No. 668,896. Patented Feb. 26, 1901.

# E. WAGER-SMITH.

## EXPOSURE INDICATOR.

(Application filed Mar. 23, 1900.)

(No Model.) 4 Sheets—Sheet 1.

FIG. 1.

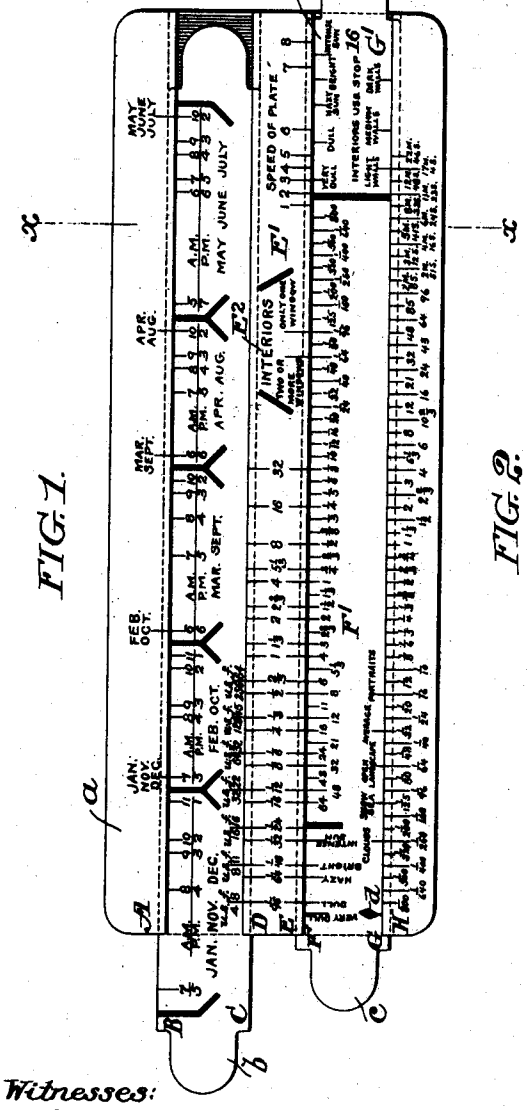
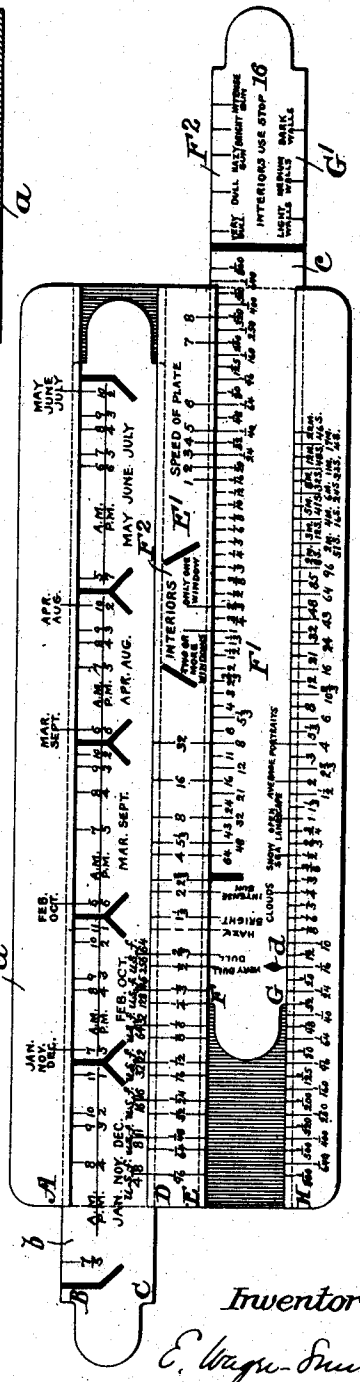



FIG. 3.




FIG. 2.




Witnesses:
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A. M. Kelly.

Inventor:
E. Wager-Smith
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(No Model.) 4 Sheets—Sheet 2.

FIG. 5.

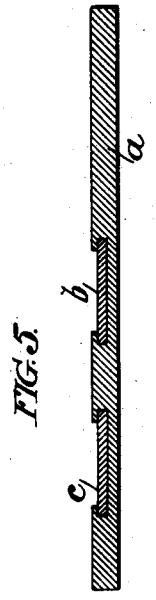
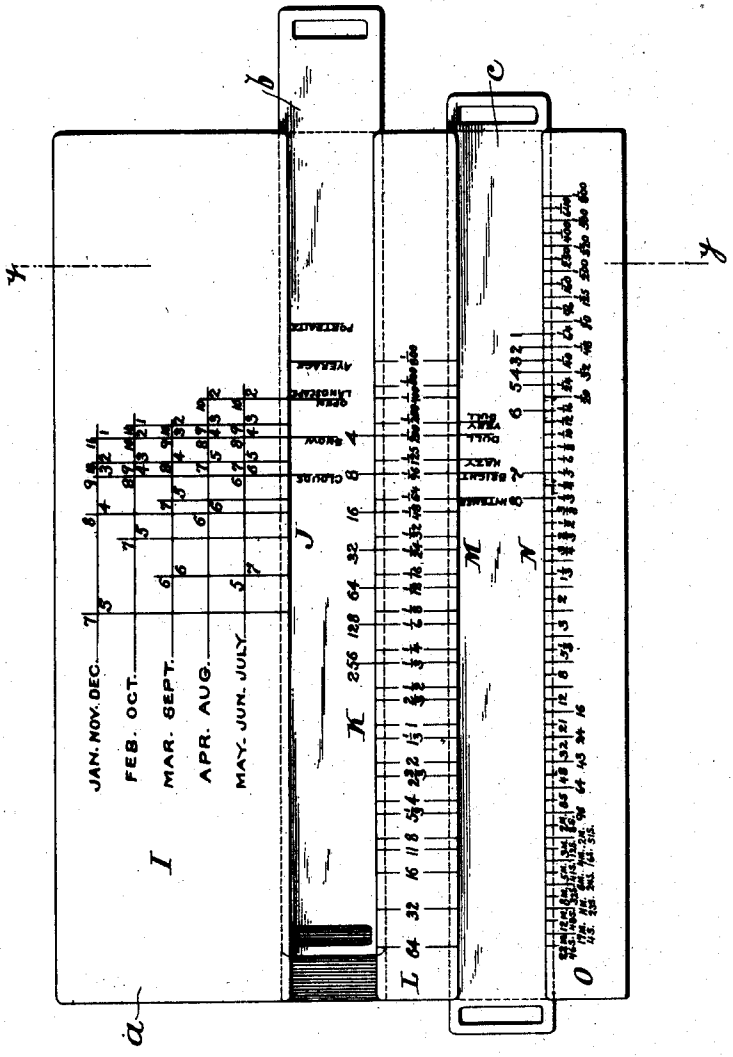



FIG. 4.




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No. 668,896. Patented Feb. 26, 1901.

E. WAGER-SMITH.

EXPOSURE INDICATOR.

(Application filed Mar. 23, 1900.)

(No Model.) 4 Sheets—Sheet 3.

FIG. 6.

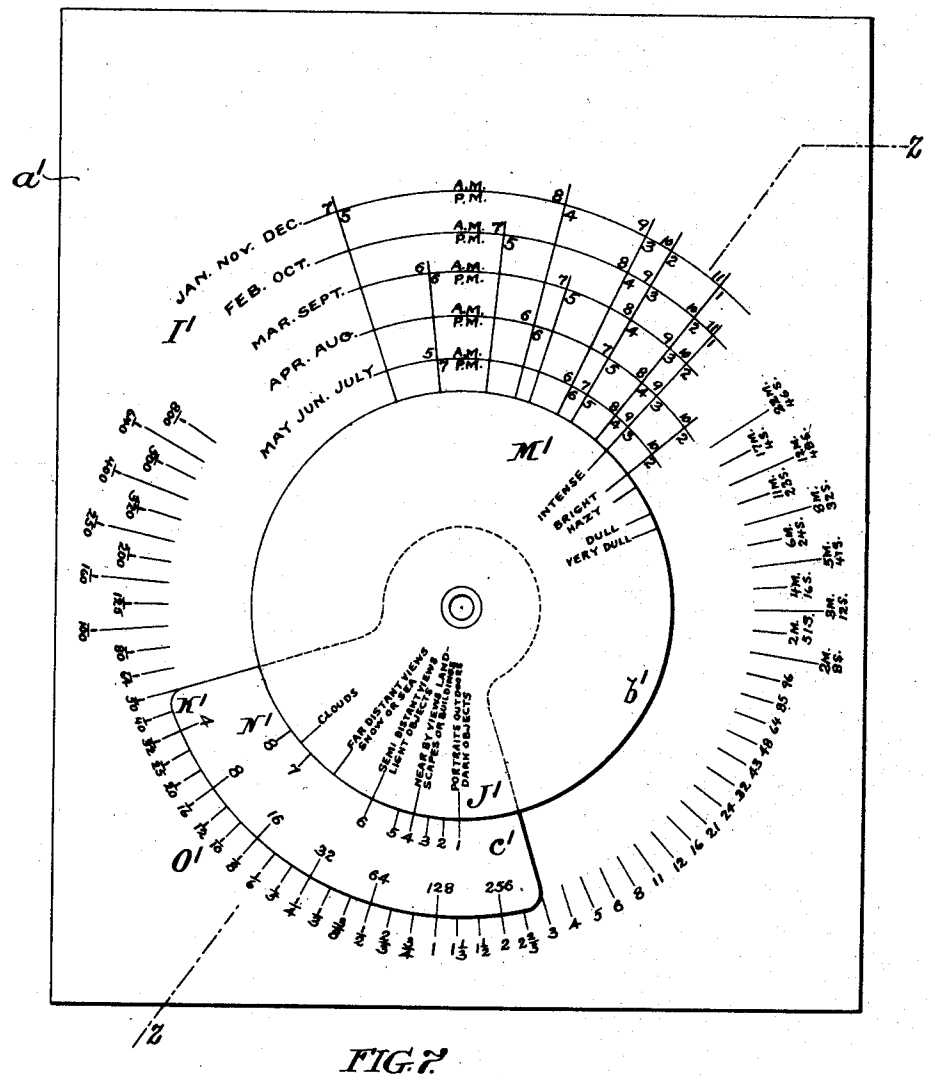
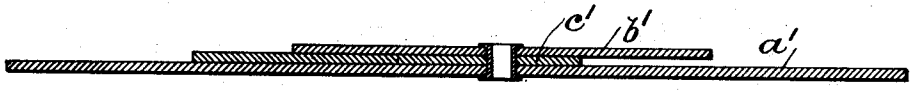



FIG. 7.




Witnesses:

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No. 668,896. Patented Feb. 26, 1901.

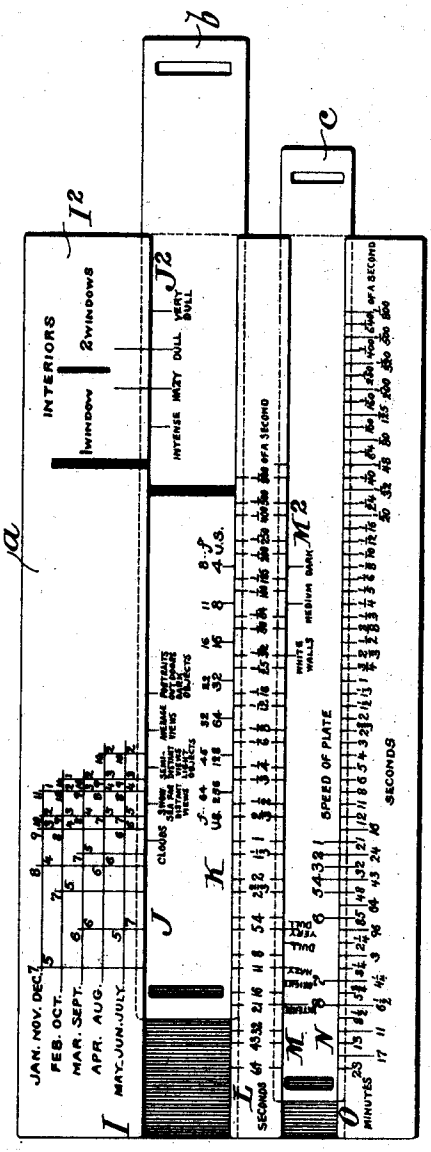
E. WAGER-SMITH.

EXPOSURE INDICATOR.

(Application filed Mar. 23, 1900.)

(No Model.) 4 Sheets—Sheet 4.

FIG. 8.




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# UNITED STATES PATENT OFFICE.

EDWARD WAGER-SMITH, OF PHILADELPHIA, PENNSYLVANIA.

## EXPOSURE-INDICATOR.

SPECIFICATION forming part of Letters Patent No. 668,896, dated February 26, 1901.

Application filed March 23, 1900. Serial No. 9,857. (No model.)

*To all whom it may concern:*

Be it known that I, EDWARD WAGER-SMITH, of the city and county of Philadelphia, in the State of Pennsylvania, have invented an Improvement in Photographers' Exposure Indicators or Scales, of which the following is a specification.

My invention relates to photographers' exposure meters, indicators, or scales, and is fully set forth in the following specification and shown in the accompanying drawings.

The great difficulty in photography, particularly to amateurs, is experienced in properly timing the exposure to suit the conditions under which the photograph is being taken, and over or under exposed plates are the rule rather than the exception. The proper time of exposure depends upon a variety of factors—the elevation of the sun, the intensity of the light, the character of the object to be photographed, the size of the "stop" or diaphragm, and the speed of the photographic plate—and in interior exposures the quantity of light admitted to the room and the color of the walls are additional factors to be considered. To the average photographer, either amateur or professional, the time of exposure under given conditions is a matter of guesswork and not of accurate calculation, and the results obtained are consequently dependent largely on chance.

It is an object of my invention to enable the exact time of exposure proper for photographing a given object under given conditions to be ascertained with ease and facility by the photographer; and this object I accomplish by means of a meter or indicator containing a series of movable scales indicating the different factors to be considered, which by proper adjustment with reference to one another to suit the exact present conditions will indicate the exact time of exposure required.

The photographic scale-meters which have heretofore been devised have been approximate only, either giving the times of exposure for average conditions or requiring further calculation and correction to suit the actual conditions existing.

It is also an object of my invention to give the exact exposure required for the actual given conditions without the necessity of further calculation or correction by photographic exposure tables.

My indicator may be arranged for either exterior or interior exposures, or for both.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of an exposure-meter embodying my invention and adapted for both exterior and interior exposures. Fig. 2 is a similar view of the same, showing a second adjustment of one of the movable parts or slides. Fig. 3 is a transverse section on the line $x\ x$ of Fig. 1. Fig. 4 is a plan view of a different form of meter adapted for exterior exposures only. Fig. 5 is a transverse section of the same on the line $y\ y$. Fig. 6 is a plan view of another form of the meter also adapted for exterior views only. Fig. 7 is a cross-sectional view of the same on the line $z\ z$ of Fig. 6; and Fig. 8 is a plan view of a meter similar to that shown in Fig. 4, but with the addition of indicating-scales for interior exposures also.

In referring to the meter shown in Figs. 1 2, and 3 and in comparing the same with the forms shown in Figs. 4 to 7 I shall first confine the description to the use of the scales for exterior views.

*a* is a flat piece of cardboard, metal, wood, celluloid, or other suitable material, in which are mounted two independently longitudinally movable slides *b c*. The upper portion of the piece *a* is provided with a graduated scale A, indicating the months of the year, which, as shown, are arranged in groups of months in which the period of sunlight is approximately the same. The central portion of the piece *a* between the slides *b* and *c* is provided with a scale D E, indicating the different times of exposure possible with a plate of the highest speed for photographing an average object with an intense sunlight, and at one end with a scale E′, indicating the different speeds of the plates. The lower portion of the piece *a* below the slide *c* is provided with a scale H, indicating the possible time of exposure under any of the conditions given for photographing objects of different characters with plates of different speed and with sunlight of various intensity. On the upper side of the slide *b*, adjacent to the scale A, is a scale B, indicating the different hours

of sunlight during a day in the different groups of months, hours in which the sun has approximately the same elevation a. m. and p. m. being grouped as shown. On the lower side of the slide *b*, adjacent to the scale D E, is a graduated scale C, indicating the different sizes of stops or diaphragms that may be employed. On the upper side of the slide *c*, adjacent to the scale D E, is a scale F, indicating the degrees of intensity of the light, and a scale F′, similar to the scale H, indicating the possible time of exposure under any of the conditions given for photographing any given object with a plate of any given speed with light of any degree of intensity. On the lower side of the slide *c*, adjacent to the scale H, is a scale G, indicating the character of the object to be photographed, and also an index or pointer *d*.

In operating the meter the slide *b* is moved longitudinally until the given hour of the day in the given month is brought under the graduation in the scale A for the corresponding month. Under the number of the given stop in the scale A will be found the time of exposure necessary at that season and hour for taking a photograph of an average object with the fastest plate and most intense sunlight. The slide *c* is then moved longitudinally until the given degree of intensity of light in the scale F is brought under the ascertained period of exposure in the scale D E. The character of the object to be photographed on scale G will then be over the graduation on the scale H, which will give the necessary time of exposure for the object in question under the given conditions if a plate of the fastest speed is used. If a plate of the fastest speed is not used, the slide *c* is again moved until the ascertained time of exposure on the scale F′ is brought under the given speed of the plate in the scale E′, when the index *d* will be above the time of exposure in the scale H for all the conditions given.

For example, suppose it is desired to photograph an ordinary open or semidistant landscape with a No. 8 stop and a No. 6 plate at ten o'clock a. m. in the month of June when the sunlight is bright. The slide *b* is moved longitudinally until the point "10 A. M." in "June" on scale B is under the point "June" in scale A. Stop 8 in the scale C will then be above "1/48." The slide *c* is then moved longitudinally until the point "Bright" in scale F is under the point "1/48" in scale D E. The point "Landscape, &c.," in scale G will then be above the point "1/64" in scale H. The slides *b* and *c* are shown in these positions in Fig. 1. The slide *c* is then moved longitudinally until the point "1/64" (just ascertained) in the scale F′ is brought under the point "No. 6" in the scale E′. The index *d* will then be above the point "1/16" in the scale H, which indicates in seconds the time of exposure required for the given conditions.

It is obvious that the relative arrangement of the scales may be varied, provided the necessary relative movements are maintained. In Figs. 4 and 5 I have shown a different arrangement by which the additional movement of the slide *c* necessary in the construction shown in Figs. 1 and 2 is avoided. In this case the upper portion of the card *a* is provided with a scale I, which combines in itself the two scales A and B of the construction shown in Figs. 1 and 2, the groups of months being arranged one above the other and the hours in vertical columns referring thereto, so that the vertical columns indicate in the scale I the different hours of sunlight in any given month. The upper part of the slide *b* is provided with a scale J, indicating the character of the object to be photographed, and the lower part with a scale K, indicating the number of the stop. The central portion of the card *a* is provided with a scale L, indicating the time of exposure under the conditions given for the most intense light and plates of the fastest speed. The upper part of the slide *c* is provided with a scale M, indicating the intensity of the light, and the lower part with a scale N, indicating the speed of the plate. The lower portion of the card *a* is provided with a scale O, indicating the time of exposure for all of the possible conditions given. In using this meter as in the example given in the case of the indicator shown in Figs. 1 and 2 the slide *b* is moved longitudinally until the object to be photographed in scale J (Open landscape) is under the time and season ("10 A. M. June") in scale I. Under the number of stop ("8") in scale K will be found in scale L the time of exposure for these conditions with the most intense light and the fastest plate, ("1/96.") The slide *c* is then moved until the given intensity of light ("Bright") in scale M is under this ascertained speed of exposure in scale L, when the speed of the plate ("6") in scale N will be over the required time of exposure ("1/16") in scale O for all the given conditions.

A still different arrangement is shown in Figs. 6 and 7, in which instead of longitudinally-movable slides rotary pieces are employed and the relative arrangement of the scales is varied. On the base-piece *a′* is a scale I′, indicating the hour and season, and a scale O′, indicating the possible time of exposure for all the conditions to be considered. *b′* is a rotary card or disk mounted on the base *a′*, containing a scale M′, indicating the intensity of the light, and a scale J′, indicating the character of the object to be photographed. C′ is a segment pivoted to the base *a′* and exposed between the disk *b′* and that portion of the base *a′* which contains the scale O′. This segment C′ contains a scale N′, indicating the speed of the plates adjacent to the disk *b′*, and a scale K′, indicating the stop adjacent to the scale O′ on the base *a′*. In using this meter as in the example given the point indicating the intensity of light ("Bright") in scale M′ is moved under the hour and season

("June 10 A. M.") in scale I'. The speed of the plate ("6") in scale N' is then moved under the character of the object to be photographed ("Semidistant views or open landscapes") in scale J', and the number of the stop ("8") in scale K' will then be opposite the required time of exposure ("1/16") in scale O'.

The scales shown in Figs. 1, 2, and 3 for interior exposures are adapted to a No. 16f or U. S. stop, although they could be arranged to suit any other stop desired, and the time of the year and hour are not considered. The central portion of the piece *a* above the slide *c* is provided with a scale $E^2$, indicating the number of windows in the room. The slide *c* is provided with scale $F^2$, adjacent to scale H, indicating the color of the walls.

Supposing a photograph is to be taken with a hazy sunlight of an average interior in a room containing only one window, with interior walls of medium color, the slide C is moved until the point "Hazy" on the scale $F^2$ is opposite the point indicating "One window" in scale $E^2$. The point "Medium walls" in scale G' will then be opposite the proper time of exposure (32 seconds) in scale H. This, however, gives the time of exposure for a No. 16f or U. S. stop and provided the photograph is taken under average conditions, not earlier than three hours after sunrise nor later than three hours before sunset, and with a plate of fastest speed. If, however, the plate used is not of fastest speed, the time of exposure for the given plate may be ascertained by moving the slide *c* until the time in the fastest plate just ascertained is under the given speed of plate in scale E'. The pointer *d* will then be over the required time of exposure in scale H for the given plate under the given condition. For example, if a No. 6 plate is used the slide *c* is moved until the time 32 seconds just ascertained is brought under No. 6 in scale E'. The pointer *d* in scale G will then be over "2 min. 8 sec." in scale H, which is the required time of exposure for a plate of that speed under the conditions given.

In Fig. 8 a meter of the type shown in Fig. 4 is employed for interiors, and this scale is adapted for any stop and for any speed of plate. On the upper part of the piece *a* is a scale $I^2$, indicating the number of windows. On the slide *b* is scale $J^2$, indicating the intensity of the light, and on the slide *c* is a scale $M^2$, indicating the color of the interior walls. In using this meter for interiors the slide *b* is moved until the point indicating the existing intensity of light in the scale $J^2$ is under the point in the scale $I^2$ indicating the given number of windows. The slide C is then moved until the point indicating the given color of the walls in scale $M^2$ is under the given stop in the scale K in the slide *b*. The given speed of the plate in scale N will then be over the necessary time of exposure in the scale O.

Suppose, for example, an interior photograph were to be taken in a room having walls of medium color, lighted from one window, with a hazy sunlight, using a No. 8 U. S. stop and a No. 6 plate. Slide *b* is moved until the point "Hazy" in scale $J^2$ is under the point "1" in scale $I^2$. The scale *c* is then moved until the point "Medium" in scale $M^2$ is under "No. 8" in the scale K. The point "No. 6" in scale N is then over the point "85 sec." in scale O, which gives the necessary time of exposure in seconds for taking the photograph under the conditions given. This is, however, strictly accurate for average conditions only, supposing the time to be not earlier than three hours after sunrise nor later than three hours before sunset. If special conditions exist, some increase or decrease of the time will be necessary to obtain the most perfect results.

I have illustrated my invention in various forms, and it will be understood that the relative arrangement of the scales may be further varied and that the details of construction shown may be changed without in any way departing from the invention.

What I claim as new, and desire to secure by Letters Patent, is as follows:

1. A photographer's exposure-meter, consisting of a part *a*, containing a graduated scale indicating periods of time (*i. e.* sun elevation) and two graduated scales fixed with reference thereto indicating times of exposure, and two parts *b* and *c* independently movable with reference to the part *a*, the part *b* being arranged between the scale of periods of time and one of the scales of times of exposure, and the part *c* between the two scales of times of exposure, said parts *b* and *c* containing four graduated scales respectively indicating the numbers of stops, speeds of plates, the character of the object to be photographed, and the intensity of the light, two of said scales being carried by each of said parts, and one of the scales of times of exposure on the part *a* being adapted to indicate the exposure required at the given period of time (sun elevation) with the factors contained in the two scales on the part *b*, and the other to indicate the exposure required for the said factors and the additional factors contained in the two scales on the part *c*.

2. A photographer's exposure-meter, consisting of a part containing two graduated scales fixed with reference to one another, one scale indicating periods of time (sun elevation) and the other the times of exposure, and two parts movable with respect to said part and to each other and containing four graduated scales respectively indicating numbers of stops, speeds of plates, character of the object to be photographed and intensity of light, two of said scales being carried by one of said parts and the other two by the other part.

3. A photographer's exposure-meter consisting of three parts movable with respect to one another and containing graduated scales

respectively indicating periods of time, times of exposure, speed of plates, numbers of stops, character of object to be photographed and intensity of light, part of said scales being carried by each of said parts and so arranged that the relative adjustment of said parts will indicate by adjacent graduations the time of exposure required for all of the given conditions.

4. A photographer's exposure-meter for interior exposures consisting of a part *a* containing a graduated scale indicating times of exposure, and two parts *b* and *c* movable with respect to each other and to the part *a*, and five graduated scales indicating respectively the number of windows or light-openings in the room, the intensity of the light, the color of the walls, the numbers of the stops, and the speeds of the plates, one of said scales being carried by the part *a* and two of the others by each of the parts *b* and *c*.

5. A photographer's exposure-meter consisting of three parts movable with respect to one another and containing graduated scales respectively indicating periods of time, times of exposure, speed of plates, numbers of stops, character of object to be photographed, number of windows or light-openings in the room in which the object is to be photographed, color of the walls and intensity of light, part of said scales being carried by each of said parts and so arranged that the relative adjustment of said parts will indicate by adjacent graduations the time of exposure required for all of the given conditions and for either exterior or interior exposures.

6. A photographer's meter for calculating both exterior and interior exposures consisting of a part *a* containing a graduated scale indicating periods of time (sun elevation) and two scales indicating times of exposure, and two parts *b* and *c* movable with respect to the part *a* and to each other, the part *b* being arranged between the scale of periods of time and one of the scales of times of exposure, and the part *c* between the two scales of times of exposure, said parts *b* and *c* containing four graduated scales indicating respectively the numbers of stops, the speeds of the plates, the character of the object to be photographed and the intensity of the light, two of said scales being carried by each of said parts, and graduated scales indicating respectively the number of windows or light-openings, the intensity of the light for interior exposures, and the color of the walls of the room one of said scales being carried by each of said parts *a*, *b* and *c*.

In testimony of which invention I have hereunto set my hand.

EDWARD WAGER-SMITH.

Witnesses:

HOWARD RHODE,

PAUL A. SUWALD.