	0.8	33.8	37	29.6	98.6
2	1.6	35.6	38	30.4	100.4
3	2.4	37.4	39	31.2	102.2
4	3.2	39.2	40	32.0	104.0
5	4.0	41.0	41	32.8	105.8
6	4.8	42.8	42	33.6	107.6
7	5.6	44.6	43	34.4	109.4
8	6.4	46.4	44	35.2	111.2
9	7.2	48.2	45	36.0	113.0
10	8.0	50.0	50	40.0	122.0
11	8.8	51.8	55	44.0	131.0
12	9.6	53.6	60	48.0	140.0
13	10.4	55.4	65	52.0	149.0
14	11.2	57.2	70	56.0	158.0
15	12.0	59.0	75	60.0	167.0
16	12.8	60.8	80	64.0	176.0
17	13.6	62.6	85	68.0	185.0
18	14.4	64.4	90	72.0	194.0
19	15.2	66.2	95	76.0	203.0
20	16.0	68.0	100	80.0	212.0
21	16.8	69.8			
22	17.6	71.6	Boiling point of water.		

Readings on one scale can be changed into another by the following formulæ, in which t° indicates degrees of temperature:

Réau. to Fahr.

$$\frac{9}{4} t^\circ \text{ R} + 32^\circ = t^\circ \text{ F}$$

Réau. to Cent.

$$\frac{5}{4} t^\circ \text{ R} = t^\circ \text{ C}$$

Cent. to Fahr.

$$\frac{9}{5} t^\circ \text{ C} + 32^\circ = t^\circ \text{ F}$$

Cent. to Réau.

$$\frac{4}{5} t^\circ \text{ C} = t^\circ \text{ R}$$

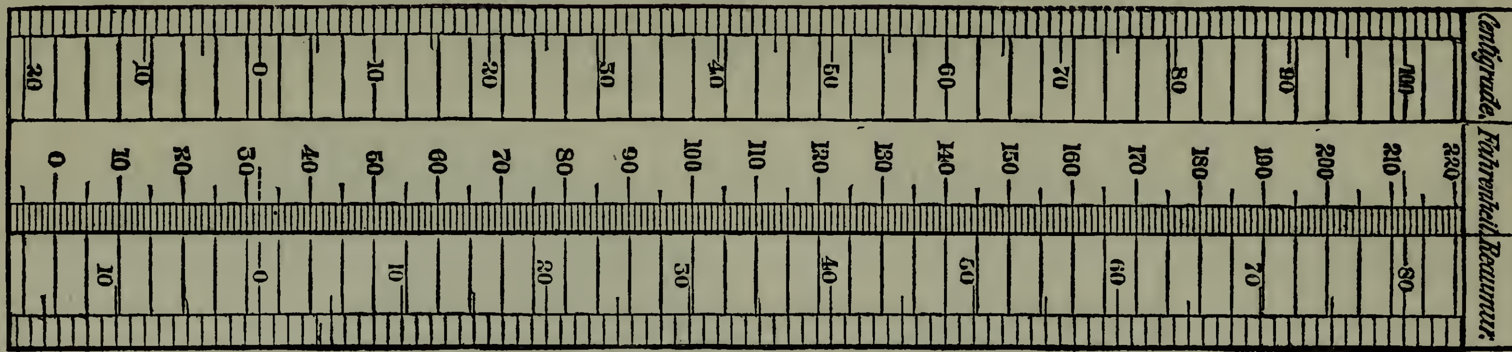
Fahr. to Cent.

$$\frac{5}{9}\left(t^\circ \text{ F} - 32^\circ\right) = t^\circ \text{ C}$$

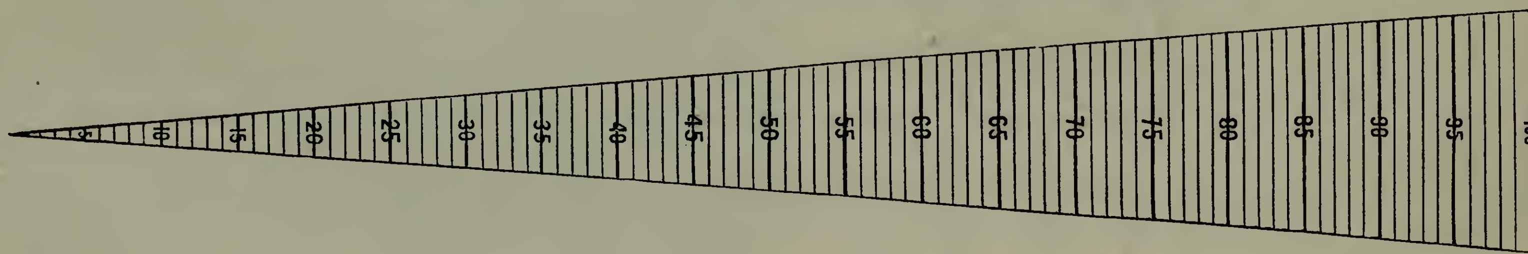
Fahr. to Réau.

$$\frac{4}{9}\left(t^\circ \text{ F} - 32\right) = t^\circ \text{ R}$$

THERMOMETER SCALES.



SCALE FOR MEASURING DIAMETERS OF STOPS FOR LENSES.



Each cross line varies in length from the adjacent one by $\frac{1}{100}$th of an inch.

To use: Lay the stop flat on this scale, and select the cross line which is of the same length as the greatest diameter of the opening; read this off, by means of the figures, which will be the measurements in $\frac{1}{100}$ths of an inch. The equivalent focal length of lens, divided by this measurement of the stop opening, will give the fraction expressing the ratio of aperture to focal length. The rapidity of different lenses, or of the same lens with different stops, is proportional to the squares of these ratios.

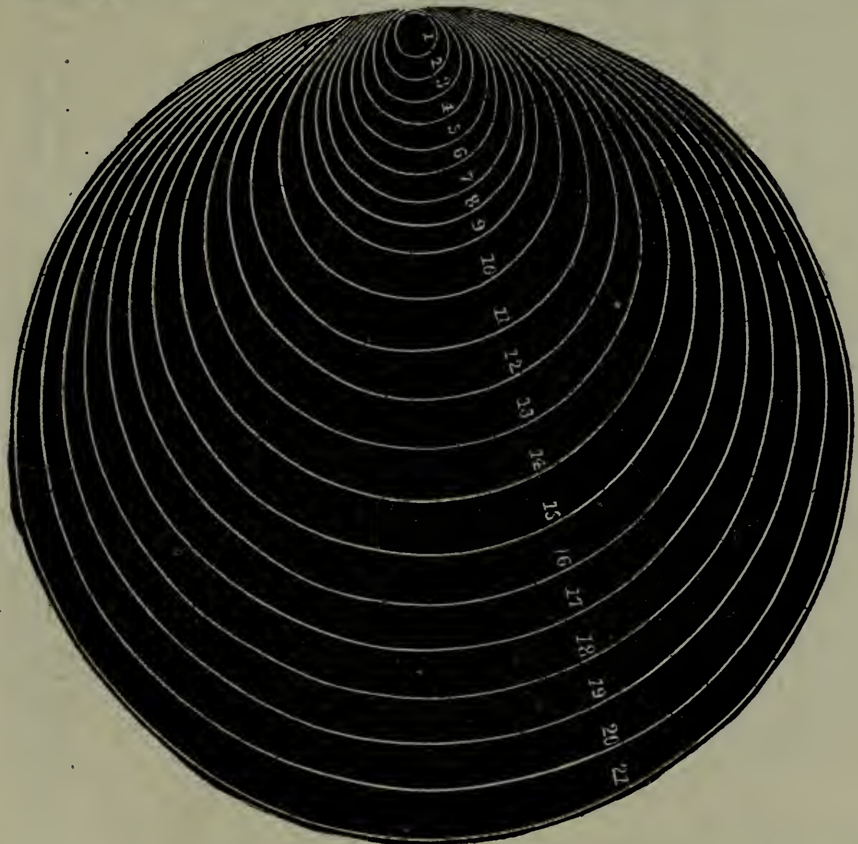
"UNIFORM SYSTEM" NUMBERS FOR STOPS FROM $\frac{f}{1}$ TO $\frac{f}{100}$.

In the following table Mr. S. A. Warburton has calculated the exposure necessary with every stop from $\frac{f}{1}$ to $\frac{f}{100}$ compared with the unit stop of the "uniform system" of the Photographic Society of Great Britain. The figures which are underlined show in the first column what $\frac{f}{a}$ must be in order to increase the exposure in geometrical ratio from $\frac{f}{4}$, the intermediate numbers showing the uniform system number for any other aperture.

f	U. S. No.	f	U. S. No.	f	U. S. No.
1	$\frac{1}{16}$	15	14.06	58	210.25
1¼	.097	16	16	59	217.56
1.414	⅛	17	18.06	60	225.00
1½	.140	18	20.25	61	232.56
1¾	.191	19	22.56	62	240.25
2	¼	20	25.00	63	248.06
2¼	.316	21	27.56	64	256
2½	.390	22	30.25	65	264.06
2.828	½	22.62	32	66	272.25
2¾	.472	23	33.06	67	280.56
3	.562	24	36.00	68	289.00
3¼	.660	25	39.06	69	297.56
3½	.765	26	42.25	70	306 25
3¾	.878	27	45.56	71	315.06
4	1.00	28	49.00	72	324.00
4¼	1.12	29	52.56	73	333.06
4½	1.26	30	56.25	74	342.25
4¾	1.41	31	60.06	75	351.56
5	1.56	32	64	76	361.00
5¼	1.72	33	68.06	77	370.56
5½	1.89	34	72.25	78	380.25
5.656	2	35	76.56	79	390.06
5¾	2.06	36	81.00	80	400.00
6	2.25	37	85.56	81	410.06
6¼	2.44	38	90.25	82	420.25
6½	2.64	39	95.06	83	430.56
6¾	2.84	40	100.00	84	440.00
7	3.06	41	105.06	85	451.56
7¼	3.28	42	110.25	86	462.25
7½	3.51	43	115.56	87	473.06
7¾	3.75	44	121.00	88	484.00
8	4	45	126.56	89	495.06
8¼	4.25	45.25	128	90	506.25
8½	4.51	46	132.25	90.50	512
8¾	4.78	47	138.06	91	517.56
9	5.06	48	144.00	92	529.00
9¼	5.34	49	150.06	93	540.56
9½	5.64	50	156.25	94	552.25
9¾	5.94	51	162.56	95	564.06
10	6.25	52	169.00	96	576.00
11	7.56	53	175.56	97	588.06
11.31	8	54	182.25	98	600.25
12	9.00	55	189.06	99	612.56
13	10.56	56	196.00	100	625.00
14	12.25	57	203.06		

THE PHOTOGRAPHIC SOCIETY'S (OF GREAT BRITAIN) STANDARD DIAPHRAGMS.

The annexed diagram and table are intended to facilitate the calculation of the proper number with which to mark the diaphragms according to the Photographic Society of Great Britain's Uniform System, which will be found described on another page. This number it is proposed to call the "U. S." (or uniform system number). The numbered circles in the diagram represent the sizes of stops. The photographer, knowing the equivalent focus of his lens, looks along the line opposite the number which represents the circle nearest inside to his diaphragm, and when he gets to the column headed by that equivalent focus the number there found is the U. S. number to be marked on the diaphragm. For example: A lens of eight inches equivalent focus has a diaphragm in size about No. 5 on the diaphragm; running the eye along the line opposite No. 5 we find in the column under—"focus eight inches" the No. 11, which is the U. S. number required.



No. of Circle.	4 focus	5 focus	6 focus	7 focus	8 focus	9 focus	10 focus	12 focus	14 focus
1	25	39	56						
2	11	17	25	34	44	56	68		
3	6¼	10	14	19	25	31	40	56	
4	4	6¼	9	12	16	20	25	36	48
5	2¾	4¼	6¼	8½	11	14	17	25	34
6	2	3⅕	4½	6¼	8	10	13	18	25
7	1½	2½	3½	4¾	6	8	10	14	19
8	1¼	2	2¾	3¾	5	6¼	8	11	15
9	1	1½	2¼	3	4	5	6¼	9	12¼
10		1	1½	2⅛	2¾	3½	4⅓	6	8½
11			1¼	1½	2	2½	3⅕	5	6
12			⅞	1⅕	1½	2	2½	3½	4¾
13				1	1¼	1⅚	1⅔	2¾	4
14					1	1¼	1½	2¼	3
15						1	1⅓	1⅞	2½
16							1	1½	2
17								1⅓	7⅜
18								1⅙	1½
19								1	1⅓
20									1⅕
21									1

Note.—This table, taken from the "British Journal Photographic Almanac," has proved to be very convenient in the calculating of stop values.

EQUATIONS RELATING TO FOCI.

The following simple optical formulas and calculations, worked out by Mr. J. A. C. Branfill, for the *British Journal Almanac*, will prove useful in many branches of photography, especially where several lenses of varying foci are in constant use for a variety of purposes:

p = Principal focus.
F = Greater conjugate focus.
f = Lesser conjugate focus.
r = Ratio of any dimension in original to the same dimensions in copy (in case of reduction), or *vice versa* (in case of enlargement).
a = Diameter of aperture to lens.
x = Exposure required, assuming that $x = 1$ when $a = \frac{p}{4}$.

$$p = \frac{r(F+f)}{(r+1)^2}$$

$$f = p\left(\frac{1+r}{r}\right) = \frac{F+f}{r+1}$$

$$F = p(r+1) = rf$$

$$F+f = p \times \frac{(r+1)^2}{r} = p\left(2+r+\frac{1}{r}\right)$$

$$r = \frac{F-p}{p} = \frac{p}{f-p} = \frac{F}{f}$$

$$x = \frac{f^2}{16\,a^2}$$

N. B.—For ordinary landscape work, where r is greater than 20, x may be taken as $\frac{p^2}{16\,a^2}$.

NOTE.—In case the above may not be clear to some photographers, the following rules may be better understood:

To find the principal focus of a lens (p), focus a near object in the camera, and measure the distance between it and the ground glass ($F+f$); next find the proportion which any dimension in the object bears to the same dimension on the ground glass (r). Thus, if the original dimension be four times as large as its reproduction, we say that r equals (=) 4. Multiply $F+f$ by r, and divide the product by the square of a number greater by one than r, that is by $(r+1)^2$. This rule was lately published by Mr. Debenham.

To find the lesser conjugate focus (f) (if p and r are known), multiply p by the sum of $r+1$ and divide the product by r. Or divide $F+f$ by $r+1$.

To find the greater conjugate focus (F) multiply p by $r+1$. Or multiply f by r.

To find $F+f$ (the distance which the ground glass should be from the object to be copied in order to get a given value for r) multiply p by the sum of $r+\frac{1}{r}+2$.

To find r divide $F-p$ (the difference between F and p) by p. Or divide p by $f-p$. Or divide F by f.

To find x divide the square of f by 16 times the square of a (the diameter of aperture to lens).

For example Focus an object which is five inches high, so that it is one inch high on the ground glass; thus we know that $r = 5$. Next measure the distance between the object and the ground glass ($F+f$), which is found to be 45 inches.

Then $p = 45 \times$ (multiplied by) $5 \div$ (divided by) $6 \times 6 = 6\frac{1}{4}$ inches.
$f = 6\frac{1}{4} \times 6 \div 5 = 7\frac{1}{2}$ inches. Or $f = 45 \div 6 = 7\frac{1}{2}$ inches.
$F = 6\frac{1}{4} \times 6 = 37\frac{1}{2}$ inches. Or $F = 7\frac{1}{2} \times 5 = 37\frac{1}{2}$ inches.
$F+f = 6\frac{1}{4} \times (5+\frac{1}{5}+2) = 6\frac{1}{4} \times 7\frac{1}{5} = 45$ inches.
$r = (37\frac{1}{2} - 6\frac{1}{4}) \div 6\frac{1}{4} = 5$. Or $r = 6\frac{1}{4} \div (7\frac{1}{2} - 6\frac{1}{4}) = 5$.

And x (the exposure required) will be $7\frac{1}{2} \times 7\frac{1}{2} \div (16 \times \frac{9}{16}) = 6\frac{1}{4}$; that is, the exposure will be $6\frac{1}{4}$ times as much as the exposure required with an aperture whose diameter equals $p \div 4$, assuming the aperture (a) to be $\frac{3}{4}$ inch diameter.

FOCUSING SCALES FOR ANY LENS OF FROM 3 TO 12 INCHES EQUIVALENT FOCUS.

Drawn by W. T. Wintringham.

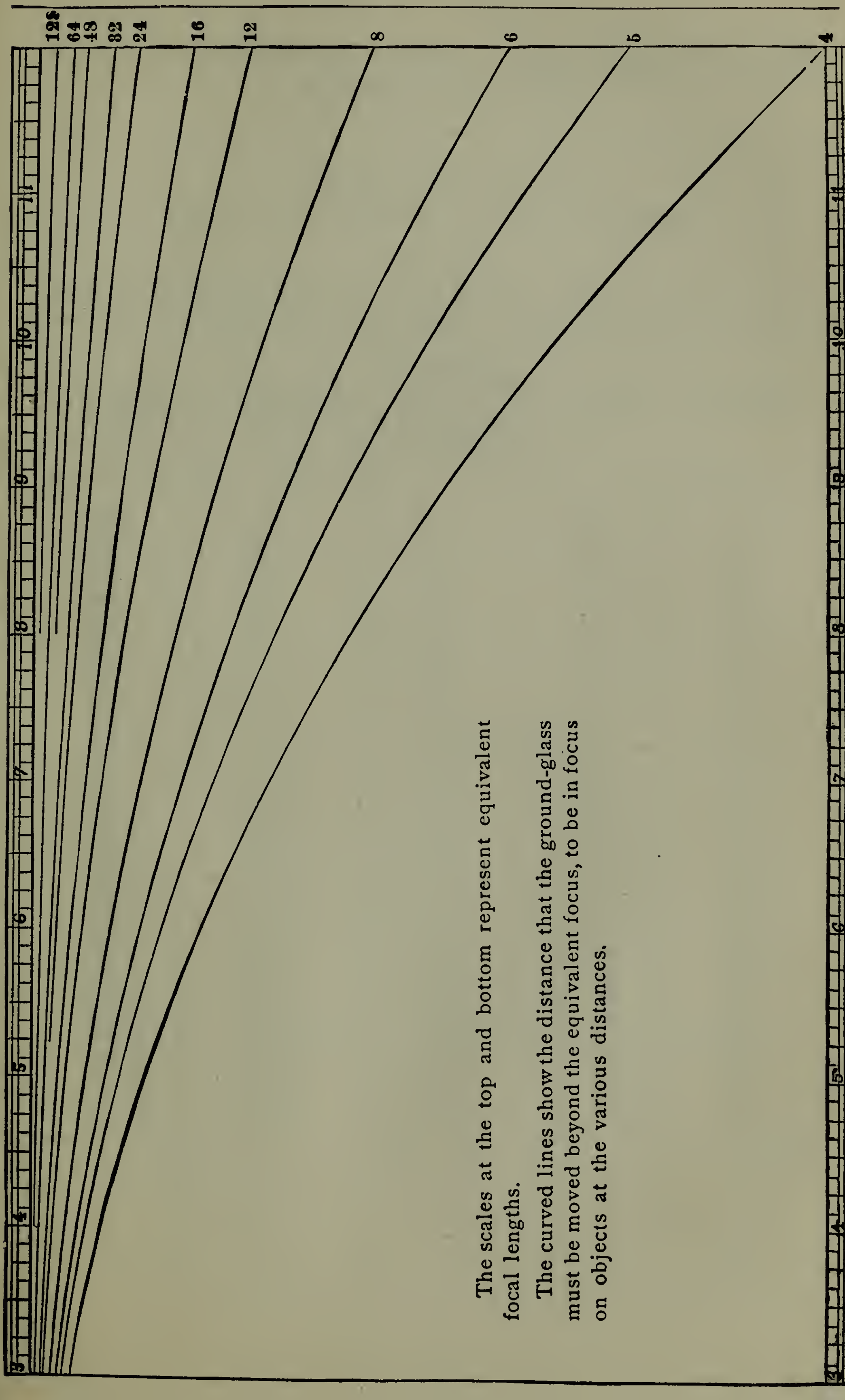


TABLE SHOWING DISPLACEMENT ON GROUND GLASS OF OBJECTS IN MOTION.

By HENRY L. TOLMAN.

[Republished, with corrections, from the *Photographic Times*.]

LENS 6 IN EQUIV. FOCUS, GROUND GLASS AT PRINCIPAL FOCUS OF LENS.

Miles per Hour.	Feet per Second.	Distance on Ground Glass, in inches, with Object 30 Feet away.	Same with Object 60 Feet away.	Same with Object 120 Feet away.
1	1½	.29	.15	.073
2	3	.59	.29	.147
3	4½	.88	.44	.220
4	6	1.17	.59	.293
5	7½	1.47	.73	.367
6	9	1.76	.88	.440
7	10½	2.05	1·03	.513
8	12	2 35	1.17	.587
9	13	2.64	1.32	.660
10	14½	2.93	1.47	.733
11	16	3.23	1.61	.807
12	17½	3.52	1.76	.880
13	19	3.81	1.91	.953
14	20½	4.11	2.05	1.027
15	22	4.40	2.20	1.100
20	29	5.87	2.93	1.467
25	37	7.33	3.67	1.833
30	44	8.80	4.40	2.200
35	51	10.27	5.13	2.567
40	59	11.73	5.97	2·933
45	66	13.20	6.60	3.300
50	73	14.67	7.33	3.667
55	80	16.13	8.06	4.033
60	88	17.60	8.80	4.400
75	110	22.00	11.00	5.500
100	147	29.33	14.67	7.333
125	183	36.67	18.33	9.167
150	220	44.00	22.00	11.000

TABLE OF COMPARATIVE LIGHT VALUES.

By Rev. Dwight W. Smith.

While there is a wider range in timing the exposure of a dry plate than is generally supposed, yet it is well known that there is but one correct interval for the best results with a normal developer. To best approximate that interval at all available hours of the day and year requires some attention and experience. There was a time when plates of a given brand and sensitiveness were quite unreliable, but now that they are so uniform, and improving more and more in this direction, tables of light values that were found to be comparatively useless will now be found of increasing value. The subjoined table, based upon the diagram in this book, by Lieutenant S. W. Very, U. S. N., has been computed for the first half of each month, and at a glance one may obtain information that would otherwise require time and trouble, and that even skill and experience does not always provide for, especially during the time indicated in which there is a rapid loss of light. It will be seen that in January, the light value for noon is given as 1.7, while at 4 P.M. the exposure would necessarily be more than five times that duration. For July, the most rapid as well as longest available light of any month, the light at noon is indicated by .2 instead of 1.7, and at 3 P.M. more than twice the time will be required.

The first column indicates the hour of the day; the second column the comparative light values in whole numbers and tenths.

JANUARY.		FEBRUARY.		MARCH.		APRIL.	
8	10	8	6	8	3	8	2
9	4	9	4	9	2	9	1.5
10	2.5	10	2	10	1.5	10	1.7
11	2	11	1.7	11	1.2	11	1
12	1.7	12	1.5	12	1	12	1
1	1.7	1	2	1	1	1	1
2	2.5	2	2.7	2	1.7	2	1.2
3	4.5	3	3.5	3	2	3	1.5
4	9	4	5	4	4	4	2
		5	60	5	20	5	4
						6	20

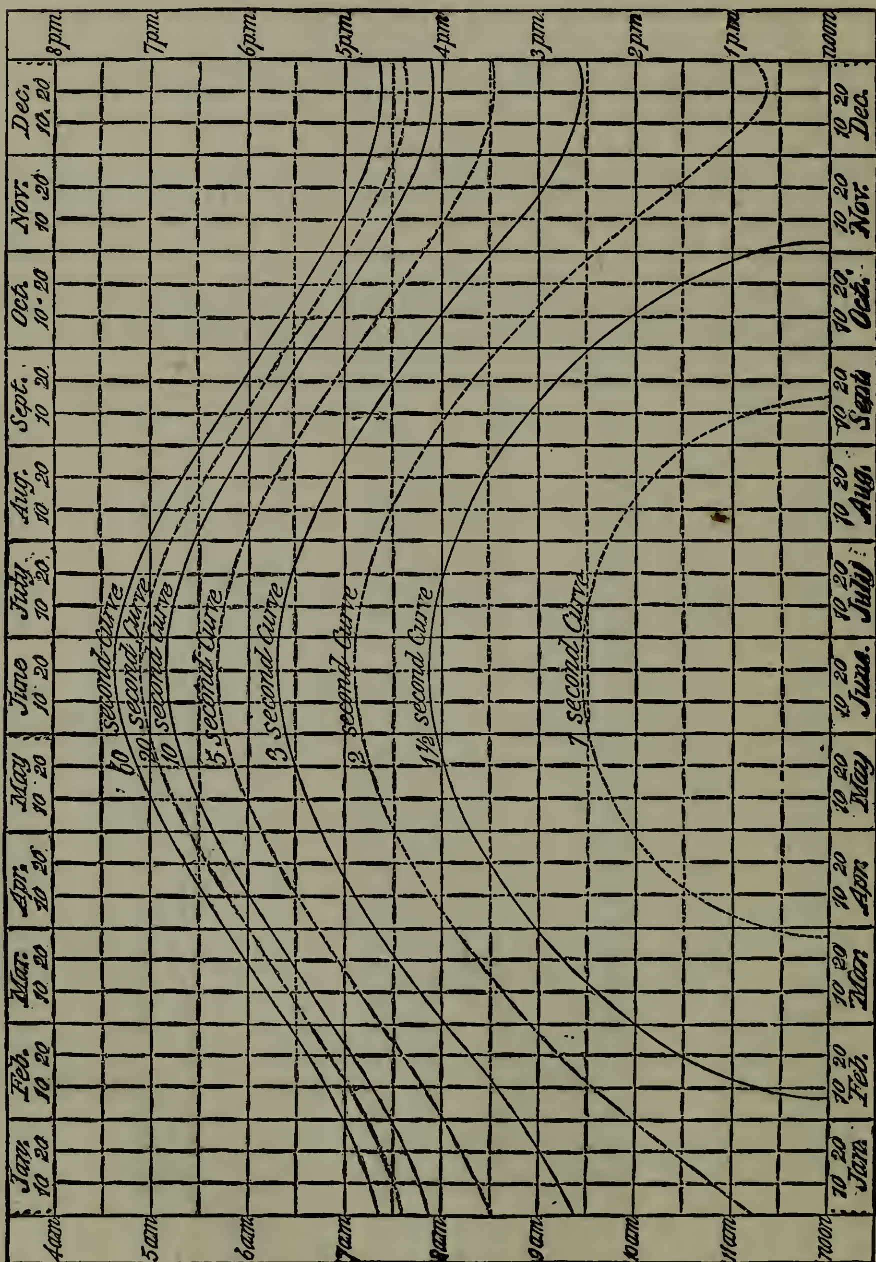
MAY.		JUNE.		JULY.		AUGUST.	
8	1.7	8	1.7	8	1.5	8	1.7
9	1.2	9	1.2	9	1.2	9	1.5
10	1	10	1	10	1	10	1
11	.7	11	.6	11	.5	11	.7
12	.5	12	.3	12	.2	12	.5
1	.7	1	.5	1	.5	1	.5
2	1	2	.7	2	1	2	1
3	1.2	3	1.2	3	1.2	3	1.2
4	1.5	4	1.5	4	1.5	4	1.7
5	2.7	5	2.2	5	2.2	5	2.5
6	15	6	5	6	4	6	5
7	80	7	20	7	15	7	60

SEPTEMBER.		OCTOBER.		NOVEMBER.		DECEMBER.	
8	2	8	3	8	4	8	9
9	1.5	9	1.7	9	3	9	3
10	1	10	1.5	10	2	10	2
11	1	11	1.2	11	1 7	11	1.5
12	.5	12	1	12	1.5	12	1.7
1	1	1	1.2	1	1.5	1	2
2	1.2	2	1.5	2	2	2	2.5
3	1.5	3	2	3	2.5	3	3.5
4	2	4	2.7	4	5	4	8
5	3	5	6	5	20	5	80
6	10	6	40	6	70		

DIAGRAM OF COMPARATIVE EXPOSURES.

Computed for the latitude of Washington, D. C. (38 deg., 54 min., N.)

By Lieut. Commander S. W. Very, U. S. N.



The straight lines in this diagram represent divisions of time; the vertical ones showing the month and day, and the horizontal ones the time of day as shown by a sun-dial.

The curved lines are curves of equal altitudes of the sun, computed for the latitude of Washington, for the year 1889.

The combination of the two systems of lines is designed to enable the photographer, whether amateur or professional, who has at some time determined the length of exposure required under certain circumstances of subject, clouds, lens, diaphragm, plate or film, etc., to decide what exposure to give *under the same circumstances*, at any time between sunrise and sunset, on any day of the year.

The diagram is based upon one constructed for the latitude of London, published in the *Photographic News*, in 1887, and reprinted in the ANNUAL of 1888, and the same standard of comparison is used in this adaptation—that is, such circumstances of subject, clouds, lens, diaphragm, plate or film, etc., as will require an exposure of one second, at noon of any day between the 4th of April and the 7th of September, or at any time between a quarter to ten in the forenoon and a quarter past two in the afternoon on the 21st of June.

The diagram, although constructed for the year 1889, and for the latitude of Washington, will serve equally well for any other year, and well enough for ordinary purposes, throughout the United States (exclusive of Alaska), although in the extreme Northern and Southern belts it will not be accurate.

The diagram is strictly accurate for "apparent time" only, but it is sufficiently so for "local mean time" (which may differ sixteen minutes from "apparent time"), and in the great majority of places for "standard time" (which in some places differs half an hour from "mean time," and may differ three-quarters of an hour from "apparent time").

EXAMPLES.

Q. With a certain lens, diaphragm, etc., it is found that on the 20th of July, at 9.30 A.M., a certain subject requires three seconds' exposure; what time should be given on the 10th of December, at 3.30 P.M., the subject, lens, etc., being the same?

A. Fifteen seconds.

Q. At noon of the 15th of May, a certain subject required ten seconds; what length of exposure should be given to the same subject, with the same lens, diaphragm, etc., on the 1st of November, at 8 A.M.?

A. Forty-five seconds.

PROF. BURTON'S TABLE OF COMPARATIVE EXPOSURES.

Apertures Calculated on the Standard System of the Photographic Society.	Sea and Sky.	Open Land-scape.	Landscape with heavy foliage in foreground.	Under Trees, up to		Fairly Lighted Interiors.		Badly Lighted Interiors, up to		Portraits in bright diffused Light out of doors.	Portraits in good Studio Light.		Portraits in Ordinary Room.	
				mins.	secs.	mins.	secs.	hrs.	mins.		mins.	secs.	mins.	secs.
No. 1, or $\frac{f}{4}$	$\frac{1}{160}$ sec.	$\frac{1}{50}$ sec.	$\frac{1}{8}$ sec.	0	10	0	10	0	2	$\frac{1}{6}$ sec.	0	1	0	4
No. 2, or $\frac{f}{5.657}$	$\frac{1}{80}$ sec.	$\frac{1}{25}$ sec.	$\frac{1}{4}$ sec.	0	20	0	20	0	4	$\frac{1}{3}$ sec.	0	2	0	8
No. 4, or $\frac{f}{8}$	$\frac{1}{40}$ sec.	$\frac{1}{12}$ sec.	$\frac{1}{2}$ sec.	0	40	0	40	0	8	$\frac{2}{3}$ sec.	0	4	0	16
No. 8, or $\frac{f}{11.314}$	$\frac{1}{20}$ sec.	$\frac{1}{6}$ sec.	1 sec.	1	20	1	20	0	16	$1\frac{1}{3}$ sec.	0	8	0	32
No. 16, or $\frac{f}{16}$	$\frac{1}{10}$ sec.	$\frac{1}{3}$ sec.	2 secs.	2	40	2	40	0	32	$2\frac{2}{3}$ secs.	0	16	1	4
No. 32, or $\frac{f}{22.627}$	$\frac{1}{5}$ sec.	$\frac{2}{3}$ sec.	4 secs.	5	20	5	20	1	4	$5\frac{1}{3}$ secs.	0	32	2	8
No. 64, or $\frac{f}{32}$	$\frac{2}{5}$ sec.	$1\frac{1}{3}$ sec.	8 secs.	10	40	10	40	2	8	$10\frac{2}{3}$ secs.	1	4	4	16
No. 128, or $\frac{f}{45.255}$	$\frac{4}{5}$ sec.	$2\frac{2}{3}$ secs.	16 secs.	21	20	21	20	4	16	21 secs.	2	8	8	32
No. 256, or $\frac{f}{64}$	$1\frac{3}{5}$ sec.	$5\frac{1}{3}$ secs.	32 secs.	42	40	42	40	8	32	42 secs.	4	16	17	4

LANTERNISTS' READY REFERENCE TABLE.

(From Optical Magic Lantern Journal.)

If A=focal length of objective, B=diameter of slide, C=diameter of disc on screen, D=distance between objective and screen, then $D=\frac{C \times A}{B}$ $A=\frac{D \times B}{C}$ $C=\frac{D \times B}{A}$

The following table has been computed by these rules and will show by a glance the relations between the size of disc and distance from screen for object glasses of all foci from 4 inches to 15 inches. The diameter of slide is taken as 3 inches, that being the usual opening of the mat.

Distance between Lantern and Screen.	FOCUS OF LENS. 4in.		5in.		6in.		7in.		8in.		9in.		10in.		11in.		12in.		13in.		14in.		15in.	
	DIAMETER OF DISC.																							
	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.
10 feet.	7	6	6	0	5	0	4	3	3	9	3	4	3	0	2	9	2	6	2	4	2	2	2	0
11 "	8	3	6	7	5	6	4	9	4	2	3	8	3	4	3	0	2	9	2	6	2	4	2	2
12 "	9	0	7	2	6	0	5	2	4	6	4	0	3	7	3	3	3	0	2	9	2	7	2	5
13 "	9	9	7	10	6	6	5	7	4	11	4	4	3	11	3	7	3	3	3	0	2	9	2	7
14 "	10	6	8	5	7	0	6	0	5	3	4	8	4	2	3	10	3	7	3	3	3	0	2	9
15 "	11	3	9	0	7	6	6	5	5	8	5	0	4	6	4	1	3	9	3	6	3	3	3	0
20 "	15	0	12	0	10	0	8	7	7	6	6	8	6	0	5	6	5	0	4	7	4	3	4	0
25 "	18	9	15	0	12	6	10	9	9	4	8	4	7	6	6	10	6	3	5	0	5	4	5	0
30 "	22	6	18	0	15	0	12	10	11	3	10	0	9	0	8	2	7	6	6	11	6	5	6	0
35 "	26	3	21	0	17	6	15	0	13	1	11	8	10	6	9	6	8	9	8	1	7	6	7	0
40 "	30	0	24	0	20	0	17	2	15	0	13	4	12	0	10	10	10	0	9	2	8	6	8	0
45 "	33	9	27	0	22	6	19	3	16	10	15	0	13	6	12	3	11	3	10	4	9	8	9	0
50 "	37	6	30	0	25	0	21	5	18	9	16	8	15	0	13	8	12	6	11	6	10	9	10	0

EXAMPLES.—An 8in. focus lens at a distance of 35ft. will give a disc of 13ft. 1in. To produce a disc of 12ft. with a lens of 10in. focus, the lantern and screen must be separated by 40ft. To produce a disc of 15ft. at a distance of 45ft. will require a lens of 9in. focus.

TABLE FOR ENLARGEMENT AND REDUCTION

COMPUTED FOR CENTIMETERS OR INCHES.

Equivalent Focus of the Lens.	Distances of the Object and the Ground Glass Screen from the Center of the Objective.																								
	1 t.	2 t.	3 t.	4 t.	5 t.	6 t.	7 t.	8 t.	9 t.	10 t.	11 t.	12 t.	13 t.	14 t.	15 t.	16 t.	17 t.	18 t.	19 t.	20 t.	21 t.	22 t.	23 t.	24 t.	25 t.
5..	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130
	10	7.5	6.7	6.2	6	5.8	5.7	5.6	5.6	5.5	5.5	5.4	5.4	5.4	5.3	5.3	5.3	5.3	5.3	5.3	5.2	5.2	5.2	5.2	5.2
6..	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126	132	138	144	150	156
	12	9	8	7.5	7.2	7	6.9	6.8	6.7	6.6	6.5	6.5	6.5	6.4	6.4	6.4	6.4	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.2
7..	14	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147	154	161	168	175	182
	14	10.5	9.3	8.8	8.4	8.2	8	7.9	7.8	7.7	7.6	7.6	7.5	7.5	7.5	7.4	7.4	7.4	7.4	7.4	7.3	7.3	7.3	7.3	7.3
8..	16	24	32	40	48	56	64	72	80	88	96	104	112	120	128	136	144	152	160	168	176	184	192	200	208
	16	12	10.7	10	9.6	9.3	9.1	9	8.8	8.8	8.7	8.7	8.6	8.6	8.5	8.5	8.5	8.4	8.4	8.4	8.4	8.4	8.3	8.3	8.3
9..	18	27	36	45	54	63	72	81	90	99	108	117	126	135	144	153	162	171	180	189	198	207	216	225	234
	18	13.5	12	11.3	10.8	10.5	10.3	10.1	10	9.9	9.8	9.8	9.7	9.6	9.6	9.6	9.5	9.5	9.5	9.5	9.4	9.4	9.4	9.4	9.4
10..	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260
	20	15	13.3	12.5	12	11.7	11.4	11.3	11.1	11	10.9	10.8	10.8	10.7	10.7	10.6	10.6	10.6	10.5	10.5	10.5	10.5	10.4	10.4	10.4
11..	22	33	44	55	66	77	88	99	110	121	132	143	154	165	176	187	198	209	220	231	242	253	264	275	286
	22	16.5	14.7	13.8	13.2	12.8	12.6	12.4	12.2	12.1	12	11.9	11.8	11.8	11.7	11.7	11.6	11.6	11.6	11.6	11.5	11.5	11.5	11.5	11.4
12..	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	240	252	264	276	288	300	312
	24	18	16	15	14.4	14	13.7	13.5	13.3	13.2	13.1	13	12.9	12.9	12.8	12.7	12.7	12.7	12.6	12.6	12.6	12.5	12.5	12.5	12.5
13..	26	39	52	65	78	91	104	117	130	143	156	169	182	195	208	221	234	247	260	273	286	299	312	325	338
	26	19.5	17.3	16.3	15.6	15.2	14.9	14.6	14.4	14.3	14.2	14.1	14	13.9	13.9	13.8	13.8	13.7	13.7	13.7	13.6	13.6	13.6	13.5	13.5
14..	28	42	56	70	84	98	112	126	140	154	168	182	196	210	224	238	252	266	280	294	308	322	336	350	364
	28	21	18.7	17.5	16.8	16.3	16	15.8	15.6	15.4	15.3	15.2	15.1	15	14.9	14.9	14.8	14.8	14.7	14.7	14.7	14.6	14.6	14.6	14.6
15..	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	360	375	390
	30	22.5	20	18.8	18	17.5	17.1	16.9	16.7	16.5	16.4	16.3	16.2	16.1	16	15.9	15.9	15.8	15.8	15.8	15.7	15.7	15.7	15.6	15.6

16..	32 32	48 24	64 21.3	80 20	96 19.2	112 18.7	128 18.3	144 18	160 17.8	176 17.6	192 17.5	208 17.3	224 17.2	240 17.1	256 17.1	272 17	288 16.9	304 16.9	320 16.8	336 16.8	352 16.8	368 16.7	384 16.7	400 16.7	416 16.6
17..	34 34	51 25.5	68 22.7	85 21.3	102 20.4	119 19.8	136 19.4	153 19.1	170 18.9	187 18.7	204 18.5	221 18.4	238 18.3	255 18.2	272 18.1	289 18.1	306 18	323 17.9	340 17.9	357 17.9	374 17.8	391 17.8	408 17.7	425 17.7	442 17.7
18..	36 36	54 27	72 24	90 22.5	108 21.6	126 21	144 20.6	162 20.3	180 20	198 19.8	216 19.6	234 19.5	252 19.4	270 19.3	288 19.2	306 19.1	324 19.1	342 19	360 18.9	378 18.9	396 18.9	414 18.8	432 18.8	450 18.8	468 18.7
19..	38 38	57 28.5	76 25.3	95 23.8	114 22.8	133 22.2	152 21.7	171 21.4	190 21.1	209 20.9	228 20.7	247 20.6	266 20.5	285 20.4	304 20.3	323 20.2	342 20.1	361 20.1	380 20	399 20	418 19.9	437 19.9	456 19.8	475 19.8	494 19.8
20..	40 40	60 30	80 26.7	100 25	120 24	140 23.3	160 22.9	180 22.5	200 22.2	220 22	240 21.8	260 21.7	280 21.5	300 21.4	320 21.3	340 21.3	360 21.2	380 21.1	400 21.1	420 21	440 21	460 20.9	480 20.9	500 20.8	520 20.8
21..	42 42	63 31.5	84 28	105 26.3	126 25.2	147 24.5	168 24	189 23.6	210 23.3	231 23.1	252 22.9	273 22.8	294 22.6	315 22.5	336 22.4	357 22.3	378 22.2	399 22.2	420 22.1	441 22.1	462 22	483 22	504 21.9	525 21.9	546 21.8
22..	44 44	66 33	88 29.3	110 27.5	132 26.4	154 25.7	176 25.1	198 24.8	220 24.4	242 24.2	264 24	286 23.8	308 23.7	330 23.6	352 23.5	374 23.4	396 23.3	418 23.2	440 23.2	462 23.1	484 23	506 23	528 23	550 22.9	572 22.9
23..	46 46	69 34.5	92 30.7	115 28.8	138 27.6	161 26.8	184 26.3	207 25.9	230 25.6	253 25.3	276 25.1	299 24.9	322 24.8	345 24.6	368 24.5	391 24.4	414 24 4	437 24.3	460 24.2	483 24.2	506 24.1	529 24	552 24	575 24	598 23.9
24..	48 48	72 36	96 32	120 30	144 28.8	168 28	192 27.4	216 27	240 26.7	264 26.4	288 26.2	312 26	336 25.8	360 25.7	384 25.6	408 25.5	432 25.4	456 25.3	480 25.3	504 25.2	528 25.1	552 25.1	576 25	600 25	624 25
25..	50 50	75 37.5	100 33.3	125 31.3	150 30	175 29.2	200 28.6	225 28.1	250 27.8	275 27.5	300 27.3	325 27.1	350 26.9	375 26.8	400 26.7	425 26.6	450 26.5	475 26.4	500 26.3	525 26.3	550 26.2	575 26.1	600 26.1	625 26	650 26

The use of the above table will best be explained by illustrations:

To enlarge six times with a lens of 15 centimeters (or inches) focal length. We find in the table under 6 *t.* and opposite 15, the figures $\frac{105}{17.5}$, hence the object must be 17.5, and the screen 105 centimeters (or inches) from the centre of the lens.

To reduce eight times with a lens of 19 centimeters (or inches) focus, the object must be 171 and the screen 21.4 centimeters (or inches) from centre of lens.

The table can be formulated thus: Where p = focal length of lens, a = distance from ground-glass to centre of lens and b = distance from object to centre of lens, then $\frac{1}{a} + \frac{1}{b} = \frac{1}{p}$

AMERICAN, FRENCH, ENGLISH AND GERMAN MONEY.

American.	French.	English.	German.	American.	French.	English.	German.
dols. c.	*fr. c.*	*s. d.*	*m. pf.*	*dols. c.*	*fr. c.*	*s. d.*	*m. pf.*
0 01	0 05	0 0¼	0 04		2 87.5		2 30
0 02	0 10	0 1	0 08	0 56	2 92	2 4	
	0 12.5		0 10		3 00		2 40
0 03	0 15	0 1½	0 12	0 58	3 02	2 5	
	0 20		0 16	0 60	3 12.5	2 6	2 50
0 04	0 21	0 2		0 62	3 23	2 7	
	0 25		0 20		3 25		2 60
0 05	0 26	0 2½		0 64	3 33	2 8	
0 06	0 31	0 3	0 25		3 37.5		2 70
	0 37.5		0 30	0 66	3 44	2 9	
0 08	0 42	0 4			3 50		2 80
	0 50		0 40	0 68	3 54	2 10	
0 10	0 52	0 5			3 62.5		2 90
0 12	0 62.5	0 6	0 50	0 70	3 65	2 11	2 92
0 14	0 73	0 7		0 72	3 75	3 0	3 00
	0 75		0 60	0 74	3 85	3 1	3 08
0 16	0 83	0 8			3 87.5		3 10
	0 87.5		0 70	0 76	3 96	3 2	
0 18	0 94	0 9			4 00		3 20
	1 00		0 80	0 78	4 06	3 3	
0 20	1 04	0 10			4 12.5		3 30
	1 12.5		0 90	0 80	4 17	3 4	
0 22	1 15	0 11			4 25		3 40
0 24	1 25	1 0	1 00	0 82	4 27	3 5	
0 25	1 30	1 0½	1 04	0 84	4 37.5	3 6	3 50
0 26	1 35	1 1	1 08	0 86	4 48	3 7	
	1 37.5		1 10		4 50		3 60
0 28	1 46	1 2		0 88	4 58	3 8	
	1 50		1 20		4 62.5		3 70
0 30	1 56	1 3		0 90	4 69	3 9	
	1 62.5		1 30		4 75		3 80
0 32	1 67	1 4		0 92	4 79	3 10	
	1 75		1 40		4 87.5		3 90
0 34	1 77	1 5		0 94	4 90	3 11	
0 36	1 87.5	1 6	1 50	0 96	5 00	4 0	4 00
0 38	1 98	1 7		1 00	5 21	4 2	4 16
	2 00		1 60	1 20	6 25	5 0	5 00
0 40	2 08	1 8		1 44	7 50	6 0	6 00
	2 12.5		1 70	1 68	8 75	7 0	7 00
0 42	2 19	1 9		1 92	10 00	8 0	8 00
	2 25		1 80	2 16	11 25	9 0	9 00
0 44	2 29	1 10		2 40	12 50	10 0	10 00
	2 37.5		1 90	2 64	13 75	11 0	11 00
0 46	2 40	1 11	1 92	2 88	15 00	12 0	12 00
0 48	2 50	2 0	2 00	3 84	20 00	16 0	16 00
0 50	2 60	2 1	2 08	4 80	25 00	20=£1	20 00
	2 62.5		2 10	9 60	50 00	£2	40 00
0 52	2 71	2 2		14 40	75 00	£3	60 00
	2 5		2 20	19 20	100 00	£4	80 00
0 54	2 81	2 3		24 00	125 00	£5	100 00

STANDARD OF FOREIGN COINS FOR CUSTOMS PURPOSES

As Proclaimed by the Director of the United States Mint, January 1, 1890, and Corrected to Date.

The Value of Imports for the Assessment of Duties is ascertained by converting Currency of Invoice into Money of the United States, as per following Table:

Country.	Unit of Currency.	Sign.	Value in U. S. Cur.
Argentine Republic........	Peso............=100 Centavos.........	$	.96.5
Austria-Hungary..........	Florin..........=100 Kreutzer.........	Fl.	.34.5
Azores....................	Milreis........ =100 Reis.............	Rs. $	.83.5
Belgium..................	Franc..........=100 Centimes........	Frs.	.19.3
Bolivia..................	Boliviano ......=10 Reales.............	$	.69.8
Brazil.....................	Milreis.........=1000 Reis	Rs. $	.54.6
British North America. *Ex. Newfoundland*........	Dollars.........=100 Cents	$	1.00
Chili......................	Peso............=100 Centavos.........	$	.91.2
China (*Haikwan*)..........	Tael............=10 Mace..............	Tael.	1.14.8
Columbia, U. S. of.........	Peso............=100 Centavos.........	$	.69.8
Costa Rica...............	Peso............=100 Centavos.........	$	.69.8
Cuba.....................	Peso............=100 Centavos.........	$	.92.6
Denmark..................	Krone..........=100 Ore..............	Kr.	.26.8
Ecuador..................	Sucre..........=100 Centavos	$	.69.8
Egypt.....................	Pound..........=100 Piastres.........	£	4.94.3
France....................	Franc..........=100 Centimes.........	Frs.	.19.3
Germany..................	Mark...........=10 Pfennige..........	Mks.	.23.8
Great Britain.............	Pound Sterling.=20 Shillings	£	4.86.65
Greece....................	Drachma........=100 Lepta...........	Dr.	.19.3
Guatemala................	Peso...........=100 Centavos.........	$	.69.8
Hayti.....................	Gourde.........=100 Cents............	$	.69.5
Honduras.................	Peso............=100 Centavos.........	$	.69.8
India.....................	Rupee..........=16 Annas.............	Rs.	.33.2
Italy......................	Lira.............=100 Centesimi.........	L.	.19.3
Japan.....................	Yen............=100 Sen Gold.........	Yen.	.99.7
do	do. ....= do. Silver	Yen.	.75.2
Liberia....................	Dollar..........=100 Cents...........	$	1.00
Mexico...................	Peso ....=100 Centavos.........	$	.75.8
Netherlands..............	Florin..........=100 Cents...........	$	.40.2
Newfoundland............	Dollar..........=100 Cents.............	$	1.01.4
Nicaragua................	Peso ....=100 Centavos.........	$	.69.8
Norway...................	Krone..........=100 Ore..............	Kr.	.26.8
Paraguay.................	Peso............=100 Centavos.........	$	1.00
Peru......................	Sol.............=100 Centavos.........	$	.69.8
Porto Rico...............	Peso...........=100 Centavos.........	$	.92.5
Portugal..................	Milreis..........=1000 Reis	Rs. $	1.08
Russia....................	Rouble..........=100 Copecks..........	S. Ro.	.55.8
Salvador..................	Peso............=100 Centavos	$	.69.8
Sandwich Islands..........	Dollar..........=100 Cents............	$	1.00
Spain.....................	Peseta..........=100 Centimos	Ptas.	.19.3
Sweden...................	Krone..........=100 Ore..............	Kr.	.26.8
Switzerland...............	Franc..........=100 Centimes.........	Frs.	.19.3
Tripoli....................	Mahbub........=20 Piastres...........	$	.62.9
Tunis.....................	Piastre.........=16 Caroubs..........	Ptrs.	.11.8
Turkey....................	Piastre.........=30 Paras,............	Ptrs.	.04.4
Uruguay..................	Patacon.........=100 Centavos.........	$	.94.9
Venezuela................	Bolivar.........=100 Centimos........	Brs.	.14

USUAL SIZES OF FRENCH AND ITALIAN DRY PLATES.

French.		Inches.	Italian.		Inches.
6½x 9	Centimetres.....	2.5x 3.6	9x12	Centimetres.......	3.6x 4.7
9 x12	"	3.6x 4.7	12x16	"	4.7x 6.3
12 x15	"	4.7x 5.9	12x18	"	4.7x 7.2
13 x18	"	5.1x 7.0	13x18	"	5.1x 7.0
12 x20	"	4.7x 7.8	12x20	"	4.7x 7.8
15 x21	"	5.9x 8.2	18x24	"	7.0x 9.4
15 x22	"	5.9x 8.6	21x27	"	8.2x10.6
18 x24	"	7.2x 9.4	24x30	"	9.4x11.8
21 x27	"	8.2x10.6	27x33	"	10.6x12.9
24 x30	"	9.4x11.8	30x36	"	11.8x14.1
27 x33	"	10.6x12.9	40x50	"	15.7x19.6
27 x35	"	10.6x13.7	50x60	"	19.6x23.6
30 x40	"	11.8x15.7			
40 x50	"	15.7x19.6			
50 x60	"	19.6x23.6			

SIZES OF GLASS, MOUNTS, PAPER, ETC.

Petite cards..	1⅝x3⅛
One-ninth plate..	2 x2½
One-sixth plate..	2¾x3¼
One-fourth plate..	3¼x4¼
Half plate..................................4¼x5½ and	4¼x6½
Half plate (English)..	4¾x6½
Whole plate (4–4)..	6½x8½
Extra 4–4..	8 x10

Other sizes are expressed by inches.

Sizes of Mounts.

Stereoscopic.................. 3½x7, 4x7, 4¼x7, 4½x7, 5x8

Victoria.............	3¼x5	Minette..............	1½x2⅜
Imperial	7⅞x9⅞	Card	2½x4⅛
Boudoir.............	5¼x8½	Cabinet..............	4¼x6½
Panel...............	4 x8¼	Promenade	4⅛x7⅛

Sizes of Albumen Paper.

18x22¾, 20½x24½, 22x36, 26x40, 27x42.

Size of blotting paper................................ 19x24

FREEZING MIXTURES.

Parts.	Reducing the Temperature	From Degrees of the Celsius	To Thermometer.
3	Nitrate of sodium + 4 Water................	+13.2 deg.	— 5.3 deg.
9	Phosphate of sodium + 4 dilute Nitric acid...	+10 "	— 9 "
3	Sulphate of sodium + 2 dilute Nitric acid.....	+10 "	—10 "
1	Nitrate of sodium + 4 Water................	....	—10.6 "
1	Chloride of potassium + 4 Water............	....	—11.8 "
5	Sal ammoniac + 5 Saltpetre + 16 Water......	+10 deg.	—12 "
1	Nitrate of ammonia + 1 Water	+10 "	—15.5 "
8	Sulphate of sodium + 5 conc. Sulphuric acid.	+10 "	—17 "
1	Sulphocyanate of Potass. + 1 Water.........	+18 "	—21 "
1	Chloride of sodium + 3 Snow................	....	—21 "
1	Sal ammoniac + 1 Saltpetre + 1 Water........	+ 8 deg.	—24 "
3	Crystal. chloride of calcium + 1 Snow.......	....	—36 "
1	Snow + 1 dilute Sulphuric acid...	— 5 deg.	—41

PHOTOGRAPHIC SCHOOLS OF INSTRUCTION.

American.

CHAUTAUQUA SCHOOL OF PHOTOGRAPHY. Headquarters, 423 Broome Street, New York. Prof. Charles Ehrmann, *Instructor.* 1. *Corresponding Class.*—Printed Lessons; Reading of Hand-books; Instruction by Correspondence. 2. *Practicing Class.*—Practical Exercises in Field and Studio; Theories; Public Lectures; Colloquies. 3. *Local Class, New York.*—Demonstration in Practical Photography; Theory of Photo-chemical Processes; Preparation of Photographic Chemicals. 4. *Corresponding Class* (*Second Course*).—Prescribed Reading; Chemistry; Optics; Examination in all Classes; Diplomas.

MOUNTAIN LAKE ASSEMBLY, MD., CLASS IN PHOTOGRAPHY. Profs. Charles F. Himes and C. C. Lines.

SCHOOL OF PHOTOGRAPHY, BAY VIEW, MICH., ASSEMBLY. M. H. Hall, *Superintendent.*

SCHOOL OF PHOTOGRAPHY, LAKESIDE ASSEMBLY, OHIO. A. Gamble, *Instructor.*

SCHOOL OF PHOTOGRAPHY, ROCKY MOUNTAIN ASSEMBLY, GLEN PARK, COL. W. H. Williamson, *Instructor.*

ANN ARBOR UNIVERSITY, MICHIGAN. *Director,* Prof. A. B. Stevens. Theory and Practice; Special Instructions in Photomicrography; Lectures on Photo-mechanical Processes. It is obligatory for the students to have passed two courses in chemistry. Examination and Diplomas.

European.

PHOTOGRAPHICAL LABORATORY OF THE POLYTECHNICUM IN CHARLOTTENBURG, BERLIN. Prof. Schlichting, *Director.* Prof. Dr. H. W. Vogel, *Instructor.* Chemistry, Physics, Drawing, Practical Exercises and Photo-mechanical Printing Methods.

BRAUNSCHWEIG DEPARTMENT OF POLYTECHNICAL SCHOOL. Prof. Dr. C. Koppe and Dr. Max Muller. Theory and Practice; Photo-micrography; Photo-grammetry.

KARLSRUHE. Prof. Dr. Schuberg. Theory and Practice in Studio and Field; Lectures.

MUNICH. Dr. M. Th. Edmann. Photography Applied to the Mechanical Arts

SCHLOSS GRÖNENBACH, BAVARIA. W. Cronenberg. Mechanical Printing Methods; Wet and Dry Processes.

VIENNA IMPERIAL POLYTECHNICUM. Prof. Dr. Joseph M. Eder. Elements of Photography and Photo-chemistry; Reproduction Methods.

VIENNA IMPERIAL INSTITUTE FOR PHOTOGRAPHIC PRACTICE, REPRODUCTION METHODS, AND MECHANICAL PRINTING. Prof. Dr. Joseph M. Eder, *Director.* Profs. Hans Lenhardt, Alex. Lainer, I. Hörwarter, C. Jasper, *Instructors.* Two Courses of Instruction. Drawing; Chemistry; Optics; Theories of Photographic Processes; Retouching Positives.

PHOTOGRAPHIC BOOKS PUBLISHED IN 1890-91.

AMERICAN.

The American Annual of Photography and Photographic Times Almanac for 1891. New York: The Scovill & Adams Company.

The Cyclopedic Index to The American Annual of Photography and Photographic Times Almanac for 1891. New York: The Scovill & Adams Company.

The Optical Lantern. By Andrew Pringle. New York: The Scovill & Adams Company.

Lantern Slides by Photographic Methods. By Andrew Pringle. New York: The Scovill & Adams Company.

Photographic Optics. By Prof. W. K. Burton. New York: The Scovill & Adams Company.

Photographic Reproduction Processes. By P. C. Duchochois. New York: The Scovill & Adams Company.

Bromide Paper and How to Use It. A Practical Treatise. Written by an Expert. New York: The Scovill & Adams Company.

The Modern Practice of Retouching Negatives. Seventh Edition. New York: The Scovill & Adams Company.

Photographic Printing Methods. By the Rev. W. K. Burbank. Third Edition. Fourth Thousand. New York: The Scovill & Adams Company.

The Photographic Instructor. By W. I. Lincoln Adams and Prof. Charles Ehrmann. Third Edition. New York: The Scovill & Adams Company.

El Instructor Fotografico. Translated by A. C. Lamoutte. (Spanish Edition of "The Photographic Instructor.") New York: The Scovill & Adams Company.

Photographic Mosaics for 1891. An Annual Record of Photographic Progress. New York: Edward L. Wilson, Ph.D., Editor and Publisher.

The Book of the Lantern. By T. C. Hepworth. New York: Edward L. Wilson.

Modern Heliographic Processes. By Ernest Lietze. New York: Edward L. Wilson.

Portraits in Crayon on Solar Enlargements. By E. Long. Quincy, Ill.: Published by the Author.

Volume 4 of the International Annual of Anthony's Photographic Bulletin. Edited by W. Jerome Harrison, F.G.S., and Prof. Arthur H. Elliott, with the assistance of W. I. Scandlin. New York: E. & H. T. Anthony & Co.

The Development of Gelatine Plates. By the Rev. W. H. Burbank. Boston: Published by the Author.

Lantern Slide Making. By the Rev. W. H. Burbank. Boston: Published by the Author.

THE PHOTOGRAPHIC IMAGE. A Theoretical and Practical Treatise of Development. P. C. Duchochois, Photographer. New York: Published by the Author.

ENGLISH.

THE BRITISH JOURNAL PHOTOGRAPHIC ALMANAC FOR 1891. Edited by J. Traill Taylor. London: H. Greenwood & Co.

THE YEAR BOOK OF PHOTOGRAPHY AND PHOTOGRAPHIC NEWS ALMANAC FOR 1891. London: Piper & Carter.

THE AMATEUR PHOTOGRAPHERS' ANNUAL FOR 1891. Edited by the Staff of *The Amateur Photographer*. London: Hazell, Watson & Viney.

PHOTOGRAPHY'S ANNUAL FOR 1891. Edited by Henry Sturmey. London: Iliffe & Son.

ADAMS & CO.'S PHOTOGRAPHIC ANNUAL FOR 1891. London: Adams & Co.

FALLOWFIELD'S ANNUAL FOR 1891. London: Jonathan Fallowfield.

PICTURES IN BLACK AND WHITE; OR, PHOTOGRAPHERS PHOTOGRAPHED. By George Mason ("Mark Oute").

PHOTOGRAPHY IN A NUTSHELL. By the "Kernal." London: Iliffe & Son.

GERMAN.

DAS LICHT. Die Photographie im Dienste der Astronomie, Meteorologie und Physik. Dr. Th. Stein. Published by Wilh. Knapp, Halle, a/S.

GESCHICHTE DER PHOTOCHEMIE UND PHOTOGRAPHIE. Von Dr. Josef Maria Eder. Second Edition. Wilhelm Knapp, Halle a/S.

AUSFÜHRLICHES HANDBUCH DER PHOTOGRAPHIE. Second Edition. Vol. I, Part 2. Die chemischen Wirkungen des Lichtes. Spectral photographic and actinometric. By Dr. Jos. M. Eder. Wilhelm Knapp, Halle a/S, Publisher.

HANDBUCH DER PHOTOGRAPHIE FÜR AMATEUR UND TOURIST. Von Major C. Pizzighelli. Halle a/S., Wilhelm Knapp.

DIE PHOTOGRAPHIE IM DIENSTE DES INGENIEURS. EIN LEHRBUCH DER PHOTOGRAMMETRIE. Friedrich Steiner. Published by R. Lechner, Wien.

MODERNE KUNST. Published by Richard Bong, Berlin.

COMPENDIUM DER PRAKTICHEN PHOTOGRAPHIE FÜR AMATEUR AND FACH-PHOTOGRAPHEN. F. Schmidt, Karlsruhe.

DIE AMATEUR PHOTOGRAPHIE. Ein Lehrbuch und Handbuch der Lichtbildkunst. Robert Talbot. Published by Romaine Talbot, Berlin.

PHOTOGRAPHISCHE KUNSTLEHRE oder die künstlerischen Grundsätze der Lichtbildnerei. Für Fachmänner und Liebhaber bearbeitet von Prof. Dr. H. W. Vogel. Published by Robert Oppenheim (Gustav Schmidt), Berlin.

DIE ELEMENTE DER PHOTOGRAPHISCHEN OPTIK. Enthaltend eine gemeinverständliche Darstellung der Einrichtung photographischer Linsensysteme, sowie Angabe über Prüfung derselben. Dr. Hugo Schroeder. Published by Robert Oppenheim (Gustav Schmidt), Berlin.

Die photographische Retouche in ihrem ganzen Umfange. Von Wilhelm Kopske. Published by Robert Oppenheim (Gustav Schmidt), Berlin.

Photographischer Almanach und Kalendar fur 1891. E. Liesegang, Düsseldorf.

Der Entwickelungsdruck auf Gelatine-Emulsions Papier. Von G. Mercator. Published by Ed. Liesegang, Düsseldorf.

Geschichte der Photographie. Von C. Schiendle. Wien. A. Hartleben.

Deutscher Photographen Kalendar, 1891. Edited and Published by Karl Schwier, Weimar, Germany.

Die Retouche photographischer Negative und Aldrücke. Prof. H. Mücke. Published by E. Liesegang, Düsseldorf.

Der Amateur Photograph. C. W. Allers. Published by R. Lechner, Vienna.

Ueber photographische Messkunst und Photogrammetrie. Vinc. Pollock. Published by R. Lechner, Vienna.

Photographische Schmelzfarbenbilder auf Email, Porcellan und Glass. Liesegang's Verlag, Düsseldorf.

Die chemischen Wirkungen des Lichtes. Spectralphotographie und Photographie im Zusammenhang mit Klimatischen Verhaeltnissen. By Dr. Jos. M. Eder. Published by Wilhelm Knapp, Halle a/S.

Der photographische Apparat. Dr. Paul Liesegang. 9th Edition. Pulibshed by E. Liesegang, Dûsseldorf.

Burtons A B C der modernen Photographie. Edited by H. Schnauss. Published by E. Liesegang, Dûsseldorf.

Meine Erfahrungen im der Photolithographie. A. Albert, Vienna.

Der Silberdruck und das Vergro's sern photographischer Aufnahmur. Dr. Paul E. Liesegang. Published by E. Liesegang, Düsseldorf.

SWEDISH.

Fotografisk Tidskrifts Arsbok. Albin Roosval, Ed. R. Blaedel & Co., Stockholm, Publishers.

FRENCH.

Les Nouveaux procédés de tirage. L. Mathet. Paris : Société générale d'éditions.

Etude sur le développement et les de 'orl oppateurs, par M. Mathet. Paris : Société générale d'éditions.

Agenda de l'amateur photographe. E. Forestier. Paris : Société générale d'éditions.

La théorie, la pratique et l'art en photographie, avec le procédé au gelatino-bromure d'argent. Frederic Dillaye, 1 vol. 8vo. 214 illustrations. Cloth. Paris : Librairie Illustrée, 8 Rue St. Joseph. 12 fr.

La photographie aide du payagiste ou photographie des peintres. Par Karl-Robert. Un Vol. in-8. avec gravures et reproductions directes, 6 fr., 1890. H. Laurens, Publisher, 6 Rue de Tournon, Paris.

Les recreations photographiques par Bergeret et Drouin. Paris, 1890, Ch. Mendel, 118 Rue d'Assas, 6 fr.

Les travaux de l'amateur photographe en hiver. Un beau volume in-18 jésus avec deux planches phototypiques, une planche photozincographique et nombreuses, vignettes. Par E. Chable, Président du Photo-Club de Neuchatel. Prix, 3 fr. Pub. by Reval Seinse, de Photographie, 6 Place des Philosophos, Geneva, Switzerland.

La photochromie. Tirage d'épreuves photographique en en couleurs, par le comte, E. Ognowski. Paris, 1891.

L'aristotypie, par M. Le Commandant V. Legros. 1 vol. illustré d'une epreuve aristotypique de M. Liesegang. Paris, 1891 ; Societe d'éditions scientifiques, 4 Rue Antoine Dubois.

L'agenda de l'amateur photographe pour 1891, par E. Forestier. Published by Société générale d'éditions, Paris.

Les épreuves a projections, par E. Trutat. Paris : Ch. Mendel.

Formulaire photographique, par P. Jouan. Paris : Ch. Mendel.

Elements de photogrammetrie, par le Commandant V. Legros. Paris : Société d'éditions scientifiques.

Traité de photographie appliquée aux reproductions artistiques, industrielles et scientifiques, par M. Fabre. Paris : A. Buguet. 10 fr.

Recettes photographiques. Editor and Publisher, Abel Buguet, Paris.

The following books were published by Gauthier-Villars, Paris .

La photographie des couleurs, par A. Berget.

Traité pratique de photogravure au mercure, on "mercurographie,' par M. Villon, 1890.

Manuel du photographe amateur, par M. Panajou.

Manuel de photographie instantanée. Agle.

Hydroquinone et potasse—nouvelle méthode de développement à l'hydroquinone, par A. Balagny.

Aide mémoire de photographie pour 1891, par C. Fabre.

Traité encyclopédique de photographie, par Charles Fabre. Vol. IV.

Traité de zincographie. V. Roux.

Optique photographique, par M. A. Soret.

Traité élémentaire de l'objectif photographique. E. Wallon. 1 vol. 8vo. This is the latest treatise on Photographic Optics.

Traité pratique des agrandissements photographiques, par M. Trutat.

La formation de l'image photographie. A. de la Baume Pluvinel.

Congres international de photographie à l'exposition universelle de 1889. 1 vol. 8vo.

UNITED STATES PATENTS.

Suits for redress on account of infringement of patents are brought in the United States Circuit Court for the District where the defendant resides. Redress may be had through an injunction preventing further infringement and an accounting of the damages caused the patentee, or the profits, gains or advantages made by the infringer.

Until recently appeals from decisions rendered by the United States Circuit Court were necessarily taken to the Supreme Court of the United States, and, owing to the great amount of business done by the latter, a delay of at least four years was suffered by an appellee.

Very recently a new Court, designated the Circuit Court of Appeals, has been provided. Appeals may hereafter be taken to this Court, and are likely to be reached and disposed of quite expeditiously. This is of particular advantage to patentees, in view of the fact that their monopolies run but a limited time.

Patents are issued in the name of the United States and under the seal of the Patent Office to any person who has invented or discovered any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement thereof, not known or used by others in this country, and not patented or described in any printed publication in this or any foreign country, before his invention or discovery thereof, and not in public use or on sale for more than two years prior to his application, unless the same is proved to have been abandoned; and by any person who, by his own industry, genius, efforts, and expense, has invented and produced any new and original design for a manufacture, bust, statue, alto-relievo, or bas-relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics, any new and original impression, ornament, pattern, print, or picture to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture; or any new, useful, and original shape or configuration of any article of manufacture, the same not having been known nor used by others before his invention or production thereof, nor patented nor described in any printed publication, upon payment of the fees required by law and other due proceedings had.

Joint inventors are entitled to a joint patent; neither can claim one separately. Independent inventors of distinct and independent improvements in the same machine can not obtain a joint patent for their separate inventions; nor does the fact that one furnishes the capital and another makes the invention entitle them to make application as joint inventors; but in such case they may become joint patentees.

Every patent contains a grant to the patentee, his heirs or assigns, for the term of seventeen years, of the exclusive right to make, use, and vend the invention or discovery throughout the United States and the Territories, referring to the specification for the particulars thereof.

If it appear that the inventor, at the time of making his application, believed himself to be the first inventor or discoverer, a patent will not be refused on account of the invention or discovery, or any part thereof, having been known or used in any foreign country before his invention or discovery thereof, if it had not been before patented or described in any printed publication.

Letters Patent granted a foreign government will not, while in force, prevent the inventor from obtaining a patent in the United States, unless the invention shall have been introduced into public use into the United States more than two years prior to the application. But every patent granted for an invention which is the subject of Letters Patent still in force and previously granted to the same inventor in a foreign country will be so limited as to expire at the same time with such foreign patent, or, if there be more than one, at the same time with the one having the shortest unexpired term, but in no case will it be in force more than seventeen years.

Applications.

Application for a patent must be made in writing to the Commissioner of Patents. The applicant must also file in the Patent Office a written description of the same, and of the manner and process of making, constructing, compounding, and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art or science to which it appertains, or with which it is most nearly connected, to make, construct, compound and use the same; and in case of a machine, he must explain the principle thereof, and the best mode in which he has contemplated applying that principle, so as to distinguish it from other inventions, and particularly point out and distinctly claim the part, improvement, or combination which he claims as his invention or discovery. The specification and claim must be signed by the inventor and attested by two witnesses.

The applicant shall make oath that he verily believes himself to be the original and first inventor or discoverer of the art, machine, manufacture, composition, or improvement for which he solicits a patent; that he does not know and does not believe the same was ever before known or used, and shall state of what country he is a citizen. Such oath may be made before any person within the United States authorized by law to administer oaths, or, when the applicant resides in a foreign country, before any minister, charge d'affaires, consul, or commercial agent holding commission under the Government of the United States, or before any notary public of the foreign country in which the applicant may be.

When the nature of the case admits of drawings, the applicant must furnish one copy signed by the inventor or his attorney in fact, and attested by two witnesses, to be filed in the Patent Office. In all cases which admit of representation by model, the applicant, if required by the Commissioner, shall furnish a model of convenient size to exhibit advantageously the several parts of his invention or discovery.

On the filing of such application and the payment of the fee required by law, if, on such examination, it appears that the claimant is justly entitled to a patent under the law, and that the same is sufficiently useful and important, the Commissioner will issue a patent therefor.

Assignments.

Every patent or any interest therein shall be assignable in law by an instrument in writing; and the patentee, or his assigns or legal representatives may, in like manner, grant and convey an exclusive right under his patent to the whole or any specified part of the United States.

Reissues.

A reissue is granted to the original patentee, his legal representatives, or the assignees of the entire interest when, by reason of a defective or insufficient specification, or by reason of the patentee claiming as his invention or discovery more than he had a right to claim as new, the original patent is inoperative or invalid, provided the error has arisen from inadvertence, accident, or mistake, and without any fraudulent or deceptive intention. The applications must be made and the specification sworn to by the inventors, if they be living.

Caveats.

A caveat under the patent law is a notice given to the Office of the caveator's claim as inventor, in order to prevent the grant of a patent to another for the same alleged invention upon an application filed during the life of the caveat without notice to the caveator.

Any citizen of the United States who has made a new invention or discovery, and desires further time to mature the same, may, on payment of a fee of $10, file in the Patent Office a caveat setting forth the object and the distinguishing characteristics of the invention, and praying protection of his right until he shall have matured his invention. Such caveat shall be filed in the confidential archives of the Office and preserved in secrecy, and shall be operative for the term of one year from the filing thereof.

An alien has the same privilege, if he has resided in the United States one year next preceding the filing of his caveat, and has made oath of his intention to become a citizen.

The caveat must comprise a specification, oath, and, when the nature of the case admits of it, a drawing, and, like the application, must be limited to a single invention or improvement.

Fees.

Fees must be paid in advance, and are as follows: On filing each original application for a patent, $15. On issuing each original patent, $20. In design cases: For three years and six months, $10; for seven years, $15; for fourteen years, $30. On filing each caveat, $10. On every application for the reissue of a patent, $30. On filing each disclaimer, $10. For certified copies of patents and other papers, including certified printed copies, ten cents per hundred words. For recording every assignment, agreement, power of attorney, or other paper, of three hundred words or under, $1; of over three hundred and under one thousand words, $2; of over one thousand words, $3. For copies of drawings, the reasonable cost of making them.

COPYRIGHT LAW OF THE UNITED STATES.

The author, inventor, designer, or proprietor of any book, map, chart, dramatic or musical composition, engraving, cut, PRINT, or PHOTOGRAPH, or NEGATIVE THEREOF or of a painting, drawing, chromo, statue, statuary, and of models or designs intended to be perfected as works of the fine arts, and the executors, administrators, or assigns of any such person, may secure to himself the sole liberty of printing, publishing, completing, copying, and vending the same, and, if a dramatic composition, of publicly performing or representing it, or causing it to be performed or represented by others.

Foreigners as well as citizens of the United States are, by a law which came into effect on July 1st, 1891, entitled to copyrights in this country, providing the nations of which they are citizens permit to United States citizens the benefit of copyright on the same basis as their own citizens, or such nation is a party to an international agreement providing for reciprocity in copyright to which the United States may become a party. Up to the present time, Great Britain, France, Belgium and Switzerland are the only foreign nations whose citizens are entitled to copyrights in this country.

Every applicant for a copyright must state distinctly the name and residence of the claimant, and whether right is claimed as author, designer, or proprietor. No affidavit or formal application is required.

A *printed* copy of the title (besides the two copies to be deposited after publication) of the book, map, chart, dramatic or musical composition, engraving, cut, print, or photograph, or a *description* of the painting, drawing, chromo, statue, statuary, or model or design for a work of the fine arts, for which copyright is desired, must be sent by mail or otherwise, *prepaid*, addressed "LIBRARIAN OF CONGRESS, WASHINGTON, D. C." This must be done before publication of the book or other article.

The *printed title* required may be a copy of the title-page of such publications as have title-pages. In other cases, the title must be printed expressly for copyright entry, with name of claimant of copyright. The style of type is immaterial, and the print of a type-writer will be accepted. But a separate title is required for each entry, and *each* title must be printed on paper as large as commercial note. The title of a *periodical* must include the date and number.

FEES.

The legal fee for *recording* each copyright claim is 50 cents, and for a *copy* of this record (or certificate of copyright) an addtional fee of 50 cents is required. Certificates covering more than one entry are not issued.

Not later than the day of publication of each book or other article, in this country or abroad, two complete copies of the best edition issued must be sent, to perfect the copyright, with the address "LIBRARIAN OF CONGRESS, WASHINGTON, D. C." The postage must be prepaid, or else the publications enclosed in parcels covered by printed Penalty labels, furnished by the Librarian, in which case they will come FREE by mail without limit of weight, according to rulings of the Post Office Department. Without the deposit of copies above required the copyright is void, and a penalty of $25 is incurred. No copy is required to be deposited elsewhere.

NOTICE OF COPYRIGHT.

A copy of the record (or duplicate certificate) of any copyright entry will be furnished, under seal, at the rate of 50 cents each.

No copyright is valid unless notice is given by inserting in every copy published, on the title-page or the page following, if it be a book; or, if a map, chart, musical composition, print, cut, engraving, photograph, painting, drawing, chromo, statue, statuary, or model or design intended to be perfected as a work of the fine arts, by inscribing upon some portion thereof, or on the substance on which the same is mounted, the following words, viz.: "*Entered according to Act of Congress, in the year ——, by——, in the office of the Librarian of Congress, at Washington*," or, at the option of the person entering the copyright, the words: "*Copyright*, 18—, *by*——."

The law imposes a penalty of $100 upon any person who has not obtained copyright who shall insert the notice, "*Entered according to Act of Congress*," or "*Copyright*," etc., or words of the same import, in or upon any book or other article.

TRANSLATIONS AND DRAMATIZATIONS.

Any author may reserve the right to translate or dramatize his own work. In this case notice should be given by printing the words "*Right of translation reserved*," or "*All rights reserved*," below the notice of copyright entry, and notifying the Librarian of Congress of such reservation, to be entered upon the record.

Since the phrase *all rights reserved* refers exclusively to the author's right to dramatize or to translate, it has no bearings upon any publications except original works, and will not be entered upon the record in other cases.

Duration of Copyright.

The original term of copyright runs for twenty-eight years. *Within six months before* the end of that time, the author or designer, or his widow or children, may secure a renewal for the further term of fourteen years, making forty-two years in all. Applications for renewal must be accompanied by explicit statement of ownership, in the case of the author, or of relationship, in the case of his heirs, and must state definitely the date and place of entry of the original copyright. Advertisement of renewal is to be made within two months of date of renewal certificate, in some newspaper, for four weeks.

Assignments.

A copyright is assignable in law by any instrument of writing, but such assignment must be recorded in the office of the Librarian of Congress within sixty days from its date. The fee for this record and certificate is $1, and for a certified copy of any record of assignment, $1.

Serials or Separate Publications.

In the case of books published in more than one volume, or of periodicals published in numbers, or of engravings, photographs, or other articles published with variations, a copyright is to be entered for each volume or part of a book, or number of a periodical, or variety, as to style, title, or inscription of any other article. But a book published serially in a periodical under the same general title, requires only one entry. To *complete* the copyright on such a work, two copies of each serial part, as well as of the complete work (if published separately), must be deposited.

Works of Art.

To secure a copyright for a painting, statue, or model or design intended to be perfected as a work of the fine arts, a definite description must accompany the application for copyright, and a photograph of the same as large as cabinet size mailed to the Librarian of Congress not later than the day of publication of the work or design.

Copyrights cannot be secured through the Librarian of Congress upon trade-marks, nor upon mere names of companies or articles, nor upon prints or labels intended to be used with any article of manufacture. If protection for such names or labels is desired, application must be made to the Patent Office, where they are registered at a fee of $6 for labels and $25 for trade-marks. The trade-marks and labels are, however, protected without registration throughout most of the States.

RECORD OF PHOTOGRAPHIC PATENTS.

ISSUED BY THE UNITED STATES PATENT OFFICE FROM OCTOBER 21, 1890, TO SEPTEMBER 1, 1891, INCLUSIVE, WITH NAMES OF PATENTEES.

COMPILED BY F. C. BEACH.

438,601.—Burnisher.
W. H. BOLES, Syracuse, N. Y.

438,834.—Camera.
G. BAUSCH, Syracuse, N. Y.

438,943.—Photographic Apparatus Shutter.
E. W. PERRY, JR., New York, N. Y.

438,944.—Photographic Camera.
E. W. PERRY, JR., New York, N. Y.

439,012.—Magazine Plate-Holder for Photographic Apparatus.
E. KIPPER, Adams, Mass., and E. W. PERRY, JR., New York, N. Y.

439,013.—Photographic Plate Holder.
E. KIPPER, Adams, Mass., and E. W. PERRY, JR., New York, N. Y.

439,021.—Emulsion for Photographic Printing Paper.
L. F. MARTER, St. Charles, Mo.

439,037.—Photographic Camera Shutter.
E. W. PERRY, JR., New York.

439,044.—Photograph Album.
J. SUTTER, Philadelphia, Pa.

439,098.—Adjustable Support for Photographic Cameras.
C. S. BLAKE, Chicago, Ill.

439,121.—Photographic Camera.
N. CRANE, Newton, Mass.

439,420.—Stereopticon.
L. D. MCINTOSH, Chicago, Ill.

439,512.—Background for Photographs.
E. N. HOWE, Forest, Ohio.

439,533.—Method of Printing Pictures on Celluloid.
P. H. MANDEL, Astoria, N. Y.

439,536.—Process of Transferring Prints or Designs.
W. H. MAXWELL, Chartiers, Pa.

439,556.—Focusing Attachment for Photographic Instruments.
F. B. QUIMBY, Quincy, Mass.

439,650.—Roll Holder for Photographic Cameras.
WILLARD H. FULLER, Passaic, N. J.

439,651.—Roll Holder.
WILLARD H. FULLER, Passaic, N. J.

439,804.—Photographic Camera.
R. W. H. LEWIS, Huntington, N. Y.

439,808.—Photographic Plate Holder.
R. A. ANTHONY, New York, N. Y.

439,999.—Photographic Flash Light Diffuser.
J. S. BRIDGES, Baltimore, Md.

440,137.—Photographic Shutter.
J. B. CHURCH, Washington, D. C.

440,228.—Camera.
G. H. HURLBUT, Belvidere, Ill.

440,325.—Flush Washer for Photographic Purposes.
G. H. RICHARDS, Philadelphia, Pa.
440,399.—Printing and Vignetting Frame.
W. & W. EASSON, Racine, Wis.
440,427.—Photographic Camera.
H. J. GRAY, London, England.
440,462.—Album and Support for the same.
B. BRANNER, New York, N. Y.
440,479.—Album.
T. KELLY, New York, N. Y.
440,583.—Photographic Shutter.
E. B. BARKER, Newark, N. J.
441,018.—Camera.
F. NOWLAN, London, England.
441,064.—Pocket Photographic Apparatus.
A. GOLDSCHMID, Zurich, Switzerland.
441,158.—Flash Light Photographic Apparatus.
W. H. HARBECK, Toledo, Ohio.
20,350.—(*Design Patent*)—Photographic Cardboard.
E. SHEPPERD, San Francisco, Cal.
441,704.—Panoramic Camera.
G. G. ROCKWOOD, New York, and H. B. SHALLENBERGER, Rochester, Pa.
441,831.—Photographic Film.
G. EASTMAN, Rochester, N. Y.
442,216.—Photographic Camera.
F. A. BROWNELL, Rochester, N. Y.
442,224.—Apparatus for Producing Flash-Lights for Photographing and other purposes.
A. HEMSLEY, Philadelphia, Pa.
442,251.—Photographic Objective.
D. GUNDLACH, Rochester, N. Y.
442,450.—Making Iron Prints by Photography.
C. R. MCBLAIR, Washington, D. C.
442,615.—Camera.
C. O. ELLISON, Liverpool, England.
442,741.—Manufacturing Highly-Sensitive Isochromatic Gelatine Plates.
H. W. VOGEL, Berlin, Germany.
443,359.—Apparatus for Facilitating the Microscopical Examination of Photographic Pictures.
HENRY DUNCAN, London, England.
443,386.—Stop or Diaphragm for Photographic Cameras.
L. G. BIGELOW, Chattanooga, Tenn.
443,555.—Photographic Camera Attachment.
A. VIGNOS, Canton, Ohio.
443,610.—Camera Apparatus, Slide, and Extension Bed.
H. BODE, New York, N. Y.
443,762.—Photographer's Background.
E. H. HAGUE, Jackson, Mich.
444,083.—Photographic Shutter.
E. BAUSCH, G. HOMMEL, and A. WOLLENSAK, Rochester, N. Y.
444,084.—Enameling Photographs and other Prints.
C. C. F. BRANDT, Muscatine, Iowa.
444,361.—Photographic Camera Shutter.
G. F. KINCAID, San Francisco, Cal.
444,422.—Photographic Apparatus for Holding and Developing Dry Plates.
G. H. COBB, Elmira, N. Y.

444,487.—Coin-Controlled Automatic Photographic Apparatus
E. G. FISHER, Minneapolis, Minn.
444,535.—Photographic Apparatus.
L. LUMIÉRE, Lyons, France.
444,714.—Photographic Objective.
P. RUDOLPH, Jena, Germany.
444,806.—Photographic Camera.
E. B. BARKER, Newark, N. J.
444,951.—Process of Preparing Plates or Surfaces for Ornamentation.
H. GOODWIN, Newark, N. J.
444,952.—Process of Preparing Plates for Utility and Ornament.
H. GOODWIN, Newark, N. J.
445,188.—Artificial Light for Photography.
T. H. MCCOLLIN, Lansdowne, Pa.
445,232.—Photographic Apparatus.
C. PASQUARELLI, Torino, Italy.
445,550.—Photographic Camera.
WILLARD H. FULLER, Passaic, N. J.
445,561.—Camera Attachment.
C. L. KNOX, Nashville, Tenn.
445,581.—Photographic Printing Apparatus.
R. L. WYNKOOP and J. M. KEMP, Paterson, N. J.
445,639.—Photographic Cabinet.
O. M. HERBERG, Hendrum, Minn.
445,805.—Photographic Background.
W. G. ENTREKIN, Philadelphia, Pa.
445,861.—Cabinet for Photographic Plate Holders, Negatives, and Stock.
G. H. RICHARDS, Philadelphia, Pa.
445,911.—Photographic Apparatus.
E. V. SWINDEN and J. EARP, Liverpool, England.
446,004.—Method of Producing Colored Impressions.
R. SCHORR, Würtemburg, Germany.
446,045.—Photographic Cameras.
F. WHITNEY, Chicago, Ill.
446,238.—Stereopticon.
A. T. THOMPSON, Boston, Mass.
446,368.—Photographic Camera.
C. WHITNEY, Chicago, Ill.
446,369.—Photographic Camera.
C. WHITNEY, Chicago, Ill.
446,370.—Photographic Plate Holder.
C. WHITNEY, Chicago, Ill.
446,371.—Photographic Plate Holder.
C. WHITNEY, Chicago, Ill.
446,372.—Photographic Camera.
C. WHITNEY, Chicago, Ill.
446,373.—Supply Case for Roll Holders in Photographic Cameras.
C. WHITNEY, Chicago, Ill.
466,374.—Photographic Camera.
C. WHITNEY, Chicago, Ill.
446,529.—Photographic Shutter.
G. W. LOW and W. SHAKESPEARE, JR., Kalamazoo, Mich.
446,880.—Shutter for Photographic Cameras.
H. B. NORTON, Minneapolis, Minn.
446,891.—Method of Producing Intense Light by Magnesium or other Glowing Materials.
J. W. C. C. SCHIRM, Berlin, Germany.

447,645.—Solar Reflecting Camera.
R. N. Reed, Covington, Ky.
447,815.—Sample or Picture Exhibitor.
H. Frercks, Chicago, Ill.
447,902.—Camera Shutter.
L. Prosch, Jr., Brooklyn, N. Y.
20,568.—*Design Patent* Album.
L. A. Lipman, Brooklyn, N. Y.
448,364.—Photographic Film.
V. Planchon, Boulogne, France.
448,383.—Photographic Plate Washing Apparatus.
T. W. Taylor, Brooklyn, N. Y.
448,447.—Photographic Copying Apparatus.
S. C. Madsen, Sleepy Eye Lake, Minn.
448,692.—Implement for Mounting Pictures on Glass.
R. H. L. Talcott, Boston, Mass.
448,801.—Photographic Roll Holder.
H. G. Ramsperger, New York, N. Y.
448,825.—Dissolving Shutter for Magic Lanterns.
J. Shannon, Wixom, Mich.
449,386.—Magic Lantern.
F. Sheidig. New York, N. Y.
449,391.—Burnisher.
S. O. Tuerk, Syracuse, N. Y.
449,487.—Portable Dark-Room.
J. H. Markley, Brooklyn, N. Y.
449,733.—Instantaneous Photographic Shutters.
T. R. Dallmeyer and F. Beauchamp, London, England.
450,214.—Camera.
T. H. Blair, Boston, Mass., and J. H. Crowell, Vineyard Haven, Mass.
450,447.—Device for Lifting Photographic Negatives.
C. H. Buchwalter, Philadelphia, Pa.
450,475.—Photographic Cabinet.
C. Quartley, Baltimore, Md.
450,794.—Photographic Paper Roll-Holder.
G. Jones, Rochester, N. Y.
450,815.—Dissolving View Magic Lantern.
F. McClintock, Grand Junction, Col.
450,963.—Water-proof and Sensitized Photographic Mount.
H. Kuhn, Springfield, Mo.
451,027.—Slide-Shutter for Photographic Cameras.
John R Connon, Elora, Canada.
451,330.—Annular Lens.
Edward W. Laurencot, Hoboken, N. J.
451,413.—Magic Lantern for Advertising Purposes.
James W. See, Hamilton, Ohio.
451,853.—Magnesium Flash-Light.
Otto Doehn, Cleveland, Ohio.
451,880.—Photographic Shutter.
C. C. Packard, Kalamazoo, Mich.
452,059.—Calender for Photographic Purposes.
A. Leutner, Vienna, Austria, Hungary.
452,119.—Photographic Camera.
B. J. Edwards, London, England.
452,766.—Support for Photographic Printing Frames.
A. J. Dawdy, Goshen, Indiana.

452,859.—Photographic Stand.
H. Vité, Berlin, Germany.
452,926.—Photographic Camera.
M. Vega, New York.
452,957.—Rotary Index and Photographic Album.
B. Staunton, Douglas, Wyoming.
452,966.—Producing Instantaneous Photographs.
W. Donisthorpe and W. C. Crafts, Westminster, England.
453,813.—Photographic Background.
C. Fredericks, Brooklyn, N. Y.
454,005.—Screen for Magic Lanterns and Photographers' Use.
E. H. Parsons and E. U. Frazer, Kane, Pa.
454,268.—Machine for Printing from Callotype or Photo-Gelatine Plates.
W. C. Hawkins, Taunton, Mass.
454,433.—Adjustable Photographic Printing Frame.
H. B. Hennemann, St. Louis, Mo.
20,840.—*Design Patent.* Photograph Mount.
G. F. E. Pearsall, Brooklyn, N. Y.
454,518.—Developing-Dish for Photographers.
A. Doyle, New York, N. Y.
454,844.—Photograph Album.
A. W. Brewerton and M. R. Szameit, Chicago, Ill.
455,954.—Apparatus for Coating Photographic Plates with Emulsion.
J. H. Smith, Low Fell, Gateshead, England.
456,047.—Producing Surprise Pictures.
O. Meyer, New York, N. Y.
456,396.—Marking Device for Photographic Negatives.
B. A. Blackmore, Staunton, Va.
456,555.—Photographer's Retouching and Marking Apparatus.
C. Cutter, Minneapolis, Minn.
456,673.—Coin Controlled Photographic Apparatus.
F. Martin, Newark, N. J.
456,842.—Photographic Camera.
E. W. Perry, Jr., New York, N. Y.
456,869.—Instrument for Calculating Photographic Exposures.
A. Watkins, Hereford, England.
457,694.—Magic Lantern.
A. W. Armstrong, London, England.
457,712.—Process of Photographing.
I. H. Hamburger, New York, N. Y.
457,817.—Preparing Photographic Plates.
O. Moh, Görlitz, Germany.
457,857.—Photographic Camera.
D. J. Tapley, Newton, N. Y.
458,128.—Photographic Camera.
Charles Mills, New York, N. Y.
458,663.—Manufacture of Flexible Photographic Films.
H. M. Reichenbach and S. C. Pasavant, Rochester, N. Y.
458,699.—Photographic Apparatus.
H. Thümler, Berlin, Germany.
458,907.—Magazine Plate-Holder for Photographic Apparatus.
E. Kipper, Adams, Mass., and E. W. Perry, Jr., New York, N. Y.
458,979.—Plate-Holder for Photographic Apparatus.
E. W. Perry, Jr., New York, N. Y.
458,980.—Method of Exposing and Shifting Photographic Plates or Films.
E. W. Perry, Jr., New York, N. Y.
458,981.—Photographic Apparatus.
E. W. Perry, Jr., New York, N. Y.

RATES OF DOMESTIC POSTAGE

TO ANY PART OF THE UNITED STATES, CANADA, OR MEXICO.

SEE NOTE H.

	cts.	oz.	See Spec'l Note.
Address Tags........	1	1	*a*
Bill Heads...........	1	1	*a*
Blotters (printed).....	1	1	*a*
Blue Prints..	1	2	*d*
Books, printed.......	1	2	*d*
Cards, playing	1	1	*a*
" printed........			
" business.......			
" Christmas, etc.‡	1	2	*a*
" Easter‡........			
" New Year‡....			
Chromos‡...........	1	2	*a*
Catalogues..........	1	2	*d*
Circulars............	1	2	*d*
Coins...............	1	1	*a b*
Copy (MSS.)........	2	1	*e*
" (with proof sheets)	1	2	*e*
Crayon..............	1	1	
Desk Blotters........	1	1	*a*
Drawings / Designs } Pen or Pencil	1	1	* *e*
Easter Cards‡.......	1	2	*a*
Engravings..........	1	2	*a*
Handbills............	1	2	*a*
Letters..............	2	1	*e*
Labels (printed)......	1	2	*a*
Lithographs....	1	2	*a*
Manifold Letters.....	2	1	*e*
Manuscript..........	2	1	*e*
Magazines...........	1	4	*d*
Merchandise.........	1	1	*a b*
Maps (printed).......	1	2	*e*
Newspapers..........	1	4	*d*
New Year Cards‡....	1	2	
Packages, sealed.....	2	1	*b*

	cts.	oz.	See Spec'l Note.
Packages, unsealed..	1	1	† *b*
Pamphlets..........	1	2	*d*
Patterns (cut)........	1	1	*a*
Periodicals.........	1	4	*d*
PHOTOGRAPHS...	1	2	*d*
Pictures (scrap).....	1	2	
Playing Cards	1	1	*a*
Postal Cards..	1	ea.	*f*
Printed Matter (*not merchandise or samples*)..............	1	2	*d*
Printed Envelopes..	1	1	*a*
Prospectuses.......	1	2	*d*
Proof Sheets........	1	2	*dg*
Plans (in writing)...	2	1	*e*
Registration........	10	ea.	*i*
Samples............	1	1	*b*
Sample copies of regular publications mailed by publisher (second-class).....	1	lb.	
Sample copies of regular publications not mailed by publisher.............	1	4	*a*
Scrap Pictures......	1	2	*a*
Seeds, Plants, etc...	1	2	
Specie.........	1	1	*a b*
Stereoscopic Views..	1	2	*d*
Tickets.............	1	2	*a*
Type Writer Work..	2	1	*e*
Valentines (if printed without embellishment with silk, satin, etc.)........	1	2	*a*
Visiting Cards (printed).............	1	2	*a*

* If pen or pencil drawings contain no written letters, figures, or words, they are fourth class matter, otherwise first class.

† May be either third or fourth class.

‡ Third-class matter if printed on paper; if on silk, cotton, satin, canvas, or other material than paper or paper board, fourth class matter.

GENERAL NOTES.

Cards, circulars, catalogues, etc., relating to the business of one or more firms, and different articles of all kinds and classes, may be placed in the same package, provided that the highest rate of postage that any part of the contents is subject to shall be prepaid on the whole package.

The following articles are unmailable, and will not be dispatched in any case:—Spirituous, malt, or vinous liquids, poisons, explosive matter, inflammable articles, live or dead animals, insects (except queen bees when safely secured), substances exhaling a bad odor, fresh fruits and vegetables, obscene or indecent books, prints, writings, or papers; all postal cards or letters on the envelopes of which lewd, obscene, or lascivious delineations, offensive duns, epithets, terms, or language are written or printed, all matter concerning lotteries or schemes devised and intended to defraud the public, or for the purpose of obtaining money under false pretences, and all mail matter not addressed to a post-office or to no particular person, firm, company, or publication.

Special Delivery.—Any mail matter, when bearing, in addition to the regular postage, a "special delivery" stamp (face value, ten cents), will be immediately delivered by special messenger on its arrival at destination, between the hours of 7 A.M. and 7 P.M., and within one mile from the post-office, if it be not a letter-carrier office. At letter-carrier offices special delivery is obligatory within the carrier limits, and between the hours of 7 A.M. and 7 P.M.

Note A.

Fourth Class Matter—Samples and Merchandise.—Weight limited to 4 pounds. Postage must be fully prepaid. The rate is ONE CENT AN OUNCE OR FRACTION THEREOF. Merchandise may have printing on it or on the wrapper. Written marks, in addition to the address, are allowed on Fourth Class matter, as follows:—The name and address of sender preceded by the word "From"; and any names, numbers, marks, or letters for the purpose of description. A request to the delivering Postmaster may also be written asking him to notify sender if the package is not delivered; also an ordinary request to return to the sender in case of non-delivery.

Note B.

Articles of the Fourth Class liable to injure or deface the mails, such as flour, sugar, glass, needles, nails, pens, etc., must first be placed in a bag, box or open envelope, which must then be enclosed in another outside tube or box, made of metal or hardwood without sharp corners or edges and having a sliding clasp or screw lid, thus securing the articles in a double package; if the articles are fragile, they must be packed with sawdust, cotton or other packing material in the inside pocket. Powdered articles, such as flour, sugar, etc., must be enclosed in a transparent bag. Admissible liquids and oils (not exceeding 4 ounces liquid measure), pastes, salves or articles easily liquefiable, must conform to the following conditions: When in glass bottles or vials, such bottles or vials must be strong enough to stand the shock of handling in the mails, and must be enclosed in a wooden or papier-mache block or tube not less than three-sixteenths of an inch thick in the thinnest part, strong enough to support the weight of mails piled in bags and resist rough handling; and there must be provided, between the bottle and its wooden base, a cushion of cork crumbs, cotton, felt, asbestos, or some other absorbent, sufficient to protect the glass from shock in handling; the block or tube impervious to liquids, including oils, etc., to be closed by a tightly fitting screw-lid of wood or metal, with a rubber or other pad so adjusted as to make the block or tube water-tight and to prevent the leakage of the contents in case of breaking of the glass. When enclosed in a tin cylinder, metal case or tube, such cylinder, case or tube should have a screw-lid with a rubber or cork cushion inside in order to make the same water-tight, and should be securely fastened in a wooden or papier-mache block (open only at one end), and not less in thickness and strength than above prescribed. Manufacturers or dealers intending to transmit articles or samples in considerable quantities, should submit a sample package, showing their mode of packing, to the Postmaster at the mailing office, who will see that the conditions of this section are carefully observed.

Note D.

Third Class Matter.—PREPAYMENT.—Postage must be fully prepaid, otherwise the matter will be "held for postage." The rate is ONE CENT FOR EVERY TWO OUNCES OR FRACTION THEREOF. THE LIMIT OF WEIGHT IS 4 pounds, except on single books. WRITING.—No writing is permitted on Third Class matter, except as follows: The name and address of the sender on the outside or inside of package, preceded by the word "From," and any printing not in the nature of personal correspondence. The sender is further allowed to mark a word or passage in a book or paper to which he desires to call special attention. He may also write a simple inscription or dedication upon the cover or blank leaf of a book or pamphlet. The date, address and signature of a circular may be written. Any other writing on Third Class matter will subject the package to letter rates of postage, and may render the sender liable to a fine of Ten Dollars. PHOTOGRAPHS and BLUE PRINTS must bear no other writing than the name of the sender.

WRAPPING.—Mail matter of the Third Class must be so wrapped or enclosed that it can be readily examined without destroying the wrapper; otherwise it will be subject to postage at the First Class rate (two cents per ounce), as will all articles enclosed in sealed envelopes with clipped ends, sides or corners, or in boxes with covers secured by nails, and all packages the wrappers of which are secured to the enclosure by postage stamps.

Note E.

First Class.—This class includes letters, postal cards, sealed packages, all matter wholly or partly in writing (whether manuscript or produced by type-writer or copying press), drawings, designs, plans and maps, if they contain descriptive words, letters, or figures in writing, produced by hand, manuscript for publication not accompanied by proof sheets, and all personal correspondence, whether in writing or in print. (See under heads "Third Class," "Fourth Class," notes "A" and "D," certain writing permitted in or on articles of those Classes.)

The rate of postage on mail matter of the First Class (sealed or unsealed) is TWO CENTS FOR EACH OUNCE OR FRACTION THEREOF, excepting postal cards, and excepting also letters for *local delivery* posted at the post-office where no letter carriers are employed, in which case the rate is ONE CENT PER OUNCE OR FRACTION THEREOF.

The law provides that the postage on all mail matter of the First Class shall be prepaid only by postage stamps or by enclosure in government stamped envelopes, and that any article of this Class (not entitled by law to free transmission in the mails) deposited in a post-office wholly unpaid or prepaid *less than one full rate*, *can not be forwarded or delivered*, but must be "held for postage." LIMIT OF WEIGHT.—There is no limit to the weight of letters or packages of First Class matter. WRAPPING OR ENCLOSURE.—Mail matter of the First Class may be wrapped or enclosed in any manner that the sender may desire. RETURN.—Letters not delivered will be returned to writer free, if a request to that effect is placed on the envelope. FORWARDING.—A letter will be forwarded by the Postmaster who may hold it, to another post-office, at the request of the person to whom the letter is addressed. Letters addressed to the care of another person, or erroneously delivered, may be redirected and returned within a reasonable time to post-office, and will be forwarded without additional charge.

The putting on of requests to return the matter to the sender in case of non-delivery is recommended by the Post-Office Department—not on first-class alone, but on all matter.

Note F.

Postal Cards.—No cards are "Postal Cards" except those issued by authority of the Postmaster-General (the imitation of which is forbidden and punished by law); and so-called "Postal Cards" issued by private parties are subject to letter rates of postage when they contain any written matter whatever in addition to the date, and the name of the addressee and of the sender, and the correction of mere typographical errors therein. Nothing whatever may be attached to a Postal Card except an address label, which may be pasted to the *address side*, and no printing or writing is permitted upon the address side of Postal Cards, except that imprinted thereon at the manufactory and such as may be necessary for the proper direction of the same. Postal Cards are returned to the senders when unclaimed, but requests to so return should *not* be placed on the address side. Postal Cards are unmailable as such when incomplete or mutilated, and in all cases where any of the above conditions are not complied with.

Note G.

Proof Sheets may be corrected or uncorrected, with or without the original manuscript, additions to or alterations in the matter, or directions as to the typographical part of the work; but directions in writing as to binding, quality of paper, etc., are not permissible unless the letter rate of postage be paid.

Note H.

Canada and Mexico.—Matter mailed in the United States, addressed to Mexico, is subject to the same postage rates and conditions as it would be if it were addressed for delivery in the United States, except that articles of miscellaneous merchandise (fourth-class matter) not sent as *bona-fide* trade samples, are required to be sent by "Parcels Post," and that the following articles are *absolutely excluded* from the mails without regard to the amount of postage prepaid, or the manner in which they are wrapped, viz.:

All sealed packages, other than letters in their usual and ordinary form; *all* packages (including packages of second-class matter, which weigh more than 4 pounds 6 ounces), except such as are sent by "Parcels Post;" liquids, pastes, confections, and fatty substances; publications which violate any copyright law in Mexico.

Single volumes of printed books, *in unsealed* packages, are transmissible to Mexico in the regular mails without limit as to weight.

"*Commercial Papers*," and *bona-fide* trade samples are transmissible to Mexico in the regular mails at the postage rate given above, opposite "Commercial Papers" and "Samples of Merchandise," respectively. See also Note 15, pp. 815 and 816 of the GUIDE for January, 1890.

Matter mailed in the United States, addressed to Canada, is subject to the same postage rates and conditions as it would be if it were addressed for delivery in the United States, except that "Commercial Papers" are transmissible at the postage rate given above opposite "Commercial Papers," and that the following articles are *absolutely excluded* from the mails, without regard to the amount of postage prepaid, or the manner in which they are wrapped, viz.:

All sealed packages, other than letters in their usual and ordinary form; *all* packages (except single volumes of printed books and packages of second-class matter), which weigh more than 4 pounds 6 ounces; Police Gazettes; publications which violate any copyright law of Canada.

Note I.

Registration.—All kinds of mail matter can be registered at the rate of ten cents for each package, in addition to the postage at regular rates, both postage and fee to be fully prepaid by stamps; all conditions as to marks, contents and method of securing packages being the same as described under the various classes (Notes A, D, E). Each package must bear name and address of sender, and a receipt will be returned from the person to whom addressed.

Domestic Money Orders.

For sums not exceeding $5	$0 05
" " " " 10	08
" " " " 15	10
" " " " 30	15
" " " " 40	20
" " " " 50	25
" " " " 60	30
" " " " 70	35
" " " " 80	40
" " " " 100	45

The fee for a Postal Note is 3 cents.

A Postal Note may be drawn for any amount from one cent to four dollars and ninety-nine cents.

INTERNATIONAL MONEY ORDERS.

The fees for International Money Orders are as follows:

For sums not exceeding $10	$0 10
Over $10 and not exceeding $20	20
" 20 " " 30	30
" 30 " " 40	40
" 40 " " 50	50
" 50 " " 60	60
" 60 " " 70	70
" 70 " " 80	80
" 80 " " 90	90
" 90 " " 100	1 00

The sender of a money order must state the particulars thereof upon a form furnished by the post-office.

A money order may be endorsed once only.

The person who presents a money order for payment must be identified if unknown to the postmaster, unless the remitter upon his application waives identification.

A domestic money order may be repaid within a year at the office of issue. The fee will not be refunded.

Duplicates of lost or invalid money orders are issued by the department free of charge upon application made through the issuing or paying postmaster by remitter, payee or indorsee.

The issue of money orders on credit is prohibited.

A money order may be paid to a second person by endorsement of payee, or upon a written order or power of attorney to be filed with the paying postmaster.

A duplicate cannot be obtained of a postal note lost or destroyed.

An invalid postal note, that is, one not paid within three months from the last day of month of issue, will be replaced at an extra charge of three cents, by a duplicate issued by the department, to be applied for through the postmaster at any money order office. The invalid note must accompany the application.

International money orders may be drawn for payment in the following countries:

Alexandria (Egypt), if drawn as a French order,
Algeria,
Bahamas,
Beyroot (Turkey),
British Bechuanaland (South Africa).
Canada,
Cape Colony,
Constantinople (Turkey),
France,
Great Britian and Ireland,
Hawaiian Islands,
Jamaica,
Leeward Islands,
Newfoundland,
New South Wales,
New Zealand,
Orange Free State (South Africa,
Panama,
Queensland,
Salonica (Turkey),
Smyrna (Turkey),
Tasmania,
Transvaal (South Africa),
Tunis (Africa),
Victoria (Australia),
Windward Islands,
Zanzibar (Africa),

Order should be sent by remitter to payee.

Alexandria (Egypt), if drawn as a British order),
Amoy (China),
Assab (Africa),
Austria-Hungary,
Azores,
Belgium,
Bermuda,
Canton (China),
Ceylon,

Order may be kept by remitter as a receipt.

Danish West Indies,
Denmark,
Egypt,
Falkland Islands,
Faroe Islands,
Foochow (China),
Gambia (Africa),
Germany,
Gibraltar,
Hankow (China),
Hoihow (China),
Hong Kong (China),
Iceland,
India (British),
Italy,
Japan,
Luxemburg (Grand Duchy),
Maderia Islands,
Malacca (Straits Settlements),
Malta,
Massowah (Africa),
Mauritius,
Natal,
Netherlands,
Ningpo (China),
Norway,
Penang (Straits Settlements),
Portugal,
Saint Helena,
Shanghai (China),
Singapore (Straits Settlements),
South Australia,
Swatow (China),
Sweden,
Switzerland,
Tangier (Morocco),
Tobago (West Indies),
Trinidad,
Western Australia,

Order may be kept by remitter as a receipt.

RATES OF POSTAGE TO FOREIGN COUNTRIES.

UNIVERSAL POSTAL UNION.

Treaty concluded at Berne, Switzerland, October 9th, 1874.

		Cts.
Letters, per 15 grams or ½ ounce (prepayment optional, except to places marked *).		5
Postal Cards, each		2
Newspapers and other printed matter, per 2 ounces		1
Commercial papers,	First 10 ounces or fraction thereof	5
	Every additional 2 ounces	1
Samples of merchandise,	First 4 ounces	2
	Every additional 2 ounces	1
Registration Fee on letters or other articles		10

All correspondence other than letters must be prepaid at least partially.

†Correspondence paid to British Indian Frontier only.

INTERNATIONAL MONEY ORDERS are issued only to Countries or Places marked ¶.

☞ **For Places not mentioned below, not in the Universal Postal Union, see Table page 411.**

COUNTRIES OR PLACES WHICH, WITH THE UNITED STATES, ARE COMPRISED IN THE UNIVERSAL POSTAL UNION, AND TO WHICH THE ABOVE RATES APPLY.

(*The Italics in brackets represent the Nationality of Foreign Possessions.*)

Abyssinia, East Africa.
Aden, Arabia, British P. O.
Africa (W. C.) Br. Colonies.
Africa (Fr. Port. & Sp. pos.)
Ajuda, Africa. (*Portuguese*)
Algeria, Africa. (*French.*)
Algiers, Africa. (*French.*)¶
Alhucemas, N. Africa. (*Sp.*)
Amar, Asia. (*Spanish.*)
Amirante Islands, E. Africa.
Amoy, Hong Kong P. O.
Andorra, Rep. of (*Spain.*)
Angola, Africa. (*Portug'se.*)
Annobon Isl'd., Africa. (*Sp.*)
Antigua, Isl'd. W.I. (*British*)
Aracan, British India.
Argentine Republic.
Aruba, S. America. (*Dutch.*)
Asia (Dch., Fr., Pr. & Sp. Col.)
Aspinwall, U.S. of Colombia.
Assinie, Africa. (*French.*)
Austria-Hungary.¶
Azores Islands. (*Port.*)¶
Bahama Islands. (*British.*)
Bakel, Africa. (*French.*)
Balearic Isles. (*Spanish.*)
Bali, Asia. (*Dutch.*)
Banca, Asia. (*Dutch.*)
Barbadoes, W. I. (*British.*)¶
Barbary (Tunis & Tripoli.)
Batavia, Java, Asia. (*Dutch.*)
Bay Islands, Sp. Honduras.
Belgium.¶
Bermuda Islds., W. I. (*Br.*)
Bien-Hoa, Coch.-China. (*Fr*)
Billiton, Asia. (*Dutch.*)
Bissao, Africa. (*Portug'se.*)
Bogota, U.S. of Colombia.
Bolivia, South America.
Bonaire Islds., W.I. (*Dutch.*)
Borneo, Asia. (*Dutch.*)
Bourbon, Isld., Africa. (*Fr.*)
Brazil, South America.
Bulgaria, Principality of.
Burmah, British India.
Cabul, Afghan, *via* Italy.*†
Cacheo, Isld., Africa. (*Port*)
Cambodia, Fr. P. Offices in.
Cameroons (or Kameroun),
West Africa.
Canary Islands. (*Spanish.*)
Canton, Hong Kong, P. O.
Cape Verde Is., Afr. (*Port.*)
Caroline Is., Oceanica. (*Sp.*)
Carthagena, U. S. Colombia.
Casablanca, Morocco. (*Sp.*)
Celebes, Asia. (*Dutch.*)
Ceuta, N. Africa. (*Spanish.*)
Ceylon. (*British.*)
Chaffarine Is., N. Afr. (*Sp.*)
Chandernagore, India. (*Fr.*)
Chili, South America.
China, *via* Russia.
China, *via* Hong Kong.
China, *via* France.
Cochin China (French Col. in)
Colombia (U.S. of) S. Amer.
Comino, Malta. (*British.*)
Cominotto, Malta. (*British.*)
Congo (State of) W. Africa.
Constantinople, Turkey.¶
Corisco Is., Africa. (*Sp.*)
Costa Rica, Cent'l America.
Cuba, W. I. (*Spanish.*)
Curacoa Is., W.I. (*Dutch.*)
Cyprus Island, (*British.*)
Dagana, Senegal. (*French.*)
Damao, Asia. (*Portuguese.*)
Denmark.¶
Desirade Isld., W. I. (*Fr.*)
Diu, Asia. (*Portuguese.*)
Dominica Isld., W. I. (*Brit.*)
Dominica, Rep. of, W. I.
East Africa, Ger. Protector-
Ecuador, S. America. [ate.
Egypt, Africa.¶
Falkland Is., S. Amer. (*Br.*)
Faroe Islands, Denmark.
Fernando Po. Is., Afr., (*Sp.*)
Finland, Gr. Duchy, Russia.
Flores, Asia. (*Dutch.*)
Foo-chow, Hong Kong P. O.
Formosa, *via* Hong Kong.
France.¶
French Colonies, all.
Fusam-po, Corea, Jap. P.O.
Gaboon, Senegal. (*French.*)
Gambia, W. Africa. (*Br.*)
Gambier, Is., Oceanica. (*Fr.*)
Genzanshin, (Corea.) Japa-
Germany.¶ [nese P. O. at.
Gibraltar, Spain. (*British.*)
Goa, Asia. (*Portuguese.*)
Gold Coast, W. Africa. (*Br.*)
Goree, Senegal. (*French.*)
Gozzo, Malta. (*British.*)
Grand Bassam, W. Afr. (*Fr.*)
Great Britain.¶
Greece.
Greenland, N. America.
Grenada, Isld., W. I. (*Br.*)¶
Grenadines Is., W. I. (*Br.*)
Guadeloupe Is., W. I. (*Fr.*)
Guadur, British India.
Guatemala, Centr. America.
Guiana, Br., Fr. and Dutch.
Hankow, Hong Kong P. O.
Hawaii, Sandwich Islands.¶
Hayti, Isld., W. I.
Hatien, Cochin China. (*Fr.*)
Heligoland Isld., Germany.
Hindostan, British India.
Hoihow, Hong Kong P. O.
Holkar, Br. Ind. *via* Italy.†
Honduras, Br. C. America.
Honduras, Rep. C. America.
Hong Kong, China.¶
Hungary.
Hyderabad, Ind., *via* Italy.*†
Iceland Isld., Denmark.
India, British.¶
India (French Est'blish'ts in)

RATES OF POSTAGE TO FOREIGN COUNTRIES—*Continued.*

Ionian Isles, Greece.
Ireland.¶
Isle of Pines, Oceanica. (*Fr.*)
Italy.¶
Jamaica, Isld., W. I. (*Br.*)¶
Japan, Asia.¶
Java, Batavia, Asia (*Dutch*).
Jinsen (Corea), Jap. P. O. at
Kalgan, China, *via* Russia.
Kameroun.
Karakal, India. (*Fr.*)
Kashmir, Ind., *via* Italy.*†
Kiung-Chow, H'g K'g P. O.
Labrador.
Labuan, Philippine Isl. (*Br.*)
Ladakh, Thibet, *via* Italy.*
Ladrone Is., Oceanica (*Sp.*)
Lagos, W. Africa (*Br.*)
Larrache, Morocco. (*Span.*)
Les Saintes, Is., W. I. (*Fr.*)
Leeward Is., W. I. (*Br.*)
Liberia, Africa.
Lichtenstein, Princ. Austria.
Lombok, Asia. (*Dutch.*)
Low Islds., Oceanica. (*Fr.*)
Loyalty Is., Oceanica (*Fr.*)
Luxemburg (Gr. Duchy of).¶
Luzon, Philippine Is. (*Sp.*)
Macao Hong Kong P. O.
Macassar, Asia. (*Dutch.*)
Madagascar Isls., Afr. (Ste. Marie and Tamatave *only*).
Madeira, Isld., Portugal.¶
Madura, Asia. (*Dutch.*)
Mahe, India. (*French.*)
Malacca Straits Sett's. (*Br.*)
Malta, Isld. (*British.*)
Mandalay, Br. Indian P. O.
Manila, Philippine Isls. (*Sp.*)
Mariana Is., Oceanica. (*Sp.*)
Marie Galante, Is., W. I. (*Fr.*)
Marquesas Is., Oce'ca. (*Fr.*)
Marshall Islands, Ger. Pro.
Martinique Is., W. I. (*Fr.*)
Massowah, R. Sea (It. P. O. at)
Mauritius Is., Africa. (*Br.*)
Mayotte, W. Africa. (*Fr.*)
Mazagan, Morocco. (*Span.*)
Melilla, N. Africa. (*Span.*)
Mindanao, Philip'ne Is. (*Sp.*)
Miquelon, Is , N. Am. (*Fr.*)
Mogador, Morocco (*Sp.*)
Moldavia, Roumania.
Moluccas, Asia. (*Dutch.*)
Monaco, Princip. of France.
Montenegro.
Montserrat, W. I. (*British.*)
Morocco, Fr. & Sp. P. O. in.
Mozambique, Africa. (*Port.*)
Muscat, British Indian P. O.
Mysore, Br. Ind., *via* Italy.†
Mytho, Cochin China. (*Fr.*)
Nassau, N. P. Bahamas. (*Br.*)
Navigators Islands. (Ger. P. O. at Apia.)
Netherlands.¶
Netherland Colonies in Asia, America and Oceanica.
Nevis, Isld., W. I. (*British.*)
New Caledonia, Ocean. (*Fr.*)
Newfoundland.
New Guinea, Oce'ca. (*Dutch.*)
New Guinea Company, Territory of, Ger. Pro.
Nicaragua, Centr. America.
Ning-po, Hong Kong, P. O.
Norway.¶
Nossi-be, W. Africa. (*Fr.*)
Nubia, Egypt.
Obock, East Coast of Africa (French P. O. at.)
Ourga, China, *via* Russia.
Palawan, Philip'ne Is. (*Sp.*)
Panama, U. S. of Colombia.
Panay, Philip'ne Isl. (*Sp.*)
Papua, Oceanica. (*Dutch.*)
Paraguay, S. America.
Patagonia, S. America.
Pegu, British India.
Pekin, China, *via* Russia.
Penang, Straits Settlts. (*Br.*)
Penon de Gomera, N. Af. (*Sp.*)
Persia, Asia.
Persian Gulf, Br. Ind. P. O.
Peru.
Philippine Is., Ocea. (*Sp.*)
Pines, Isle of, Oceanica.
Pondicherry, India. (*Fr.*)
Porto Rico, W. I. (*Span.*)
Portugal.¶
Port. Col'o's, Asia & Africa.
Poulo-Condor, C. China. (*Fr.*)
Prince, Isld., Africa. (*Port.*)
Rabat, Morocco, Spa. P. O.
Reunion Isld., Africa. (*Fr.*)
Rhio-Riouw, Asia. (*Dutch.*)
Rodrigues Is., Africa. (*Br.*)
Roumania.
Russia.
Saba Islds., W. I. (*Dutch.*)
Saffi, Morocco, Span. P. O.
Saigon, Cochin China. (*Fr.*)
Salvador, Central America.
Samoan Islands (Ger. P. O. at Apia.)
Sandwich Islds., Oceanica.
San Domingo Republic, W. I.
San Marino Republic, Italy.
Senegal, W. Africa. (*Fr.*)
Senegambia, W. Africa. (*Br.*)
Servia.
Seychelles, Is., Africa. (*Br.*)
Shanghai (U. S. Postal Agency at.)
Shanghai, *via* Hong Kong.
Shanghai, *via* France.
Siam, Asia.
Sierra Leone, W. Af. (*Br.*)
Singapore, Asia. (*British.*)
Soudan, Egypt.
S. W. Africa, Ger. Pro.
Spain.
Spanish Colonies in Asia, Africa, America & Oce'ca.
St. Bartholomew, Is'ld, W. I. (*French.*)
St. Christopher I., W. I. (*Br.*)
St. Croix Isl., W. I. (*Dan.*)
St. Domingo, Republic, W. I.
St. Eustatius Is., W. I. (*Dut.*)
St. John Is., W. I. (*Dan.*)
St. Kitts Is., W. I. (*Br.*)
St. Lucia Is., W. I. (*Br.*)¶
St. Louis, W. Africa. (*Fr.*)
Ste. Marie Madagasc'r. (*Fr.*)
St. Martin, W. I. (*Fr. & Dut.*)
St. Pierre, W. I. (*French.*)
St. Thomas Is. W. I. (*Dan.*)
St. Thome Is.. Afr. (*Port.*)
St. Vincent, W. I. (*Br.*)¶
Staten Island, S. America.
Straits Settlem'ts, Asia. (*Br.*)
Sumatra, Asia. (*Dutch.*)
Sumbawa, Asia. (*Dutch.*)
Surinam, S. America. (*Dut.*)
Swatow, Hong Kong P. O.
Sweden.¶
Switzerland.¶
Tahiti Isld., Oceanica. (*Fr.*)
Tamatave, Madagasc'r. (*Fr.*)
Tangier, F. & Span. P. O.
Tenasserim, British India.
Terra del Fuego.
Tetuan, Morocco, Sp. P. O.
Tien-Tsin, China, *via* Russia.
Timor, Asia. (*Dut. & Port.*)
Tobago Isld., W. I. (*Br.*)¶
Togo, W. Africa, Ger. Pro.
Tonquin (French P. O. in.)
Touboual, Oceanica. (*Fr.*)
Trinidad Isld., W. I. (*Br.*)
Tripoli (Italian P. O. at.)
Tschandok, Co. China. (*Fr.*)
Tuamotou, Oceanica. (*Fr.*)
Tunis, (Fr. and Italian P. O.)
Turkey—Europe and Asia.
Turk's Island, W. I. (*Br.*)
Uruguay, S. America.
Venezuela, S. America.
Vingh-Long, C. China. (*Fr.*)
Virgin Isles, W. I. (*British.*)
Wallachia, Roumania.
West Indies.
Yanaon, India. (*French.*)
Zanzibar, Afr., *via* Aden.*

COUNTRIES IN UNIVERSAL POSTAL UNION WITH WHICH THE UNITED STATES HAS SPECIAL CONVENTIONS.

Canada, comprising Provinces of *British Columbia, Manitoba, New Brunswick, Nova Scotia, Ontario, Prince Edward Island, Quebec,* and *North West Territories*..	*Limit of letter-weight* 30 gr. or 1 oz.; *postage-rates* on all classes of mail matter; the United States domestic rates.
Mexico..	

*Regarding exceptions, see Note H., p. 406.

COUNTRIES OR PLACES NOT IN UNIVERSAL POSTAL UNION.

Prepayment is compulsory.

† The limit of payment is at port of debarkation ; for all other places, to destination.

‡ Samples are not accepted for these destinations.

§ Registration is allowed on letters and other articles: Fee, 10 cents.

‖ Registration is allowed *only* on letters. Fee, 10 cents.

¶ Money orders are issued at same rates as specified at top of page 409.

Postal cards can not be sent from the United States to any of the following places *except* Canada.

COUNTRIES OR PLACES OF DESTINATION.	Per 15 Grams, or ½ Ounce.	News-papers.		Other Print'd Matter and Samples	
		Limit of Weight.	Each Paper.	Limit of Weight.	Each Package.
	Cts.	Oz.	Cts.	Oz.	Cts.
Africa, except Egypt, Liberia, Congo, the Transvaal, British, French, Spanish and Portuguese Colonies, the Territories of South-West Africa, and of Togo, Western Africa (German Protectorates), Tunis, and the European post-offices in Morocco, Abyssinia, and Madagascar, by British Mail......†	15	4	4	2	5
Ascension Island, S. Atlantic, British Mail...	15	4	4	2	5
Australia, all parts, by British Mail, *via* Brindisi................‖	12	no	2	4	4
Basutoland, *see* Cape Colony.					
Bechuanaland, S. Africa, British Mail...........................§	19	no	5	2	7
Caffraria, *see* Cape Colony.					
Cape Colony, S. Africa, British Mail..........................§¶	15	4	4	2	5
Chatham Islands, Oceanica, *via* San Francisco.................‖	12	no	2	4	4
China, British Mail, *via* Brindisi..................................§	13	4	5	2	4
Comoro Islands (except Mayotte) Mozambique Channel..........	5	no	2	2	1
Fiji Islands, *via* San Francisco and Sydney.....................†‡	5	no	2	2	2
Griqualand, *see* Cape Colony.					
Kimberly, *see* Cape Colony.					
Madagascar, except St. Mary's and Tamatave, by British Mail.†	13	4	4	2	4
Morocco, except Spanish Possessions on West Coast...........†	15	2	2	2	2
Natal, S. Africa, by British Mail..................................§	15	4	4	2	5
Navassa, West Indies, direct mail.............................†‡	5	no	2	2	2
Navigator's Islands, Pacific ....†‡	5	no	2	2	2
New South Wales...¶	12	no	2	4	4
New Zealand...‖¶	12	no	2	4	4
Norfolk Island, Pacific, *via* San Francisco........................‖	12	no	2	4	4
Orange Free State, *see* Cape Colony.					
Pitcairn Island, Pacific (*no registration.*) ....†‡	5	no	2	2	2
Queensland..¶	12	no	2	4	4
St. Helena, South Atlantic, British Mail..........................§	15	4	4	2	5
Samoan Islands, *see* Navigator's Islands.					
Shanghai, direct, *via* San Francisco.............................‡‖	5	no	2	2	2
Tasmania or Van Diemens Land.....................................¶					
Transvaal, South Africa, British Mail.............................§	19	no	5	2	7
Victoria...¶	12	no	2	4	4
West Australia, British mail, *via* Brindisi, exclusively...........	12	no	2	4	4

PARCELS POST.

STATEMENT SHOWING THE COUNTRIES TO WHICH PARCELS MAY BE SENT; THE DIMENSIONS, WEIGHT AND RATES OF POSTAGE APPLICABLE TO PARCELS, AND THE EXCHANGE POST OFFICES WHICH DISPATCH AND RECEIVE PARCELS POST MAILS.

Names of Countries.	Allowable Weight of Parcels.				Postage.		Exchange Post Offices.	
	Greatest Length.	Greatest Length and Girth Combined.	Greatest Girth.	Greatest Weight—Pounds.	For a Parcel not exceeding One Pound.	For every additional Pound or Fraction of a Pound.	United States.	Foreign.
Bahamas	3 feet 6 inches.	6 feet.	......	11	12 cts.	12 cts.	New York.	Nassau.
Barbadoes	3 " 6 "	6 "	......	11	12 "	12 "	"	Bridgetown.
Colombia	2 "	......	4 feet.	11	12 "	12 "	All offices authorized to exchange mails between the two countries.	
Costa Rica	2 "	......	4 "	11	12 "	12 "		
The Danish West Indies	3 " 6 "	6 "	......	11	12 "	12 "		
The Hawaiian Kingdom	3 " 6 "	6 "	......	11	12 "	12 "	San Francisco.	Honolulu.
Honduras (British)	3 " 6 "	6 "	......	11	12 "	12 "	New Orleans.	Belize.
Jamaica	3 " 6 "	6 "	......	11	12 "	12 "	New York.	Kingston.
Leeward Islands	3 " 6 "	6 "	......	11	12 "	12 "	"	St. John, Antiqua.
Mexico	2 "	......	4 "	11	12 "	12 "	All offices authorized to exchange mails between the two countries.	
Salvador	3 " 6 "	6 feet.	......	11	12 "	12 "		

AMERICAN PHOTOGRAPHIC SOCIETIES.

Albany Camera Club, The—29 Steuben Street, Albany, N. Y. Organized October 21, 1887. *President*, William W. Byington; *Vice-President*, Thomas S. Miles; *Board of Directors*, Trevor C. Lentze, Robert Shaw Oliver, Charles L. Palmer, Charles S. Pease, J. S. Van Buren, M. H. Rochester, Dr. Howard Van Rensselaer, Dr. Samuel B. Ward and the officers *ex-officio; Treasurer*, Karl J. Phisterer; *Librarian*, Robert Lenox Banks, Jr.; *Secretary*, John S. Paterson, 29 Steuben Street, Albany, N. Y. Place of meeting, 29 Steuben Street. Ordinary meetings, first Friday in each month, at 8 P.M. Special meetings may be called by the President at any time. Annual Meeting, first Friday in April. Membership: Associate, 8; active, 43; non-resident, 19; total, 70. Exhibitions, at least two, public. Lantern Slide Exhibitions are held each year. The Club was incorporated April 27, 1891.

Amateur Photographic Association, Selma, Ala.—(Originally Y. M. C. A. Camera Club). Organized December 29, 1887. *President*, Walkins Vaughan; *Executive Committee*, Charles E. Wallin, W. S. Monk; *Secretary and Treasurer*, S. Orlando Trippe. Place of meeting, Wallin's photographic studio. Ordinary meetings, first Thursday of each month. Special meetings, call of President. Annual meeting, first Thursday in January. Membership: Active, 12.

Association of German Photographers.—New York. Organized March 4th, 1868. *President*, Anton Mildenberger; *Vice-President*, Karl Kutscher; *Executive Committee*, A. Esselborn, H. Borgfeld, L. Schill; *Treasurer*, G. L. Bellneitz; *Librarian*, Otto Buehler; *Secretary*, L. Schmid, 62 East 4th Street. Place of meeting, Metropolitan Association Rooms, 62 East 4th Street. Ordinary meetings, second and fourth Wednesday of every month, at 8 P.M. Annual meeting, second Wednesday in March. Membership: Honorary, 6; active, 42; corresponding, 1; total, 49.

Brooklyn Academy of Photography.—Brooklyn, N. Y. Incorporated February, 1887. *President*. Frank La Manna; *First Vice-President*, Gonzalo Poey; *Second Vice-President*, William Arnold; *Council*, composed of the President, First and Second Vice-Presidents, Treasurer and both Secretaries; and six other members, as follows: John Merritt, M.D., George S. Wheeler, Starks W. Lewis, R. N. Denison, M.D., T. B. Mills, H. Allen Smith; *Treasurer*, Edward H. Quantin; *Librarian*, George S. Wheeler; *Recording Secretary*, Hermance Tremper, 41st Street and Fort Hamilton Avenue, West Brooklyn; *Corresponding Secretary*, Harry S. Fowler, 578 Halsey Street, Brooklyn. Place of meeting, Brooklyn City Safe Deposit Company Building, 177 and 179 Montague Street, corner Clinton Street, Brooklyn. Ordinary meetings, second Wednesday in each month, at 8 P.M. Informal social meetings every Wednesday evening. Annual meeting, second Wednesday in February, at 8 P.M. Membership: Active, 88; corresponding, 14; total, 102. Exhibitions held in Lecture Hall, Hoagland Laboratory, monthly, from October to May; or more frequently, if matter is presented.

Brooklyn Society of Amateur Photographers.—Organized March 22d, 1889. *President*, Homer Ladd; *Vice-President*, C. M. Trowbridge; *Treasurer*, Allan Ormsbee; *Secretary*, H. P. Sewall, 101 Hicks Street, Brooklyn. Place of meeting, at members' residence. Ordinary meetings, first Thursday in each month, at 8 o'clock P.M. Annual meeting, first Thursday after first Wednesday in January. Membership: Honorary, 1; active, 15: total, 16.

Boston Camera Club.—50 Bromfield Street, Boston, Mass. Organized in October, 1881, as The Boston Society of Amateur Photographers. Reorganized in October, 1886, as The Boston Camera Club; and incorporated as such, April 6, 1887. *President*, Henry N. Sweet; *Vice-Presidents*, Francis Blake, George M. Morgan, S. Henry Hooper; *Executive Committee*, Henry N. Sweet, Francis Blake, George M. Morgan, S. Henry Hooper, Wilbur C. Brown, F. Alcott Pratt, Charles H. Currier, John G. Hubbard, Charles E. Davis, Jr., William O. Witherell, John C. Lee, Benjamin P. Richardson and Parker B. Field; *Treasurer*, F. Alcott Pratt; *Librarian*, John C. Lee; *Secretary*, Wilbur C. Brown, Secretary, Boston Camera Club, 50 Bromfield Street, Boston, Mass. Place of meeting, Club Rooms, 50 Bromfield Street. Ordinary meetings, first Monday of each month, except in July, August and September. Special meetings at the call of the President, or of five members, through the Secretary. Annual meeting and election, first Monday in January. Membership: Honorary, 2; active, 118; associates, 6; total, 126. Exhibitions: A joint exhibition with the Photographic Society of Philadelphia and the Society of Amateur Photographers of New York, to be held in Boston, in spring of 1892; exact date will not be set for several months yet. Regular monthly exhibitions of members' work in the Club's Library and Reading-room, from October 1 to June 1.

Buffalo Camera Club.—Organized October 10, 1888. *President*, Dr. M. D. Mann; *Vice-President*, Mr. George R. Howard; *Board of Managers*, Dr. G. Hunter Bartlett, Mr. George J. Bailey, Mr. Charles W. Hamlin, Mr. Alfred G. Hauenstein, Mr. E. F. Hall, Dr. M. D. Mann, Mr. Charles E. Hayes, Mr. Michael J. Stark, Mr. George R. Howard; *Treasurer*, Mr. Charles E. Hayes; *Secretary*, Mr. George J. Bailey, 18 West Genesee St., Buffalo. Place of meeting, 379 Main Street, or at Buffalo Medical College. Ordinary meetings at 8 P.M., on second Tuesday in each month. Special meetings as called. Annual meeting, second Tuesday of October in each year. Membership: Active, 41; subscribing, 1; total, 42. Exhibitions, Saturday evening about twice a month, as called, at Buffalo Medical College. Admission by card.

Camera Club of Hartford, The—Hartford, Conn. Organized March 4th, 1885. *President*, Dr. George L. Parmele; *Executive Committee*, Dr. George L. Parmele, Charles R. Nason, Edward H. Crowell, Fred D. Berry, A. H. Pitkin, Elmer M. White, O. H. Ham; *Treasurer*, Fred D. Berry; *Corresponding Secretary*, Edward H. Crowell; *Secretary*, Charles R. Nason, P. O. Box 865, Hartford, Conn. Place of meeting, 25 Pratt Street. Ordinary meetings, second Tuesday in each month, excepting July and August. Special meetings called by the President and at the written request of five members. Annual meeting, second Tuesday in February. Membership: Honorary 4; active, 98; total, 102. Exhibition: The Club will probably have an exhibition during the winter months.

Capital Camera Club of Washington, D. C.—Organized May, 1891. *President*, Albert Le Breton; *Vice-President*, Jno. Everett Mitchell; *Secretary-Treasurer*, F. B. Dante; *Board of Directors*, Albert Le Breton, Jno. Everett Mitchell, F. B. Dante, A. L. Moore, Dr. Arthur J. Hall. Place of meeting, Crandell Building, 401 7th Street, N.-W., Washington, D. C.

Central Y. M. C. A. Camera Section.—502 Fulton Street, Brooklyn, N. Y. Organized 1888. *President*, William H. Lowery; *Vice-President*, Francis F. Braillard, Jr.; *Executive Committee*, Officers, *ex-officio; Treasurer*, William D. Johnson; *Librarian*, B. A. Burger; *Secretary*, Louis Clarence Bennett, 527 Throop Avenue, Brooklyn, N. Y. Place of meeting, "Studio," 502 Fulton Street. Ordinary meetings, Second and Fourth Monday in each month, at 8.15 P.M. Special meetings on demand of any five members. Annual meeting, second Monday in January. Membership: September 1: Honorary 3; active, 40; corresponding, 5; total, 48. Publications, *Y. M. C. A. Bulletin*. Exhibitions of lantern-slides last meeting in each month. Annual exhibition of photographs and bromide enlargements in the fall.

Chautauqua Photographic Exchange Club.—Organized August, 1888. *President*, Dr. Charles Ehrmann; *Treasurer*, Miss Ella Switzer, assisted by Mrs. John A. Mull; *Secretary*, Miss Ella Switzer, Philipsburg, Centre Co., Pa. Annual Meeting, Chautauqua, August 24. Exhibitions at Chautauqua. Our Club is organized merely for the exchange of pictures, a specimen of which being submitted to the President for criticism, the pictures are distributed quarterly by the Secretaries.

Camera Club of Rochester, N. Y., The—Organized December, 1889 ; incorporated 1890. *President*, G. H. Croughton ; *Vice-President*, C. F. Hovey ; *Board of Directors*, G. H. Croughton, J. L. Willard, W. G. Mitchell, A. S. Clarkner, F. A. Frick, W. F. Goor, Dr. L. A. Weigel ; *Treasurer*, W. G. Mitchell ; *Secretary*, J. L. Willard, 55 North Avenue, Rochester, N. Y. Place of meeting, over 62 State Street. Ordinary meetings, every alternate Friday evening at 8 o'clock. Special meetings, when called. Annual meeting, first regular in January. Membership : Honorary, 3 ; active, 58 ; total, 61. We have a demonstration in some branch of photography every regular meeting.

Case School Camera Club.—Cleveland, Ohio. Organized December, 1888. *President*, Edw. A. Phillips ; *Vice-President*, Arthur C. Spencer ; *Treasurer and Recording Secretary*, Edw. H. Williams ; *Corresponding Secretary*, Milton B. Punnett, Case School of Applied Science, Cleveland, Ohio. Place of meeting, Chemical Laboratory, Lecture Room, Case School of Applied Science. Ordinary meetings, Thursdays, 4 P.M. Membership : Honorary, 2 ; active, 23.

Chicago Camera Club, The—182–184 Wabash Avenue. Organized May, 1889. *President*, Fred. K. Morrill ; *Vice-President*, Wm. H. Shuey ; *Executive Committee*, Fred. K. Morrill, E. Burton Holmes, John W. Buehler, J. B. McCleary, Miss J. B. Putnam ; *Treasurer*, John W. Buehler ; *Librarian*, Miss Josephine B. Putnam ; *Secretary*, E. Burton Holmes, 229 Michigan Avenue, Chicago, Ill. Place of meeting, club rooms, 182–184 Wabash Avenue. Ordinary meetings, second Tuesday of each month. Annual meeting, second Tuesday in April. Membership : Honorary, 10 ; active, 113 ; associate, 6 ; total, 129. Exhibitions of lantern slides at every meeting. Plans for public exhibition for next year not yet matured.

Chicago Lantern Slide Club, The—Organized Fall of 1886. *President*, Lieutenant Charles P. Stivers ; *Executive Committee*, the officers, and Dr. T. W. Sheardown, Robert Berger; *Treasurer*, E. J. Wagner, 1,216 Michigan Avenue; *Secretary*, Walter A. Morse, 20 Kemper Place. Place of meeting, The Athenæum Club, Room 48. Ordinary meetings, every third Thursday evening in each month. Special meetings, whenever called by Executive Committee. Annual meeting, December regular meeting. Membership: Honorary, 2; active, 32; total, 34. Member of International Lantern Slide Interchange.

Cleveland Camera Club.—Organized 1886. *President*, Frank Dorn (M. Rogers, resigned); *Vice-President*, no election yet; *Executive Committee*, A. Ogier, F. Ogier, Professor Bolten; *Treasurer*, William Dorn; *Secretary*, Robert Dayton, 5 Euclid Avenue. Place of meeting, 5 Euclid Avenue. Ordinary meetings, first and third Tuesdays. Special meetings, subject to call. Annual meeting, first Tuesday in January, unless Tuesday is the 1st, then third Tuesday. Membership: Honorary, 1; active, 35; total, 36.

College Camera Club.—Akron, Ohio. Organized November, 1890. *President*, Prof. C. M. Knight; *Secretary*, Agnes Claypole; *Treasurer*, Will. Green; *Executive Committee*, Prof. Wm. D. Shipman, Prof. Mary B. Jewett, and James Cole, with the President and Secretary of the club. Place of meeting, Club Rooms at Buchtel College. Ordinary meetings, the second and fourth Mondays of each month, except July and August. Membership, 35.

Columbia College Amateur Photographic Society.—Columbia College, New York City. Organized 1886. *President*, Henry R. Taylor; *Vice-President*, George W. Giddings; *Treasurer*, Dwight W. Taylor; *Secretary*, Harry M. Brookfield. Place of meeting, Columbia College. Ordinary meetings, first and third Fridays during college term. Membership: Honorary, 24; active, 26; total, 50. Exhibitions held regularly in Spring, about April.

Columbus Camera Club.—88½ North High Street. Organized October 6, 1884, as Columbus Amateur Photographic Association. Reorganized March 5, 1888, as Columbus Camera Club. *President*, Frank H. Howe; *Vice-President*, Prof. Jos. N. Bradford; *Board of Directors*, F. H. Howe, J. N. Bradford, F. J. Combs, J. J. Jennings, Jos. C. Hull, John Field, W. H. Miller, W. B. Kimball, George L. Graham; *Treasurer*, J. J. Jennings; *Librarian*, John Field; *Corresponding Secretary*, Jos. C. Hull, care Deshler Bank; *Recording Secretary*, Frank J. Combs, care Cornell & Pheneger Chemical Co. Place of meeting, Dunn Building, Room 10. Ordinary meetings, third Thursday in each month. Annual meeting, third Thursday in December. Membership: Honorary, 4; active, 37; total, 41. Exhibitions, September 23, 24, 25.

Cranford Camera Club.—Cranford, Union County, N. J. Organized September 13, 1888. *President*, Wm. Chamberlain; *Treasurer*, J. M. P. Joseph; *Secretary*, A. H. Plummer, Cranford, Union County, N. J. Place of meeting, Cranford. Ordinary meetings, every Saturday night. Membership: Honorary, 1; active, 7; corresponding, 4; total, 12. Exhibitions, annual, in November.

Department of Photography of the Brooklyn Institute.—Organized March 29, 1889. *President*, George H. Cooke; *Vice-President*, Mrs. Geo. W. Banker; *Curator*, Dr. Louis E. Meeker; *Treasurer*, P. L. Le Brun; *Secretary*, Gould W. Hart, 849 Munroe

Street, Brooklyn. Place of meeting, 502 Fulton Street, Brooklyn. Ordinary meetings, second Tuesday in each month. Annual meeting, second Tuesday in May. Membership, 135. Exhibitions, an exhibition of photographs was held May 12, 1891, in the gallery of the Brooklyn Art Association.

Hoboken Camera Club.—380 Park Avenue. Organized March 22, 1889. *President*, A. J. Thomas; *Vice-President*, G. E. Mott; *Trustees*, W. Schrader, A. Beyer and E. E. Wooley; *Board of Governors*, all officers, Trustees and Standing Committees, which see below, represent the Board of Governors, fifteen in all; *Treasurer*, C. L. A. Beckers; *Custodian*, W. Allen; *Recording Secretary*, Geo. H. Steljes, care of Camera Club; *Corresponding and Financial Secretary*, F. Child, care of Camera Club. Place of meeting, 380 Park Avenue (Camera Building). Ordinary meetings, first Tuesday of each month, at 8.30 P.M. Board of Governors' meeting, third Friday of each month. Annual meeting, first Tuesday in March. Membership: Honorary, 5; active, 36; associate, 5; total, 46. Exhibitions, monthly exhibitions from November 1, 1891. *Standing Committees—Entertainment Committee*, R. Beyer, C. Sudhaus, A. Ruprecht and W. Sachs; *House Committee*, F. A. Muench and L. R. Trickel.

Indianapolis Camera Club, The—Indianapolis, Ind. Organized November 18, 1887. *President*, Chas. McBride; *Vice-President*, H. C. Chandler; *Executive Committee*, John T. Harris, Rembrandt Steele, Henry Koethe; *Treasurer and Secretary*, Carl H. Lieber, 33 South Meridian Street. Place of meetings, various. Ordinary meetings, first Tuesday in each month. Special meetings on call of Executive Committee. Annual meeting, November. Membership: Honorary, 1; active, 35; total, 36.

Louisville Camera Club.—Louisville, Ky. Organized April 24, 1888. *President*, Alex. Griswold; *Vice-President*, Henry Terstegge; *Executive Committee*, C. R. Peaslee, Alex. Griswold, Henry Terstegge; *Treasurer*, R. L. Stevens, 11th and Main Streets; *Seretary*, R. L. Stevens, 11th and Main Streets, Louisville, Ky. Place of meeting, south-east corner of 3d and Main Streets. Ordinary meetings, second and fourth Thursday each month, 8 o'clock P.M. Special meetings, none. Annual meeting, second Thursday in February. Membership: Active, 18; corresponding, 2; total, 20. Exhibitions during the fall and winter months.

Lowell Camera Club.—Lowell, Mass. Organized January, 1889. *President*, William P. Atwood; *Vice-President*, Chas. J. Glidden; *Executive Committee*, Hon. Charles H. Allen, Paul Butler, W. E. Badger, and officers of club; *Treasurer*, Henry W. Barnes; *Librarian*, Burt L. Williams; *Secretary*, George A. Nelson, 81 Appleton Street. Place of meeting, Central Block. Ordinary meetings, third Tuesday of each month, from November to March, inclusive, 8 o'clock P.M. Special meetings at the call of the President. Annual meeting, November. Membership: Honorary, 1; active, 36; associate, 2; total, 39.

Lynn Camera Club, The—42 Broad Street, Lynn, Mass. Organized January 3, 1888; incorporated December 20, 1889. *President*, Wm. H. Drew; *Vice-President*, Joseph N. Smith; *Executive Committee*, Wm. H. Drew, J. N. Smith, J. W. Gibboney, A. J. Purinton, E. F. Bacheller, A. H. Carsley, W. B. Gifford, Wm. A. Pevear; *Treasurer*, Edw. F. Bacheller; *Librarian*, A. H. Carsley; *Recording Secretary*,

J. W. Gibboney; *Corresponding Secretary*, Arthur J. Purinton, 42 Broad Street. Place of meeting, Club House, 42 Broad Street. Ordinary meetings, first Tuesday in each month, at 8 o'clock. Special meetings subject to call of President. Annual meeting, first Tuesday in January. Membership: Honorary, 1; active, 77; social, 19; associate, 3; total, 100. Exhibitions on prints in spring of each year.

Marlboro Camera Club.—Organized 1889. *President*, H. C. Russell; *Vice-President*, A. M. Howe; *Executive Committee*, President, Vice-President, Secretary, and Treasurer; *Treasurer*, Murray E. Allen; *Librarian*, Miss Blanche Hoitt; *Secretary*, J. J. Otterson, Marlborough, Middlesex County, Mass. Place of meeting, at homes of members. Ordinary meetings, first Tuesday in each month. Special meetings, on call of President, Annual meeting, first Tuesday in January. Membership: Honorary, 15; active, 24; total, 39.

Mattapan Camera Club, The—Organized May, 1890. *President*, John Locklin; *Treasurer*, Alfred Karcher; *Lecturer*, Henry B. Locklin; *Secretary*, Erdmann Sonnenbroitt, post-office box 83, Mattapan, Mass. Place of meeting, at private residences of members; notice of place of meeting, date, and hour, to be given by the Secretary two weeks in advance. Special meetings, when called for. Annual meeting, month of May. Membership: Honorary, 1; active, 8; total, 9.

Millbury Camera Club.—Millbury, Mass. *President*, Geo. C. Webber, M.D.; *Vice-President*, T. D. Bristol; *Executive Committee*, T. D. Bristol, E. B. Luce, T. E. Bottomley; *Treasurer*, T. E. Bottomley; *Secretary*, T. E. Bottomley, Box 582, Millbury, Mass. Place of meeting, Natural History Rooms. Ordinary meetings, first Monday in month, at 7.45 P.M. Special meetings, when called by Committee. Annual meeting, June, first Monday. Exhibitions each year at the Agricultural Fair in September.

Minneapolis Camera Club.—Organized October, 1885 (about). *President*, R. D. Cleveland; *Vice-President*, F. E. Read; *Treasurer*, W. Cartwright; *Secretary*, C. A. Hoffman, 20 South Fourth Street, Minneapolis, Minn. Place of meeting, 20 South Fourth Street. Ordinary meetings, every second Wednesday.

Montreal Camera Club, The—Montreal, Canada. Organized 1889. *President*, Alex. Henderson; *Vice-President*, J. B. Abbott; *Executive Committee*, L. O. Armstrong, Albert Holden, Fred. M. Cole, George R. Prowse, J. J. Mackintosh; *Honorary Secretary-Treasurer*, Charles F. Dawson, 233 St. James Street, Montreal, Canada. Place of meeting, Club Rooms, Young Mens' Christian Association Building. Ordinary meetings, first Monday in each month. Special meetings at option of Committee. Annual meeting, first Monday in April. Membership: Active, 60. Exhibitions from time to time, as circumstances permit; no regular ones.

Mystic Camera Club.—Medford, Mass. Organized June 4, 1889. *President*, Joseph H. Wheeler; *Vice-Psesident*, A. F. Boardman; *Executive Board*, Joseph H. Wheeler, A. F. Boardman, Will. C. Eddy, John F. Wade, Geo. L. Stone, B. D. B. Bourne, E. H. Balcone; *Treasurer*, John F. Wade; *Secretary*, Will. C. Eddy, 146 Boston Avenue, Medford, Mass. Place of meeting, Odd Fellows' Hall, Opera House Block. Ordinary meetings, first Tuesday in each month, at 8.15 P.M. Special meetings, third Tuesday, or by direction of

Executive Board. Annual meeting, first Tuesday in January. Membership: Active, 45. Exhibitions at direction of Executive Board; usually three afternoons and evenings in February.

Newark Camera Club.—828 Broad Street, Newark, N. J. Organized April 25, 1888. *President*, Chas. Leroy; *Vice-President*, Paul Thiery; *Executive Committee*, Miles T. Anson, F. M. Olds, Wm. Archibald, G. C. Gilmore, Henry Eberhardt, Col. A. J. Clark, Dr. Chas. A. Meeker, Isaac Denman, Fredk. T. Feary; *Treasurer*, Fredk. T. Feary; *Secretary*, none elected at the last annual meeting. Place of meeting, 828 Broad Street. Ordinary meetings, second and fourth Mondays of each month, 8.30 P.M. Special meetings, as called. Annual meeting, second Monday in April. Membership: Honorary, 4; active, 54; corresponding, 4; total, 62. Exhibitions, two public lantern exhibitions, Spring and Fall; one print exhibition, probably in November, 1891, exact date not yet settled.

New Brunswick Camera Club.—New Brunswick, N. J. Organized October 1, 1888. *President*, Prof. Peter T. Austen; *Treasurer*, George K. Parsell; *Secretary*, Dr. Harvey Iredell, New Brunswick, N. J. Place of meeting, Chemical Lecture Room of Rutger's College. Ordinary meetings, first Wednesday in each month, at 8 P.M. Special meetings, at call. Membership, September 1; Total, 30.

New Orleans Camera Club.—3 Carondelet Street, New Orleans, La. Organized December 12, 1886. Incorporated May 3, 1888. *President*, Horace Carpenter; *Vice-President*, C. A. L. duQuesnay; *Board of Directors*, H. Carpenter, C. A. L. duQuesnay, R. S. Charles, Jr., P. E. Carriere, L. E. Bouman, T. W. Castleman, S. L. Mitchel, P. F. Reynes, B. C. Shields; *Treasurer*, P. E. Carriere; *Librarian*, S. L. Mitchel (Chairman), Dr. Jos. Bauer, P. F. Reynes; *Secretary*, R. S. Charles, Jr., care of Illinois Central Railroad Company, Cotton Exchange Building. Place of meeting, 3 Carondelet Street. Ordinary meetings, every Wednesday, 7.30 P.M. Regular meetings, first Wednesday each month, 7.30 P. M. Annual meeting, first Wednesday of November, 7.30 P. M. Membership: Honorary, 11; active, 110; corresponding, 5; total, 126. Exhibitions, no regular time.

New York Camera Club.—314 Fifth Avenue. Organized 1888. *President*, David Williams; *Executive Committee*, W. I. Cassard, Chairman; *Treasurer*, Robert J. Devlin; *Librarian*, Harry B. Reid; *Secretary*, W. Townsend Colbron, 314 Fifth Avenue. Place of meeting, 314 Fifth Avenue. Ordinary meetings, Monday evenings during winter months. Annual meeting, second Wednesday in January. Membership: Active, 98; coresponding, 2; total, 100. Exhibitions, Spring and Autumn.

Old Colony Camera Club.—Rockland, Mass. *President*, David Smith; *Vice-Presidents*, Frederick Ames, Wesley E. Turner; *Executive Committee*, David Smith, George O. Barbour, Emery H. Jenkins; *Treasurer*, Horace W. Studley; *Librarian*, Pearl Arnold; *Secretary*, Horace W. Studley, Albion Street, Rockland, Mass. Place of meeting, Smith Block, Liberty Street. Ordinary meetings, first and third Saturdays. Special meetings, subject to call of President. Annual meeting, first meeting in January.

Pacific Coast Amateur Photographic Association.—San Francisco, Cal. Organized February 19, 1893. *President*, Major W. H.

Heuer, U. S. A.; *Vice-President*, Alpheus Bull, Jr.; *Executive Committee*, Miss C. A. Burk, Messrs. Dewey, Church, Keyes and Darwin; *Treasurer*, C. F. Cormack; *Secretary*, G. Knight White, 89 Flood Building, San Francisco, Cal. Place of meeting, Flood Building, San Francisco, Cal. Ordinary meetings, first Thursday after the first Monday in each month. Special meetings at the call of the President. Annual meeting in March. Membership: Honorary, 5; active, 81; corresponding, 12; total, 103. Exhibitions, annually in May, and occasionally at other times.

Photographers' Association of America.—Organized 1879, under laws of the State of Illinois. *President*, W. G. Entrekin; *First Vice-President*, Frank Place; *Second Vice-President*, C. T. Stuart; *Executive Committee*, all the officers; *Treasurer*, G M. Carlisle, M.D.; *Secretary*, Adam Heimberger, New Albany, Ind. Place of meeting, Chicago, Ill. Convention, 1893. Membership: About 300. Exhibitions, photographic and photographic materials.

Photographic Association of Brooklyn.—Organized March 20, 1888. *President*, E. H. Reidel; *Vice-President*, E. F. Wagner; *Trustees*, Dr. F. A. Schlitz, Dr. E. Schaefer, C. Wapler; *Treasurer*, J. A. Gafney; *Librarian*, Jos. Sefrin; *Secretary*, Charles M. Heid, 54 Stone Street, New York City. Place of meeting, Arion Hall, Brooklyn. Ordinary meetings, first and third Wednesday each month. Annual meeting, March 19th. Membership: Honorary, 3; active, 38.

Photographic Association of Canada.—Organized January 24th, 1884. *President*, C. S. Cochran, Hamilton, Ont.; *Vice-Presidents*, S. J. Jarvis, Ottawa, F. Cooper, London, J. C. Walker, Toronto; *Executive Committee*, the officers; *Secretary and Treasurer*, E. Poole, St. Catharine's, Ontario. Place of meeting, Toronto. Membership, September 1: Total, about 125. Exhibitions, annual.

Photographic Society of Chicago.—*President*, Judge James B. Bradwell; *Vice-President*, James H. Smith; *Executive Committee*, J. Maul, Benjamin Eichelman, Charles E. Smith; *Treasurer*, C. Gentile; *Secretary*, C. Gentile. Place of meeting, Camera Club. Ordinary meetings, first Wednesday in the month.

Photographic Society of Waterbury, The—Brown Block, Room 13, East Main Street, Waterbury, Conn. Organized March 30, 1889. *President*, Hiram W. Hayden; *Vice-President*, S. B. Hill; *Executive Committee*, George S. Husker, S. P. Hill, Frank W. Welton; *Treasurer*, E. W. Mooring, Jun.; *Librarian*, Edward A. Beach; *Secretary*, George S. Husker, 19 North Street, Waterbury, Conn. Place of meeting, room 13, Brown's Block, East Main Street. Ordinary meetings, first and third Fridays, at 8 P.M. Annual meeting, first Friday in April. Membership: Active, 32; corresponding, 3; total, 35. Exhibitions of prints latter part of October. Exhibition of lantern slides last meeting in each month, from October to May inclusive. Two public exhibitions of slides during Winter of '91 and '92.

Photographic Club of Baltimore City, The—Northeast corner Madison and Eutaw Streets, Baltimore. Organized June 1st, 1891. *President*, Harry D. Williar; *Vice-President*, F. M. Clotworthy; *Directors*, Harry D. Williar, F. M. Clotworthy, W. C. Farber, John S. Bridges, George L. Smith, F. W. McAllister, A. S. Murray, Charles Quartley, A. J. Godley, W. H. Corner, James S. Cummins, B. G. Buck; *Treasurer*, B. G. Buck; *Corresponding Secretary*, W. C. Farber, 37 Hopkins Place, Baltimore; *Recoraing Secretary*, George L. Smith, 1214 North Calvert Street, Baltimore. Place of meeting, northeast corner Madison and Eutaw Streets. Ordinary meetings, every Tuesday, at 8 P.M. Monthly meeting. first Tuesday in month, at 8 P.M. Annual meeting, first Tuesday in October. Membership, September 1: Associate, 7; active, 43; corresponding, 2; total, 52. Exhibitions: Lantern slide exhibitions are purposed to be held at intervals during the winter; also lectures on various photographic processes.

Photographic Section of the American Institute—Organized March 26th, 1859. *President*, Henry J. Newton; *Vice-President*, Cornelius Van Brunt; *Executive Committee*, Officers of the Section; *Treasurer*, Edward Schell; *Librarian*, John W. Chambers; *Secretary*, Oscar G. Mason, Photographical Department, Bellvue Hospital, New York City. Place of meeting, 115 West 38th Street. Ordinary meetings, first Tuesday of each month, except July and August, at 8 o'clock P.M. Special meetings on call of officers. Annual meeting, first Thursday in February, at 8 P.M. Membership, about 2,000. General exhibition of the Institute each Autumn. All members of the Institute are by virtue of such membership also members of the various sections.

Photographic Section, Agassiz Association, Manhattan Chapter.—131 East 40th Street, New York. Organized 1881. *President*, Edward B. Miller; *Vice-President*, Frederick Schneider; *Board of Trustees*, E. B. Miller, C. F. Groth, W. T. Demarest, W. S. Miller, A. Nelubas, J. Beuermann, H. T. Rowley, F. Kromm, W. Schneider; *Treasnrer*, William S. Miller; *Librarian*, D. Hajek; *Corresponding Secretary*, William T. Demarest, 339 West 27th Street. Place of meeting, 141 East 40th Street. Ordinary meetings, the Friday after first Monday of each month. Annual meeting, January meeting. Membership: Honorary, 2; active, 50; includes all members after the chapter. Exhibitions held occasionally.

Photographic Section of Society of Natural History (Cincinnati Camera Club).—Organized January 21th, 1884. *President*, T. B. Collier; *Vice-President*, A. L. Fogg; *Board of Managers*, Officers of Society; *Treasurer*, M. A. High; *Librarian*, A. I. Carson; *Secretary*, Edward E. Shipley, 61 West 3d Street, Cincinnati, Ohio; *Corresponding Secretary*, T. H. Kelly. Place of meeting, 108 Broadway. Ordinary meetings, second and fourth Mondays each month, at 8 P.M. Special meetings, on call of President. Annual meeting, second Monday in April. Membership, September 1: Honorary, 1; active, 137; total, 138. Exhibitions: One print exhibition and one lantern exhibition, open to public; exhibition of interchange slides, fourth Monday in each month.

Pittsburgh Amateur Photographic Society.—5th Street. Organized 1884. *President*, W. S. Bell; *Vice-President*, R. F. Smythe; *Treasurer*, H. W. Beymer; *Librarian and Secretary*, J. H. Hunter, 5th Street Academy of Science, Pittsburgh, Pa. Place of meeting, Academy of Science. Ordinary meetings, second Monday of each month. Annual meeting, second Monday of April. Membership, September 1: Honorary, 2; active, 40; total, 42. Exhibitions, annual.

Plainfield Camera Club, The—Organized June 7th, 1888. Incorporated September 13th, 1890. *President*, O. S. Teale; *Vice-President*, G. H. Babcock; *Board of Directors*, O. S. Teale, G. H. Babcock, G. E. Greenleaf, W. H. Lyon, Jr., J. B. Platt, J. E. Stewart, Harold Serrell ;

Treasurer, W. H. Lyon, Jr.; *Secretary*, G. E. Greenleaf, Plainfield, N. J. Place of meeting, Clarkson Building, 17 East Front Street. Ordinary meetings, first and third Tuesday in each month. Special meetings at call. Annual meeting, third Tuesday in December. Membership: Honorary, 3; active 51; total, 54. Exhibitions: November, 1891, and April, 1892. Members of other clubs or societies are always welcome to our rooms.

Providence Camera Club.—87 Weybosset Street, Providence, R. I. Organized September, 1883. *President*, R. Clinton Fuller; *Vice-President*, L. L. Anderstrom; *Executive Committee*, R. C. Fuller, A. B. Ladd, C. E. Hudson, J. Miller, Jr., C. A. Stoddard, H. J. Reynolds. E. Q. Gladding, H. B. Cottelle, H. B. Deming; *Treasurer*, Arthur B. Ladd; *Librarian*, S. B. Burnham; *Secretary*, Joseph A. Miller, Jr., 87 Weybosset Street, Providence, R. I. Place of meeting, 87 Weybosset Street, Providence, R. I. Ordinary meetings, first Saturday and the Tuesday after the third Saturday of each month, at 8 P.M. Special meetings at call of President, or at the written request of any five members. Annual meeting, first regular meeting in March Membership: Active, 51; associate, 4; total, 55. Annual exhibitions in May. Lantern slide exhibitions monthly, from September 1st to July 1st.

Photographic Society of Philadelphia, The—1305 Arch Street, Philadelphia. Organized 1862. *President*, John G. Bullock; *Vice-Presidents*, Joseph H. Burroughs, Edmund Stirling; *Board of Directors*, John G. Bullock, Joseph H. Burroughs, Edmund Stirling, Robert S. Redfield, Samuel M. Fox, John C. Browne, Samuel Sartain, John Carbutt, George M. Taylor, Charles L. Mitchell, M.D., William H. Rau, George Vaux, Jr., Frederick E. Ives; *Treasurer*, Samuel M. Fox; *Secretary*, Robert S. Redfield, 1601 Callowhill Street, Philadelphia. Place of meeting, 10 South 18th Street. Ordinary meetings, second Wednesday evening of each month. Conversational meetings, fourth Wednesday evening of each month, 8 o'clock, P. M. Annual meeting, second Wednesday evening in April. Membership: Active and life, 203. Exhibitions, triennial.

Postal Photographic Club.—Headquarters, West Chester, Pa. Organized 1885. Reorganized 1889. *President*. Randall Spaulding, Montclair, N. J.; *Treasurer, Librarian and Secretary*, Dr. J. Max Mueller, West Chester, Pa. Membership: Active, 30. Publications, monthly albums and note books containing photos from members.

Quebec Camera Club.—Quebec, P. Q. Organized 1887. *President*, J. George Garneau; *Treasurer and Librarian*, James Brodie; *Secretary*, Ernest F. Würtele, Quebec Montmorency and Charlevoix Railway Co., Quebec, P. Q. Place of meeting, Captain Imlah's Citadel. Annual meeting, second Monday of December in each year. Membership September 1: 10.

Society of Amateur Photographers of New York, The—No. 111, 113 & 115 West 38th Street. Organized March 28, 1884. *President*, James M. Stebbins, Jr.; *Vice-President*, R. A. B. Dayton; *Recording Secretary*, T. J. Burton; *Corresponding Secretary*, F. C. Beach; *Treasurer*, C. C. Roumage. Directors, Frederick Vilmar, R. L. Bracklow, E. Warren, L. B. Schram, F. C. Elgar, H. S. Mack, James Spies, Dexter H. Walker. Place of meeting, No. 111, 113 & 115 West 38th Street. Ordinary meetings, second Tuesday of each month, except July and August, at 8 P. M. Special meetings, lantern slides exhibition fourth Friday of each month. Annual meeting, second Tuesday in April. Membership: Honorary, 13; active, 152; corresponding, 71; subscribing, 40; total, 276.

Springfield Camera Club.—Corner Main and Sandford Streets, Springfield, Mass. Organized October, 1886. *President*, John Leshure; *Executive Committee*, John Leshure, W. M. Lester, H. N. Bowman, M. D. Fletcher, C. A. Emery; *Treasurer*, H. N. Bowman; *Librarian*, M. D. Fletcher; *Secretary*, W. M. Lester, P. O. box 1528, Springfield, Mass. Place of meeting, corner Main and Sandford Streets. Ordinary meetings, third Wednesday of each month, at 7.30 P. M. Special meeting, at call of Executive Committee. Annual meeting, third Wednesday in October. Membership: Honorary, 2; active, 60; total, 62. Exhibition, slide and print some time between December 1st and March 1st.

St. Louis Camera Club.—Club Rooms, Vandeventer Place, corner of Vandeventer Avenue. Organized 1885. Incorporated 1889. *President*, John B. Holman, 714 Walnut Street; *Vice-President*, John W. Dunn, 3418 Meramac Street; *Executive Committee*, Henry B. Alexander, of Lantern-slide Committee; Charles M. Alexander, of Membership Committee; Julian Laughlin, of House Committee; The President and Vice-President *ex officio* members; *Secretary and Treasurer*, William M. Butler, 2636 Osage Street; *Assistant Secretary*, Frank Hickman, 404 Market Street. Place of Meeting, Club Rooms, Vandeventer Place, corner Vandeventer Avenue. Ordinary meetings, first and third Tuesday in each month. Special meetings, at call of President. Annual Meeting, first Tuesday in April. Membership: Honorary, 12; active, 55; associate, 4; total, 71. The annual field day occurs in May; prizes are awarded for the best work done on that day.

Syracuse Camera Club.—322 South Salina Street. Organized October 22, 1886. *President*, J. D. Pennock; *Vice-President*, John R. Clancy; *Executive Committee*, J. D. Pennock, John R. Clancy, S. W. Rose, William H. Olmsted, R. Wynyard, Bellhouse; *Treasurer*, S. W. Rose; *Secretary*, R. Wynyard Bellhouse, 41 White Memorial Building, Syracuse, N. Y. Place of meeting, 322 South Salina Street. Ordinary meetings every Friday. Annual meeting, first Friday in January. Membership: Associate, 13; active, 78; total, 91.

"Tech" Camera Club.—Worcester Polytechnic Institute, Worcester, Mass. Organized September, 1889. *President*, Harry Sinclair; *Treasurer*, Arthur H. Smith. *Keeper*, George F. Freed; *Secretary*, Howard W. Bracken, 13 Dix Street, Worcester, Mass. Place of meeting, Worcester Polytechnic Institute. Ordinary meetings, second and fourth Saturday evenings of each month. Special meetings at the call of President. Semi-annual meeting, last Saturday of each half-year. Exhibitions of prints and negatives held about Christmas.

Toronto Amateur Photographic Association.—Toronto, Canada. Organized 1887. *President*, Frank Manchee; *Vice-President*, Dr. Ellis; *Executive Committee*, W. B. McMurrich, J. S. C. Bethune, A. W. Croil, T. Langton, Hugh Neilson, R. Muntz, Charles Riggs; *Treasurer*, R. S. Clark, Imperial Bank; *Secretary*, E. Havelock Walsh, 219 Beverley Street. Place of meeting, College of Physicians and Surgeons. Ordinary meetings every Monday evening, from 1st September to 1st May. Special meetings, first Monday in each month. Annual Meeting, first Monday in October. Membership: Total, 60. Exhibitions occasionally.

Yonkers Photographic Club, The—Hawthorne Hall, Yonkers, N.Y. Organized February 8th, 1889. *President*, John W. Alexander; *Board of Directors*, John W. Alexander, F. W. R. Eschmann, George B. Ritter, George S. Pentz, Edward T. Sherman, George B. Wray, Eugene D. Gardner; *Treasurer*, George B. Wray; *Secretary*, E. D. Gardner, 138 Buena Vista Avenue, Yonkers, N. Y. Place of meeting, Hawthorne Hall, Yonkers, N. Y. Ordinary meetings, first Monday of each month, at 8 P.M., club night. Social and informal meetings, Monday evenings. Special meetings may be held at any time at the call of the Board of Directors, or whenever it is requested in writing by 10 active members. Annual meeting, last Monday in April of each year. Membership: Active, 45; corresponding, 6; total, 51. Exhibitions: Annual print exhibition in May.

FOREIGN PHOTOGRAPHIC SOCIETIES.

Great Britain and British Colonies.

Amateur Photographic Association.—London, S. W. Place of meetings, 58 Pall Mall. Secretary, Arthur James Melhuish.

Amateur Photographic Association of Victoria.—Melbourne, Australia. Time of meeting, second Monday in each month. Hon. Secretary, J. H. Harvey, 59 Hotham Street, East Melbourne.

Arbroath Amateur Photographic Association.—Brothock Bridge, Arbroath. Ordinary meetings, last Tuesday of month. Place of meeting, association's rooms, Brothock Bridge. Secretary, George K. Reid, 214 High Street, Arbroath.

Albany Institute Amateur Photographic Society.—Camberwell, London. Ordinary meetings, alternate Thursdays, commencing with second Thurday in January, 8 o'clock, P. M. Place of meeting, Albany Institute. Secretary, W. A. B. Gee, 3 Welby Street, Camberwell, London, S. E.

Barnstaple and North Devon Photographic Society.—Barnstaple, North Devon. Ordinary meeting, first Wednesday in each month, at 7.30 P. M. Place of meeting, North Devon, Athenæum, Barnstaple. Secretary, Arthur C. King, 18 Hills View, Barnstaple, North Devon.

Bury Photographic and Arts Club.—Bury. Ordinary meetings, third Wednesday in each month, at 7.30 P. M. Place of meeting, Temperance Hall. Secretary, Mr. Roger Wood, 190 Bolton Street, Bury.

Bolton Photographic Society.—10 Rushton Street (off Corporation Street), Bolton. Ordinary meetings, first Tuesday in every month. Place of meeting, 10 Rushton Street. Secretary, C. A. Mackechim, M. B., 355 Blackburn Road, Bolton-le-Moors.

Blackburn and District Photographic Society, The—Royal Chambers, Victoria Street, Blackburn, Lancashire. Ordinary meetings, last Thursday in each month, at 8 P.M. Place of meeting, 33 Victoria Street, Blackburn. Secretary, W. B. Burrows, 20 Richmond Terrace, Blackburn.

Brechin Photographic Association.—Brechin, N. B. Ordinary meetings, first Wednesday of each month, at 8.15 P.M. Place of meeting, Rooms in St. Mary's Street. Secretary, James D. Ross, 6 High Street, Brechin, N. B.

Brighton Photographic Society.—Brighton. Ordinary meetings, second and fourth Tuesdays, at 8.15 P.M. Place of meeting, Arch 40. Ship Street Gap. Secretary, A. H. C. Corder, 77 Buckingham Road, Brighton.

Bristol and West of England Amateur Photographic Association.—Ordinary meetings, second Friday in each month. Place of meeting, Literary and Philosophic Club, 28 Berkeley Square, Bristol. Hon. Secretary, Frederick Bligh Bond, Liverpool Chambers, Corn Street, Bristol.

Bath Photographic Society.—Terrace Walks, Bath. Ordinary meetings, last Wednesday evening in each month. Place of meeting, Royal Literary and Scientific Institution. Secretary, W. M. Ashman, 12A Old Bond Street, Bath.

Birmingham Photographic Society.—Birmingham. Conversational meetings on Tuesday evenings, at Club Room, 7.30 P.M. Ordinary meetings, second and fourth Thursdays in October, November, December, January, February, March and April. Fourth Thursday only in May, June, July, August and September. Place of meeting, Club Rooms, Collonade Hotel, New Street. Hon. Secretaries, J. H. Pickard, 361 Moseley Road; A. H. Leeson, 20 Cannon Street.

British Association for the Advancement of Science.—22 Albemarle Street, until September next; after that date Burlington House, London, W. Place of annual meeting, 1891 (August 19), Cardiff; 1892—Edinburgh. General Secretaries, Sir Douglas Galton, K.C.B.; A. Vernon Harcourt, Esq., F.R.S.

Camera Club.—Charing Cross Road, London. Ordinary meetings, from October to May, every Thursday. Place of meeting, Camera Club, Charing Cross Road, W. C. Hon. Secretary, G. Davison, Camera Club, Charing Cross Road, London, W. C.

City of Belfast Y. M. C. A. Camera Club.—Rooms, 14 Wellington Place. Ordinary meetings, last Monday of each month. Place of meeting, 14 Wellington Place. Secretaries, James H. Hamilton, 3 Eden Terrace, Shankhill Road; James McCleery, 63 Royal Avenue.

Croydon Camera Club.—Croydon, Surry. Ordinary meetings, October to April, fortnightly; May to September, monthly, at 8 P.M. Club open every week day from 10 A.M. to 10.45 P.M. Place of meeting, 96 George Street, Croydon. Secretary, Geo. R. White, 55 Albert Road, Croydon.

Darlington Photographic Society.—County Durham. Ordinary meetings, second Monday in each month, 8 P. M. Place of meeting, Trevelyan Hotel, Darlington. Secretary, P. W. Poster, Elenbank, Darlington.

Devon and Cornwall Camera Club.—Plymouth, England. Ordinary meetings, winter session, fortnightly, on Mondays; summer session, excursion fortnightly, on Wednesdays. Place of meeting, Athenæum, Plymouth. Honorary Secretary, Robert Burnard.

Dewsbury Amateur Photographic Society.—Malkroyd Lane, Dewsbury. Ordinary meetings, second Thursday in each month. Place of Meeting, Dewsbury and District Technical School. Secretary, George Kilburn, 51 Eastfield, Batley Carr, Dewsbury.

Enfield Camera Club.—Waldron House, Southbury Road, Enfield. Ordinary meetings, second and fourth Wednesday each month, at 8 o'clock. Place of meeting, Waldron House, Southberry Road, Enfield, Secretary, James Dudin, "Roseneath," Chase Green Avenue, Enfield.

Edinburgh Photographic Club.—5 St. Andrews Square. Ordinary meetings, third Wednesday of each month. Hon. Secretary, G. G. Mitchell, 139 Dalkeith Road.

Ealing Photographic Society.—Ordinary Meetings, first and third Thursdays in October to April inclusive. Place of meeting, the public buildings, Ealing. Seeretary, F. H. Williams A.R.I.B.A., the Chantry, Florence Road, Ealing.

Exeter Amateur Photographic Society.—Exeter (Devon) and neighborhood. Ordinary meetings, April to September, first Tuesday in month. October to March, first and third Tuesday in month, at 8 P.M. Place of meeting, the College Hall, South Street. Secretary, Rev. John Sparshatt, M.A., Fairfield House, Alphington Road, Exeter.

Faversham Institute Photographic Society, The—Ordinary meetings, the third Tuesday in every month. Place of meeting, Faversham Institute, Kent. Secretary, Percy Dan, 44 East Street, Faversham.

Falkirk Amateur Photographic Association.—Ordinary meetings, in winter, every month. Place of meeting, Newmarket Street. Secretary, John B. Walls, Robertswynd, Falkirk.

Glasgow and West of Scotland Amateur Photographic Association.—Glasgow. Ordinary meetings, third Monday of month, October to April. Conversation meeting every Monday evening throughout the year. Place of meeting, rooms of the association, 180 West Regent Street. Secretaries, William Goodwin and J. C. Oliver, 180 West Regent Street, Glasgow.

Glasgow Photographic Association.—Glasgow. Ordinary meetings, first Thursday of each month, from November till May, at 8 P.M. Place of meeting, Philosophical Society's Rooms, 207 Bath Street. Secretary, Fred. Mackenzie, 122 Wellington Street, Glasgow.

Glenalmond Photographic Club.—Trinity College, Glenalmond, Scotland. Ordinary meetings, fortnightly on Saturdays, Summer at 8; winter at 9 P.M. Place of meeting, Trinity College, Glenalmond, Secretary, E. H. Cunningham-Craig, Trinity College, Glenalmond, Perthshire, Scotland.

Glossop Dale Photographic Society, The—Howard Street, Glossop, Derbyshire. Ordinary meetings, Tuesday, Thursday and Saturday, weekly. Council meeting, first Wednesday each month at 8 P. M. Place of meeting, Howard Street Chambers (offices of society). Secretary, J. K. Hollingbery, Howard Street, Glossop, near Manchester.

Guildford Amateur Photographic Society.—Guildford. Ordinary meetings, second Tuesday in each month, 8 P.M. Place of meeting, Mission Hall, Chapel Street, Guildford. Secretaries, Mr. A. W. Bullen and Mr. I. H. Nunn, 115 High Street, Guildford.

Harlesden and Willesden Photographic Society.—Harlesden, London, N. W. Ordinary meetings, second Tuesday in each month at 8.30 P. M. Place of meeting, Court House, Harlesden. Secretary, Isaac Cohen, 26 Wendover Road, Harlesden, London, N. W.

Herefordshire Photographic Society.—Mansion House, Hereford. Ordinary meetings, first Tuesday in each month at 7.30 P. M. Place of meeting, Mansion House, Hersford. Secretary, John Parker, C. E., Mansion House, Hereford.

Hackney Photographic Society.—Hackney. Ordinary meetings, second and fourth Thursdays in the month. Place of meeting, Morley Hall. Secretary, W. Fenton-Jones, F.S.Sc., 6 Victoria Street, King Edward Road, Hackney, N. E.

Holmfirth Amateur Photographic Society.—Ordinary meetings, last Friday in each month. Place of meeting, at each member's house alternate. Secretary, David Bilson, Birchin House, Holmfirth.

Keighley and District Photographic Society.—Ordinary meetings, first and third Thursday in each month, October to March. Place of meeting, Mechanics Institute, North Street, Keighley. Secretary, John Gill, 27 Highfield Lane, Keighley.

Kendal Literary and Scientific Institution, Photographic Section.—Ordinary meetings, second Wednesday of each month, at 7.30 P. M. Place of meeting, Museum Library. Secretary, Charles E. Greenall, Prospect, Kendall, England.

Ipswich Photographic Society.—Ordinary meetings, secend Wednesday in month, at 8 P.M. Plaee of meeting, Art Gallery, Ipswich. Secretary, Leonard Hill, Ashdown, Foxhall Road, Ipswich.

Jersey Amateur Photographic Society.—Channel Islands, Great Britain. Ordinary meetings, first Wednesday in month for papers, etc. Place of meeting, 21 Grove Place, Jersey. Secretary and Librarian, F. Woodland Toms, F.I.C., F.C.S., 21 Grove Place, Jersey.

Leeds Photographic Society.—Technical meetings, third Monday in each month. Ordinary meetings, first Thursday in each month. Place of meeting, Leeds Mechanics' Institution. Secretary, S. A. Warburton, 9 Banstead Terrace, Leeds.

Leith Amateur Photographic Association.—Place of meeting, Duke Street. Secretary, Mr. Alexander Pitkethly, 8 Wilkie Place, Leith, W.B.

London and Provincial Photographic Association.—Champion Hotel, 15 Aldersgate Street, London, E. C. Ordinary meetings, every Thursday evening, at 8. Place of meeting, Champion Hotel, Aldersgate Street. Hon. Secretary, R. P. Drage, 95 Blenheim Crescent, London, W.

Lantern Society, The—20 Hanover Square, W. Ordinary meetings, second and fourth Mondays in each month, from October to April, at 8 P.M. Place of meeting, 20 Hanover Square, W. Secretary, Commander C. E. Gladstone, R. N., 6 Bolton Street, London, W.

Leicester and Leicestershire Photographic Society.—Ordinary meetings, second Wednesday in each month, from January to April. Place of meeting, Mayor's Parlor, Old Town Hall. Secretary, Henry Pickering, High Cross Street, Leicester.

Lancaster Photographic Society, The—Lancaster, England. Ordinary meetings, the last Tuesday in each month. Place of meeting, Springfield Barracks. Secretary, W. Briggs, 21 Cheapside, Lancaster.

Leamington Amateur Photographic Society.—Ordinary meetings, every second Friday in month. Place of meeting, Trinity Church Room. Secretary, Signor Asha, Leamington.

Manchester Photographic Society.—36 George Street, Manchester. Ordinary meetings, second Thursday in each month. Place of meeting, 36 George Street, Manchester. Hon. Secretary, W. Holker Farrow, 58 Greenhey's Lane, Manchester.

Manchester Amateur Photographic Society, The—Ordinary meetings, second Tuesday in each month. Place of meeting, Lecture Hall, Manchester Athenæum. Hon. Secretary, R. O. Gilmore, Solicitor, 1B Cooper Street, Manchester.

Morley and District Amateur Photographic Society.—Ordinary meetings, first Wednesday in each calendar month. Place of meeting, M. and D. A. P. S's. rooms, Chapel Hill, Morley. Secretary, Harold E. Spafford, 12 Parliament Street, Morley, Leeds.

Newcastle-on-Tyne and Northern Counties Photographic Association.—Ordinary meetings, second Tuesday from January to April, and October to December. Place of meeting, Mosley Street Cafe, Newcastle. Secretary, Edgar G. Lee, 11 Beverley Terrace, Cullercoats, near Newcastle-on-Tyne.

North Kent Amateur Photographic Society, The—Gravesend. Ordinary meeting, second Thursday in each month, at 8 P.M. Place of meeting, Gravesend. Secretary, G. W. Cobham, P.A.S.I., 3 Edwin Street, Gravesend.

North Middlesex Photographic Society.—Jubilee House, Hornsey Road, London. Ordinary meetings, second and fourth Mondays in each month, except July and August; in those months, the second Mondays only, at 7.30 P.M. Place of meeting, Jubilee House, Hornsey Road. Secretary, J. McIntosh, 14 Lowman Road, Holloway, London, N.

Nottinghamshire Amateur Photographic Association.—Association Chambers, 32 Market Street, Nottingham. Ordinary meetings, alternate Mondays, at 8 P.M. Place of meeting, association rooms. Secretary, P. E. Knight, Java Villa, Blythe Street, Mapperley, Nottingham.

Oldham Photographic Society.—Ordinary meetings, the last Thursday in each month, at 7.45 P. M. Place of meeting, Ordham Lyceum, Union Street, Oldham. Hon. Secretary, Thomas Widdop, 16 Burnaby Street, Oldham.

Oxford University Photographic Club.—Oxford. Ordinary Meetings, arranged terminally. Place of meeting, the society's rooms, George Street. Secretary, A. J. Clay, New College, Oxford.

Oxford Photographic Society.—136 High Street, Oxford, Great Britain. Ordinary meetings, first and third Tuesday in each month, at 8 o'clock. Place of meeting, 136 High Street, and new inn, Hall Street. Hon. Secretary, W. Davis, 136 High Street.

Photographic Club, The—Ordinary meetings, every Wednesday, at 8 P. M. Place of meeting, Anderson's Hotel, Fleet Street, London, E. C. Secretary, F. A. Bridge.

Photographic Convention of the United Kingdom, The—Place of meeting for 1892, Edinborough. Secretary, F. P. Cembrano, Jr., 10 Cambridge Gardens, Richmond, Surrey, England.

Peterboro Photographic Society.—The Museum, Peterboro. Ordinary meetings, first Monday each month, 8 P. M. Place of meeting, the

Museum, Minster Precincts. Secretary, A. W. Nicholls, 11 Cornwell Road, Peterboro.

Photographic Club, Sutton Scientific and Literary Society.—Mulgrave Road, Sutton, Surrey. Ordinary meetings, first Tuesdays in each month. Place of meeting, club rooms, Mulgrave Road, Sutton. Secretary, Emily Culverhouse, The Hundred Acres, Sutton, Surrey.

Photographic Society of Great Britain.—Ordinary meetings, Bloomsbury, W.C. Place of meeting, 50 Great Russell Street, W.C. Hon. Secretary, Captain A. M. Mantell, R. E., 8 Mansion Row, Old Brompton, Chatham.

Photographic Society of Ireland.—15 Dawson Street, Dublin. Ordinary meetings, second Friday and fourth Thursday during winter months. Place of meeting, 15 Dawson Street. Secretary, J. H. Hargrave, 3 Newtownsmith, Kingstown, Dublin.

Putney Amateur Photographic Society.—Putney, London, S.W. Ordinary meetings, October to April, second Wednesday and last Saturday in each month; May to September, first Wednesday in month. Place of meeting, 90 High Street, Putney, S.W. Secretary, Charles Ballard, 45 Disraeli Road, Putney, London, S.W.

Paisley Photographic Society.—Paisley, Scotland. Ordinary meetings, monthly, from October till April. Place of meeting, free library and museum. Secretary, David B. Jack, Glencairn, Blackhall, Paisley.

Richmond Camera Club.—Richmond, Surrey. Ordinary meetings, Fridays, at 8 P.M. Place of meeting, Greyhound Hotel, Richmond. Hon. Secretary, E. G. Richardson, 20 Hermitage Villas, Richmond, Surrey.

Royal College of Science Photographic Society.—Ordinary meetings, when convenient, about one every fortnight. Place of meeting, Royal College of Science. Secretary, Lionel M. Jones, A.R.C.S., Royal College of Science, London, S.W.

Sheffield Camera Club.—New Surrey Street. Ordinary meetings, fourth Wednesday in each month. Place of meeting, New Surrey Street. Secretary, G. E. Malsham, 2 Collegiate Crescent, Sheffield.

Sheffield Photographic Society.—Yorkshire, England. Ordinary meetings, first Tuesday in each month at 7.30 P.M. Place of meeting, Masonic Hall, Surrey Street. Secretary, Ernest Beck, Fairmont, Shoreham Street, Sheffield.

Society for the Encouragement of Art Manufacture and Commerce.—Place of meeting, society's house, Adelphi, London, W. C. Secretary, Sir Henry Trueman Wood, M. A.

Southsea Amateur Photographic Society.—3 Kings Road, Southsea. Ordinary meetings, first and third Wednesdays in each month. Place of Meeting, 3 King's Road. Hon. Secretary, Dr. F. Lord, Wilton House, Landport Terrace, Southsea.

Shropshire Camera Club.—No. 7 the Square, Shrewsbury. Ordinary meetings, second Monday in each month. Place of meeting, No. 7 the Square, Shrewsbury, Secretary, Walter W. Vaunton, No. 9 the Square.

Stockton-on-Lees Photographic Society.—Stockton-on-Lees. Ordinary meetings, second Tuesday in each month, at 8 o'clock. Place of meetings, society's own rooms, Stockton-on-Lees. Secretary, J. E. Ellam, Yarm, Yorks.

Swansea Amateurs Photographic Association.—Ordinary meetings, last Friday in month, at 7.30 P. M. Place of Meeting, Tenby Hotel. Secretary, E. Ernest Morgan, Bryn-Naut, Swansea.

Sydenham Camera Club.—Sydenham. Ordinary meeting, alternate Tuesdays, 8 P. M. Place of meeting, Greyhound Hotel, Sydenham. Secretary, H. H. Gray, 9 Thicket Road, Anerly, S. E.

Staffordshire Potteries Amateur Photographic Society.—Burslem. Ordinary meetings, first Tuesday in month, at 8 P. M. Place of meeting, Town Hall, Burslem. Secretaries, J. F. Hewitt, 35 Market Place ; F. C. Powell, Swan Square, Burslem.

Sun and Company.—Limited to forty amateurs. Hon. Secretary, Martin J. Harding, Nor 4 Lexden Gardens, Shrewsbury.

St. Bartholomew's Hospital Photographic Society.—St. Bartholomew's Hospital, West Smithfield, London, E. C. Place of meeting, St. Bartholomew's Hospital. Secretaries, D. J. Armitage, R. J. Hillier, St. Bartholomew's Hospital.

The Auckland Photographic Club.—Auckland, N. Z. Ordinary meetings, second and fourth Fridays in each month at 8 P.M. Place of meeting, club room, Australian Mutual Provident Society's Building. Secretary *pro tem*, G. R. Boulton, care of Bank of New South Wales, Auckland.

The Photographic Society of India.—Calcutta. Ordinary meetings, every Thursday at 6 P.M. Place of meeting, 57 Park Street, Calcutta. Secretary, T. Archdale Pope, 57 Park Street, Calcutta, India.

The South London Photographic Society.—Ordinary meetings, first and third Monday in the month at 8 P. M. Place of meeting, Hanover Hall, Hanover Park, Rye Lane, Peckam, London, S. E. Secretary, S. W. Gardner, 7 Barry Road, Peckam, Rye, London, S. E.

Tunbridge Wells Amateur Photographic Association.—Ordinary meetings, first Thursday in each month. Place of meeting, Mechanics' Institute. Hon. Secretary, Joseph Chamberlain, 14 Calverley Park Gardens, Tunbridge Wells.

Uttoxeter Photographic Society.—Uttoxeter, Staffordshire. Ordinary meetings, first Wednesday in the month, at 5.30 P.M. Place of meeting, Carber Street, Uttoxeter. Secretary, Alfred Parker, High Street, Uttoxeter.

Warrington Amateur Photographic Society, The—Ordinary meetings, last Tuesday in each month, at 8 o'clock P.M. Place of meeting, Warrington Museum Committee Room. Secretary, Frederick Pearson, Stockton Heath, Warrington.

West Kent Amateur Photographic Society.—Ordinary meetings, fortnightly outings, during summer, monthly. Place of meeting, Bexley and Sideup. Secretary and Treasurer, Edward Hawkins, Manor Estate, Sideup, Kent.

West Surrey Photographic Society.—Clapham Junction, London, S.W. Ordinary meetings, first and third Wednesdays in each month, and fortnightly Saturday outings during the summer. Place of meeting, St. Mark's Schools, Battersea Rise. Secretary, F. H. Smith, 107 Falcon Road, London, S.W.

Wallasey Photographic Association.—Egremont, Cheshire, England. Ordinary meetings, first Wednesday in each month. Place of meeting, Egremont Institute. Secretary, George G. Breading, 72 Church Street, Egremont, Cheshire.

Wolverhampton Photographic Society.—Ordinary meetings, first Tuesday in each month, at 8 o'clock. Place of meeting, Blind Institute, Victoria Street. Secretary, J. W. Evans, 52 Darlington Street, Wolverhampton.

West London Photographic Society.—London. Ordinary meetings, second and fourth Fridays in winter months, at 8 P.M. Place of meeting, Broadway Lecture Hall, Hammersmith, W. Secretary, H. Selby, 42 Ladbroke, Grove Road, London, W.

Yorkshire College Photographic Club, The—Ordinary meetings, last Thursday in each month during college session. Place of meeting, the Yorkshire College. Secretary, Henry B. Hall.

Yorkshire Philosophical Society, Photographic Section.—Ordinary meetings, the first Wednesday in each month, at 8 P.M. Place of meeting, the Museum, York. Secretary, Henry R. Moiser, F.G.S., Heworth Grange, York, England.

Germany.

Berlin Freie Photographische Vereinigung.—President, Prof. Dr. Gustav Fritsche, Hotel Jansen Mittelstrasse, 53 and 54, N. W.

Berlin Deutsche Gesellschaft von Freunden der Photographie. President, Prof. Dr. H. W. Vogel, Kurfuerstenstrasse, 124 W.

Berlin Photographisher Verein.—President, Dr. Fr. Stolze, Louisenstrasse, 36 N. W.

Berlin Verein zur Förderung der Photographie.—President, Prof. Dr. H. W. Vogel, Kurfuerstenstrasse, 124 W.

Berlin Verein Photographischer Mitabeiter.—President, Herrmann Aschenbrenner; addr. E. Guenther, Zion's Kirchstrasse, H. N.

Brannschweig Verein von Freunden der Photographie.—President, Prof. Dr. Max Müller.

Deutcher Photographen Verein.—President, Karl Schwier, Weimar.

Dresden Photographen Verein.—President, Paul Krause, Restaurant Fuchsbau, Kreutzstrasse, 2.

Frankfurt o/M. Verein zur Pflege der Photographie und Verwandten Kunste.—President, H. P. Hartmann, Bockenheimer, Landstrasse, 70.

Hamburg Verein Photographischer Mitarbeiter.—President, W. Pappe, Sen., Holstenhalle, Peter Löhde.

Hamburg-Altona Photographishe Gesellschaft.—President, G. Wolf, Augustiner-bräu, Alter Jungfernstieg.

Hanover Photographisher Verein.—President, Major von Hammerstein, Lutherstrasse, 17, II.

Magdeburg Verein der Photographen Gehilfen.—Hon. Pres., dent, E. von Flottwell, per addr. Rud. Welter, Knochenhaneruferstrasse, 27-28 II.

München Photographische Gesellschaft.—President, F. Werner, Landwehrstrasse, 31.

Nürnberg Photographen Verein.—Per addr. Fr. Schöninger, Obere Canalstrasse, 8 a.

Rheinisch Westphaelischer Verein zur Pflege, der Photographie und Verwandter Künste.—President, Th. Creifels, Cologne, o/R.

Photographische Gesellschaft von Essen und benachbarten Staedten.—President, H. Witteanys, Hügelstrasse, 49.

Schlesische Gesellschaft von Freunden der Photographie.—President, Prof. Dr. A. Neisser, Museumstrasse, 11 Breslau.

Schleswig-Holstein Photographen Verein.—President, Wilhelm Dreesen, Fleusburg.

Verein Photographischer Mitarbeiter zu Berlin.—President, A. Arke.

Austria-Hungary.

Vienna Club der Amateur Photographen.—President, Carl Srna, Wallfischgasse, 4 Wien I.

Vienna Photographische Gesellschaft.—President, Lt.-Col. Ottomar Volkmer, Carmelitergasse, 7, Wien II.

Vienna Verein Photographischer Mitarbeiter.—Paniglestrasse, 17, Zumgoldenen Sieb, Wien IV.

Switzerland.

Cercle des Effigistes (Amis-photographes).—President, A. Chevalley, Geneva.

Neufchatel Photo Club de.—President, C. Chable.

Schweizerischer Photographen Verein.—President, F. Pricane, Geneva.

Société Génévoise de Photographie.—President, H. C. Nerdinger, Geneva.

Société Photographique de Lausanne.—President, O. Welti, Lausanne.

Zürich Photographische Gesellschaft.—President, K. Nussbaummer, Hattingen.

France.

Photo-Club de Paris.—President, Maurice Bereguet; Secretary, Paul Bourgeois, 67 Rue de Roder.

Photo-Club de Sud Est Lyon.—President, Donnadieu, 25 Rue de Plat.

Société Francaise de Photographie.—President, Janssen (de l'institute), 76 Rue des Petits Champs, Paris.

Société Photographique et Artistique de Limoge.—President, Charles Lamy de la Chapelle; Secretary Générale, A. de Galard Béarn.

Société Photographique du Sud-Ouest Angoulême.—President, de la Laurentee, p. Adr. F. Braun, Phot. Angoulême.

Société Photographique du Nord de la France.—President, M. Vibert; Secretary, M. Eugene Cocheteur, 3 Rue de Notre Dame, Duai.

Société Photographique de Toulouse.—President, Sipiére.

Syndicate Général de Photographie.—President, Leon Vidal, 10 Cité Rougemont, Paris.

Belgium.

Association Belge de Photographie.—President, Jos. Mans; Secretary, Ch. Puttemans, Rue du Moulin, 59 a Bruxelles.

Mutuell Photographique Belge.—President, Aug. Lemaire, addr. Bd du Hainaut 94, Bruxelles.

Holland.

Amateur Fotografen Vereeniging. — President, H. v. d. Mash Spakler; Secretary, Michel Ameshot, 4 Westeringplantsoen, Amsterdam.

Nederlandsc Vereeniging von Dilettant Fotografen Helios. —President, P. Fraissinet, Amsterdam.

Nederlandsc Fotografen Vereeniging. — President, W. Ivens, Nymwegen.

Denmark.

Dansk Fotografisk Forening.—President, J. Peterson; Secretary, M. Steenbro, Bredgade 20, Copenhagen.

Fyensk Fotografisk Forening.—President, L. Denensen, addr., Sauder Nielsen, Nyberg.

Norway.

Norsk Fotografisk Forening.—President, L. Szacinski, Christiania.

Sweden.

Fotografiska Forening.—President, Prof. H. Gylden, addr., Wallhallawagen 27, Stockholm.

Upsala Fotografic Forening.—President, Prof. N. C. Dunér, Upsala.

Zinketsare Klubber.—President, John Staehlberg, Westmannagata 19.

Russia.

Imperial Society of Technology, Photographic Section.—President, S. Levitski, Pantelejmonskaja, 2, St. Petersburg, Russia.

Fotografi Amator Klubben.—Helsingför, Finland. President, Hugo of Scholten; Secretary, Th. Hahnberg, Estnasgatan, 23.

Italy.

Societa Fotografica Italiana.—President, Prof. Cov. Giorgio Roster, via S. Reparata 60, Firenze.

Associàcione degli Amatori di Fotografia.—President, Antonio Ruppi Duc d'Artaglié, via Pali 25, Roma.

Hawaiian Islands.

Hawaiian Camera Club.—President, Walter M. Gifford; address, Clarence W. Ashford, P. O. Box 112, Honolulu.

HOTELS HAVING DARK-ROOMS FOR THE CONVENIENCE OF TOURIST PHOTOGRAPHERS.

CALIFORNIA.

East Pasadena—THE RAYMOND.
Monterey—DEL MONTE.
Santa Barbara—SAN MARCO.
San Diego—HOTEL CORONADO.
San Rafael—HOTEL RAFAEL.
The Geysers, Sonoma Co.—THE GEYSERS.

NEW YORK.

Adirondacks.—CASCADE LAKE HOUSE. Has a dark-room with running water.
Big Indian, Catskill Montains—SLIDE MOUNTAIN HOUSE.
Blue Mountain Lake, Hamilton County—PROSPECT HOUSE.
Lakewood—THE STILLINGSWORTH.
Lake George—FORT WILLIAM HENRY HOTEL.
Lake George, Bolton—LAKE VIEW HOUSE.
Kidders Ferry, Cayuga Lake—COLES HOTEL.
Niagara Falls—SPENCER HOUSE.
Hunter—BREESE LAWN. Has a dark-room with running water.
Westport—THE WESTPORT INN. Has a dark-room with running water.

NEW HAMPSHIRE.

Littleton—CHISWICK INN.
White Mountains—PROFILE HOUSE.
Mt. Washington—SUMMIT HOUSE.

NORTH CAROLINA.

Hot Springs—MOUNTAIN PARK HOTEL.

ONTARIO.

Muskoka, Lake Joseph—THE STANLEY HOUSE.

PENNSYLVANIA.

Dingman's Ferry—HIGH FALLS HOUSE.
Sullivan Co.—HOTEL EAGLESMERE.

VIRGINIA.

Luray—LURAY INN.

GEORGIA.

Savannah—HOTEL DE SOTO.

FLORIDA.

St. Johns—MAGNOLIA HOTEL.

Crosscup & West Eng. Co., Phila.

"ENGAGED?"

JOHN C. MOSS, *President*
M. A. MOSS, *Treasurer*

R. B. MOSS, *Superintendent.*

H. A JACKSON, *Secretary*
F. KALKHOFF, *Asst. Sec'y.*

C. T. RAYNOLDS & CO.

MANUFACTURERS OF

Artists' Materials.

ARTISTS' OIL COLORS,

In Double or Large Size Tubes,

Used and Recommended by Leading Artists.

FINE BRUSHES,

CANVAS,

Water Colors,

Varnishes,

OILS.

FINEST QUALITY

PURE

Enamel Colors,

Produce a Hard, Polished Surface on

Furniture, Wicker Ware, Walls, Interior Decorations, Etc.

SEND FOR SAMPLE CARD.

Convex Glass and Materials for Chromo-Photography.

ARCHITECTS' AND DRAUGHTSMEN'S SUPPLIES.

Ready Mixed Paints, White Lead, Zinc, Oils and Varnishes.

INTERIOR AND EXTERIOR WOOD FINISHES.

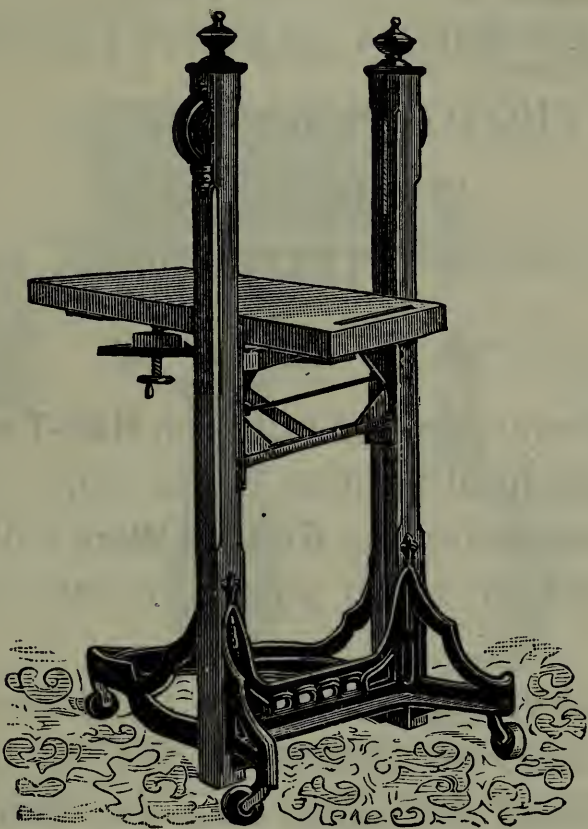
106 & 108 Fulton Street, New York.

HORGAN, ROBEY & CO.,

Photographic Stock Dealers.

SOLE AGENTS FOR

SILVER MEDAL.



AWARDED FIRST PRIZE.

The Semi-Centennial Camera Stand.

C. H. C. & Co.'s Albumen Paper.

The Venus Improved Lantern.

Odin Fritz Retouching Medium.

New England Agents for American Optical Company's Goods.

Send for Price List.

34 Bromfield St., BOSTON, MASS.

ESTABLISHED 1857.

OFFICE OF

CHAS. COOPER & CO.

CHEMISTS AND IMPORTERS,

194 WORTH ST., NEW YORK.

DEAR SIR :

We are the Sole Owners of a collection of **Thorwaldsen's Bas-Reliefs**, from which we make Photographic Reproductions. As works of art they are unexcelled, and a joy for ever to the cultivated mind.

The pictures measure 16 inches in diameter and are mounted on 22 x 28 card-boards.

To dealers the net cash price is $1.00 apiece, and we now offer them to Photo. Artists at the same figure ; the selling price should not be below $2.50.

We will send four or more pictures, with descriptions, by Express C.O.D., subject to approval, the Express agent to hold the money until goods have been examined by you.

The Collection comprises :

Day and Night.
The Four Seasons.
The Four Symbols.
Cupid's Power over the Elements.
Boys Gathering Fruit.
Harvest.
Amor and Bacchus.
A Shepherdess with a Nest of Cupids.
Amor and Psyche.
The Four Evangelists.
Christ Blessing Children.
Holy Mary with the Child Jesus and John.
Inconstancy.
Faithfulness.
Venus with the Golden Apple.
Thorwaldsen by Himself.

Yours truly,

CHAS. COOPER & CO.

CROSSCUP & WEST ENGRAVING CO.

911 FILBERT ST. PHIL'A.

ENGRAVERS

"IVES" PROCESS OUR SPECIALTY

Commercial Engraving

OF ALL KINDS

BY ALL THE BEST METHODS.

Book, Newspaper and Magazine

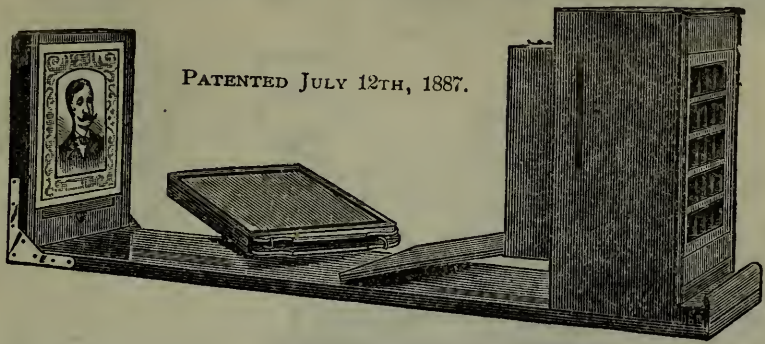
ILLUSTRATING.

Fine Art Engraving.

Write us concerning Engraving of whatever nature required.

Copied from Photograph. A MOORISH GIRL. Lewis Engr. Co., Boston.

HYATT'S Patent Stamp Portrait Cameras.

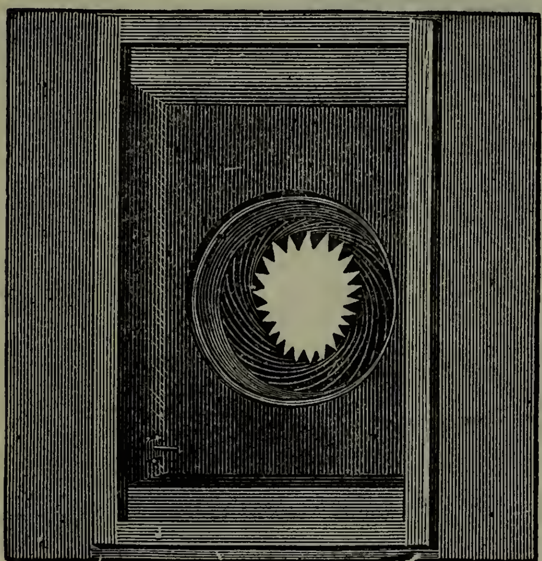


I am now prepared to furnish our **PATENT STAMP PHOTO. APPARATUS**, manufactured under the KUHN Patent, issued July 12th, 1887, with the right for using same, at the following low prices, and would respectfully caution the trade against purchasing or using any infringing apparatus.

Stamp size, with 16 lenses for making 16 on 4x5 plate, . . .	$25 00
Minette " " 4 " " " 4 " 4x5 " . .	25 00
Combination Stamp and Minette, making 16 Stamps or 4 Minettes on 4x5 plate, ...	40 00
Stamp size, with 25 lenses for making 25 on 5x7 plate . .	50 00
Minette size, with 8 lenses for making 8 on 5x8 plate, . . .	40 00
Perforators for perforating same, under our *Stamp Patent* (also issued July 12th, 1887), ...	35 00

THE NEW MAGIC VIGNETTER.

For Producing the Popular BLACK BACKGROUND or EBONY PHOTOGRAPH.



Patented May 31, 1887.

No more trouble or expense than making plain photographs.

It is easily attached to any camera by fastening it on the inside of diaphragm of box (as shown in cut).

The opening can be adjusted to the proper size by simply turning the thumb screw, focus and expose as usual.

Every one guaranteed.

Price, each, $8.00.

Sample photographs of work done with it furnished on receipt of 10c.

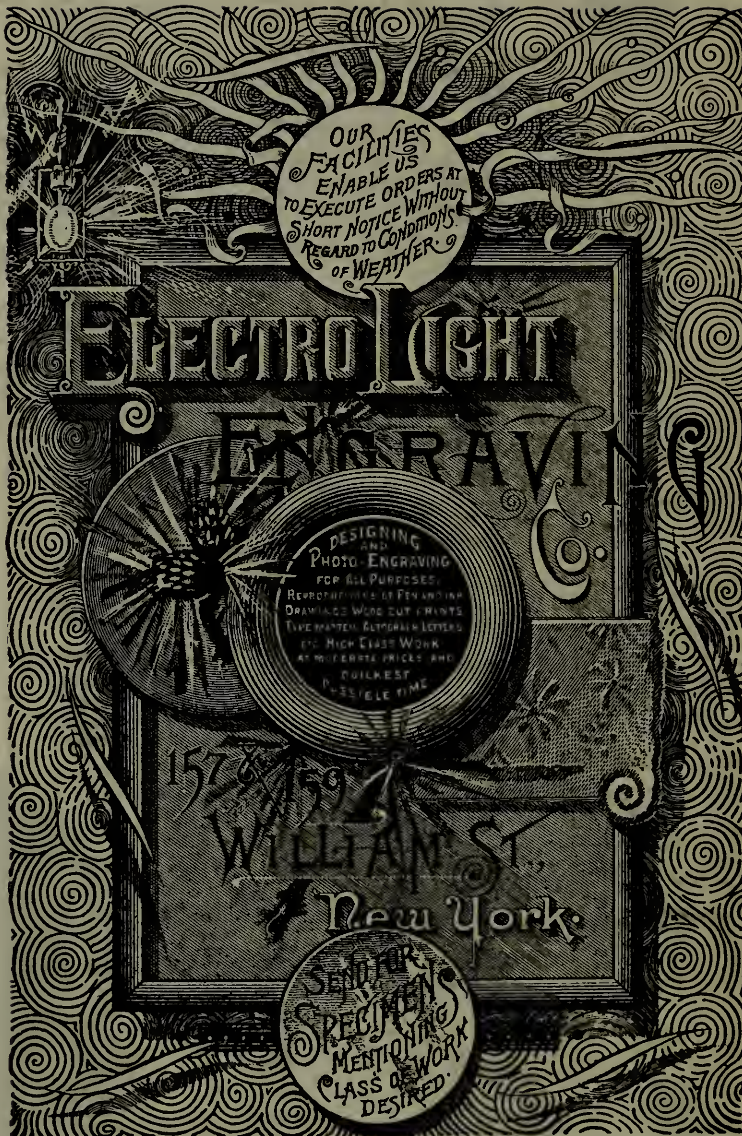
To get the best results with this Vignetter use a black Felt background, which we furnish at the following prices:

3x3 $0 80	4x6 $2 00	6x8 $4 00
3x6 1 50	6x6 3 00	6x10 5 00

Address all orders to **H. A. HYATT,**

Dealer in PHOTOGRAPHIC SUPPLIES of Every Description,

ST. LOUIS, MO.



OUR FACILITIES ENABLE US TO EXECUTE ORDERS AT SHORT NOTICE WITHOUT REGARD TO CONDITIONS OF WEATHER.
ELECTRO LIGHT
ENGRAVING
CO.
DESIGNING AND PHOTO-ENGRAVING FOR ALL PURPOSES.
HIGH CLASS WORK
157 & 159
WILLIAM ST.,
New York.
SEND FOR SPECIMENS MENTIONING CLASS OF WORK DESIRED.

ROSS' PORTRAIT and VIEW LENSES.

Gold Medals and Highest Awards at all Great Exhibitions.
Used by leading Photographers throughout the World.

SPECIAL NOTICE.

ROSS & CO. beg to announce that they have been engaged for several years past in calculations and experiments with the NEW JENA OPTICAL GLASS, with the result that they have been able greatly to improve the properties of their Landscape and Portrait Lenses, and to introduce several New Series, which will be found of greater excellence and more Aplanatic than Lenses of the same class hitherto supplied.

All Lenses are now fitted with Improved Iris Diaphragm or Aluminum Mounts when desired. All orders can be promptly executed from stock.

ROSS' UNIVERSAL SYMMETRICAL LENSES

(Extra Rapid). A new series for Landscapes, Portraits, Groups, and Instantaneous. F—5,657.

ROSS' RAPID SYMMETRICAL LENSES

(New Formula), for Groups, Views, Interiors, Copying, and all out-door Photography. F—8.

ROSS' PORTABLE SYMMETRICAL LENSES,

The most popular Lenses for Landscapes, Architecture, and Copying. F—16.

ROSS' WIDE-ANGLE SYMMETRICAL LENSES

(New Series). For Landscapes, Architecture, and Confined Situations. F—16.

ROSS' NEW WIDE-ANGLE SINGLE LENSES,

Introduced for purely Landscape purposes. Flat Field and Brilliant Image. F—16.

ROSS' IMPROVED PORTRAIT LENSES,

Cabinets and C. de V.'s. Invaluable for either standing or sitting figures.

ROSS' NEW PATTERN DRY-PLATE CAMERAS,

Extra light and portable. Double extension. All sizes in stock.

ROSS' LENSES are kept in stock by

THE WILSON-HOOD-CHENEY CO., Ltd.,
910 Arch Street, Philadelphia.

WM. C. CULLEN,
61 William Street, New York.

And may also be obtained through the Principal Photographic Stock Dealers throughout the United States and Canada.

ROSS & CO.,

112 NEW BOND STREET, LONDON, ENGLAND.

Works—CLAPHAM COMMON.

MULLETT BROS.

New Wide-Angle Rectilinear View Lens.

These Lenses are by far the finest Lenses for the money, and their work is simply wonderful. They are almost entirely free from distortion and positively without any central spot or "ghost." They work with great depth of focus, embracing an angle (with the small stop) of about 100 degrees. Each size quoted will cut plate of next size larger—*i.e.*, a 6½ x 8½ Lens will cover an 10 x 12 plate.

	Diameter of Lens.	Back Focus.	Size Plate.	Price.
No. 1	¾ in.	3½ in.	4 x 5	$9 50
" 2	1 3/16 in.	5½ in.	5 x 8	12 00
" 3	1⅜ in.	6¼ in.	6½ x 8½	18 00
" 4	1 11/16 in.	9 in.	8 x 10	22 00
" 5	2⅛ in.	11 in.	10 x 12	30 00
" 6	2½ in.	13¾ in.	12 x 16	38 00
" 7	2¾ in.	15¾ in.	16 x 20	50 00

"M. BROS."

UNRIVALLED PORTRAIT LENS,

WITH IRIS DIAPHRAGM.

	Diameter of Lenses.	Back Focus.	Size Plate.	Price.
No. 1	1 7/16 in.	8⅛ in.	5 x 8	$25 00
" 2	1⅝ in.	9⅞ in.	6½ x 8½	35 00
" 3	2 1/32 in.	12¼ in.	8 x 10	45 00
" 4	2 5/16 in.	13¾ in.	10 x 12	57 50
" 5	2 9/16 in.	17¼ in.	12 x 16	67 50
" 6	3⅛ in.	22¾ in.	16 x 20	83 00

TRY THEM ONCE AND YOU WILL HAVE NO OTHER.

A full assortment of all leading styles of apparatus and supplies. Orders solicited.

MULLETT BROS.,

KANSAS CITY, MO.


THE LEVYTYPE CO.
OF PHILADELPHIA
DESIGNERS
AND
PHOTO=
ENGRAVERS
7TH & CHESTNUT STS.
PHOTO-
RELIEF-
ENGRAVING
IN
ALL ITS BRANCHES
EXECUTED IN THE
HIGHEST STYLE
OF THE ART.
PLATES FOR THE
PRINTING PRESS
IN
HALF-TONE
DIRECT
FROM PHOTOGRAPHS
OR BRUSH DRAWINGS
BY THE
LEVYTYPE
AUTOGLYPHIC
PROCESS
S.E. CORNER 7TH & CHESTNUT STS.
PHILADELPHIA, PA.

COMPLETE PRICE LIST

CARBUTT'S DRY PLATES

TRADE MARK

AND "CELLULOID" FILMS.

SIZE OF PLATES.	"Eclipse," "Special," "A," "B," and Orthochromatic Plates.	Stripping Plates. — "Special," Sen. 23 to 25, kept in stock. Other brands to order.	Ground Glass Transparency, Plates.—"A" Emulsion.	Plain Opal Plates.—Coated with "A" Emulsion.	Ground Opal Plates. — Coated with "A" Emulsion.
	Doz.	Doz.	Doz.	Doz.	Doz.
2½ x 2½ 2⅝ x 2⅝	$0 30	....	....	....	....
2½ x 4	35	....	....	....	...
3¼ x 4¼	45	...	....	$0 55	$0 60
4 x 5	65	$0 90	$0 70	80	85
4¼ x 5½	75	1 00	95	1 00	1 15
4¼ x 6½	90	1 20	1 15	1 20	1 45
4¾ x 6½	1 00	1 25	....	....	...
5 x 7	1 10	1 45	1 40	1 50	1 80
5 x 7½	1 25	1 65	....	....	....
5 x 8	1 25	1 65	1 60	1 70	2 25
			½Doz.	½Doz	½Doz
6½ x 8½	1 65	2 20	1 15	1 20	1 45
8 x 10	2 40	3 20	1 65	1 75	2 15
10 x 12*	3 80	5 05	2 50	2 65	3 25
11 x 14	5 00	6 65	3 20	3 50	4 20
14 x 17	9 00	12 00	5 50	6 00	7 00
16 x 20	12 50	16 65	....	....	....
17 x 20	13 00	17 30	....	....	....
18 x 22	15 50	20 00	....	....	....
20 x 24	18 50	24 50	....	....	....

"Celluloid" Films for the Moessard Panoramic Camera.

8 x 28 Cm.	$1 30	24 x 84 Cm.	$12 15
12 x 42 "	3 20	28 x 98 "	17 60
16 x 50 "	4 90	32 x 112 "	23 00
20 x 70 "	8 50		

Size of "Celluloid" Films for Negatives, coated with "B," Special, Eclipse, or Ortho. Emulsion; for Positives with "A" Emulsion.	PRICE OF "Celluloid" Films. Negative and Positive.
	Doz.
3¼ x 4¼	$0 55
4 x 5	80
4¼ x 5½	90
4¼ x 6½	1 10
4¾ x 6½	1 20
5 x 7	1 40
5 x 7½	1 50
5 x 8	1 55
6½ x 8½	2 10
8 x 10	3 00
10 x 12	4 75
11 x 14	6 25

French Measure.

PLATES AND FILMS.

Centimeter.	Plates.	Films.
9 x 12	$0 60	$0 80
12 x 16	95	1 15
12 x 16½	1 00	1 20
13 x 18	1 10	1 40
12 x 20	1 25	1 50
18 x 24	2 20	2 85
21 x 27	2 85	3 10
24 x 30	3 80	4 30
27 x 33	4 50	4 95

* 10 x 12 and larger are in ½ dozen boxes.

CARBUTT'S LANTERN PLATES 55 cts. PER DOZEN.

On Specially Imported THIN CRYSTAL GLASS, Size 3¼ x 4.

Manufactured by JOHN CARBUTT,

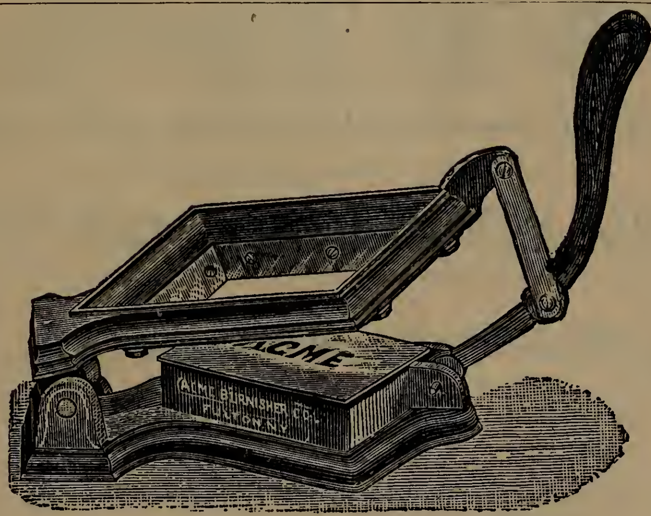
(Pioneer Manufacturer of *Gelatino-Bromide* and *Orthochromatic Plates* in America.)

KEYSTONE DRY PLATE AND FILM WORKS,

WAYNE JUNCTION, PHILADELPHIA.

ACME
Print Trimmer.

⁕ THE LATEST. ⁕



PATENTED AUGUST 26, 1890.
OTHER PATENTS PENDING.

Always cuts Prints exactly the same.

The only Trimmer that cuts a whole sheet of paper, all sides, at once.

Absolutely accurate Never gets out of adjustment. Self-sharpening. Simplest Trimmer in the world.

PRICES.

No. 1.—3¾x5⅝	inches,	16 cabinets to sheet,	- - -	$12.00
No. 2.—3⅞x6	"	12 " "	- -	12.00
Panel Sizes,			- - - - - - - -	16.00
"Sunbeam" and Card Sizes,			- - - - - -	12.00

Any Special Size to Order, $1.00 extra.

FOR SALE BY ALL DEALERS.

MANUFACTURED BY

ACME BURNISHER CO.,

FULTON, N. Y.

THE SCOVILL & ADAMS CO., TRADE AGENTS,

423 BROOME STREET, N. Y. CITY.

SCOVILL PREPARED SOLUTIONS, POWDERS, &c.

S. P. C. Clarifying Solution. Per bottle, $0 50

S. P. C. Reducing Solution. Small bottle, . 50

Large bottle, ... 75

Reduces density in negatives and positives on glass or paper. Can be applied locally to remove halation marks, ghosts, etc.

S. P. C. Hypo Eliminator. (For Removing every trace of Hyposulphite of Soda from Negatives and Prints.) Price, per bottle, with book of testing paper, ... 50

S. P. C. Retouching Fluid. (For Varnished and Unvarnished Negatives.) Price, per bottle, . 25

Magnesium Flash Compound, oz. bottle, 50

Hall's Intensifier. (For Strengthening Weak Negatives.) Price, per bottle, ... 75

S. P. C. Negative Varnish. . Per bottle, 35

French Azotate. (For Toning Prints.) " " 25

Kristaline Varnish, . . . " " 40

S. P. C. Toning Solution. Per package, . . 1 00

Produces the most brilliant tones, ranging from chocolate to black on ready-sensitized paper.

S. P. C. Orthochromatic Solutions.

By which any plate may be rendered color-sensitive. Price, per package, ... 1 50

Buy from Dealers or the Scovill & Adams Company.

SCOVILL Prepared SOLUTIONS. Powders and Capsules.

JUST INTRODUCED,

S. P. C. Eikoquinole Developer. Price per bottle, $0 35

S. P. C. Eikonogen Developer. Per package, 75

S. P. C. Pyro and Soda Developer. Price per Package, 60

S. P. C. Hydrochinon Developer.
Does not stain the fingers or leave the plate yellow; works equally well with all brands of plates, giving perfect detail, density and brilliancy in the negative. Full directions enclosed in each package. Price, per package, . 60

S. P. C. Pyro and Potash Developer.
Price, per package, ... 60

S. P. C. Bromide Paper Developer
for Star Bromide Paper. Set, ... 75

S. P. C. Restrainer. In accurate dropping bottle, 50

S. P. C. Developing Powders. Per box of 12, 50

Hydrochinon Capsules, . . . per box, 60

Buy from Dealers or the Scovill & Adams Company.

KODAKS.

Several improvements recently added to Kodaks are worthy of mention.

A simple *counting device* added to the junior Kodaks will be appreciated by many who desire to keep track of the number of their exposures.

The new *glass plate attachments* for junior and folding Kodaks are simple, compact and practical. These devices can hardly be called attachments in the ordinary sense of the term, inasmuch as they form, when substituted for the roll-holder accompanying the Kodak, a complete and symmetrical camera, without any of the "trappy" appearance of many such devices.

The new *frictionless Shutter* added to the Folding Kodaks has a wider range of adjustment than heretofore thought possible—1-100 to 5 seconds is the normal range, but these are not the extremes. The frictionless valve is a wonder.

Several other new features in the folding Kodaks, such as the *folding key and outside indicator*, are of less importance, but contribute to make the Folding Kodaks the King among cameras.

The Eastman Company,

115 Oxford St., LONDON. *ROCHESTER, N. Y.*

4 Place Vendome, PARIS.

EASTMAN'S

Permanent Bromide Paper

Still holds its own in the markets of the world against all comers as the

MOST UNIFORM,

BEST SURFACE,

MOST DELICATE GRADATIONS.

For purity of whites and velvety depth of shadows it is unequalled.

Sepia Tones can now be obtained on this paper by a simple formula, furnished on application.

The Eastman Company,

ROCHESTER, N. Y.

115 Oxford St., LONDON.
4 Place Vendome, PARIS.

Transparent Films.

The completion of our great Film Works marks a new era in the manufacture of sensitive photographic goods.

No money has been spared to render them perfect, and visitors pronounce them

The Cleanest Place on Earth,

which means a great deal photographically.

The new works have been in operation since June, and the improved quality of the Film turned out is already attracting attention.

NO FRILLING,

NO SPOTS,

NO STREAKS,

NO CURLING.

The Film for 1892 will be still further improved.

The Eastman Company,

ROCHESTER, N. Y.

NEW WORKS:
Near ROCHESTER, N. Y.
Near HARROW, ENGLAND.

PREMIER.

THE Shutter is a novel device and is so constructed that it revolves in one direction only, not requiring to be set, and only requires to be wound up to be always ready ; it will make six exposures without re-winding. The repeating shutter is of especial advantage in using a Roll-Holder and Films, as no safety device is required to cover the Lens while setting the shutter.

The lens is our well-known R. O. Co. Single View Lens, with revolving diaphragms, and the camera is so made that any other lens may be substituted if desired.

With this camera either glass plates or films can be used, or both, as the Plate-Holders and Roll-Holder are interchangeable.

The camera is made capable of carrying six Perfection Holders, holding one dozen plates.

PRICE.

4 x 5, Complete with one Holder, . .	$18 00
Extra Perfection Holders, ...	1 00
Roll-Holder, loaded for 48 exposures, .	13 00

For Rapid Rectilinear Lens instead of Single View Lens, add $6.00.

We make all kinds of View Cameras.

Send for our Catalogue.

Rochester Optical Co.,

ROCHESTER, N. Y.

ESTABLISHED
1860.

GEO. KNELL,

Patentee and Manufacturer.

Fig. 20.—PHARAOH CHAIR.

The back of this Chair can be raised and owered. The new adjustable fringed table. The curved rod will move it to any position, and the arm and table can be removed at will. This Chair is handsome in appearance, durably made, spring seat. Hand-made fringes to match spun-silk covering; suitable colors. Price, **$32.00.**

Fig. 40.—ROMAN CHAIR,

Has a prominent carved front and back. New adjustable table and one arm attached, as seen on Fig. 20. It is an artfully designed piece of work. Spring seat, spun-silk covering, select colors, hand-made fringe to match. Price, **$32.00.**

Fig. 4.—ADJUSTABLE RECLINING CHAIR.

Plain Tufting, Plush, Leather or Tapestry Covering. Price, **$48.00.**

Fig. 6.—SLIDING-ARM CHAIR.

The Pioneer of Photographic Chairs, Upholstered in figured goods. Price, **$9.00.**

Reclining Chairs, Independent Leg-Rest Reclining Chairs, Commode Reclining Chairs, Sofa Beds, Chairs for Fractured Limbs, Elevated Pillow Couches, and Roller Reclining Chairs.

Send for Illustrated Catalogue.

628 NORTH SIXTH STREET, PHILADELPHIA, PA.

OMEGA SENSITIZED PAPER (CHLORO-BROMIDE EMULSION).

This paper is unexcelled for FINE RESULTS and SIMPLICITY OF OPERATION. Its KEEPING QUALITIES are unsurpassed, it being in good condition for months after manufacture. It will give the fine effects of fresh silver paper, without the necessary separate operations attending toning, fixing, etc. The different solutions are combined in one bath, making it specially desirable to the amateur, there being only two operations, toning and washing, then mounting the same as Albumen or other paper.

Any tone from a rich brown to a dark purple may be obtained, according to the time left in the toning-bath.

The print is permanent, can be burnished, also glacéd by squeegeeing on a ferrotype plate.

CAUTION.—**Buy only in original packages, with Trade Mark on wrapper.**

PRICE LIST OF OMEGA PAPER:

Size.	Dozen in Package.	Gross in Package.
3¼ x 4¼	$0 20	....
4 x 5	25	...
4 x 6	....	$2 00
3⅞ x 5½ (Cabinets, trimmed)	30	2 00
4¼ x 6½ (" untrimmed)	35	....
5 x 7	40	....
5 x 8	45	....
6½ x 8½	70	....
8 x 10	90	....
10 x 12	1 20	....
11 x 14	1 50	....
20 x 24	4 00	½ doz., 2 25

FULL AND EXPLICIT DIRECTIONS ON EACH PACKAGE.

OMEGA TONING SOLUTION, for toning and fixing Aristotype, Omega, or Albumen Prints. Gives any tone and clear prints. 10 oz. Bottles, 50 cents.

Use **OMEGA PASTE** for **OMEGA PRINTS,** and you will agree that it is "the boss sticker." It is the cleanest, sweetest paste ever made.

PRICE LIST OF OMEGA PASTE:

	Each.
Half pint Jars	$0 25
Pint Jars	45
Quart Jars	70
Pint Bottles	35
Quart Bottles	55
Gallon Bottles	2 00

For sale by THE SCOVILL & ADAMS CO.,

423 BROOME STREET, NEW YORK.

Sepia Tones

WITH

Eastman's Permanent Bromide Paper.

The following improved formula will enable users of Eastman's Bromide paper to get warm tones of any degree from dark brown to red chalk effects with certainty and ease.

The prints are to be developed with oxalate, and fixed in the usual manner and *thoroughly washed.* Then immerse (in daylight) in the following

TONING SOLUTION.

Potassium Ferricyanide, - - -	9 grains.
(*Not Ferrocyanide.*)	
Uranium Nitrate, - - - - - -	8 "
Glacial Acetic Acid, - - - -	5 drams.
Water, - - - - - -	16 ounces.

Dissolve the Ferricyanide in the water and let stand a few minutes, add the acetic acid, then the uranium nitrate; filter if any precipitate is formed.

This Toning solution will keep for about three days—it may be used to tone about twenty prints of almost any size.

If any precipitate forms during the operation, filter it off as it will discolor the print.

Tone to the desired color and wash in running water for about twenty-five minutes, or until the print is clear and free from yellow color.

The secret of success lies in washing the print free from hypo and iron before toning.

The Toning solution acts slightly as an intensifier, and the best success is attained with prints from thin negatives.

The permanency of the picture is not believed to be impaired by the above process.

We are prepared to furnish enlargements by this process at same price as for black and white.

The Eastman Company,

ROCHESTER, N. Y.

Andrew B. Dobbs, Photo. WHAT A "WATERBURY" LENS CAN DO. N. Y. Printing and Engr Co.

THE ACME SCIOPTICON.

No. 1 SCOVILL SCIOPTICON,
Complete with Double Slide Carrier,
$30.

No. 2 SCOVILL SCIOPTICON,
Complete with Double Slide Carrier
$50.

After experimenting with most of the lanterns in the market, we have come to the conclusion that for parlor or small hall exhibitions, chemical and optical experiments, etc., the SCOVILL LANTERN affords, at a moderate price, the greatest number of advantages, and from its simplicity and non-liability to get out of order, gives, even in inexperienced hands, results superior to all others.

The No. 1 SCOVILL SCIOPTICON when packed for carrying, in its own Russia iron case, measures 15 x 10 x 6 inches, and weighs 12 pounds: the case serving as a convenient stand when the lantern is in use.

The CASE and BODY of the Lantern are of Russia iron, and neat and compact in form. That part of the body which surrounds the lamp is double, the outer cover being ornamentally perforated so as to allow a constant current of air to circulate and keep down the temperature.

The lamp is of the triple wick variety, and so constructed that the three flames combine, and by the draught of a ten-inch chimney give a brilliant flame.

The CONDENSER is four inches in diameter, neatly mounted in brass, thoroughly ventilated, and arranged with screw flange so that the lenses may be separated and cleaned when required.

The CONE, which carries the objective, and the mount of that lens are nickel-plated. The objective is a double achromatic lens of one and a half inch clear aperture and five-inch focus, so that at a distance of twelve feet from the screen, it gives a brilliant picture on disc six feet in diameter. The focus is roughly obtained by sliding the front, carrying both cone and lens; and fine adjustment by a rack and pinion on the objective.

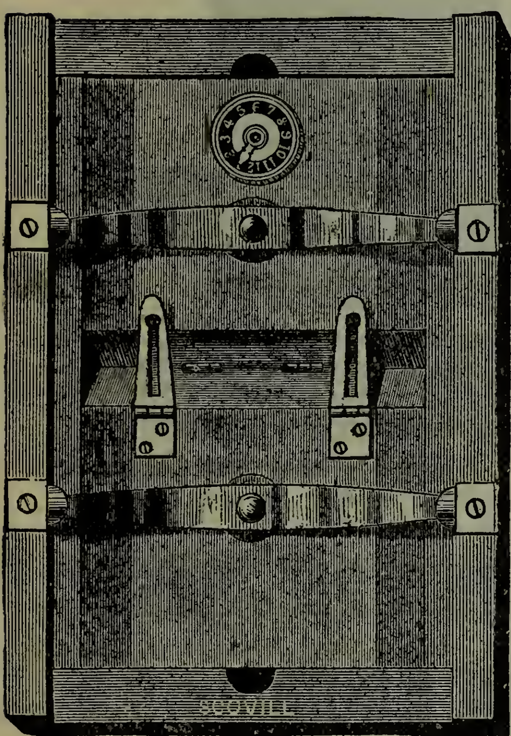
The No. 2 SCOVILL SCIOPTICON measures, when packed in case for carrying, 18½x12x8½, and weighs 19 pounds. The objective is a double achromatic lens of 1½ inches clear aperture and 5½ inches focus so that at a distance of about 12 feet from the screen it shows a brilliant picture on disc eight feet in diameter. The lamp has **five wicks and is correspondingly** more powerful than the lamp with the No. 1 SCIOPTICON.

Buy from Dealers or the Scovill & Adams Company.

IRVING PRINTING FRAMES

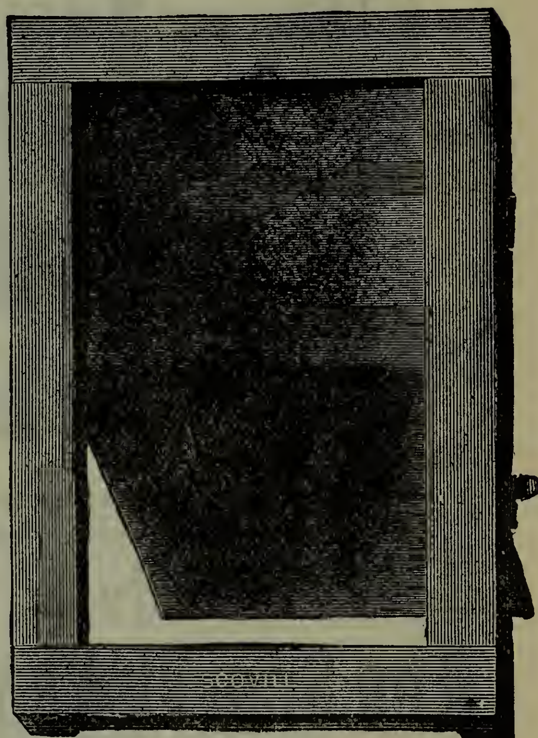
WITH ADJUSTABLE SUPPORTS.

(PATENTED.)



IRVING PRINTING FRAME, CLOSED

FRONT VIEW.



IRVING PRINTING FRAME, OPEN.

BACK VIEW.

The IRVING FRAMES have valuable features which cannot be copied. They are in workmanship, design, and other respects, superior to all other printing frames.

The continuous felt pads made especially to order for us, insure absolute protection and uniform pressure throughout. The Irving Patent Catches lock the back, so that when one flap is open there is not the slightest danger of the flaps, paper or negative slipping.

The springs are cut by dies of specially tempered and tested metal, and are riveted to the backs with washers underneath to protect the woodwork.

The IRVING FRAMES are made of cherry guaranteed not to warp or crack.

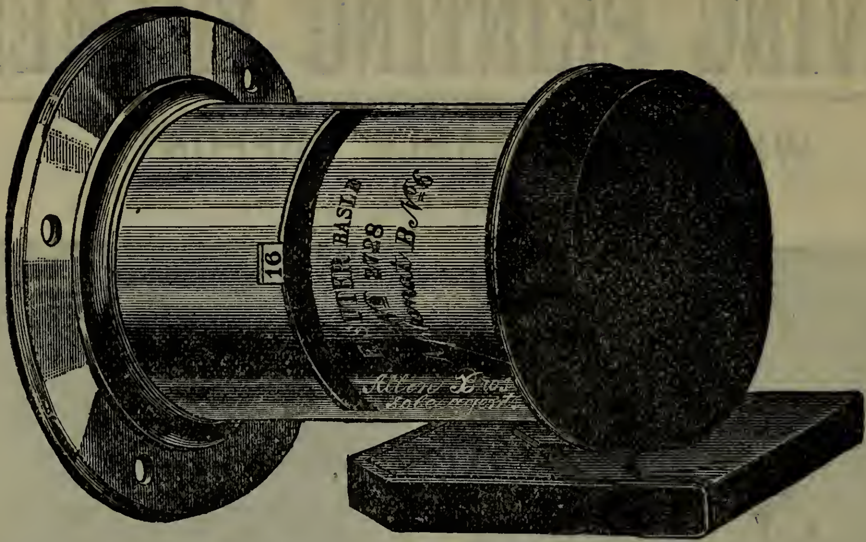
The tally does not depend upon any other part of the frame to lock it, for the pointer will remain in place no matter what is done to other parts of the frame.

Prices for Half or Two-thirds Opening Styles.

3¼ x 4¼	$ .45	5 x 7	$.60
4 x 5	.48	5 x 8	.65
4¼ x 5½	.50	6½ x 8½	.70
4¼ x 6½	.55	8 x 10	.80

When made with backs to open lengthways, ten per cent. is added to the foregoing prices, for the respective sizes.

Buy from Dealers or the Scovill & Adams Company.



SUTER LENSES.

THE BEST IN THE WORLD.

WE ARE ALSO AGENTS FOR THE EUREKA, AN EXCELLENT RECTILINEAR RAPID LENS—CHEAP, BUT GOOD.

Send for Price Lists and Testimonials.

ALLEN BROS., DETROIT, MICH.

The Scovill Wonder Equipments

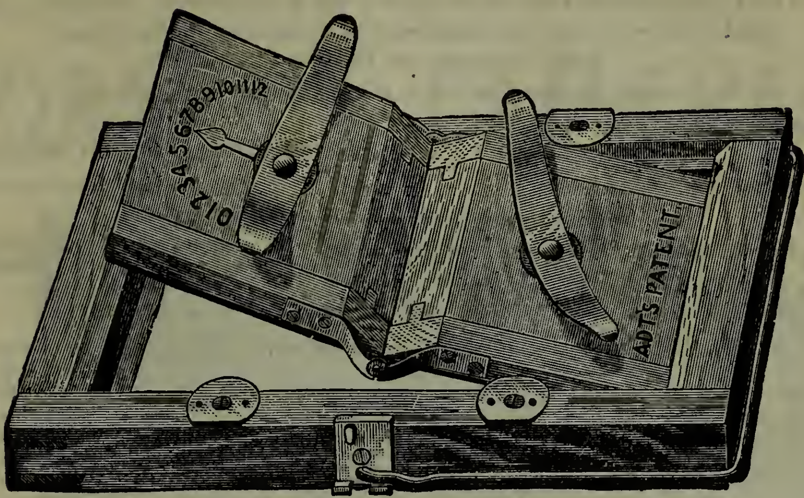
No. 1, Price $7.50, consists of

1 4 x 5 Wonder Camera,
1 Wonder Lens,
1 Folding Tripod,
1 Double Plate-Holder,
1 Package S. P. C. Ferrous Oxalate Developer,
2 Japanned Iron Trays,
1 Package Hyposulphate Soda,
1 Ruby Lantern,
1 Rubber Focus Cloth,
1 Package Carbutt's 4 x 5 Dry Plates,
1 Package Sensitized Paper,
1 4 x 5 Flat Printing Frame,
1 Jar Paste,
1 Package Mounts, round corners (Crimson),
1 Set S. P. C. Toning Solution,
1 Ounce Graduate,
1 Manual.

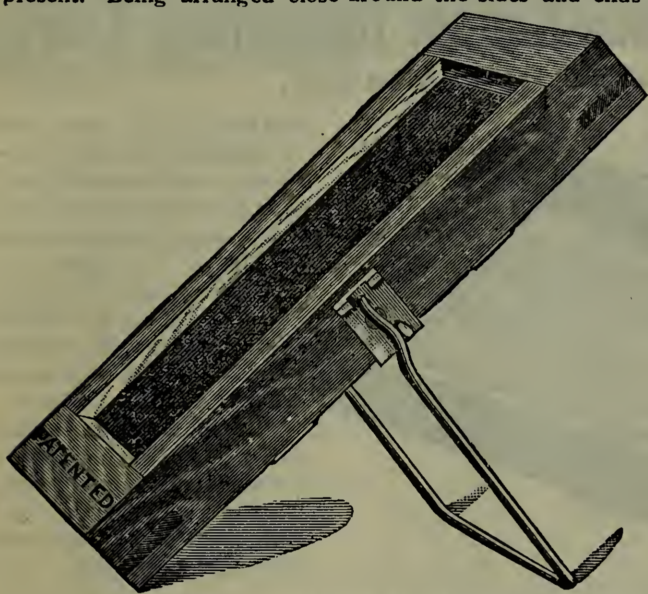
No. 2, $4\frac{1}{4} \times 6\frac{1}{2}$ size, $10.00. No. 3, 5 x 7, $12.00.

Buy from Dealers or the Scovill & Adams Co.

ADT'S PATENT PRINTING FRAMES.



These Frames are now supplied (without extra charge) with Adt's Patent Support with which the frame can be stood on either end, and at four different angles, for exposure while printing. It is out of the way of the printer when introducing the paper, or examining the print, for when the frame lies or is held with back up, the support instantly drops upon its stops for rest, and is entirely out of the way of the hand of the printer, so that he may remove or open the back-board, or replace it, as if there were no support present. Being arranged close around the sides and ends of the frame, it occupies so little space as not to interfere with the packing or storage of the frames, and when the printer places his frame for exposure the support readily finds its position for supporting the frame without any special manipulation.



PRICES.

3¼ x 4¼	$0 50
4 x 5	50
4¼ x 5½	50
4¼ x 6½	60
5 x 7	65
5 x 8	65
6½ x 8½	75
8 x 10	85
10 x 12	1 15
11 x 14	2 15
13 x 16	2 40
14 x 17	2 80

When made with back to open lengthways, an additional charge of 10 per cent. will be added to the above prices.

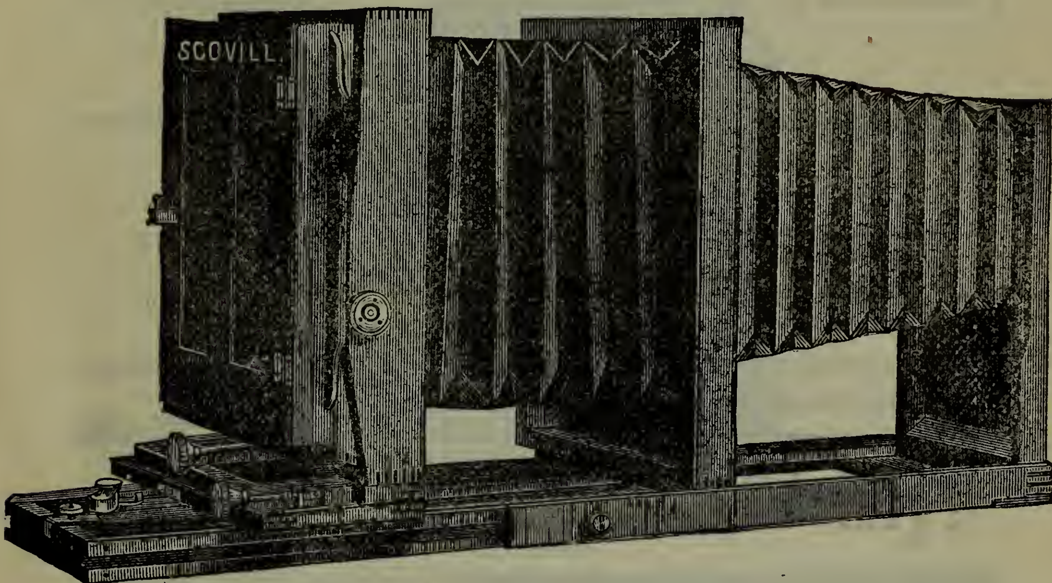
As will be seen by a glance at the cut, the adjacent edges of the parts of the back-board are beveled outward, and the hinges placed on the sides with their axes on a line with the surface. This permits the attachment to the face of the back-board of a **Heavy, Continuous Elastic Felt Pad.** This obviates the necessity of using a separate pad, which is so easily misplaced and lost.

Buy from Dealers or the Scovill & Adams Company.

American Optical Co.

UNRIVALED

PORTRAIT CAMERAS.



The American Optical Company Portrait Cameras are manufactured from the best mahogany, French polished, and have the Lever Focusing Attachment, by which the most delicate focus can be adjusted with the utmost facility and ease. Above 10 x 12 size, they have double bellows, vertical shifting front, the V-shaped wooden guide, and telescopic platform.

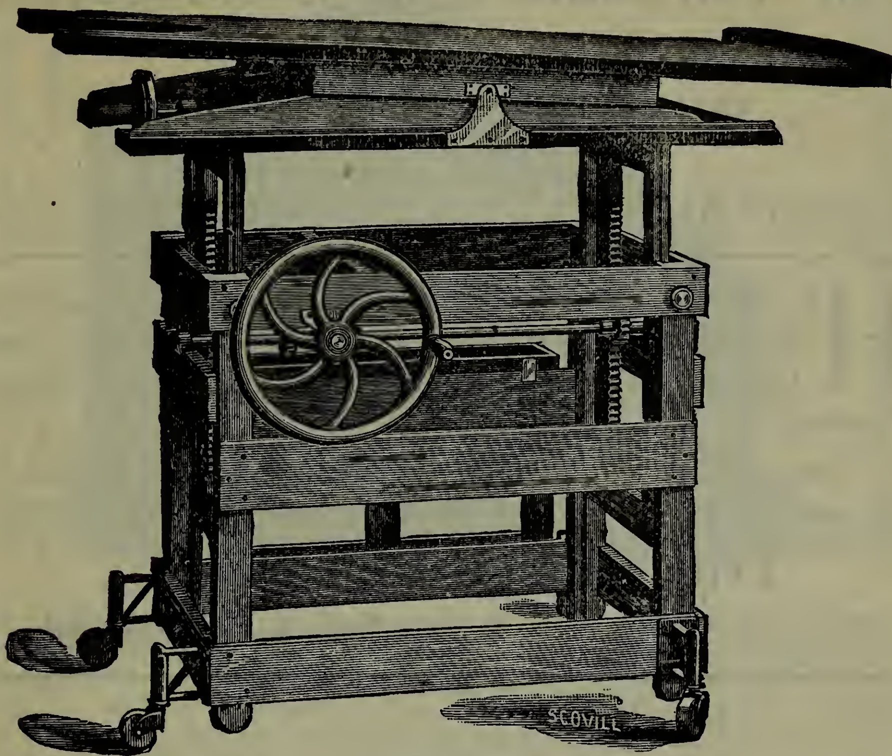
No. Size.				With Double Swing-back.
5— 8x10 ins.,	with rigid platform	30 ins. long	....	$38 00
6—10x12	" " "	36 "	....	48 00
7—11x14	" extension	48 "	double bellows and vertical shifting front,	64 00
8—12x15	" "	48 "	"	72 00
9—14x17	" "	60 "	"	76 00
10—16x20	" "	65 "	"	88 00
11—17x20	" "	65 "	"	90 00
12—18x22	" "	70 "	"	100 00
13—20x24	" "	72 "	"	110 00
14—22x27	" "	72 "	"	130 00
15—25x30	" "	80 "	"	170 00

Buy from Dealers or the Scovill & Adams Company.

THE

"ELITE" STUDIO STAND.

(PRIZE WINNER.)



Patented.

These are the only Stands suited in workmanship and finish, also in size, to the large American Optical Co.'s Cameras, with their great length of bellows and extension platform. Practical portraitists cannot fail to admire the ease with which these stands can be adjusted at any desirable height or inclination, and the noiseless manner in which they may be moved from place to place, their elegant appearance and accurate construction.

Instead of the clumsy levers and racks, by which accurate adjustment of the platform was obtained in the older stands; the proper elevation and inclination are produced in the "Elite" stand by cog-wheel and snake screw, and the manipulation at one side by a wheel with handle, and within reach of the operator, so that he may adjust the height or inclination of this camera without taking his head from under the focusing cloth. By means of the wheel worked at the rear end of the platform, the horizontal position of the platform may be inclined upward or downward to a limit of 15 degrees. A great advantage from this movement, we observe, is that a true horizontal position —so difficult to obtain in the old camera stands—is, with these, an easy matter to effect. This is especially important to those who may use them for reproduction work. In the No. 2 size the platform is fifty-two inches long and twenty-five inches wide, and its length may be increased to seventy inches by an attachment which slides out forward, making it quite long enough for supporting a large copying camera. Then a semi-circular cut-out, to the rear end of the platform, is a convenience to the operator, who is thus enabled not only to stand closely up to the ground glass, no matter how far the camera may have been pushed forward, but bending of the body is obviated, which is quite a necessity with all the older stands.

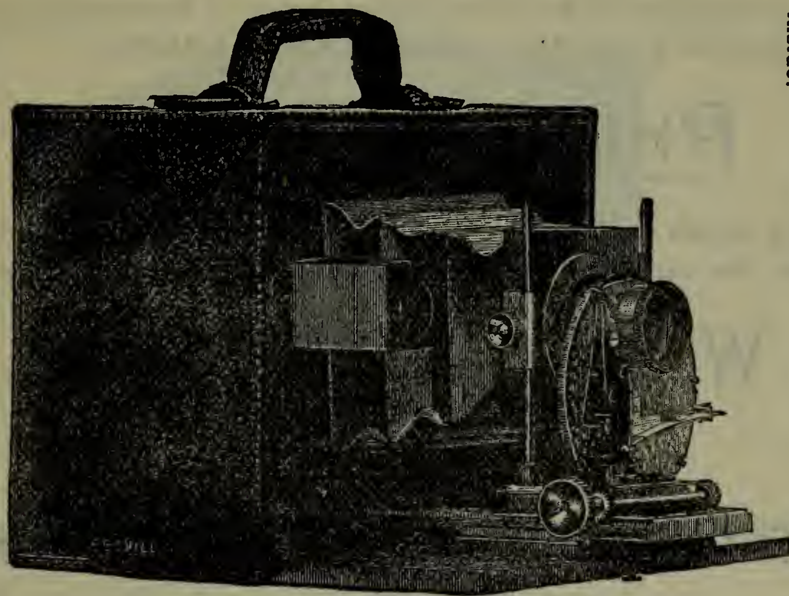
"ELITE" STUDIO STANDS

	No. 1 Size.	No. 2 Size
PRICE, with Rack and extension for Plate Holder	$32.00	$36.00
Highest point from platform to floor	48	48
Lowest " " " "	32	32
Width of platform	22	26
Length of platform without attachment	45	52
" " with "	60	70

Buy from Dealers or the Scovill & Adams Company.

THE HENRY CLAY CAMERA.

This is the only Double-Shifting and Swing-Front Hand Camera.



The case is leather-covered, and when closed there is no finder visible, or openings elsewhere, to indicate that the Camera mechanism is concealed inside.

To open the Camera, press on the knob visible on the front, thus allowing the front to slide and then swing under the bottom of the Camera. The platform or bed of the Camera is carried with this board, and, by turning the wheel, the bed is made perfectly rigid. It will at once be apparent how the front may be racked outward until the front end of it is over the lines which indicate the focus for various distances. The figure 60 on the focusing scale indicates the focus for 60 feet or beyond. The finder of the Camera is now placed on the top of the front board, and is therefore always at the same angle as the lens ; the finder is a reversible one, which may be turned when the Camera is fastened to a tripod, or is held, not with the handle upward, but with the handle on the side, in order to secure a vertical instead of a horizontal view. The front board is arranged to slide upward when taking a tall building, church spire, or any high object, and it is also arranged to swing, to still further aid in that endeavor.

By an ingenious arrangement the swing and vertical sliding adjustments may be made to work when the Camera is turned over and used horizontally.

One of the advantages of this Camera, when used in the hand, is in the taking of street scenes from an elevated position and having the lines of the building straight, while the subjects taken may be near by.

On the same principle, objects situated above the Camera level may be taken by reversing the position of lens and finder.

PRICE.

5 x 7 Henry Clay Camera complete, with Instantaneous Lens and Shutter, ...	$50 00
Ditto, with Roll-Holder and one Double Plate or Film-Holder, ...	65 00

MANUFACTURED BY THE

AMERICAN OPTICAL COMPANY.

THE SCOVILL & ADAMS CO., Proprietors.

1869. 22 Years. 1891.

During the time above-named, we have been continuously engaged, in Louisville, in supplying the wants of

PHOTOGRAPHERS

in the South and West. With a large stock, bought on best terms, we can give satisfaction when others fail to please.

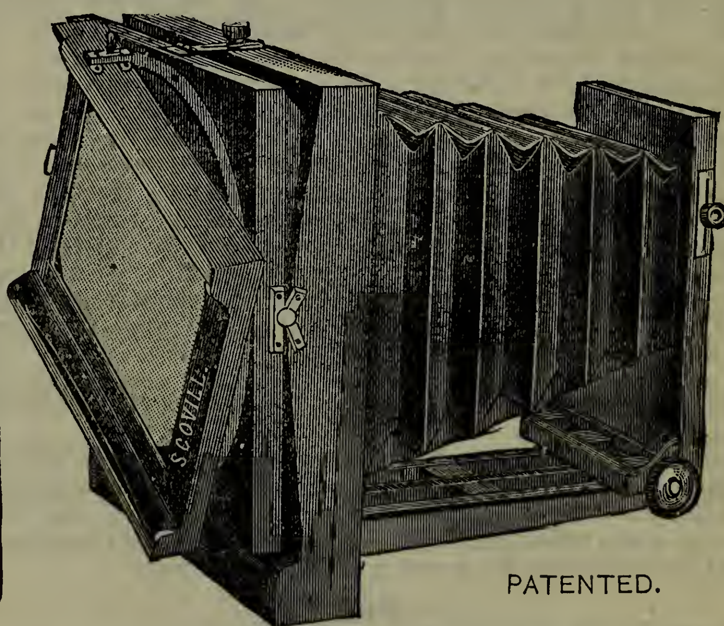
W. D. GATCHEL, Agt.,

LOUISVILLE, KY.

GATCHEL'S PHOTO. STOCK HOUSE,

BIRMINGHAM, ALA.

SCOVILL
REVOLVING BACK CAMERAS
FRONT FOCUS PATTERN.



FOR SALE BY ALL DEALERS.
SEE REDUCED PRICE-LIST
IN NEW AMERICAN OPTICAL CO. CATALOGUE.

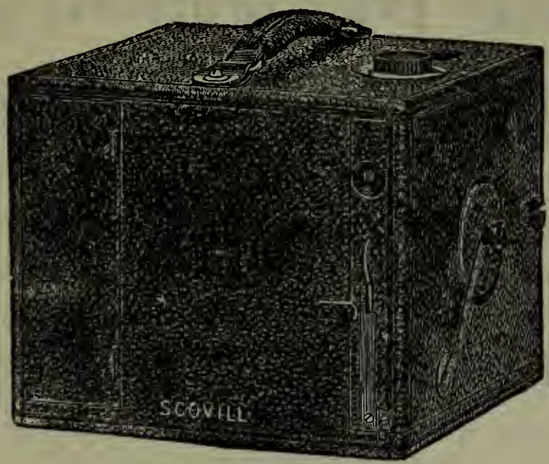
REVERSIBLE No.	For View	Sing. Sw.	Doubl. Sw.	With Reversible Back and Holder Extra
120	4 x 5 in.	$27.00	$32.00	......
121	4¼ x 5½	29.00	34.00	......
122	4¼ x 6½	31.00	36.00	......
123	5 x 7	33.00	38.00	......
124	5 x 8	35.00	40.00	......
125	6½ x 8½	40.00	45.00	......
126	8 x 10	45.00	50.00	......

With Detachable Back.

REVERSIBLE No.	For View	Sing. Sw.	Doub. Sw.	With Reversible Back and Holder Extra
127	10x12	$60.00	65.00	
128	11x14	65.00	70.00	$ 90.00
129	14x17	75.00	80.00	105.00
130	17x20	85.00	90.00	115.00
131	18x22	95.00	100.00	130.00
132	20x24	115.00	120.00	150.00

Buy from Dealers or the Scovill & Adams Co.

THE WATERBURY DETECTIVE CAMERAS.



MANUFACTURED BY THE AMERICAN OPTICAL COMPANY.

Timed and Instantaneous Photographs. This is the only Detective Camera which is as well adapted for making timed views as for photographing quickly moving objects. The negatives produced are of such sharpness that they may be enlarged to almost any size. It is

The only Detective Camera made with plate for tripod, and with ground-glass the full size of the plate, just as in an ordinary view camera. This ground-glass is where it cannot easily be broken.

The Recessed Finder shows *the same image* as is included on the ground-glass, though diminished in size. Without this accurate finder, one cannot be sure of what is taken in or left out of an instantaneous photograph.

The Focusing Scale is beside the Finder, where it may be readily seen and adjusted.

PRICE LIST.

	Leather Covered.
4 x 5 Waterbury Detective Camera, with 2 Double Holders......	$25 00
5 x 7 " " " " 2 "	40 00

BUY FROM DEALERS OR THE SCOVILL & ADAMS COMPANY.

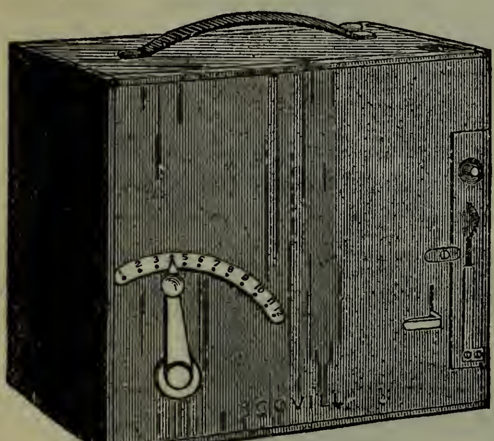
SCOVILL

MAGAZINE CAMERAS

FOR CUT FILMS.

DIRECTIONS. { *SET THE SHUTTER.* *TOUCH THE RELEASE.* *MOVE THE INDICATOR.* }

There are many amateur photographers who do not want to be encumbered with glass plates, nor do they want to use films in rolls, as in many roll holders one hundred exposures must be made before any portion of the roll can be developed, and the finished pictures conveniently made. Our



Patent applied for.

Magazine Cameras

—made for either twelve or eighteen cut films—are a happy medium between these extremes. Each film carrier has a number corresponding to a similar number on the outside of the camera. After exposing one film move the indicator along from one number to the next number to get the exposed film out of the way and the unexposed film into place.

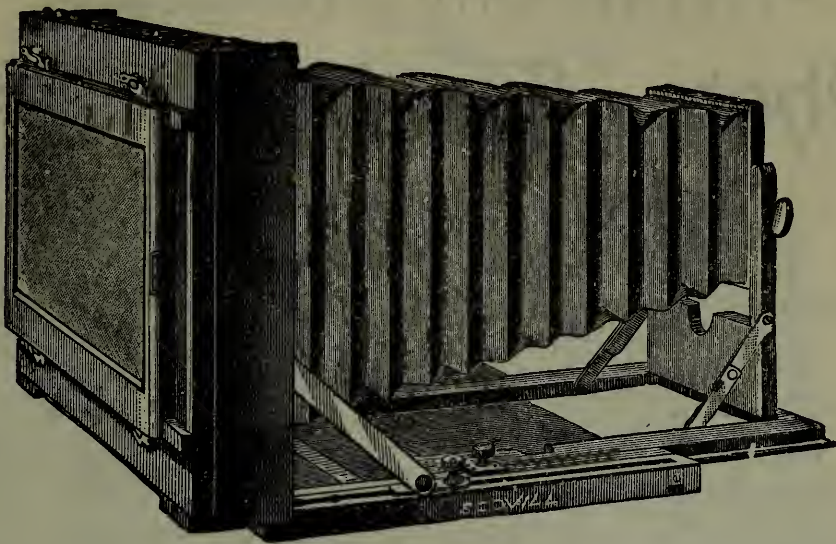
The camera is fitted with an Instantaneous Lens, which has an arrangement connected with it for changing the stops in the Lens without opening the camera. The shutter is arranged for both timed and instantaneous exposures. Attached to the leather-covered case there is a recessed finder.

	PRICE.
No. 1, for 12 4 x 5 Films, - - - -	$25 00
No. 2, for 18 4 x 5 Films, - -	25 00
No 3, for 12 4 x 5 Glass Plates, -	25 00

Buy from Dealers or the Scovill & Adams Company.

IRVING VIEW CAMERAS.

The IRVING Camera recently introduced by the American Optical Co. was awarded the highest prize by the judges at the American Institute Fair. They expressed themselves as unable to see how a more complete, compact, light, handsome and serviceable camera could be made.



The Irving Cameras all have swing front in addition to swing back, vertical shifting front board. They have the Howe patent reversible back, fitted with self-locking ground-glass frame, and when desired, celluloid is used in place of glass for the focusing screen.

One of the best features of the camera is the absence of detachable screws. An idea of this is conveyed by the illustrations showing the camera when extended and when folded.

A superb canvas case, the finest ever made, is supplied with each one of the Irving Cameras. Price list is as follows:

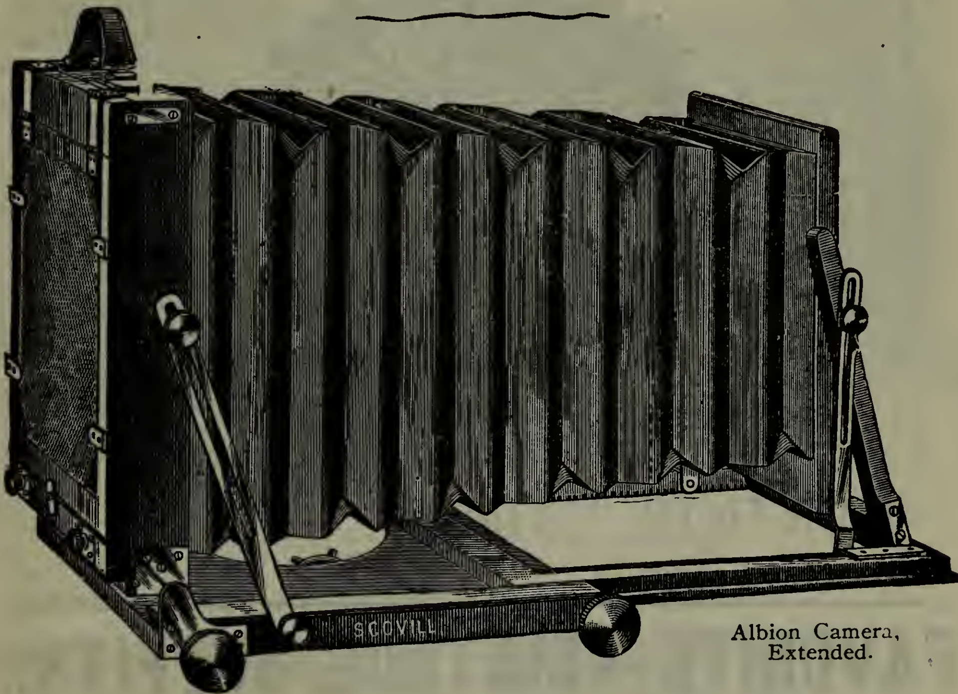
	Single Swing.	Double Swing.		Single Swing.	Double Swing.
4 x 5	$27.00	$32.00	10 x 12	60.00	$65.00
5 x 7	33.00	38.00	11 x 14	65.00	70.00
5 x 8	35.00	40.00	14 x 17	75.00	80.00
6½ x 8½	40.00	45.00	17 x 20	85.00	90.00
8 x 10	45.00	50.00	18 x 22	95.00	100.00

In order to convey an idea of the lightness of these cameras, it is sufficient to say that the 5 x 8 size camera weighs only 3 lbs.

Buy from Dealers or the Scovill & Adams Company.

THE

Albion Cameras.



Albion Camera,
Extended.

Showing Turn-table for Tripod.

PRICE LIST

OF

Albion Cameras.

Each with Albion Tripod and Extra Fine Canvas Carrying Case.

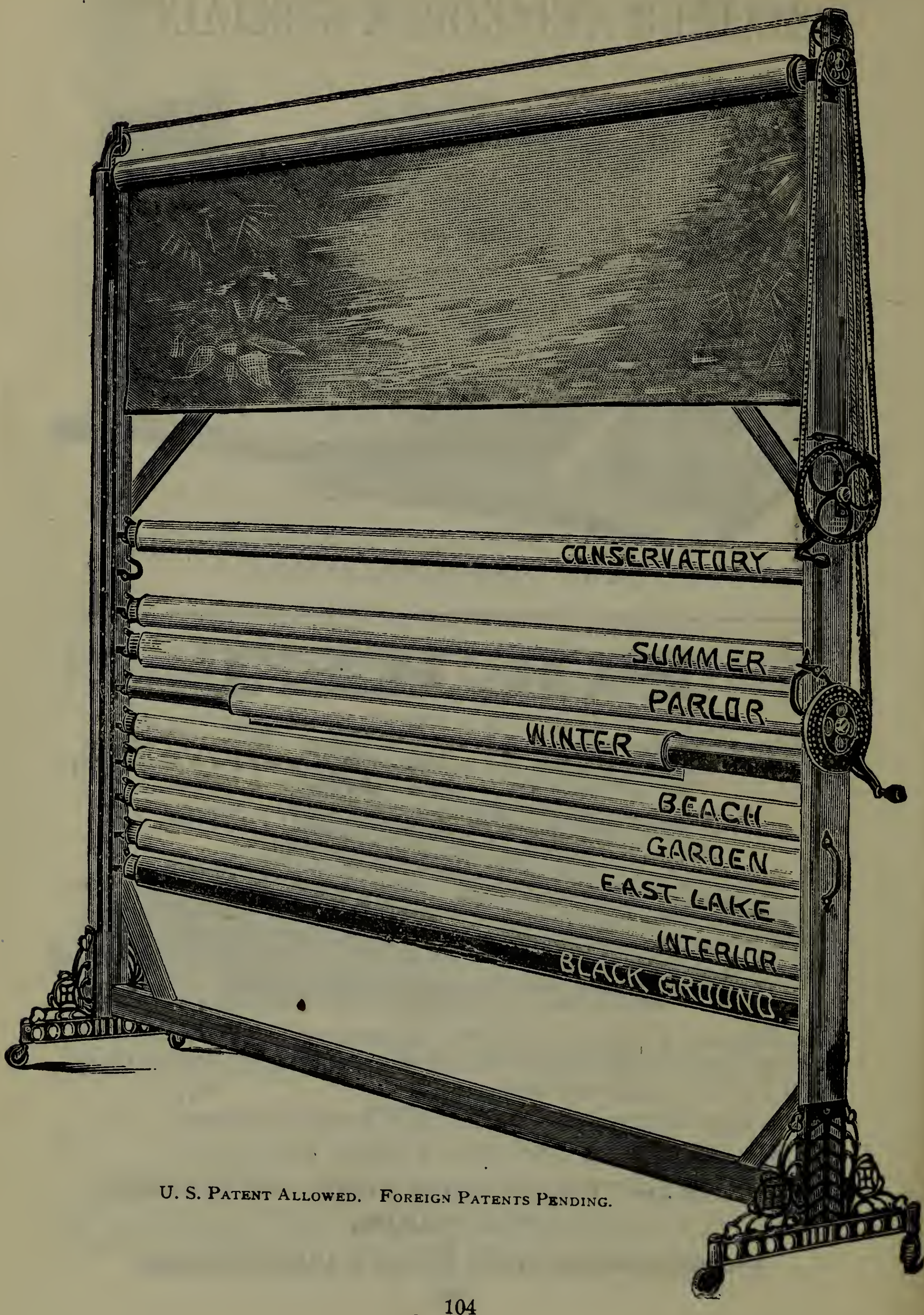
No.	Size.	Price.
550.	$4\frac{3}{4} \times 6\frac{1}{2}$	$47 00
551.	5×7	48 00
552.	5×8	49 00
553.	$6\frac{1}{2} \times 8\frac{1}{2}$	50 00
552.	8×10	60 00

MANUFACTURED BY

THE SCOVILL & ADAMS CO.

Send for Descriptive Circular.

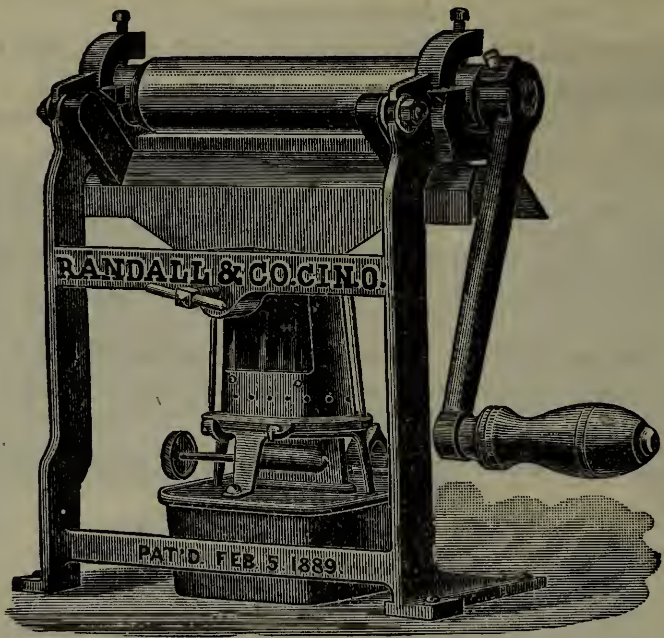
CASWELL'S BACKGROUND HOLDER.



U. S. Patent Allowed. Foreign Patents Pending.

RANDALL PHOTO. BURNISHER.

NICKEL-PLATED ROLL. **STEEL BURNISHING BAR.**

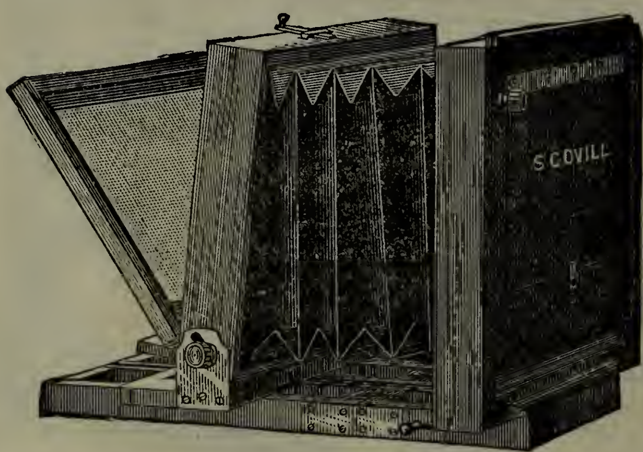


$12.00	**$15.00**
10½ in.	15½ in.

RANDALL & CO.,

520 West Sixth Street, **CINCINNATI, OHIO.**

WATERBURY OUTFITS.



THE WATERBURY CAMERAS are made of mahogany, are well polished, have rubber bellows, folding platform, *patent latch* for making bed rigid instantaneously, single swing, vertical shifting front, and are as light and compact as substantial Cameras can be constructed.

4 x 5 Waterbury Outfits, Complete **$12.00**

Consisting of single swing Camera, with new style holder, with registering slides (double dry), wood carrying case, Taylor tripod, and No. A Waterbury lens with revolving diaphragm.

4¼ x 5½	**Waterbury Outfits, Complete**	**14.00**
4¼ x 6½	" " "	**15.00**
5 x 7	" " "	**16.00**
5 x 8	" " "	**16.50**
6½ x 8½	" " "	**21.00**

Buy from Dealers or the Scovill & Adams Company.

HOWARD · ALBUMS.

This cut illustrates a single card with picture mounted, ready for binding into the album.

A collection of 25 or 50 cards are bound together in an album by a strong binding cord suitably attached to the handsome covers.

This method of making an album affords the amateur the best means of preserving the results of his labor, because each picture may be finished before putting the card in the album. The arrangement of the pictures may also be altered at will—if a single card is spoiled the whole album is not ruined. If a picture is taken out, it can be quickly and readily done without injury to the volume.

PRICE OF HOWARD ALBUMS.

Full Cloth, Embossed, Gold Label, with A. M. Collins Manufacturing Co.'s No. 1 Cards.

			With 25 Collins Cards.
No. 1 — 6x 7	Cards, for 4 x 5	Photographs	$1 25
" 2 — 7x10	" " 5 x 8	"	1 50
" 2½— 8x10	" " 6½x 8½	"	2 00
" 3 —10x12	" " 6½x 8½	"	2 25
" 4 —11x14	" " 8 x10	"	2 50

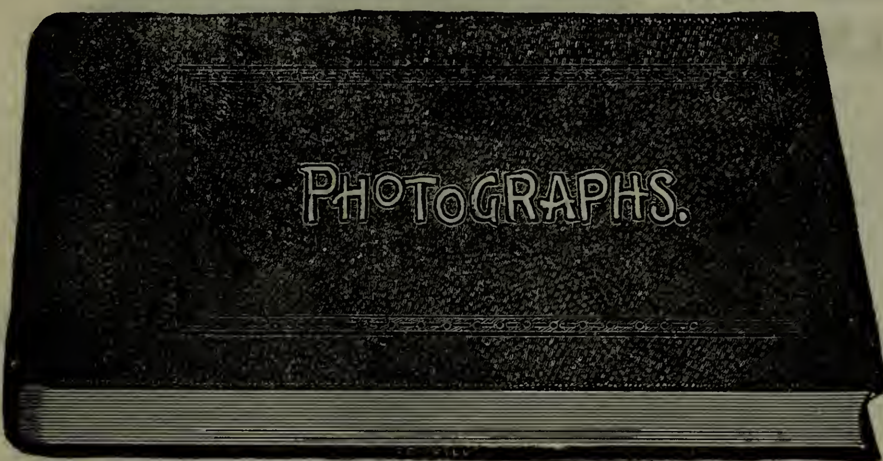
Morocco, Half Leather, Extra Gold Finish, with A. M. Collins Manufacturing Co.'s Cards. Boxed.

			With 25 Collins Cards.	With 50 Collins Cards.
No. 5— 7x10	Cards, for 5 x 8	Photographs	$2 00	No. 11—$3 50
" 6— 8x10	" " 6½x 8½	"	2 50	" 12— 4 00
" 7—10x12	" " 6½x 8½	"	3 00	" 13 - 4 75
" 8—11x14	" " 8 x10	"	3 50	" 14— 5 50
" 9—14x17	" " 10x12 or 11x14		5 50	" 15— 9 00
" 10—16x20	" " 11x14 or 14x17		7 75	" 16—11 00

HOWARD ALBUMS

With Interchangeable Cards for Photographs.

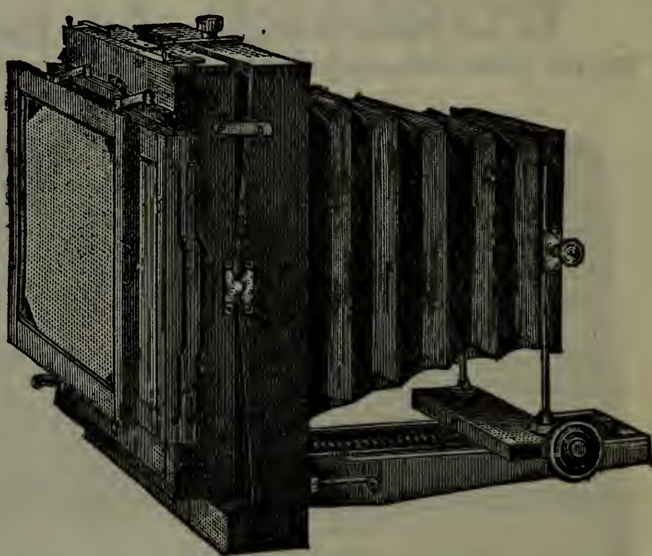
(Patented and Label Registered.)



The Howard Album, with interchangeable cards, is the latest novelty in the way of an album for mounting photographs. In handsomely embossed covers are bound 25 of Collins' cards, which are chemically pure from all matter that would injure the photographs. In the mode of binding, and their interchangeable feature, lies the difference between this and other Albums.

Each card is mounted independently with a metallic bearing surface at the outer edge, protecting the holes through which the binding cord passes from tearing out.

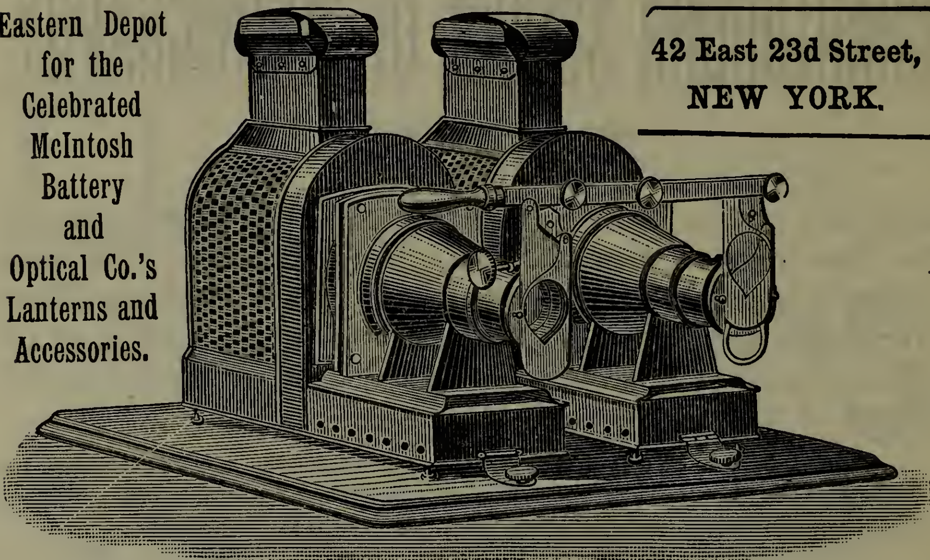
Order from Dealers or the Scovill & Adams Company.



OELSCHLAEGER BROS.

(ESTABLISHED 1869),

Eastern Depot for the Celebrated McIntosh Battery and Optical Co.'s Lanterns and Accessories.



42 East 23d Street,
NEW YORK.

IMPORTERS AND MANUFACTURERS OF

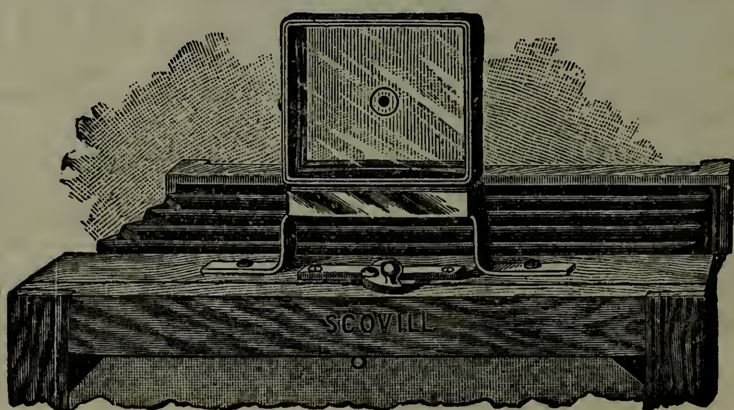
STEREOPTICONS AND FINE MAGIC-LANTERNS, LANTERN-SLIDES AND ACCESSORIES.

Photographic Lenses, Condensing Lenses and Objectives a Specialty.

SCOVILL MAGIC FINDERS,

(PATENTED.)

Unequaled for Landscape Photography.



One sees through them a marvelously clear *non-reversed* image *the exact proportion* of the reversed one on the ground-glass. The Magic Finders are light, ornamental, easily adjusted and detached, and pronounced a great convenience by view takers.

PRICE LIST.

No. 1, for 4x5 Camera........	$1 50	No. 3, for 6½x 8½ Camera...	$2 25
" 2. " 5x8 "	1 75	" 4, " 8 x 10 " ...	2 75

Buy from Dealers or the Scovill & Adams Co.

Remember

Reifschneider's superb Photo. Album, the "Eclipse," Reifschneider's "Non-Cockle," can always be found at

SCOVILL & ADAMS COMPANY,
423 Broome Street, N. Y.

A full line of
Howard Albums
can always be found at
SCOVILL & ADAMS COMPANY,
423 Broome Street, N. Y.
The cheapest line of Albums made. If not
convenient to call and examine them,
send for Catalogue. Nearly all
Photo. Stock Dealers keep
them in stock, or
ought to.

Heinrich Riffarth, Photo. and Engr.

HERR NESPER AS "WALLENSTEIN."

A Record.

The first year this annual was issued—

	1887	1888	1889	1890
Number of Copies guaranteed,	3,000	5,000	8,000	10,000
Actually published, . . .	6,150	7,600	8,110	15,150

This edition is over 16,000, and we hope the demand will be for a 20,000 edition.

Read a list of the authors and compare with other Annuals.

Contributions for 1893 Annual solicited.

Your attention is called to the Tables, P. O. Dept. information, which were compiled for this Annual, and are original.

HOWLAND & CHADWICK,

PHOTOGRAPHIC STOCK HOUSE.

KODAK HEADQUARTERS. DARK-ROOM FREE.

211 SOUTH MAIN ST., LOS ANGELES,
OPP. THE CATHEDRAL. CAL.

E. LONG & SON, SOLAR PRINTERS,

QUINCY, ILL.

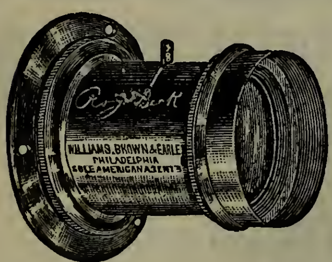
MAKE GOOD, HONEST, DURABLE, SOLAR PRINTS.

Send for Price List.

LONG'S CRAYON INSTRUCTOR,

Third Edition, Enlarged and Illustrated. Price, $1.00.

For sale by E. LONG & SON, QUINCY, ILL., and Stock Dealers generally.



THE BECK LENS

IS THE BEST.

WILLIAMS, BROWN & EARLE,

Sole American Agents.

33, 35 & 39 S. Tenth, Cor. Chestnut, PHILADELPHIA, PA.

PHOTOGRAPHIC SUPPLIES OF EVERY DESCRIPTION A SPECIALTY.

SEND FOR PRICED CIRCULAR.

PROMPT! PERFECT! PERMANENT!

SOLAR AND ELECTRIC ENLARGEMENTS

IN PLATINUM,

FOR ARTISTS AND THE TRADE.

For Price List, address

S. A. THOMAS, 717 Sixth Ave., New York.

JUST THINK OF IT!

AJAX

4 x 5	Rapid Rectilinear Lens	$9 60
5 x 8	Rapid Rectilinear Lens	11 20
6½ x 8½	Rapid Rectilinear Lens	16 00
8 x10	Rapid Rectilinear Lens	19 20

Send for Price List and descriptive circular.

BUCHANAN, BROMLEY & CO., Importers,

1226 Arch Street, Philadelphia.

THE LARGEST PHOTO. SUPPLY HOUSE AND PICTURE-FRAME FACTORY IN WESTERN PENNSYLVANIA.

A COMPLETE LINE OF

PHOTOGRAPHIC · GOODS, · PICTURE · FRAMES · AND · MOULDINGS

OF ALL KINDS CONSTANTLY ON HAND.

BEST GOODS AND LOWEST PRICES. YOUR PATRONAGE SOLICITED AND SATISFACTION GUARANTEED.

BROUDE MANUFACTURING COMPANY,

OFFICE AND WAREROOMS,

242, 244, 246 and 248 Fifth Avenue, 21, 25 and 27 Watson Street,

Telephone 1356. **PITTSBURGH, PA.**

THE MORRISON

WIDE-ANGLE VIEW LENSES.

These Lenses are absolutely rectilinear; they are the most rapid, and are universally conceded to be the BEST WIDE-ANGLE LENSES MADE.

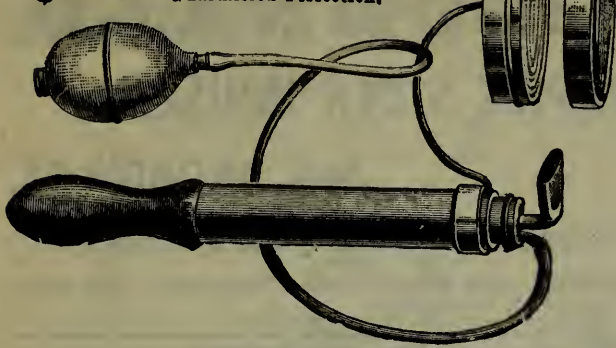
No.	Diameter of Lens.	Size of Plate.	Equivalent Focus.	Price.	
0	1 inch	3¼ x 2¼ inch		$20 00	
3	1 "	4¼ x 4¼ "		25 00	
4	1 "	5 x 8 "	5¼ inch, each,	25 00	These 3 sizes will fit into 1 flange.
5	1 "	6½ x 8 "	6½ " "	25 00	
6	1 "	8 x 10 "	8 " "	30 00	
7	1¼ "	11 x 14 "	10½ " "	40 00	These 2 sizes will fit into 1 flange.
8	1¼ "	14 x 17 "	14 " "	50 00	
9	1½ "	17 x 20 "	17 " "	60 00	These 3 sizes will fit into 1 flange.
10	1½ "	20 x 24 "	22 " "	80 00	
11	1½ "	25 x 30 "	28 " "	100 00	

☞ Nos. 1 to 6 are all made in matched pairs for stereoscopic work. The shorter focused Lenses are especially adapted for street and other views in confined situations. For general purposes, a pair of No. 5 Lenses will be found most useful.

THE SCOVILL & ADAMS CO., AGENTS.

LITTLE GIANT REPEATING FLASH LAMP.

$2.50. Guaranteed Perfection.



OVER 10,000 of our various Lamps sold in this country and Europe. The Standard ($3.50 and $4.50) and the Triple Standard ($5.00 and $7.50), give either continuous or intermitting light of great brilliancy. Our Lamps, which are non explosive, and the most perfect ones on the market, are for sale by all dealers in Photo. Supplies. Examine before purchasing any other.

Physicians' Supply Mfg. Co.,
140 Nassau St., NEW YORK.

BROOKLYN CAMERA CO.

1197 & 1199 Bedford Ave., Brooklyn, N. Y.,

MANUFACTURERS FOR THE TRADE OF

"Miniature Camera" and Outfit,	"Nassau Camera" and Outfit,	"Brooklyn Camera" and Outfit,
—$1.50.—	—$3.50.—	—$5.00.—

Agents for Chautauqua Plates and Apollo Sensitized Paper.

Dealers in Photographers' Supplies, Sporting Goods, Novelties, Etc.

The ∴ Scovill ∴ Magnesium ∴ Compound

IS ENTIRELY FREE FROM POISONOUS INGREDIENTS.

In order to demonstrate this, quantities have been eaten at various times. It has often been pounded in a mortar to show that it does not explode.

The results obtained by using our Magnesium Compound have never been surpassed.

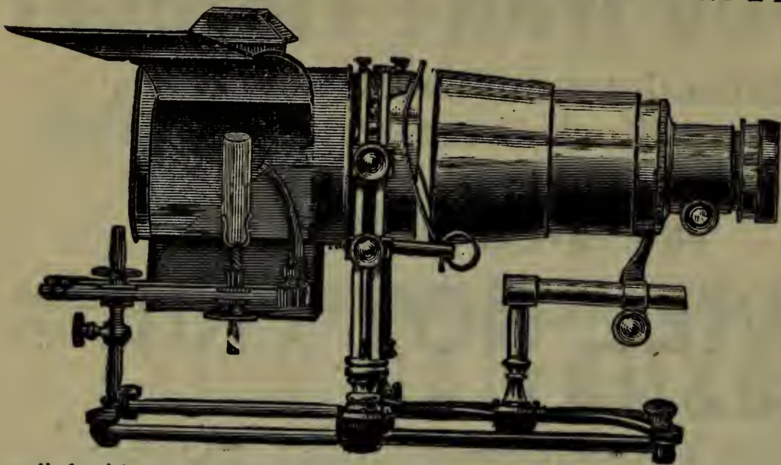
PRICE OF SCOVILL MAGNESIUM COMPOUND.

In ounce bottles, with fuses	$ 50
In quarter pound cans, with fuses	1 40
In half " " " "	2 65
In one " " " "	5 00
In five " " " "	20 00

PRICE OF SCOVILL MAGNESIUM CARTRIDGES.

	Per. Pkg.	Per Gro.
No, 1, Small Size, in packages of six	$0 25	$6 00
No. 2, Medium, " "	40	9 00
No. 2½, in packages of six	60	13 00
No. 3, " "	75	17 00

PARABOLON OPTICAL LANTERNS.



A NEW LIGHT

NEW LANTERNS

NEW SLIDES

AND

ACCESSORIES

Supplied with our **Parabolon Oil Lamp No. 15**, the most convenient Lamp to use with any Lantern, and the **Most Perfect** and **Satisfactory Oil Lamp made.**

Of THIS LAMP the editor of *The Beacon*, in No. 29, of Vol. III, says: "We employ it constantly in testing slides, and for private or home exhibitions, and the more frequently we use it the better we like it."

We also make several other styles of Lanterns singly, and in pairs, for use with **Oil and Lime Light.** Also **Oxy-Hydrogen Jets and Improved Lantern Accessories.**

Special facilities for the production of **High-Grade Apparatus and Lantern Slides.**

Catalogues Free.

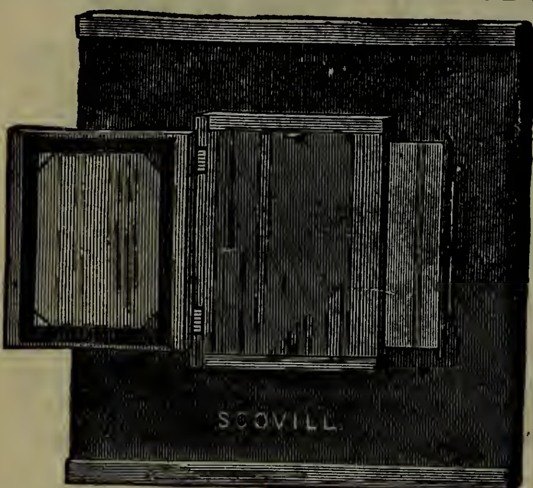
J. B. COLT & CO.,

16 Beekman Street, NEW YORK. **53 Calumet Building, CHICAGO, ILL.**

LOUIS L. DAVIS, Manager Chicago Office.

THE AMERICAN OPTICAL CO.

CABINET PLATE HOLDER ATTACHMENT



Consists of a board the same size of the plate-holder of the camera. It is put in place the same as holders. upon pegs, with spring catch at top In center of board is an opening with hinged ground-glass to receive the holder selected, 4¼x6½, 5x7, or 5x8. Can be fitted to any 8x10 or larger portrait camera by sending exact size of plate-holder. When wishing to use larger plates can be instantly removed. By the aid of this attachment and twelve single light-weight holders you always have a supply of plate-holders loaded and ready for use, save the expense of large extra holders and many a trip to the dark-room, and you are sure of always getting your subject in the proper position on the plate.

For 8 x 10	Am. Optical Co. Best Portrait Camera with one single Light-Weight Holder, price,	$8 00
" 10 x 12	" " " " " " " "	9 00
" 11 x 14	" " " " " " " "	10 00
" 12 x 15	" " " " " " " "	11 00
" 14 x 17	" " " " " " " "	11 00
" 15 x 18	" " " " " " " "	12 00
" 17 x 20	" " " " " " " "	13 00
" 18 x 22	" " " " " " " "	13 00
" 20 x 24	" " " " " " " "	14 00

CABINETS, CORRECT SIZE, TRIMMED, $2.00 PER GROSS.

The unprecedented reputation and sale which our paper has at the present time, taking the place of Albumen and other papers of much longer standing, has demonstrated the fact to all that

OMEGA SENSITIZED PAPER Ω TRADE MARK **IS HERE TO STAY.**

Give it a thorough trial. You will find that

IT SAVES

TIME Prints and tones quickly in combined bath.

LABOR Requires no Silvering, Fuming, previous Washing or Trimming.

TROUBLE Has no Blisters, Measles, Curling, Fading, Cracking, and will not stretch either way.

See page 75 *for prices.*

GIVES RESULTS

That are a surprise to all Photographers. Great detail and high finish.

GIVES PICTURES

That bring better prices than Albumen, at the same time costing no more.

KEEPS IN GOOD CONDITION FOR SIX MONTHS.

Thoroughly practicable for Landscape, Portrait and Gallery work.

TRY IT. For sale by all Dealers.

BRADFISCH & HOPKINS, Manufacturers,

16-24 Division St., BROOKLYN, N. Y.