



INSTRUCTIONS

FOR THE USE OF

HURTER & DRIFFIELD'S

ACTINOGRAPH

(PATENTED)

ENTERED AT STATIONERS' HALL

LONDON
MARION & CO.

1892



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PREFACE

SINCE the publication of the first edition of *Instructions for the use of Hurter & Driffield's Actinograph*, we have carried out a series of photo-chemical investigations, the main object of which was to discover a method of ascertaining the relative rapidity of sensitive plates. This object met with such success as, for the first time in the history of photography, to render it possible to estimate and compare the speeds of plates, as well as to obtain a knowledge of their other characteristics. Our investigations have also incidentally confirmed opinions we previously held with respect to the connection which exists between exposure and development.

The reliability, theoretical accuracy, and practical utility of our method of speed-determination has been recognised by Messrs. Marion & Co., and they have been the first manufacturers of dry plates to adopt it. As plates marked with their

Actinograph speed may therefore now be obtained from Messrs. Marion & Co., we have found it necessary to issue a second edition of our instructions for the use of the instrument. This edition has been carefully revised, and to it such additions have been made as will, we trust, further facilitate the use of the Actinograph.

F. HURTER.

V. C. DRIFFIELD.

APPLETON, WIDNES,
Jan. 1, 1892.

THE ACTINOGRAPH

THE ACTINOGRAPH is an instrument for calculating the necessary exposure, in the camera, of photographic plates, and we place it before the photographic public confident that it will be found to supersede any previous effort to facilitate such calculations. And as we hold that the production of a technically-perfect negative is absolutely dependent upon an accurate exposure, we have every reason to hope that the Actinograph will supply one of the most pressing photographic needs of the day.

We are aware that many photographers would prefer an Actinometer, or direct means of measuring the light, rather than the mere provision of data for calculating what the light must of necessity be ; and if it were possible accurately to measure the light at the precise moment of making the exposure, no doubt an Actinometer would be preferable. Though we ourselves, however, possess probably the only instrument capable of measuring diffused daylight, we prefer rather to base our exposures upon the Actinograph than upon our Actino-

meter, because from the former the condition of the light may be ascertained at the precise moment of making the exposure, while the reading of the latter gives the condition of the light some time previously, and is consequently far more likely to mislead.

We do not propose to enter here into any of the scientific principles upon which the construction and working of this instrument depend, and will therefore at once proceed, in as concise a manner as possible, to describe the instrument, and give instructions for its use.

Before the Actinograph can be used it is imperative that the photographer ascertains the ratio existing between the diameters of his stops and the focal lengths of his lenses. When we speak of a lens and a particular stop working at $F/8$, we mean that the diameter of the stop is $\frac{1}{8}$ th of the focal length of the lens. For example, if the focal length of a certain lens is 8 inches, and the diameter of the stop is $\frac{1}{2}$ an inch, this lens and stop would be said to work at $F/16$, because $\frac{1}{2}$ an inch is contained in 8 inches 16 times. The first thing to do therefore is to ascertain the focal length of the lens, and this may be done with sufficient accuracy for our purpose as follows :—

With the lens to be measured, focus as sharply as possible, in the camera, some object at a considerable distance away, say at least 100 yards. Having done this, measure the distance from the ground glass to the lens if a single one, or to the diaphragm-slit if a double or triple combination, and the result will be the focal length of the lens. Divide this focal length successively by the diameters of the stops belonging to the lens, and the figures so obtained will give the ratios of aperture to focal length. These ratios will probably sufficiently nearly agree with some of those given on the Actinograph, but it is easy to enlarge a stop, if necessary, so as to make it agree accurately with one of the Actinograph ratios. It is, however, unquestionably most satisfactory when the stops are adjusted to the lens by the optician himself.

The Actinograph consists of four scales which correspond respectively with the light, the lens, the exposure, and the speed of the plate.

THE LIGHT is indicated on the revolving scale by means of curves for every day of the year, and for every hour of the day when it is photographically active.

The amount of light, apart from atmospheric influence, is, on any given hour of any given day, fixed—being merely a function

of the sun's altitude. We take, as our unit of light, the $\frac{1}{100}$ th part of the brightest possible diffused daylight when the altitude of the sun is 90° . This we call one Actinograph degree.

THE LENS SCALE on the upper edge of the long slides shows the ratios of aperture to focal length in general use. There are three marks to each ratio of the system advocated by the Photographic Society of Great Britain. These three marks, 1, 2, and 3, correspond respectively to single lenses, doublets, and triple combinations. There are only two marks, however, for each ratio of the decimal system, *i.e.* for single lenses and doublets. The triplet has in this case been omitted in order to prevent confusion, but its place can be easily judged by the eye, should it be required.

THE EXPOSURE SCALE on the lower edge of the long slide indicates exposures ranging from $\frac{1}{20}$ th of a second to one minute.

THE SPEED SCALE.—The speed of the plates as marked on this scale has no relation to the arbitrary and unreliable speeds generally spoken of, but is based upon scientific principles and upon clearly defined units. We define the speed of a plate as that exposure, expressed in seconds, which,

with one Actinograph degree of light, will produce a theoretically perfect negative of an ordinary landscape ; the light reaching the plate being equal to that reflected by the objects. The marking of packets of plates with their Actinograph speed will be a very great boon to photographers, if only because the exposures the plates will require will be exactly proportional to the speed indicated. If, for example, a photographer has worked successfully with some plates of which the Actinograph speed was 10, and the next packet he procures is marked 20, he will at once know that the latter requires just half the exposure of the former, because twice as rapid.

Sliding between the speed and exposure scales is a smaller slide. Upon the upper edge of this slide are five points, pointing simultaneously to five different times of exposure. The five points are marked with the words "*Very bright,*" "*Bright,*" "*Mean,*" "*Dull,*" and "*Very dull,*" and the exposure must be selected opposite that point which most nearly corresponds with the atmospheric conditions at the time of exposure. The selection of the right point to use presents no difficulty if our definition of a "mean" light be borne in mind. A "mean" light is indicated when there is just sufficient sun to cast a very

faint shadow. There is practically no difficulty whatever in deciding the point when the light is on the bright side of "mean." A little doubt may, however, arise as to what condition of light is indicated by "very dull." We can only say that this term indicates the dullest light in which it would be at all reasonable to take a photograph; but photography, under such circumstances, is of course very exceptional.

On the lower edge of this short slide is a single mark termed the "*Speed Index*."

INSTRUCTIONS and EXAMPLES FOR USE OF ACTINOGRAPH.

EXAMPLE No. 1.

To find the Exposure for an ordinary
Landscape.

Data given.	Day	7th October.
	Hour.. .. .	4 P.M.
N. Lat. 52° 30'	Lens and Stop	Doublet F/22.6.
	Speed of Plate	15.
	Light	"Very bright."

1. Turn the revolving scale until the date 7th October is level with the edge of the lens scale.

2. Set the "speed index" to 15 on the speed scale.

3. Move the long slide until the point marked F/22.6 (2) coincides with the curve on the revolving scale marked 8 A.M. and 4 P.M.

The exposure to be given will now be found opposite the point marked "very bright," viz. 2 seconds.

To ascertain the Speed of a Plate.

CASE I.

The speed of a plate is most accurately determined by means of the method we have recently discovered. This method is quite independent of any camera test, and is conducted in the dark room. It consists, broadly, in submitting the plate to be tested to the direct action of a standard light. A number of exposures are made, and the silver deposits resulting after development are measured by means of a special photometer. These measurements, graphically expressed, give the speed of the plate under investigation. It is not our intention here to enter again into particulars of our method of speed determination; it has been fully described elsewhere, and we think that photographers

generally will hardly care to undertake it for themselves, when plates are to be procured tested by the method and marked accordingly.

CASE II.

If the photographer possesses a record of a satisfactory exposure made with unmarked plates of which he wishes to ascertain the Actinograph speed, he will proceed as follows:—

Supposing his standard negative of an ordinary landscape was taken on the 15th of April at 2 P.M., with a doublet lens $F/32$, and that on this occasion the sun, clouds, and atmosphere indicated the brightest possible light, and that the exposure given was 4 seconds—

1. Set the revolving scale so as to bring 15th April level with the edge of the lens scale.

2. Move the long slide until $F/32$ (2) coincides with the curve marked 10 A.M. and 2 P.M.

3. Move the short slide till the point "very bright" coincides with 4 seconds on the exposure scale.

The speed of the plate will now be found opposite the "speed index," viz. 5.

CASE III.

If no reliable record of a satisfactory exposure exists, and there is no clue to the rapidity of the plates, we recommend the following course to be taken :—

Choose a day, if possible, for the experiment when the light corresponds with “very bright.”

Assume a medium speed, say 15, and set the “speed index” accordingly to 15. Now proceed to ascertain the exposure as described in Example No. 1, and take an ordinary landscape, giving this exposure.

If, upon development, the negative is satisfactory, the assumed speed is the actual speed of that plate. Should the negative prove to be under-exposed, the speed of the plate is less than 15. If, on the other hand, it proves to be over-exposed, the speed of the plate is more than 15, and a second experiment will probably decide the question.

If, from necessity, the speed of a plate has to be ascertained when the light is *not* at its maximum, that exposure must of course be chosen which corresponds with the then existing condition of the light. It is always preferable, however, to ascertain the speed of a plate when the light is “very bright,” the result being then most reliable.

"INSTANTANEOUS" LANDSCAPE WORK.

The exposure scale of the Actinograph commences with 0.05 or $\frac{1}{20}$ th of a second. Circumstances frequently arise when a smaller exposure than this is necessary, as in the case of using a large lens aperture with an exceeding rapid plate, and in a very bright light. The following example will indicate how to use the Actinograph in such cases :—

EXAMPLE No. 2.

Data given.	Day	21st June.
	Hour	12 noon.
N. Lat. 52° 30'	Lens and Stop	Doublet F/8.
	Speed of Plate	50.
	Light.. .. .	"Very bright."

Proceeding with these data as in Example No. 1, we should find that no exposure can be read off opposite the point marked "very bright."

In a case such as this, assume the speed of the plate to be $\frac{1}{10}$ th of its actual value, and instead of setting the "speed index" to 50, set it to 5. An exposure will then be indicated opposite point "very bright" of 0.2 second, which is 10 times too great

because we took the speed 10 times too small, and therefore the required exposure is 0.02 or $\frac{1}{50}$ th of a second.

It must be borne in mind that this exposure is what is required to give a *correctly exposed* negative. Much so-called "instantaneous" work is, in reality, considerably under-exposed.

So far we have merely considered the taking of what we have called an "ordinary" landscape which we define as one in which there is no massive object in the immediate foreground. We shall now proceed to show how to use the Actinograph for other purposes—portraiture, interiors, etc. It will be seen that we take the ordinary landscape as our unit, and that we obtain the exposure for any other class of subject simply by multiplying the ordinary landscape exposure by a certain factor.

TABLE OF FACTORS.

VIEWS.

Ordinary Landscape	1
Heavy foreground or close object.. ..	2 to 3
Distant Landscape	$\frac{1}{2}$ to $\frac{1}{5}$
Clouds	$\frac{1}{10}$

PORTRAITURE.

In Diffused Light, out of doors	5 to 10
In Sitting Room.. .. .	120 to 200
In Studio	about 50

INTERIORS.

Fairly Lighted	about 300
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COPYING.

Photograph, same size, in diffused light, out of doors	7
(Or say half as much again as portrait under same conditions.)	
Black lines on white paper, in diffused light, out of doors	1/4
(Or 1-20th exposure for portrait under same conditions.)	

Instead of multiplying the ordinary landscape exposure by these factors, it is frequently more convenient to divide the speed by them. For example, if the speed of the plate is 15, and the exposure indicated by the Actinograph has to be multiplied by 5, the same result will be directly given by the instrument if the speed is divided by 5, and instead of setting the "speed index" to 15, it is accordingly set to 3.

Multiplying the exposure is equivalent to dividing the speed, and *vice versa*.

EXAMPLE No. 3.

Data given.	Subject	Clouds.
	Day.. ..	19th February.
	Hour	3 P.M.
N. Lat. 52° 30'	Lens and Stop	Doublet, F/22.6.
	Speed of Plate	10.
	Light	"Mean."
	Factor	1/10.

If the instrument is set in accordance with these data, an exposure will be found opposite "mean" of 5 seconds, but for a cloud negative we have, by the factor table, to take $\frac{1}{10}$ th of the indicated exposure, which would in this case be half a second.

Now this result might be directly arrived at by multiplying the speed of the plate by 10 instead of dividing the exposure by 10. If therefore the "speed index" is set to 100 instead of to 10, the correct exposure will be found opposite "mean."

EXAMPLE No. 4.

Data given.	Subject	{ Portrait in dif- fused light, out of doors.	
	Day.. ..		20th March.
	Hour		4.30 P.M.
N. Lat. 52° 30'	Lens and Stop	Doublet F/8.	
	Speed of Plate	20.	
	Light	"Dull."	
	Factor	5.	

An exposure will be found opposite "dull" of 0.6 second, which multiplied by 5, gives the required exposure of 3 seconds.

In this case again it would be more convenient to divide the speed of the plate by 5, and set the "speed index" to 4 instead of to 20, when the required exposure would be directly indicated opposite "dull."

In this example we have given the time as 4.30 P.M. The lens index will, in such a case, be placed midway between the hour curves for 4 P.M. and 5 P.M., and so on for other fractions of the hour.

EXAMPLE No. 5.

Data given.	Subject	{ Portrait in sitting room.
	Day.. ..	25th October.
	Hour	4 P.M.
N. Lat. 52° 30'	Lens and Stop	Portrait (triplet) F/4.
	Speed of Plate	36.
	Light	"Bright."
	Factor	120.

Set to these data, the instrument will indicate an exposure opposite "bright" of 0.075 second, which multiplied by 120 gives the required exposure of 9 seconds.

This result may also be obtained as follows : Divide the speed by 12, and set the "speed index" to 3 instead of to 36. This is equivalent to multiplying the exposure by 12, and opposite "bright" an exposure of 0.9 second will be found which only requires to be further multiplied by 10 to give the correct exposure, viz. 9 seconds. Instead of multiplying in the first instance by 120, we have done so at two operations, first by 12 and then by 10.

We strongly recommend that the examples we have given should be worked out with the Actinograph itself, and when this is done, we are confident that the instrument will be fully understood, and the method of using it mastered.

It must be distinctly understood that each Actinograph can only be used with accuracy within a certain range of latitude north or south of that marked on the instrument. The Actinograph provided with light diagram for north latitude $52^{\circ} 30'$ is no doubt sufficiently accurate for the whole of England and Ireland, but it would become more and more unreliable as we go farther north and south of this latitude. As, however, its unreliability would be chiefly felt in the earlier and later hours of the day and in the winter, the Actinograph

will serve for a more extended range of latitude if the photographer confines his work to the middle of the day and to the summer months.

Actinographs may be specially ordered with light scales for any desired latitude.

Price for Latitude $52^{\circ} 30'$,

10/6 each.



MARION'S DRY PLATES.

Each box is marked with Hurter & Driffield's Actinograph number.

Sizes. In Inches.	Ordinary Rapidity. (Yellow label)		Rapid Rapidity. (White label)		Instantaneous Rapidity. (Brown label)		Academy Rapidity (Cobalt label)	
	Per doz.		Per doz.		Per doz.		Per doz.	
	s.	d.	s.	d.	s.	d.	s.	d.
1½ × 1½ ..	1	0	1	3	1	6	1	6
2 × 2 ..	1	0	1	3	1	6	1	6
3½ × 3½ ..	1	0	1	3	1	6	1	6
3½ × 2½ ..	1	0	1	3	1	6	1	6
4½ × 3½ ..	1	0	1	3	1	6	1	6
5 × 4 ..	1	7	2	0	2	6	2	6
6½ × 3½ ..	2	2	2	9	3	3	3	3
6½ × 4½ ..	2	2	2	9	3	3	3	3
6½ × 4¾ ..	2	3	3	0	3	8	3	8
7½ × 4½ ..	2	10	4	0	4	6	4	11
7½ × 5 ..	3	5	4	6	4	10	4	10
8½ × 6½ ..	4	3	5	6	6	6	6	6
9 × 7 ..	5	0	6	6	7	6	7	6
10 × 8 ..	7	3	9	6	11	0	11	0
12 × 10 ..	10	0	13	0	16	0	16	0
15 × 12 ..	18	0	23	0	28	0	28	0
16 × 11 ..	18	6	23	6	29	0	29	0
16 × 12 ..	21	6	27	0	33	0	33	0
16 × 13 ..	22	0	27	6	35	0	35	0
16 × 14 ..	24	0	30	0	38	0	38	0
17 × 11 ..	22	0	28	0	38	0	38	0
17 × 12 ..	23	0	29	0	40	0	40	0
17 × 13 ..	24	0	30	0	42	0	42	0
17 × 14 ..	26	0	33	0	44	0	44	0
18 × 16 ..	37	0	45	0	53	0	53	0
20 × 16 ..	41	0	49	0	64	0	64	0
24 × 18 ..	51	0	63	9	77	0	77	0

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