INSTRUCTIONS. *7th Edition.* **Price 10 cts.**

THE WATKINS
Bee Exposure Meter
(AND QUEEN BEE).

Available for All Outdoor and Indoor Camera Exposures.

The SPEED LIST is on a separate card. It is corrected and printed at frequent intervals. The latest edition can always be had for 1½d.

The WATKINS MANUAL (1/-) gives the fullest particulars of systematic exposure and development, and should be read in connection with these instructions.

Sole Agents for United States and Mexico—

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BEE METER—INSTRUCTIONS.

The instrument indicates the correct camera exposures to give under all conditions, the basis being an actual test of the light by the sensitive paper in the meter, this one test taking the place of the elaborate classification of time of day, year, position of subject, and state of weather in other calculators.

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

PLATE—The sensitiveness of the plate.
STOP—The diaphragm or stop used.
LIGHT—The actinic force of the light falling on the subject.

Scales will be seen on the Meter for these three values, and a fourth scale, EXP., indicates the exposure.

In some exceptional subjects, another factor, the colour or character of the subject, has to be taken into consideration, and these exceptions are considered under the heading " Special Subjects."

The instrument is arranged to give correct indications of all subjects of *average colour*, such as landscapes, foliage, trees, buildings, portraits, groups, ordinary rooms, Church and other interiors, groups of flowers, etc.

The basis of calculation in the Watkins'

system is a test of the light which is actually illuminating the shadiest part of the subject to be photographed, and the first thing to do therefore, is

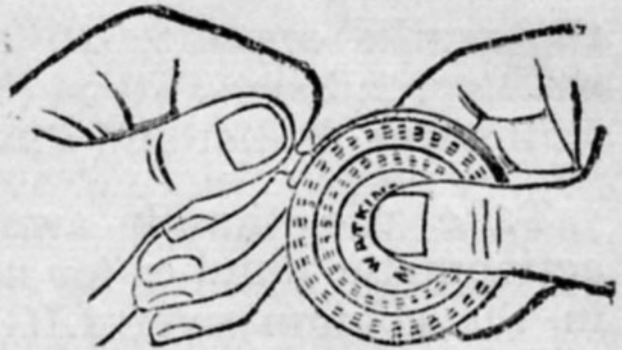
TO TEST THE LIGHT.

Hold the meter to face *the source of the light which falls upon the subject, not to face the subject ;* revolve the back lid of the meter for just sufficient space to expose a fresh surface of sensitive paper through the aperture in lower part of dial, and at the same instant count " nought," continue counting " one, two," etc.,

in seconds. The number of seconds taken for the paper to darken to the standard tint is the actinometer value. In testing the light, the depth of tint, not the colour, 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 darker nor lighter is that to be timed, and the judgment is greatly aided if the instrument is held at arm's length, and *the eyes half closed*.

TO CALCULATE THE EXPOSURE.

Look out the speed of plate or film on the speed card.



Hold the meter by the handle in left hand, and with right thumb over the centre of glass and fingers at back. Grip the glass and the back firmly together, and in this way the scales easily revolve together with the paper and back. Look at left hand side of meter, and by revolving the glass, set the diaphragm you are using (in column over STOP) against the plate speed (in column over PLATE).

If using the Meter with U.S. dial for Kodaks,

the marks opposite 16 and 64, represent the *medium* and *small* stops (if unmarked) of F.P.K. Bull's Eye, Bullet and Plico.

Take the thumb away and look out the actinometer number (or nearest available value) in the column over LIGHT, and against this will be found on the outer scale, the correct exposure to give. The exposure scale extends almost round the outer circle, the plate number being utilised again as fractions. If the number indicated is 1, or to the right of 1, it is a whole number, if to the left of 1 it is a vulgar fraction, and has a dash against it, Thus '4 is $\frac{1}{4}$, '130 is $\frac{1}{130}$. The exposure is indicated in *seconds* (or fractions of a second), when the light value

is taken in seconds. But in the case of a poor light, where the actinometer takes more than 130 seconds, the light value is taken in minutes, and the exposure scale also indicates minutes or fractions of a minute. It is possible that, owing to the rounded edge of meter, some of the dashes will be missing, but all figures on the left hand side of outer ring are fractions.

For interiors and poor lights the most convenient plan is described under the heading *interior*.

It will be seen that when the meter is set for plate and stop, these values can be verified at

a glance, and need not be altered for any number of exposures while the same plate and stop is used, and only the exposure number need be read against the actinometer value.

Examples—

Plate 90, Stop F/16, Act. 6=Exp. '4 or ¼ second.

Plate, 65, Stop F/28, Act. 16=Exp. 3 seconds.

Example—

With U.S. Dial—medium stop of F.P.K.

Plate 130, Stop 16, Light 32, Exp. 1 second.

When the exposure number is a fraction, it is wrong way up to the actinometer value.

FURTHER DETAILS.

ACTINOMETER TEST.

The light which falls upon the worst lighted part of the subject in which detail is required in the negative is that to be tested. Where full detail is wanted in shadows in out-door work the direct sun-light should not be tested, but the meter should point to the sky in a direction at right angles to the sun's rays, which should not fall upon the paper. Where the shadows are not so important, it is a good plan to take the average between the sun light test and the sky test for the A number. It is only when

there are no shadows of importance or in open, landscape, that the direct sunlight test should be taken for the A number.

Instances—

View under trees or in shady lane—expose actinometer under shade of trees.

Portrait, in or out of doors—expose actinometer in the place occupied by sitter.

Sunlit buildings or landscape partly in shadow —expose actinometer in the shadow, or the shade of your own body, if more convenient.

Sunlit landscape, or building with no shadow —expose actinometer in sunlight.

INTERIOR.

Expose actinometer in the worst lighted part of the subject, *not out of doors.*

In order to save the time occupied in testing a weak light, a diaphragm may be used in the lens, of such a size that the camera exposure shall be equal to the actinometer exposure, and the light may be tested while the plate is being exposed. The use of the usual tint (the whole tint) makes necessary an inconveniently small stop. It is sometimes useful to use the first visible darkening of the paper which is equal to a sixteenth tint, as it takes place in one sixteenth the full actinometer time. (The quarter tint is no longer provided on the face

of the meter, but can be had mounted on a complete dial and carried separately if required.)

To find the stops required to use with these tints see table following.

Examples—

With plate speed 130, a stop of F/22 can be used in the lens, the actinometer laid down, facing the light (not the roof) in the worst-lighted part in which detail is wanted, the lens uncapped and the cap put on again as soon as the paper begins to discolour visibly (sixteenth tint). The discolouration of the paper may be seen by turning the back lid round and back a trifle, for an instant. With the quarter tint and plate 130, the required stop would be F/45.

The following table shows the stops required with different speeds of plates to make the actinometer exposure and the camera exposure equal with either of the tints, with an ordinary subject. This method can also be used for all kinds of out-door work, besides the interiors, For instance, if P45 is the speed, and if stop of F/28 is used, the exposure will always be the same time that is required to discolour the paper to the quarter tint, no calculation being required.

For the small stops (64) of most Kodaks, expose the time of darkening to a decided tint, more than $\frac{1}{16}$th but less than the quarter.

P.	Whole tint.	Qtr. tint.	$\frac{1}{16}$ tint.
11	$\frac{F}{28}$	$\frac{F}{14}$	$\frac{F}{7}$
16	$\frac{F}{32}$	$\frac{F}{16}$	$\frac{F}{8}$
22	$\frac{F}{40}$	$\frac{F}{20}$	$\frac{F}{10}$
32	$\frac{F}{45}$	$\frac{F}{22}$	$\frac{F}{11}$
45	$\frac{F}{56}$	$\frac{F}{28}$	$\frac{F}{14}$
65	$\frac{F}{64}$	$\frac{F}{32}$	$\frac{F}{16}$
90	$\frac{F}{80}$	$\frac{F}{40}$	$\frac{F}{20}$
130	$\frac{F}{90}$	$\frac{F}{45}$	$\frac{F}{22}$
180	$\frac{F}{112}$	$\frac{F}{56}$	$\frac{F}{28}$
250	$\frac{F}{128}$	$\frac{F}{64}$	$\frac{F}{32}$
350	...	$\frac{F}{80}$	$\frac{F}{40}$
500	...	$\frac{F}{90}$	$\frac{F}{45}$

PLATE SPEEDS.

The plate numbers on speed card must be only regarded as approximate, and a guide to the first trial; for in the first place, few makes are always issued at the same sensitiveness and, in the second place, different workers vary in their idea of what a negative ought to be. The P number may be regarded as the "regulator" of the instrument, to be set fast or slow according to individual needs.

If at any time you get over-exposure, and feel sure you have rightly tested the light, increase your P number; if under exposure, decrease your P number.

SPECIAL SUBJECTS.

The BEE Meter is set for all objects of average colour (S100 on the standard meter), but for special subjects the following variations should be made from the indicated exposure.

Sky, or Sky and Sea,	$\frac{1}{10}$th the indicated exposure.
Snow and Glacier scenes, white or black and white objects, sea views with shipping ...	$\frac{1}{4}$ " " "
Light col'd objects open landscape (no foreground), lake, or water scenes ...	$\frac{1}{2}$ " " "
Very dark coloured objects as old oak	$1\frac{1}{2}$ " " " or twice

COPYING.

When copying pictures, near objects, or making lantern slides, the actual light falling upon the picture or negative must be tested as usual, and the exposure indicated by the meter multiplied (or divided) in accordance with the table below. To use the table, it is necessary to measure the distance from lens to object in terms of the focus of the lens (a stick cut to the length of the focus of the lens is convenient for this purpose).

Thus, if with a 10 in. lens the distance from lens to a black and white picture is 55 inches, it would be " $5\frac{1}{2}$ times focus from lens," and in accordance with the table, you would give $\frac{3}{8}$ths

the exposure indicated by the instrument. Where much copying, enlarging, and lantern slide making is done, the Standard Meter is invaluable for these purposes, as it has a special scale for the purpose.

U.S. DIAL FOR KODAKS, PREMOS AND FRENAS.

Not marked with the usual F/- numbers, but with the U.S. numbers on stops of above Cameras. Also marked for *medium* and *small* stops of Kodaks not numbered.

Interchangeable with the usual dial Meters supplied with these without extra charge.

COPYING TABLE.	THIN NEG. Black and White.	MED. NEG. Photo-graphs.	DENSE NEG. Coloured Pictures or Objects.
15 times focus from lens	$\frac{1}{4}$	$\frac{1}{2}$	1
10 ,, ,, ,, ,,	$\frac{1}{4}$	$\frac{5}{8}$	$1\frac{1}{4}$
$5\frac{1}{2}$,, ,, ,, ,,	$\frac{3}{8}$	$\frac{3}{4}$	$1\frac{1}{2}$
$3\frac{1}{4}$,, ,, ,, ,,	$\frac{1}{2}$	1	2
$2\frac{3}{4}$,, ,, ,, ,,	$\frac{5}{8}$	$1\frac{1}{4}$	$2\frac{1}{2}$
$2\frac{1}{2}$,, ,, ,, ,,	$\frac{3}{4}$	$1\frac{1}{2}$	3
2 ,, ,, ,, ,, copying equal size.	1	2	4

DIAPHRAGMS.

The subjoined table indicates (with practical though not absolute accuracy) the position of the U.S. Nos., Dallmeyer's and Zeiss Nos., and other stops. U.S. figures are marked on Kodak R.R. stops. Dallmeyer's lenses earlier than No. 43,000 do not bear these numbers.

U.S.		Dallmeyer's Nos.	Zeiss Nos.
128	$\frac{F}{45}$	200	4
96	$\frac{F}{40}$	150	8
64	$\frac{F}{32}$	100	

U.S.		Dallmeyer's Nos.	Zeiss Nos.
48	$\frac{F}{28}$	75	16
32	$\frac{F}{22}$	50	
24	$\frac{F}{20}$	40	32
16	$\frac{F}{16}$	25	
12	$\frac{F}{14}$	20	64
8	$\frac{F}{11}$	15	
6	$\frac{F}{10}$	10	128
4	$\frac{F}{8}$	7·5	
3	$\frac{F}{7}$	5	256
2	$\frac{F}{56}$	3	

SHUTTER PHOTOGRAPHY.

The Meter will prove useful to calculate what shutter speed to use, or, if shutter speed is decided upon, the stop to use. It must however be remembered that the indication thus given is for *full* exposure, (the one giving the best results), and that half this is as much as is generally possible to give under the circumstances, indeed, one quarter the full exposure aften passes muster as " good for a snap shot."

In calculating for shutter exposures, therefore, take for actinometer number *half* the value of the light test, and the exposure indicated will be the minimum efficient one.

The meter is also useful to ascertain the worst light in which it is safe to take snap shots.

To do this, set plate speed against the value of the largest stop of your lens; then against the fraction on exposure scale, which indicates the *slowest* shutter speed practicable to give, will be indicated the light required for a full exposure. And double this number indicates the slowest light in which you can work. If, therefore, in future, the light is worse than this, it is useless to take snap shots. The largest opening of single lens snap shot cameras usually vary between F/12 and F/14, and the shutter speed may be about 1-32 nd.

The new FOCAL PLANE METER is much more convenient for above purposes than the usual pattern, its dial is *not* interchangeable with that in the Bee Meter.

SENSITIVE PAPER.

(Each meter contains spare paper behind the pad or spring plate.)

The steadfast paper darkens slower if exceedingly dry, and quicker if very damp, and these extremes should be avoided by carrying in the pocket.

It is unreasonable to expect that any such exceedingly sensitive paper should keep indefinitely ; but so far it has shown excellent keeping qualities.

When adopting a new box of refills, always take off the old tint with its black paper mask and gum on the new one enclosed in the box. If the paper refuses to turn, see that the edges *of the pad are tucked within the back lid.*

TO CHANGE THE PAPER.

Open the meter by holding as in previous illustration and pressing smartly with the thumb. Or it may be levered open with the back of a knife inserted between two halves of case. Do not throw away used paper, but put behind the pad, replacing by a new disk, yellow side towards glass. Change in dull indoor light. Only one disc must be in front of the pad.

The contents must be kept fairly tightly packed and no paper thrown away. In case of the glass turning when not required, clean the face of glass and inside of lid, as dirt makes it slip, also *stretch* pad by pulling with fingers before replacing.

For explanation of any difficulty consult the . WATKINS MANUAL.

EXPOSURE NOTES is also a help for . . . . Systematic Work. . . .

U.S. BEE METER.

SHORT INSTRUCTIONS (Supplementary to short or full Bee Instructions).

The dial gives the same results as the usual dial of the Bee Meter, and is interchangeable with it The U.S. numbers which are marked on it are the Uniform System values of stops adopted on the higher priced Kodaks and some "medium" priced Kodaks, also on some other cameras.

The short line opposite 16 indicates approximately the No. 2 (Medium) stop of all Kodaks on which the stops are marked 1, 2, 3, with the following exceptions:—

No. 2	Brownie	medium stop is U.S. 32.
,, 2	Folding Brownie	,, ,, ,, ,, 32.
,, 3	Bull's Eye	,, ,, ,, ,, 32.

The short line opposite 64 indicates approximately the No. 3 (smallest) Stop of all Kodaks in

which the stops are marked 1, 2, 3, with the following exceptions:—

No. 2 Brownie	No. 3 stop is 128.	
,, 2 Folding Brownie	,, 3 ,,	,, 128.
No. 2a Folding Brownie.	No. 3 stop is 32.	No. 4 stop is 128.
Stereo Brownie.	,, 3 ,, ,, 32.	,, 4 ,, ,, 96.
,, 1 F.P.K. (new model).	,, 3 ,, ,, 32.	,, 4 ,, ,, 64.
,, 1a F.P.K. (new model).	,, 3 ,, ,, 32.	,, 4 ,, ,, 64.
,, 3b Quick Focus.	,, 3 ,, ,, 64.	

Examples:—Film 180 Stop 16, Light 22 = Exposure '2 or ½ second.

Film 180, Stop 128, Light 6 = Exposure 1 second.

The figure 2 on dial is the dividing point between the stop and light scales.

Where F values of stops are mentioned in Bee instructions, the equivalent U.S. number can be found by table on page 22.

No extra charge for Bee Meters fitted with U.S. dial. If sold separately or in addition to the usual dial with F stops 6d. (post 1d.)

Ilford Empress	90	MS
„ King's Own	180	S
„ Chromatic	130	Q
„ Rap. Chrom.	180	M
„ Spec. Rap.	130	VS
„ Monarch	350	VS
„ Zenith	250	VS
„ Panchromatic... ...	250	M
Imperial Ordinary	65	Q
„ Fine Grain Ord. ..	16	VVQ
„ N.F. Ortho.	180	MQ
„ Sovereign	180	M
„ Spec. Sensitive ...	250	MS
„ Spec. Rapid ...	180	M
„ Flash Light	250	MS
„ Roll Film	180	
„ Ortho. Spec. Rap. ...	180	M
„ Ortho. Spec. Sens. ...	250	M
Wellington (or Watalu) Speedy	250	S
„ „ Ex. Speedy	350	S
„ „ Speedy Iso	180	M
„ Films ...	180	VS
„ Landscape ...	65	Q
„ Ortho. Process ...	32	
„ Anti-Screen ..	180	M

COLOUR SCREEN PLATES

Speed when used with maker's filter

Autochrome	3
Paget	11
Dufay	3
Omnicolore	4

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WATKINS SPEED CARD.

Exposure speeds—for Watkins Meters with any developer—indicated as numbers and grouped; thus 180 means a speed somewhere between 152 and 215. Development speeds indicated by letters, as under, the figures in table being minutes development (average for the group) at 60 deg. with the Watkins Time Developer. Approximate only, as different batches vary. All from actual tests. No time can be quoted for any other developer, but the ratio between groups would be the same. Where two brands of the same maker are quoted alike they may differ slightly, but samples tested came in the same group.

DEVELOPMENT SPEEDS.

VQ	Q	MQ	M	MS	S	VS
$2\frac{1}{4}$	3	4	$5\frac{1}{4}$	7	9	$11\frac{1}{2}$

Minutes at 60 deg. for a contrast of $\gamma 9$.

Development Speeds have nothing to do with Exposure Meters.

The words Isolar, Simplex, Anti-Halo, or Backed, do not indicate any difference in speed.

Agfa	90	M
,, Isolar	180	MQ
Ansco Film...	90	M
Central Special	90	M
,, Comet	130	M
Cramer, Contrast	22	VVQ
,, Iso. Slow	90	MQ
,, Iso Med	180	MQ
,, Iso. Fast	250	M
,, Anchor	90	MS
,, Banner X	180	MS
,, Crown	350	S
Eastman, Extra Rapid... ...	180	M
,, Ortho.	180	MQ
Kodak, N.C. Film	180	S
,, Ex. Rap. Film ...	250	S
Kodoid	180	S
Premo Film Pack	180	S
Hammer, Slow	45	VQ
,, Record	250	MS
,, Ortho. Extra Fast ...	350	M
Hammer, Extra Fast	250	MS
,, Aurora	250	M
Lumiere, Ex. Rapid	180	MS
Lumiere A. Ortho.	180	MS
,, Sigma	350	MS
,, C. Panchromatic ...	180	MS
Seed, 23	90	MQ
,, 26	180	MS
,, 27 Gold Edge	250	MS
,, Tropical...	130	VS
,, C. Ortho.	65	VQ
,, L. Ortho.	180	Q
,, Pan-chromatic	65	VQ
Standard, Extra	180	M
,, Imp. Port.	130	M
,, Ortho.	180	M
Stanley 50	250	M
Vulcan	130	S
[illegible] Blue Label [illegible]	250	M
[illegible] Ortho	250	M
Banner Ordinary	45	M
,, Medium	90	M
,, Ex. Rap.	130	M
,, S. R. Red Diamond ..	250	MS
,, Red Seal	250	M
,, Studio 200	130	M
,, Studio 350	250	MS
,, Med. Ortho.	90	MQ
,, Ex. Rap. Ortho. ...	130	MS
,, Super Speed Ortho ..	250	M
,, Self Screen Ortho ...	130	S
Ilford, Ordinary	45	Q
,, Versatile Rapid ...	130	MS
,, ,, Most Rapid ...	250	MS
,, ,, Ortho ...	180	M