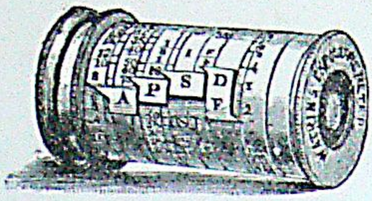
EXPOSURE NOTES

FOR USE WITH THE

WATKINS EXPOSURE METER



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COMPARATIVE TRIALS OF EXPOSURE TABLES AND METERS.

Extracted from a detailed report to the Edinburgh Photographic Society, by Mr. F. Dundas Todd.

"In carrying out a series of experiments to determine the comparative merits of the various exposure tables and meters that compete for public favour, I believe I break new ground; for, so far as I can learn, no one has preceded me."

"Once the collection was complete, each received very careful examination to familiarise me with the method used to find the duration of exposure in any particular case. Then, in the way of preliminary trial, a few plates were exposed under various conditions, the necessary calculations from the tables and meters being made at the time."

"The experience acquired in the preliminary trials led me to the conclusion that **Watkins' Meter** was a *perfectly reliable* guide, and when I settled down to actual comparison, I almost invariably gave the exposure as indicated by this instrument. The results justified this course, as in every instance I got good negatives. Practically, therefore, the whole matter resolved itself into this—How near did the others approach this standard of excellence?"

After commenting adversely on all other Exposure Meters and Tables, the writer thus concludes:—"I found **Watkins' Meter** the *simplest to use, always correct, and the only one capable of giving indications in all situations, and under all conditions.*

EXPOSURE NOTES.

COMPRISING FULL INSTRUCTIONS

FOR THE USE OF THE

WATKINS EXPOSURE METER

WITH

Ruled pages for noting down Exposures and other information on the subject.

PRICE EIGHTEENPENCE.

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"The instrument, when first seen and handled, seems complex; but with a few instructions it is marvellous how easy the use of it becomes."

THE PHOTOGRAPHER.

The Meter is of little use without a knowledge of the simple system which it carries out; to gain this, read the Elements before proceeding to the Instructions.

THE ELEMENTS OF
Photographic Exposure,

BY

ALFRED WATKINS.

THE subject is a complex one, and no instrument or system can convert the question of "how long to expose" into a simple problem.

Five factors (conditions or influences) affect the duration of a photographic camera exposure ; they are :—

Light, Plate, Subject, Diaphragm, Distance.

Each one of these factors is liable to considerable variation, quite independently of the other factors ; these variations being sometimes within and sometimes outside the control of the photographer. In most cases (not always in the case of distance) any change in one of the factors requires a corresponding change in the exposure.

For instance, let a small object—say a terra-cotta bust—be placed at the end of a long board, and the camera at the other end, and several exposures made without alteration in the plate, subject (the bust), diaphragm, or distance, but let the first exposure be in sunlight, the second with the whole carried into the shade, the third in a room near the window, the fourth in a room at some distance from a window. Experience teaches that the exposures must increase in exact proportion as the power of the light under these different circumstances decrease. In this case the factor of *light* would vary, but the other factors would remain unaltered.

But let a white plaster bust be substituted for the terra-cotta one, and experience teaches that $\frac{1}{4}$th part of the exposure will be sufficient ; in this case the factor of *subject* would vary.

Again, let four different exposures be given with four different diaphragms (other conditions remaining unaltered) these marked by the optician as F/8, F/11.3, F/16, F/22.6. Experience (and mathematical fact) teaches that the second exposure must be double the first, the third exposure double the second, and the fourth exposure double the third. This would be a variation in the factor of *diaphragm*.

In the same way the use of different brands of plates will necessitate exposures in exact proportion to the sensitiveness.

It will now be seen how the different factors (or conditions) act *entirely independently* of each other, and therefore the only correct method of considering an exposure is to treat each factor as an independent influence.

Let us more closely define and examine these factors.

A.—The actinic power and volume of light falling upon the worst lighted part of the subject in which detail is required.

Light varies in chemical or actinic power (and this is the quality which concerns a photographer, not merely its brightness to the eye) with every hour of the day and every month of the year, in addition to this the atmospheric conditions—east wind, recent rain, &c.,—alter its value. Then the *volume* of light reaching the subject varies very much, perhaps a large part of it is cut off by overhanging trees or adjacent buildings ; or the subject is in a room and and only a small proportion of the out-door light reaches it by means of the window,

based upon the idea that "an exposure should be in exact proportion to the amount of actinic light reflected from the subject, or its most non-actinic part." This presumption is an entire fallacy; it would be correct if the object of an exposure were to get an equal deposit or density in the negative for each class of subject, but it need hardly be pointed out that the object of photography is to show correctly the *difference* in the lightness or darkness of objects.

My system makes a standard of average coloured objects, such as the average in a street view or landscape or portrait; this is valued at 100, and objects or groups of objects, which experience teaches require different exposures, are valued in proportion, darker up to 300, and lighter down to 25.

In landscape, the distant objects (say over 100 yards or so) are best treated with less than the average exposure (see explanation under F.), but in nine cases out of ten this shorter exposures can not be given, as the view generally contains a foreground which has to be the key-note for exposure.

It is in the estimation of *subject* value that the artistic skill of the photographer comes in; light, plate, and diaphragm can be treated mechanically, the subject can not.

The subject values of negatives to be used for enlarging, reducing, and printing, come under entirely separate rules: they are in proportion to the time they take to print on ordinary sensitive paper.

D.—The size of diaphragm or stop.

A lens may be regarded as a window through which light may be admitted to the sensitive plate; the larger the opening of the window (*i.e.* the

diaphragm) the more light admitted, and the shorter the exposure required. Now, a small window, which would sufficiently light up the walls of a room 10 feet square, would be insufficient to equally light a 20 feet room. It is therefore obvious that a mere statement of the size of a diaphragm is not sufficient for photographic purposes, unless the focus of the lens (the same thing as the length of the room in my comparison) is stated.

The general method of giving this informatiou is to state what fraction of the lens focus the stop is, thus a half inch stop would be marked F/16 if used with an 8 inch lens, while if used with a 5 inch lens it would have a different value and be marked F/10.

If the figures in these fractions are squared, they express the proportionate exposures to be given, and the squared figures, divided by 16, are the U.S. (uniform systems) numbers of the Photographic Society of Great Britain. The standard diaphragms most in use are: F/4, F/5.6, F/8, F/11.3, F/16, F/22.6, F/32, F/45, F/64, and each one of this series requires double the exposure of the previous one.

Unfortunately all makers do not adopt this system, but mark their stops according to their own ideas. It is therefore often necessary for a photographer to mark the value or ratio on each stop for himself. This is easily done without any calculation. Find the equivalent focus of the lens by focussing it on some distant object (chimney or tree), and measuring the distance from the stop (if a double lens) or the back combination (if a single lens) to the focussing screen. Suppose this distance to be 10 inches. Draw a line 10 inches long on a sheet of paper; now take the diameter of one of the stops with the points of a pair of compasses,

and see by "stepping" the legs, how many times it will go into the line you have drawn. Thus, if the stop is 1 inch in diameter, it will of course "step" ten times in the 10 inch line, and the diaphragm must be marked F/10.

A useful diagram and table for marking stops with their U.S. numbers is given in the "British Almanac" for 1888, and elsewhere.

It should be mentioned that in stating the diaphragm used with a lens its rapidity is stated, if a "rapid" and a "landscape" lens are both worked with F/16 for instance, they are worked at the same rapidity.

F.—The distance of subject from lens.

This is a point much misunderstood even by experienced photographers.

It may be taken as a general rule that, except when photographing near objects (less than 24 times the focus of the lens distant), or on the other hand extreme distance in landscape, no variation need be made for differences in distance.

When a very near object is photographed, the camera has to be racked out, and the exposure increases in proportion to the square of the increased focus of the lens. When the subject is more than 24 times the focus of the lens distant (18 feet for a 9 inch lens) this variation is too minute to be taken into account, and if the air were perfectly clear—as it is sometimes among the Swiss peaks—all objects beyond that distance would require the same exposure. In England, however, the slight fog or mist almost always present in the air, adds reflected light to objects more than one or two hundred yards distant, and thus decreases the exposure, (it is impossible to

express this by rule, as it depends entirely upon the *amount* of mist in the air); this shorter exposure can not often be taken advantage of, as pointed out previously.

I have not provided in ordinary instruments a separate scale for this (F.) factor, but have given a table showing how the exposure should be increased when photographing near objects, and when copying, enlarging, or lantern-slide making.

Having now summed up the separate influences which these factors have upon the exposure, there is, I think, no need to dwell upon the older method of estimating the exposure.

The newer plan, adopted in my Exposure Meter, is to do away with all need for experienced judgment in estimating the light, and to ascertain its actual value by means of a bromide of silver actinometer; to assign a value to the other three factors; and then by means of a mechanical calculator, which does away with the need of reference to tables to calculate the required exposure. The exact method of doing this is fully dealt with in the instructions for the instrument.

INSTRUCTIONS.

PART I.—ORDINARY PHOTOGRAPHY.

Four conditions or factors have to be taken into consideration, and a number or value assigned to each factor, they are :—

P.—The sensitiveness of the plate.
S.—The colour or character of the subject.
D.—The diaphragm or stop used.
A.—The actinic force of light falling on the subject.

(A fifth factor **F.**, the increased focus of lens, comes into use in copying, enlarging, &c., but this need not be considered in ordinary work.)

Clear your mind of all other systems of plate or sensitometers numbers, light values, and subject numbers.

The instrument consists of a simple actinometer for testing the light, a chain pendulum for counting seconds or half-seconds (for timing both the actinometer and camera exposure), and four movable calculating rings carrying pointers P., S., D., and A., which, when adjusted to the numbers representing the value of each factor, cause a fifth pointer E. to indicate the correct exposure.

INSTRUCTIONS FOR USE.

Means of ascertaining exact value of factors P., S., and D. will be found later on.

First to test the value of A. :—Unfasten the lid of pendulum box, and allow it to swing, then hold the actinometer to face the light *which falls upon the subject* (not to face the subject), pull out a fresh surface of sensitive paper under the aperture, and at the same instant count "naught;" continue counting "one, two," &c., in time with the swing of the pendulum (counting at one end of swing only for seconds). The number of seconds taken for the paper to darken to the standard tint is the actinometer or A. number. In testing the light the *depth* of tint is the important point. The paper darkens rapidly in light ; up to a certain point it is *lighter* than the standard tint, after this point it is *darker!* The point when it is neither lighter nor darker is that to be timed.

Now to calculate the exposure :—

Put cap on pendulum box, and turn all the movable rings round to left against their stops. Hold the instrument horizontally in the fingers of the right hand with the thumb on pointer P. Turn the double milled head of the pendulum end with the left hand until the pointer P. indicates the plate number. Move the thumb of right hand back to pointer S., and again turn the instrument until S. indicates the correct subject number; do the same in succession with pointers D. (for diaphragm number) and A. (for actinometer number), taking care that the rings already adjusted are not moved, and the pointer E. will then indicate the correct exposure in seconds or fraction of a second. The outside edge of the pointers (*upper* edge of P., S., D., and A., and *lower* edge of E.,) should be set to the division line. It is not well for the fingers of the left hand to touch the rings.

If the exposure is less than a second, E. will point to a number which is a decimal fraction of a second, thus 250 is ·250 or 250/1000 or ¼ second, but when E., on its second round, passes 900, the figures represent seconds. The pointers must be moved in the order indicated.

In the case of a bad light where the actinometer takes more than a minute to discolour (say three minutes), set A. to the number of *minutes* (3), and read E. as *minutes* instead of seconds.

CAUTION.—The P. Nos. given are all calculated for fully-exposed negatives, suitable for platinum printing. Workers who prefer thin negatives may think them over-exposed, and can use P. Nos. one-half greater than or double those given.

In instantaneous work especially, a higher plate number would be used, as a minimum of exposure is usually given.

To test P. number for any plate accurately :—

First fix upon the number you expect will be nearest right (judging from the tables), and then expose two trial plates, one for a *larger* P. number and the other for a *smaller* than you expect to be right. Thus for Ilford Ordinary you would expect them to be P15, but would expose one plate as one-half more P22, and the other plate as half this latter number P11. The subject to test upon should be of average colour, such as a basket, pile of books, stone-work, &c., and at a distance not nearer than 12ft. for a 6in. lens, or 18ft. for a 9in. lens. The light must of course be tested according to instructions, the subject number used S100 and the exposure estimated with the instrument.

Mark each plate with lead pencil on face, with the P. number used, and then develop both together in one dish the usual time with the developer accustomed to. If the one plate is under-exposed and the other over-exposed, the medium plate number will be about right, if not, it is easy to see which of the trial negatives is nearest right, and the P. number fixed once for all.

If at any time you get over-exposure, and feel sure you have rightly estimated both A. and S., increase your P. number, if under-exposure, decrease your P. number.

S.

This varies according to the *colour* of the subject, or its capacity for reflecting light, without considering in the slightest degree what light is falling upon it, for instance a piece of dark carved oak would be S300, whether it be in full sunshine or in a dark interior. S100 is the standard number used in four cases out of five, and the others may be considered as variations to suit special subjects.

Sky	S 10
Snow Scenes or Sea Views ..	
White objects in which detail is required or copying black and white (see special table for distances).	S 25
Extreme distance in landscape.	
Light objects and panoramic or open landscape	S 50
Average landscape with foreground, buildings, portraits, and everything of average colour	S100
Dark, yellowish, or reddish objects	S200
Very dark or non-actinic objects in which detail is required	S300

D.

There are two scales on the instrument, the right hand being the focal values of diaphragms in common use, the left hand being the corresponding U. S. numbers of the Photographic Society of Great Britain.

Dallmeyer has made several changes in his stops, but in all lenses marked 43,000 and upwards, F/10 is the standard (this being No. 10 on his scale). These values of F/10, F/14, F/20, &c. (each being double the exposure of the previous one) are practically identical with the U. S. numbers 6, 12, 24, &c., on the instrument.

PART II.—CLASSIFYING NEGATIVES.

A subject number may be assigned to negatives in proportion to their printing density by means of the instrument.

Put the negatives to print with albuminized paper in the shade, and note the time. Print the usual depth to give good prints when toned. While printing test the light which falls upon the frames two or three times, and note the average. Note the number of minutes each negative takes to print.

Set P at 20 (paper number for albuminized paper. Scholzig's was used for trial), move all the other pointers on until E. indicates the number of *minutes* the negative took to print, move D. back until A is pointing to the average actinometer number (seconds) just observed, S. remaining close against D., which is not used, will then point to the correct subject number for the negative, with which number it should be ticketed, and which may be used for calculating all kinds of enlarging, reducing, and contact printing exposures. A batch of negatives tested will serve as guides to ticket others. The classification of cloud negatives will save much waste of prints; the trial print in this case must, of course, be printed faintly.

PART III.—COPYING, DAYLIGHT ENLARGING, AND LANTERN-SLIDE MAKING.

Another factor comes into effect and increases the exposure when the camera has to be racked out for the above purposes; the usual subject number is used to calculate with, and the calculated exposure is then multiplied by the number given in the F. tables.

A.

The actinometer must be held facing the light, exactly in the place of the negative, which must be removed for the time. A piece of ground glass or oiled tissue paper in front of the negative (and of the actinometer) is almost necessary to get even illumination from a sky.

When enlarging by artificial light it is quite useless to test the light, as the use of a condenser upsets the calculations. It may be found convenient, having once found out the correct exposure with a certain negative, distance, and stop, to use the slide rules of the instrument for calculating variations from this test. The special instrument with F. scale is best for this purpose.

S.

The subject number for copying black and white prints or plans is 25, for albuminized prints 50, for coloured pictures 100 or higher.

Subject numbers for negatives are ascertained as in Part II.

F. COPYING.

The exposure, as calculated by the instrument, is correct when subject (or negative) is over 24 times the focus of lens from the lens, but when subject is

18	times	focus	from	lens	multiply it by $1\frac{1}{8}$
10	"	"	"	"	$1\frac{1}{4}$
$5\frac{1}{2}$	"	"	"	"	$1\frac{3}{8}$
$4\frac{1}{5}$	"	"	"	"	$1\frac{3}{4}$
$3\frac{1}{2}$	"	"	"	"	2
3	"	"	"	"	$2\frac{1}{4}$
$2\frac{3}{4}$	"	"	"	"	$2\frac{1}{2}$
$2\frac{1}{2}$	"	"	"	"	3
$2\frac{1}{8}$	"	"	"	"	$3\frac{1}{2}$
2	"	"	"	"	4

(Copying equal size.)

TABLE FOR ENLARGING.

The exposure, as calculated by the instrument, is taken as a basis, but when enlarging

1½ diam.	{ with screen	2½	times focus from lens, multiply it by	6
2	,,	,,	3	,,	9
2½	,,	,,	3½	,,	12
3	,,	,,	4	,,	16
4	,,	,,	5	,,	25
5	,,	,,	6	,,	36
6	,,	,,	7	,,	49
8	,,	,,	9	,,	81
10	,,	,,	11	,,	121
15	,,	,,	16	,,	256
20	,,	,,	21	,,	400
25	,,	,,	26	,,	676

It will be noticed that the unit of measurement is the equivalent focus of the lens used, and that it is the *larger* conjugate focus which is measured, that is for *copying* (up to equal size) measure from lens to object (or negative), while for *enlarging*, measure from lens to screen. A stick cut exact length of focus of lens is a convenient measuring rule. In photographing small near objects the table should be consulted, and even when taking a bust in portrait work, the distance then being 15 times focus.

(When using the special instrument with F. pointer, the engraved scale takes the place of the above tables; the figures from 18 to 2 are "distance of subject from lens," and from 2 upwards "distance of screen from lens;" the pointer F. is kept close against its stop when the instrument is used for ordinary photography.)

PART IV.—CONTACT PRINTING BY DAYLIGHT.

Test the light which falls upon the frames; set P. to the paper number as given below, S. to the subject number of the negative, D. (which is not used) against S., and A. to the actinometer value of the light (seconds); the pointer E. will then indicate the correct number of *minutes* to print, provided the light does not vary much; if it does, an allowance should be made. The special value of the method is for printing skies in platinum, &c.

Albuminized paper (Scholzig) P20. Platinotype (hot bath) P35 for dense negatives, or P20 for cloud negatives. Carbon P40 to P70 (according to time kept *before* and *after* printing). One trial will give the P. number for any other process.

This application of the instrument is new and but little tested, its weak point is that the A. number when tested may not represent the light during the whole of the exposure.

PLATE NUMBERS.

	P.		P.
Wratten's Ordinary	5	Ilford Ordinary ..	15
,, Drop Shutter	40	,, Rapid ..	25
,, Instantaneous	33	,, Spec. Rapid	45 80
Fry's Ordinary ..	5	Britannia Ordinary	15
,, 60 times ..	40	,, Rapid ..	25
,, Kingston Spec.	16	Thomas' S. Landsc.	8
,, German ..	5	,, Cyclist ..	55
Edwards' Landscape	15	,, Ex. Rapid	40
,, Spec. Portrait	50	Paget XXX ..	35
,, Instantaneous	27	,, XXXXX ..	60
,, Isoch. Medium	22	Rouch Slow ..	3
,, ,, Slow ..	5	,, Ex. Rapid	15
,, ,, Instant.	50	Barnet Ordinary..	15
Mawson's	65	,, Rapid ..	20
,, Castle ..	20	Star Ordinary ..	30

AMERICAN PLATES.

	P.		P.
Carbutt B.	5	Harvard	30
,, Eclipse ..	40	Newcomb & Owen	40 55
Cramer B.	15	,, ,,	30 24
,, 60	60	,, ,, slow	—
Stanley	80	Carbutt Special ..	26
New Eagle	45	,, Special Ortho and Stripping	23
Seed 23	25		
,, 23X	45	,, B20	12
,, 26	30	Chautauqua	20
Allen & Rowell Slow	5	Peerless	45
Eastman transparent film (marked 28W)			40

FOREIGN PLATES.

	P.		P.
Monckhoven ..	15	Lumiere Rapid ..	50
Kiefell	20	Schippang ..	25
Sachs	20	Werth	40
Westendorp ..	50	Angerer	55
Schleusner	50	Weisbrod ..	60
Obernatter	60	Matter	60
,, Eosine ..	50	Nys	15
Beernaert	40		

LANTERN PLATES. P. NUMBERS.

Fry	13	Mawson	3
Thomas	2	Edwards' Spec. ..	4
Ilford Spec. ..	6		
Eastman	6	Carbutt A. ..	18

BROMIDE PAPERS.

Eastman	6	Ilford Slow ..	3
Fry's Argentotype ..	8	,, Rapid ..	30
Morgan & Kidd ..	15	Dr. Just	4
Anthony Rapid ..	50	Anthony Slow ..	50
Eastman's Transfero.	6	Mawson	6

APPENDIX.

The lid of the actinometer box should not be taken off except to put in a fresh roll of paper, which should be done in a faint light. The sensitive surface of the roll is *outside*, and the protecting covering of brown paper should be stripped off with the point of a penknife.

When the roll of paper is almost exhausted, a double pencil line appears as warning that only about ten exposures remain.

(Rolls of paper may be had, post free, 7d.)

"The instrument, when first seen and handled, seems complex; but with a few instructions it is marvellous how easy the use of it becomes."

THE PHOTOGRAPHER.

1893

DATE.	No.		SUBJECT.	MAKERS' PLATE.	P	S	D	A	E	LENS.	DEVELOPMENT AND REMARKS.
April 30th			Miss Moore	Ilford	15	100	12	20	4½	Lancaster	failure
30/4	-	-	G. M. V. M. B. S.	Ilford	15	100	12	20	4½	"	failure
30/4	-	-	Miss V. Moore	Ilford	15	100	12	20	4½	"	failure
May 4th	1	24	Miss V. Moore	Ilford	45	100	18	10	2	"	fairly good
4th	-	-	Miss V. Moore	Ilford	45	100	18	10	2	"	moved failure
4th	1	17	V. M. & B. S.	Ilford	15	100	18	10	3½	"	very good
4th	1	33	Miss B. Stoake	Ilford	15	100	18	10	3½	"	very fair
22nd	1	23	Canal between Llangollen & Berwyn	Ilford	15	100	20	30	9	"	fair
22nd	1	18	Horse ~~shoe~~ falls at "	Ilford	45	100	20	20	3½	"	very good
22nd	1	24	River Dee by Llangollen	Ilford	15	100	20	35	8	"	raining {not good
22nd	1	25	River Dee by Llangollen	Ilford	15	100	20	30	7	"	{not good
22nd	1	29	Old Maid's House Plas Newydd	Ilford	15	100	30	35	10	"	fairly good

REMINDER LIST

Articles not absolutely necessary are in brackets.

A DAY'S OUTING.

Camera
Loaded Dark Slides
Tripod Head with screw on
Lenses with caps tied on
Diaphragms
Focussing Cloth
Tripod Stand
[Adapters]
[Colour Screen]
[Focussing Glass]
[View Meter]
[Spirit Level]
[Pocket Compass]
[Map, Ordnance by preference
[Rapid Shutter]
Exposure Meter (see there is enough paper)
Pencil and Note Book
[Changing Bag]

PHOTOGRAPHIC TOUR.

Write ten days beforehand for the plates you want (those you are thoroughly accustomed to) and glance at this list to see if you want anything else. Test plates before starting to vertify P. number.

Apparatus as in "A Day's Outing," also:—

——Doz. Plates
Folding Red Lamp
Ends of Candle
Empty Plate Box or Boxes
Rubber Bands for ditto
Several Sheets of Orange Paper
Pure Paper, cut to size for Repacking Plates
Piece of Golden Fabric
Pins
String
Small Gummed Labels for Numbering Exposed Plates
Extra roll of Paper for Meter
(If abroad, warning labels as in Adams's Annual)

JOTTINGS.

Note down particulars of each exposure immediately it is made.

Use pendulum of Meter for counting exposures; half-seconds are counted at *each end* of swing: for 2½ seconds count 5 half-seconds. Always begin counting with "naught" the instant of pulling off the cap.

Don't use the Meter as a guide merely, but trust to its estimate entirely; you will soon find it is not a mere mechanical guide, but enables you to exercise your artistic judgment and to use your previous experience in the selection of the S. number.

"Matching the tint" is a great bugbear to some very colour sensitive people. Remember that the exact *colour* is no more the test of the sun's action than it is in the deposit in a negative. A comparatively rough match of degree of *darkness* is all that is wanted.

A pink colour in the exposed paper indicates excess of damp, and makes it unreliable; *damp* paper will be all right again if dried.

Carry your Meter in your pocket, or when not in use keep in a warm, dry room: the slight warmth will keep the paper in condition even in damp weather.

Paper kept "bone dry" by means of calcium chloride (as platinum paper is kept) is comparatively insensitive until it has absorbed a little moisture from the air.

The sensitive paper darkens to the standard tint in two seconds' exposure to mid-day sunshine in June. The exact equivalent to this has been found in two grains magnesium ribbon burned in a coil at 4¾ inches from the paper. The paper and tint are kept to a uniform standard by this test, and as an improved make of paper (less sensitive to damp) is now issued, a new standard tint is enclosed with each roll.

Common sense must be used in testing "the light which falls upon the subject." A man was seen close against and facing the wall of a house he was about to photograph, his head and body completely overshadowing the actinometer with which he was testing the light; he would inevitably get an incorrect result.

Have as few *loose* things in your kit as possible: camera screw tied or fastened to tripod head, caps fastened by short chain or string to lenses, case of diaphragms cemented to cap (but iris diaphragms are far better). Straps for packing tripod legs screwed to one of the legs.

Focussing cloth large, with loops and buttons on three edges. A circular spirit level on top of swing-back is cheap and invaluable.

The slide rules of the instrument may be used for many photographic calculations.

The Meter is useful to test what proportion of actinic light a yellow glass screen (orthochromatic work), or ground glass, or tissue paper, &c., transmits. To do this, test the light under the sky, then test the same light with the screen in question covering the actinometer.

The bright surface of leaves in Spring reflect more light than the dull sad Autumn foliage; a smaller S. number is therefore required for Spring landscape.

In photographing figure subjects, or animal groups; test the light, fix upon stop, and calculate the exposure first of all, even before you put your camera in position. You can then give your undivided attention to the artistic part; if the light changes a little, make an allowance accordingly.

While the Meter will calculate the exact fraction of a second for a so-called instantaneous exposure under given circumstances, the mechanical means of providing this exact exposure is of course outside its sphere.

A photographer in the near future will not be content with an adjustable rapid shutter, unless it has the various fractions of a second to which it can be set, *accurately* indicated.

The rapid shutter of the future will be a part of the camera front, so that various lenses can be fitted to its opening by bayonet joints or other means.

It often happens that the method advocated for interiors indicates a smaller stop than it is convenient to use. For instance with P40 and S100: F/45 is the stop to be used to make the camera and actinometer exposures equal. Now it would probably be more convenient and take exactly half the time to use F/32 inst~ad. This can be done and a proper exposure secured by allowing the sensitive paper in the actinometer to darken only to a "half tint" before capping the lens.

What this half tint is, may be judged by a test under the open sky. Supposing the actinometer takes six seconds to read the standard tint: expose it afresh to the same light for three seconds, and keep this "half tint" thus formed in your mind's eye for *future use*.

When suitable clouds are present in a landscape there is no difficulty in securing them on the same plate, by shading in front of the lens with a piece of brown paper torn roughly to the shape of the sky line. To do this, a simple fitting was contrived by the writer some years ago. A brass hoop ¼-wide is made to fit and slip inside the hood of lens, a saw cut (exactly like a diaphragm slot) is made in the centre of the hoop, and half way through it. The view is focussed with a small stop, a piece of brown paper inserted in the slot and torn and adjusted until it exactly shades the sky (as seen on the focussing screen). The lens cap is then put on the front part of the hoop, the shutter drawn, and nine-tenths of the exposure given, the paper is snatched away, the remaining tenth (about half a second) given, and the cap put on. The plan is useful in other ways for giving longer exposure to part of the subject.

It sometimes happens in photographing interiors with wide angle lenses, that the diaphragm indicated by the instrument is *larger* than it is desirable to use, in this case fall back upon the usual method for out-door work, only test the light (in minutes) after the exposure has commenced, E. will also be given in minutes. Any desirable stop may be used.

Separate pages will be found indicated in the Contents, in which to record your experience of suitable S. and P. numbers, and for formulæ and sundry information which you may wish to copy from various sources.

Expose your plates for your developer; do not develop according to exposure.—*A. Levy.*

No developing formula will correct wrong exposure to the extent that we would like it to do, and it is this desire which causes so many requests for formulæ, in the vain hope that one will be given which will make up for all errors in exposure.—*D. Andersen-Berry.*

That tentative, feel-your-way, restrainer-ready-to-dash-on system, called Rational Development, was only the outcome of inexact exposures.

Ferrous Oxalate will probably work well with exact exposures; it is a splendid developer, but did not accommodate itself to the "rational" system, and so fell out of use.

The inferiority of nearly all the cheap plates, as regards their capacity for giving a dense well graduated image, was very noticeable in testing a large number of brands for their P. number. The developers advised by the makers are very cleverly adapted to make the most of these thin, weak films, but a liberally coated plate is well worth the small extra cost to the out-door photographer. Most of the drawbacks of thin plates are obviated by "backing" them.

The valuable researches of Messrs. Hurter and Driffield (although not yet sufficiently confirmed) tend to show that to get a perfect negative—one whose graduations are exactly similar (inversely) to the subject—there is but one correct exposure under given circumstances, and this exposure is the same whatever developer is used.

The writer's experience is that a variation up to 50 per cent. more, or down to 25 per cent. less than this exposure may be given without noticeable difference in results. The errors made by average beginners are in exposing three or four times too much or too little.

The *length of exposure* determines the scale of graduation in a negative.

The *length of development* determines the density, and experience teaches that for each printing process there is a particular standard of density in a negative, which gives best results with that process.

With a correctly exposed negative any error in under, or over development may be corrected by intensifying or reducing, as the correct scale of graduations is already there. The Wellington silver intensifier (British Almanac, 1890) is most valuable.

The Howard Farmer reducer (a weak solution of hypo, made pale sherry colour with a little solution of potasic ferridcyanide) is the best way of treating an ever-dense negative.

In pyro development the 10 per cent. solution system is by far the most convenient method (see under formula), for the worker knows how many grains to the ounce of each constituent he uses each time he makes up his developer. Any maker's formula may be followed with the 10 per cent. sytem by referring to the table in the Almanacs compiled by Messrs. Clarke and Ferrero.

"Photography with a purpose" should be the aim of every worker; not too much "pretty, pretty." Here are some suggestions for *systematic* work :—

Studies of Trees.
Varieties of local Apples.
,, ,, Pears.
Birds' Eggs of a district.
Wings of Insects.
Feathers of Birds.
Or in Archi ecture—
The decorated Doorways of a district.
,, ,, Chimneys ,,
,, ,, Windows ,,
Norman Remains ,,
Roman ,, ,,

The writer systematically surveyed and photographed all the ancient Pigeon Houses (fast vanishing) of his county; the Royal Archæological Institute hearing of it, induced him to read a paper on the subject at their annual meeting.

When looking at a view or building to see how it will photograph, shut the eylids very nearly and glance through the lashes. The shadows and lights will fall into a di^erent relation (more correct photographically), and many a view apparently interesting to the eye will be seen to be stale, flat, and unprofitable.

The sun must never shine on the lens during exposure, or it will instantly cause fog; nevertheless effective pictures are often taken with the sun in front, the direct rays being shut off by a sky shade or other means.

Probably landscape photographers get much undesirable fog in their negatives by not having an ample projecting hood to the lens, which will cut off all sky-light not included in the picture.

A dealer's shelf is often in a damp position, and a newly purchased meter is not unlikely to contain paper out of condition. The remedy is to carry it in the pocket for a few hours.

The statement made in the instructions that the instrument is not directly applicable to enlarging by artificial light must not be misunderstood. The difficulty is solely on account of the use of condensers. The actinometer estimates the value of artificial light quite as correctly as it does daylight. Photographs of pictures, or of groups of flowers, &c., can be very conveniently made with an illumination of two paraffin lamps (one on each side of the lens, but shaded from it), and the meter will correctly estimate the exposure.

It is not claimed for the instrument that it supercedes and makes unnecessary experience and judgment. It is really an accurate method of recording and utilizing such experience; with the advantage that beginners can share the benefits of other's experience. It does not calculate an exposure *ab initio*, but calculates *variations from one test exposure*. The result of this test exposure is indicated in the P. number.

In photographing a stained-glass window it should be regarded as a transparency, and the light which falls upon it *outside the building* tested. The S. No. would be about 50.

This note book, and the instrument which it explains, have one aim—the production of a technically perfect negative. Frankly it must be stated, that the imaginative power, the insight, the patience and artistic skill, which lead to the selection and worthy rendering of a worthy subject are still more important.

Gift 2.5.81

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Hereford.
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