# N° 1388 A.D. 1890

*Date of Application, 27th Jan., 1890*
*Complete Specification Left, 15th Oct., 1890—Accepted, 15th Nov., 1890*

## PROVISIONAL SPECIFICATION.

## An Instrument for Calculating Photographic Exposures.

I, ALFRED WATKINS, of The Imperial Flour Mills, Hereford, Miller, do hereby declare the nature of this invention to be as follows :—

The exposure required for a photographic plate is dependent upon four conditions *viz.* :—A the actinic force of the light; P the sensitiveness of the plate; C, the colour or character of the object to be photographed; and D the relation of the diaphragm of the lens to its focal length.

All these conditions except A are easily known to the photographer, and A can be readily ascertained by observing in an actinometer how long the light takes to darken a piece of sensitive bromide paper (treated with nitrite of potash) to a standard tint.

My invention consists of the combination in one instrument of (1) an actinometer, (2) a set of moveable calculating rings for ascertaining the exposure, and (3) a pendulum for timing both the actinometer and exposure time.

My instrument is a short metal tube, the interior of which is divided in the centre into two compartments or boxes, one of which contains the sensitive paper for the actinometer. The other compartment is arranged to hold the pendulum, which is made of light metal chain so as to easily drop back into the box, and is about 10 inches long to swing in half seconds. The lid of the box forms the bob of the pendulum.

The calculating part of the instrument is as follows :—On the exterior of the circular tube which forms the body of the instrument are six separate flat metal rings, the first four carrying the scale of figures for A P, C, and D (as explained above); the last ring carrying the scale of figures (in seconds) which indicate the exposure or result of the calculation. The two outer rings are fixed to the body of the instrument, the four inner rings are free to revolve smoothly. The four moveable rings each carry indicating fingers which point to the scale of figures on the ring to the left. A stop is also fixed to each ring (except the last) which prevents the pointer travelling back below the commencement of the scale.

The scale on each of the rings is so divided that a movement equal to the distance between the figures 1 and 2 doubles the value of the figures in any part of the scale.

If the first ring to the left (A) is moved on, it carries with it (by means of the pointers and stops) the other moveable rings (P, C, and D). If P is then moved on to a desired figure (recorded on the ring A, which is held back by friction or other means and remains stationary), it in like manner carries with it C and D.

In the same way C and D may be successively moved to any required figures. It will be found that the last moveable ring (D) has moved on with each of the others, and the total result is recorded by a pointer E on the outer fixed ring, which is so marked as to give the correct exposure in seconds.

The five scales A. P, C, D and E are marked in accordance with tables well known to photographers.

ALFRED WATKINS.

[*Price 8d.*]

## COMPLETE SPECIFICATION.

# An Instrument for Calculating Photographic Exposures.

I, ALFRED WATKINS of The Imperial Flour Mills, Hereford, Miller, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement :—

The exposure required for a photographic plate is dependent upon four conditions, namely A, the actinic force of the light ; P, the sensitiveness of the plate ; S, the color or character of the object to be photographed, and its distance from the lens, and D, the relation of the diaphragm of the lens to its focal length.

All these conditions except A are usually known to the photographer and A can be readily ascertained by observing in an actinometer how long the light takes to darken a piece of sensitive bromide paper (treated with potassium nitrite) to a standard tint, in a manner well known to photographers.

My invention relates to an instrument in which are combined an actinometer and a set of moveable calculating scales for ascertaining the exposure, with which is by preference also combined a pendulum for timing both the actinometer and the duration of exposure.

The construction of the said instrument which I prefer to employ is of tubular form, the scales being in the form of moveable rings on the outer surface of the tube, which is internally divided into two compartments, one of which contains the sensitive paper for the actinometer which is situated at the one end of the tube, while the other compartment is made to contain the pendulum which is preferably made of a light metal chain about 10 ins. in length so as to swing in half seconds, the lid of the box being conveniently made to form the bob of the pendulum.

Fig. 1 of the accompanying drawings shews a perspective view of the form of the instrument which I prefer to employ, and Fig. 2 shews a longitudinal section of the same.

*a* is a metal tube divided internally by a partition *b* into two compartments, one of which contains the roll of sensitive paper *c* of the actinometer *d* which forms a cap to one end of the tube. The other compartment contains a metal chain *e* attached at one end to the tube *a* or to the partition *b*, and at the other end to the cover *f* closing the other end of the tube, which cover when removed as shewn in dotted lines, forms the bob of the pendulum.

For calculating the time of exposure, there are provided on the outer surface of the tube *a* six rings *g*, *h*, *i*, *j*, *k*, *l*, of which the two outer ones, *g*, *l*, are fixed to the tube while the other four can be rotated upon it. The ring *g* is marked with a scale for A, before mentioned, the ring *h* has the scale for P, the ring *i* the scale for S, the ring *j* the scale for D, while the ring *l* is marked with a scale of seconds indicating the time of exposure, or the result of the calculation. The rings *h*, *i*, *j*, *k*, have each a projecting stud marked respectively A, P, S, and D, E and having a pointer projecting over the preceding scale, so that the pointer A of ring *h* indicates the divisions on the scale for A of ring *g*, and so on, while the second pointer E on the ring *k* (which has no scale) indicates the division on the scale of *l*. On the ring *g* is a stop-pin $g^1$ against which the pointer A bears when it is opposite the commencement of scale A so that the ring *h* cannot be turned back below the first division.

In like manner, the pointers P, S and D, in projecting over the studs of the preceding rings, prevent their respective rings from being turned backward beyond the point of contact with the stud, while if the ring *h* is advanced on the scale A, it will at the same time cause all the other scales to advance with it, and thus it will be seen that each successive scale can only be moved into a position in advance of that given to the preceding one, so that the scale constitute a mutually dependent series.

The several scales are divided in logarithmic proportion in a similar way to those of an ordinary slide rule, the complete circle of each scale being divided into

one thousand parts; they are marked in accordance with tables well known to photographers, and consequently require no further description.

It will be evident that instead of making the rings cylindrical, as shewn they may be of disc form of varying diameters as shewn in section and elevation at Figs. 3 and 4, where the rings or discs *g* and *l* are fixed to the tube *a*, as before, while *h i j k* are rotatable; these discs are marked with scales, and are provided with the pointers A, P, S, D E in precisely the same manner as in the first described arrangement. *d* is the actinometer with sensitive paper *c*.

The box containing the pendulum may either be separate or it may be added, as indicated by dotted lines Fig. 3.

Or the actinometer may be a separate instrument, and the tube *a* constitute the box for the pendulum. I prefer however to combine all three parts in the form indicated at Figs. 1 and 2, as being the most compact and useful.

Having now particularly described and ascertained the nature of this invention and in what manner the same is to be performed I declare that what I claim is :—

1. An instrument for calculating photographic exposures, consisting of the combination of a set of moveable circular slide rules, an actinometer and a pendulum, substantially as described.

2. The use, in an instrument for calculating photographic exposures, of a set of circular moveable slide rules so arranged with stops and pointers as to be mutually dependent upon each other, substantially as described.

3. An instrument for calculating photographic exposures combined and operating as herein described with reference to the accompanying drawings.

Dated this 14th day of October 1890.

ABEL & IMRAY,
Agents for the Applicant.

London : Printed for Her Majesty's Stationery Office, by Darling & Son, Ltd.—1890.

A.D. 1890. JAN. 27. Nº 1388.

WATKINS' COMPLETE SPECIFICATION.

(1 SHEET)

Fig. 1

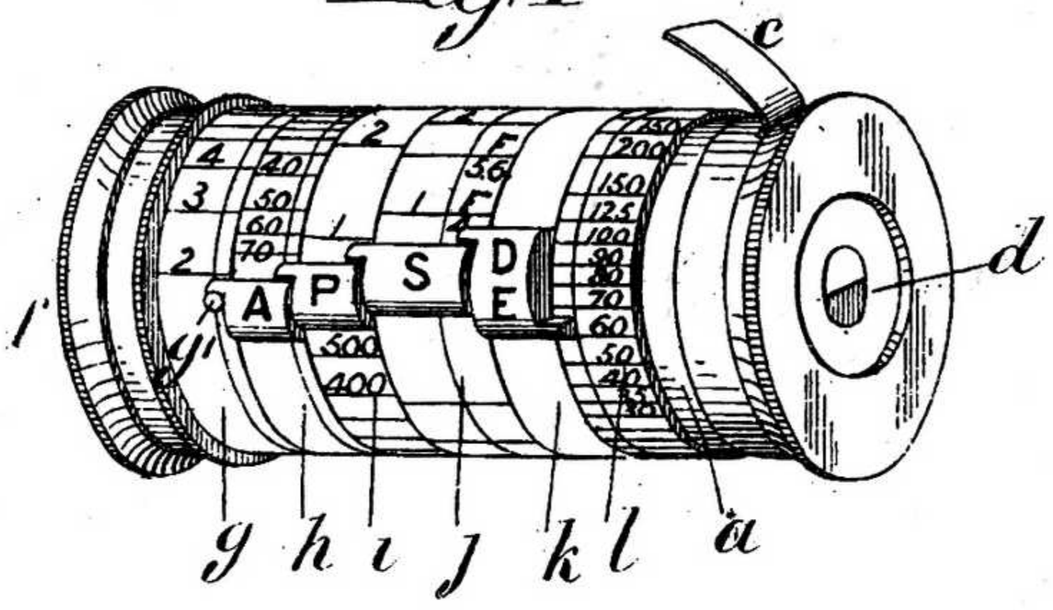
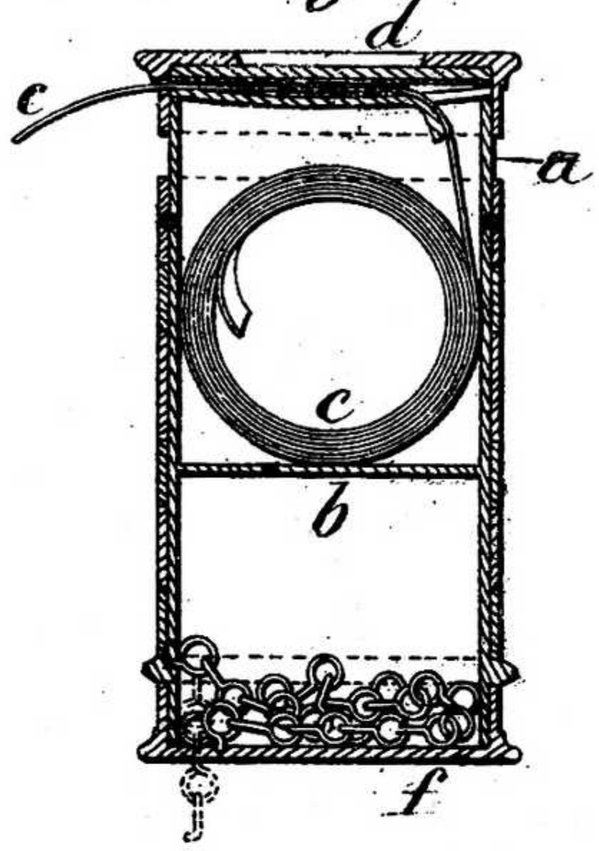



Fig. 2.



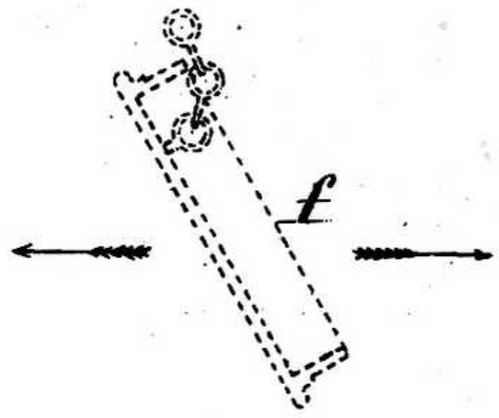




Fig. 4

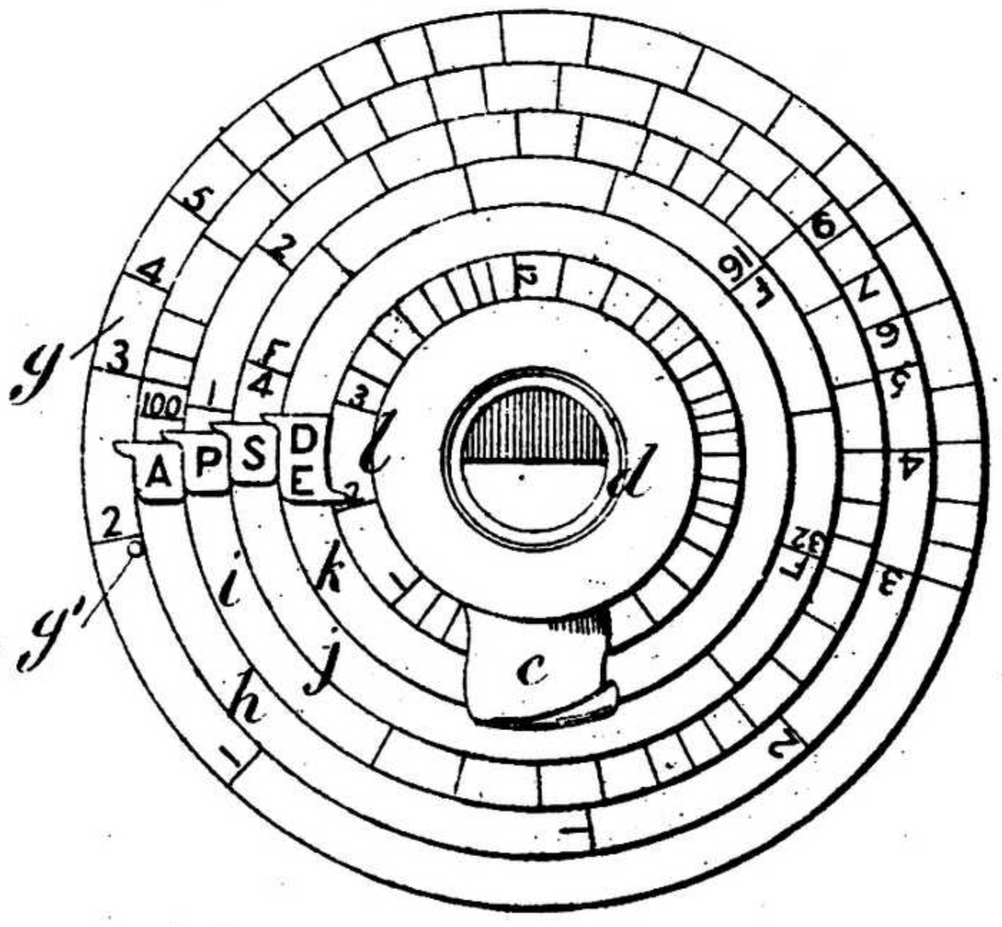
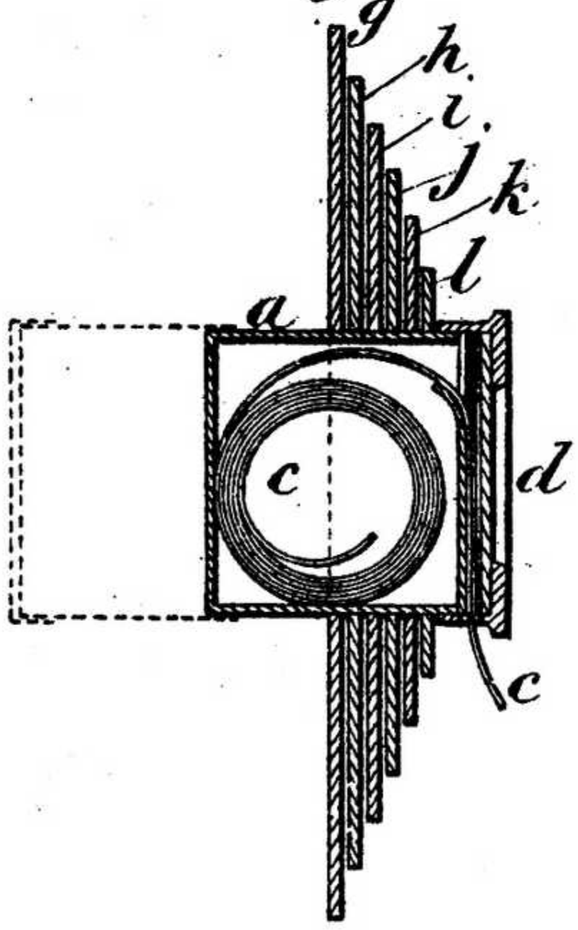



Fig. 3



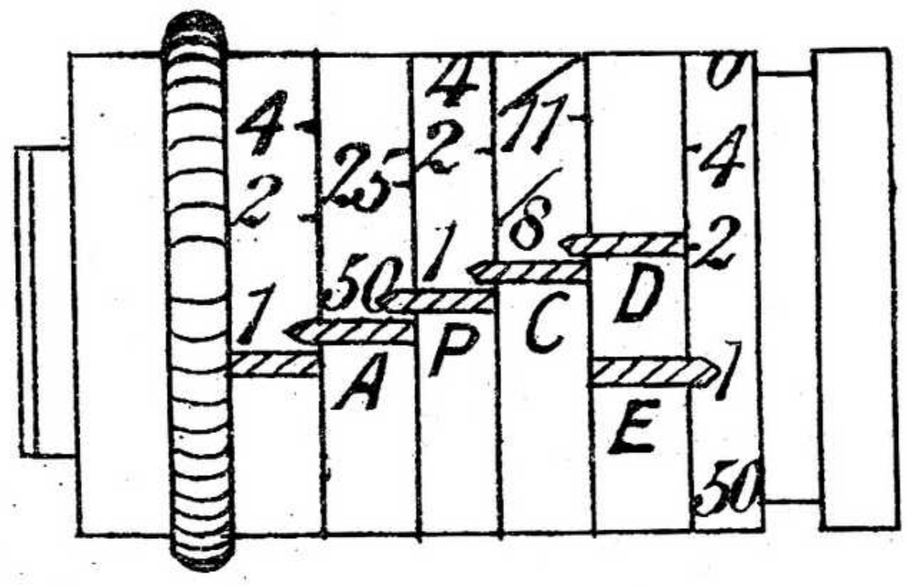

[This Drawing is a reproduction of the Original on a reduced scale.]

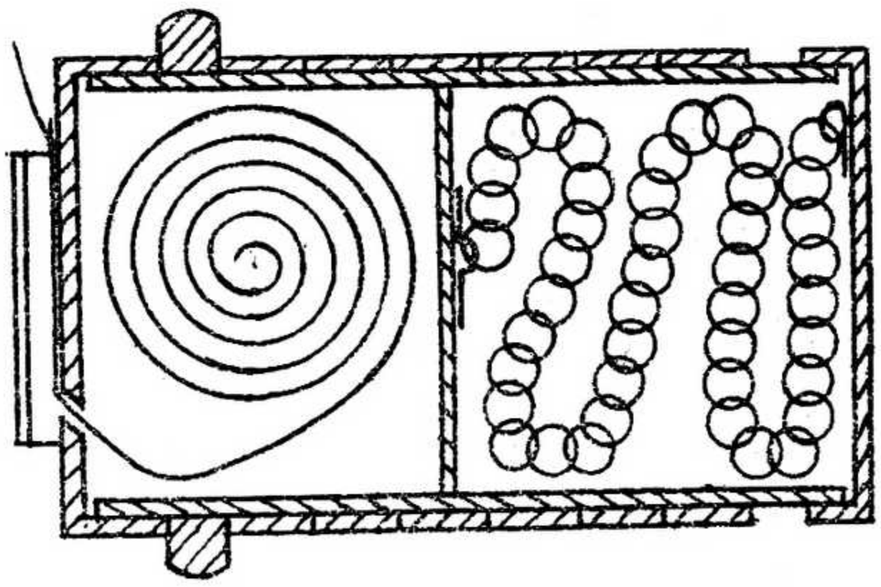
LONDON.—Printed by DARLING and SON Ld.
for Her Majesty's Stationery Office. 1890.

Malby & Sons, Photo-Litho.

A.D. 1890. JAN. 27. Nº 1388.

WATKINS' PROVISIONAL SPECIFICATION. *(1 SHEET)*



*[This Drawing is a full-size reproduction of the Original.]*

LONDON.—Printed by DARLING and SON Ld.
for Her Majesty's Stationery Office. 1890.

Malby & Sons, Photo-Litho.