Oct. 10, 1933. F. E. ALTMAN ET AL 1,930,139

PHOTOGRAPHIC PRINTER

Filed Jan. 23, 1932

Fig. 1.

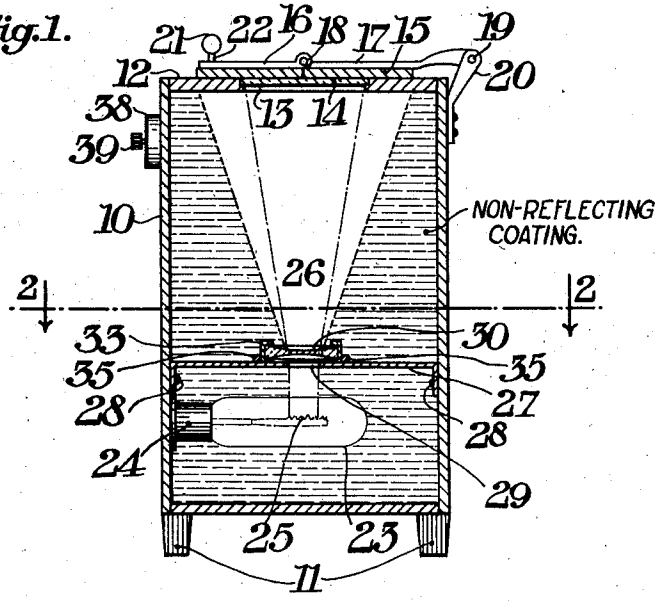



Fig. 2.

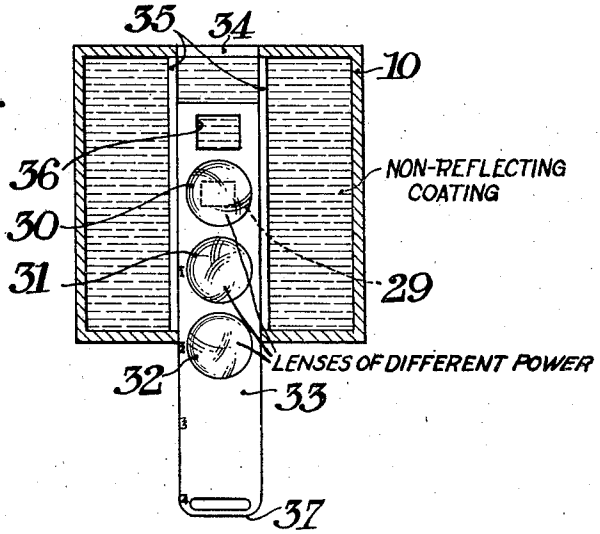
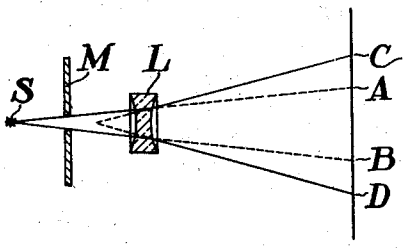



Fig. 3.




Fred E. Altman &
Clifton M. Tuttle,
Inventors:

By Newton M. Perrine
Lolla N. Carter
Attorneys

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# UNITED STATES PATENT OFFICE

1,930,139

## PHOTOGRAPHIC PRINTER

Fred E. Altman and Clifton M. Tuttle, Rochester, N. Y., assignors to Eastman Kodak Company, Rochester, N. Y., a corporation of New York

Application January 23, 1932. Serial No. 588,424

3 Claims. (Cl. 95—73)

Our invention relates to photography and more particularly to photographic printing machines. In photographic printing it is frequently desirable to control the intensity of the light falling on the printing panel or to control the intensity level of a series of photographic exposures without altering the intensity of the source of light or its distance from the panel.

It is an object of our invention to provide a printer which will accomplish the above-described results and with which any lighting arrangement once used may be accurately duplicated at any time. Another object of our invention is to provide a printer in which a series of two or more printing intensities may be secured with a known relation existing between them.

Other objects and advantages of our invention will appear from the following description when read in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

Printing machines designed to give a series of exposure steps have generally made use of a density wedge for successively varying the intensity level of the printing exposure. It is possible to secure fairly good results with such wedges for a time, but eventually the several densities change so that the ratio between them varies and it is difficult to keep them clean with the result that the operator has no definite assurance that two series of exposures made at widely separated intervals would be substantially identical.

Our present printer is designed to overcome the above difficulties by using lenses to control the intensity level of the printing light. These lenses remain unchanged for an indefinite period and are quite easy to keep clean. The operator therefore knows that the exposures obtained by using various lenses always bear the same definite relation to each other and to an exposure made without a lens in the light beam.

The use of our invention also eliminates the necessity of pressing the negative and positive firmly together to secure sharp, clearly defined prints by printing from a light beam composed of undiffused light rays as set forth in Patent Number 1,799,817 issued April 7, 1931, to Roy S. Hopkins.

Referring to the drawing:

Fig. 1 is a side elevation in section of a printer constructed in accordance with and illustrating one embodiment of our invention;

Fig. 2 is a horizontal section on line 2—2 of Fig. 1; and

Fig. 3 is a diagrammatic showing of the optical principle used in our invention.

The printer is illustrated as consisting of a box-like structure 10 which may be supported by legs 11. The top 12 of the printer is provided with an aperture 13 in which a glass plate 14 is mounted to form a printing panel.

Over the top of the printing panel 14 there is a platen 15 carried by a frame consisting of two parts 16 and 17 hinged together at 18, section 17 being hinged at 19 to a yoke 20 secured to the box 10. A handle 21 carried by a lug 22 on the platen frame 16 is provided for moving the platen to and from the printing panel 14.

The source of illumination includes a printing lamp 23 carried by a socket 24 mounted on a wall of the box-like structure 10. The lamp 23 is preferably of a type employing a concentrated filament 25, such lamps being often used for projection purposes. In order to mask off all reflected rays and in order to permit direct rays to form a light beam 26 to pass to the printing panel 14, we use a mask plate 27 secured to the box 10 by screws 28 so as to lie close to the printing lamp 23.

This mask is equipped with an opening 29 of substantially the same proportion as the printing panel 14 and is located directly in line with the filament 25 and panel 14 so that the unreflected rays will be evenly distributed over the panel.

All of the interior walls of the box 10, as well as all interior fittings, are preferably made non-reflecting as by painting with a dull black paint.

As thus far described, the printing machine is merely a typical one which has been selected as suitable for illustrating our invention. In order to vary the intensity of the printing light falling on the panel 14 without altering the intensity of the lamp 23, a series of negative lenses 30, 31 and 32 may be employed. These lenses are adapted to be selectively placed in position over the opening 29 in the mask 27 and differ in power from each other by a predetermined amount.

A structure suitable for the easy manipulation of these lenses is shown in Fig. 2 as comprising a flat board-like member 33 adapted to slide on and be supported by the top surface of the mask 27. Openings 34 in the walls of the box 10 permit endwise movement of the lens carrier 33 and guide members 35 suitably mounted on the mask 27 are adapted to maintain the lens carrier 33 in proper alinement with the light opening 29. In addition to the lenses 30, 31 and 32, the carrier 33 is provided with a free open-

ing 36 which when in position over the light opening 29 permits the lighting of the panel 14 at the highest intensity.

The lens carrier 33 is provided with a handle 37 which may be gripped by hand for adjustment and preferably is also provided with position indicating marks 1, 2, 3 and 4 so that the operator by a glance may determine what intensity he is using.

The manner in which the negative lenses vary the intensity of the light falling on the printing panel will be readily understood by reference to Fig. 3. A light source S of constant intensity is shielded by a mask M so that normally an area A—B will be illuminated at a certain intensity level. If now a negative lens L is placed behind the mask M, the light beam will be diverged and illuminate an area C—D at a lower intensity level than without the lens L for now the same amount of light flux is distributed over a larger area, the size of which depends upon the power or focal length of the lens L. For any given lens the reduction in the intensity level is a fixed ratio and by using a series of selected lenses it is obvious that a series of intensity levels may be obtained having a definite relation with one another.

The embodiment illustrated is provided with three lenses and therefore will give four different intensity levels for printing.

It will be obvious that the several lenses may be separately movable and placed in position by hand or they may be mounted in turret fashion and rotated into position in a well known manner.

To enable the operator to make exposures for a constant time interval there may be provided a time switch 38 of any well known type adapted to be actuated by a knob 39. It will be obvious that the switch 38 may control the circuit of the lamp 23 or may actuate an opaque shutter (not shown) to uncover the opening 29 for the desired interval.

It should be noted that once the relationship between the various lenses is known it can be depended upon not to change and that it is quite easy to keep the lenses clean.

It is to be understood that our invention is not limited to printing with undiffused light or direct light rays for it is equally applicable to printers in which a diffusing screen is positioned near the printing panel.

Obviously many modifications may be made in the embodiment described without departing from the spirit of our invention or the scope of the appended claims.

What we claim as new and desire to secure by Letters Patent of the United States is:—

1. In a photographic printing apparatus the combination with a printing panel of a source of light for effecting the printing and a plurality of lenses of substantially different focal lengths individually movable into position between the source of light and the printing panel for varying the intensity of the light falling on said panel.

2. In a photographic printing apparatus the combination with a printing panel of a source of light of constant intensity for illuminating the panel including a masked lamp adapted to pass a beam of light of definite cross-section at the plane of said panel and a lens of known focal length movable into said beam of light at a substantial distance from said panel for changing the cross-section of said beam at the plane of said panel whereby the intensity of the light falling on said panel is altered a substantial amount.

3. Photographic printing apparatus including a printing panel and a source of light of constant intensity for illuminating the printing panel, means for obtaining selectively a variety of predetermined intensity levels of light on said printing panel comprising a plurality of lenses differing substantially in focal length and individually movable into position between the source of light and said printing panel at a point which is substantially nearer to said source than to said panel whereby the intensity of the light falling on said panel is varied without altering the intensity of the light source.

FRED E. ALTMAN.
CLIFTON M. TUTTLE.