April 23, 1940. R. S. JOHN 2,198,115

METHOD OF PHOTOGRAPHY

Filed April 2, 1936 4 Sheets-Sheet 1

Fig. 1.

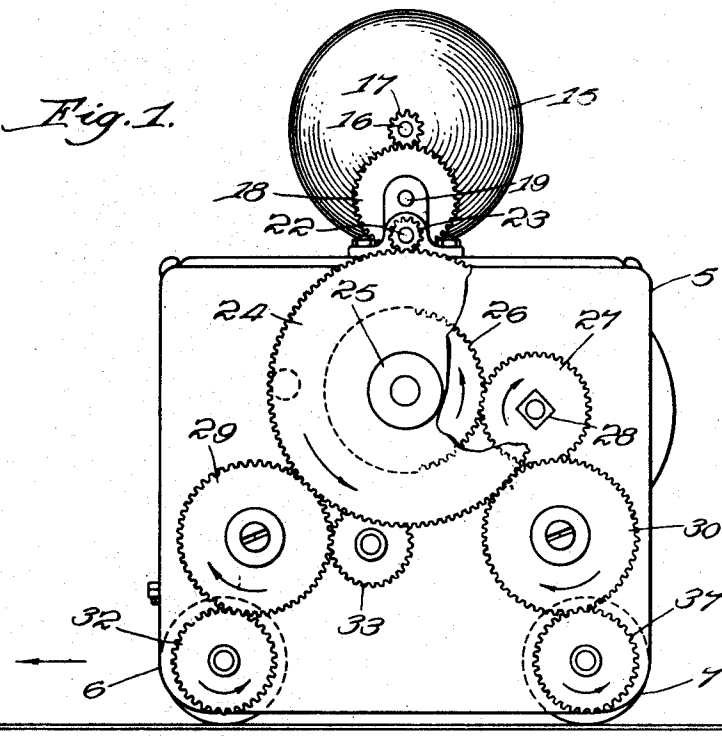
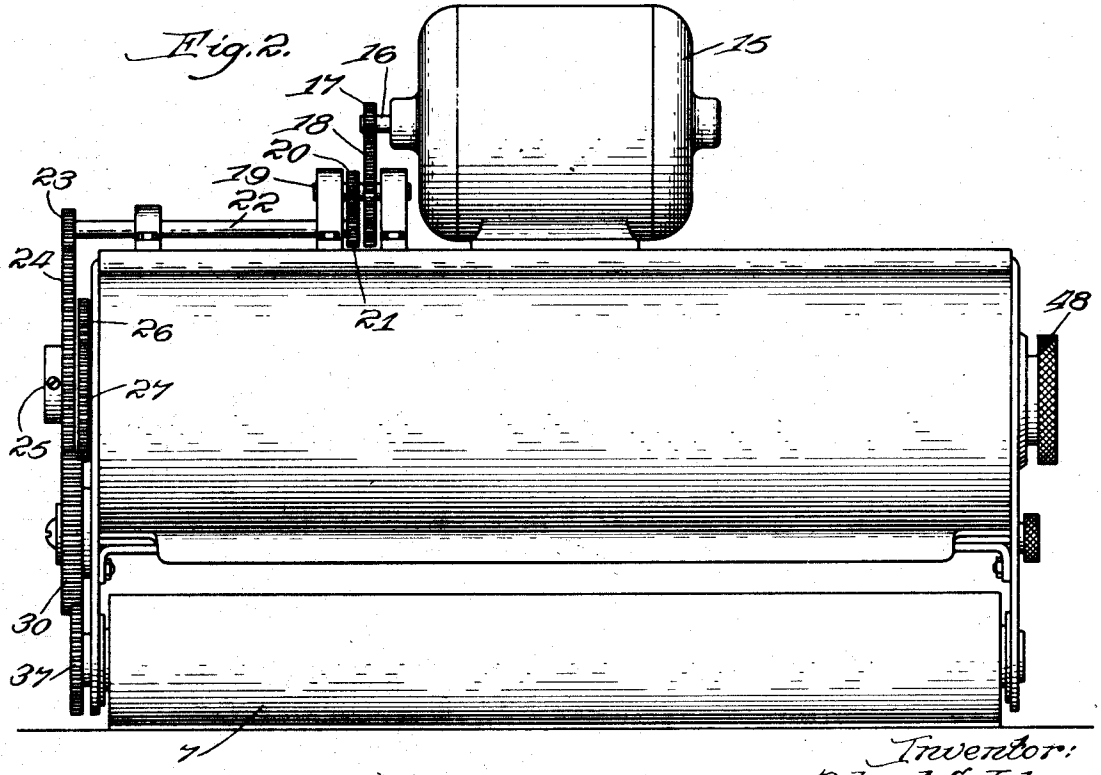


Fig. 2.



Inventor:
Robert S. John.
By Dyrenforth, Lee, Chritton & Wills.
Attys.

April 23, 1940. R. S. JOHN 2,198,115

METHOD OF PHOTOGRAPHY

Filed April 2, 1936 4 Sheets-Sheet 2

Fig. 3.

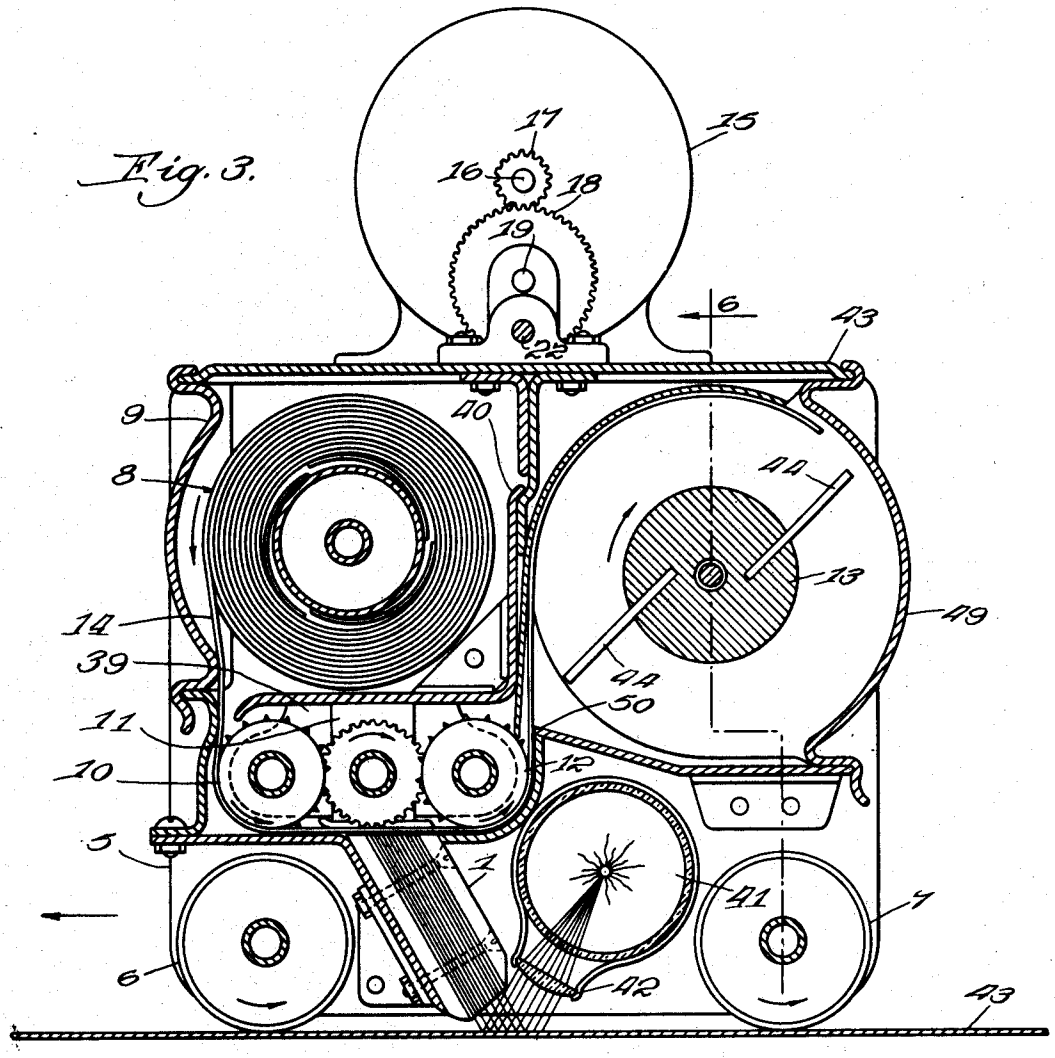


Fig. 4.

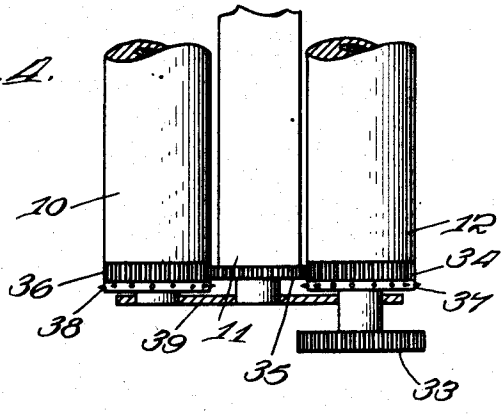
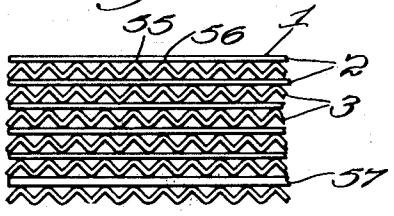


Fig. 5.



Inventor:
Robert S. John.
By Dyrenforth, Lee, Chritton & Wilks.
Attys.

April 23, 1940. R. S. JOHN 2,198,115

METHOD OF PHOTOGRAPHY

Filed April 2, 1936 4 Sheets-Sheet 3

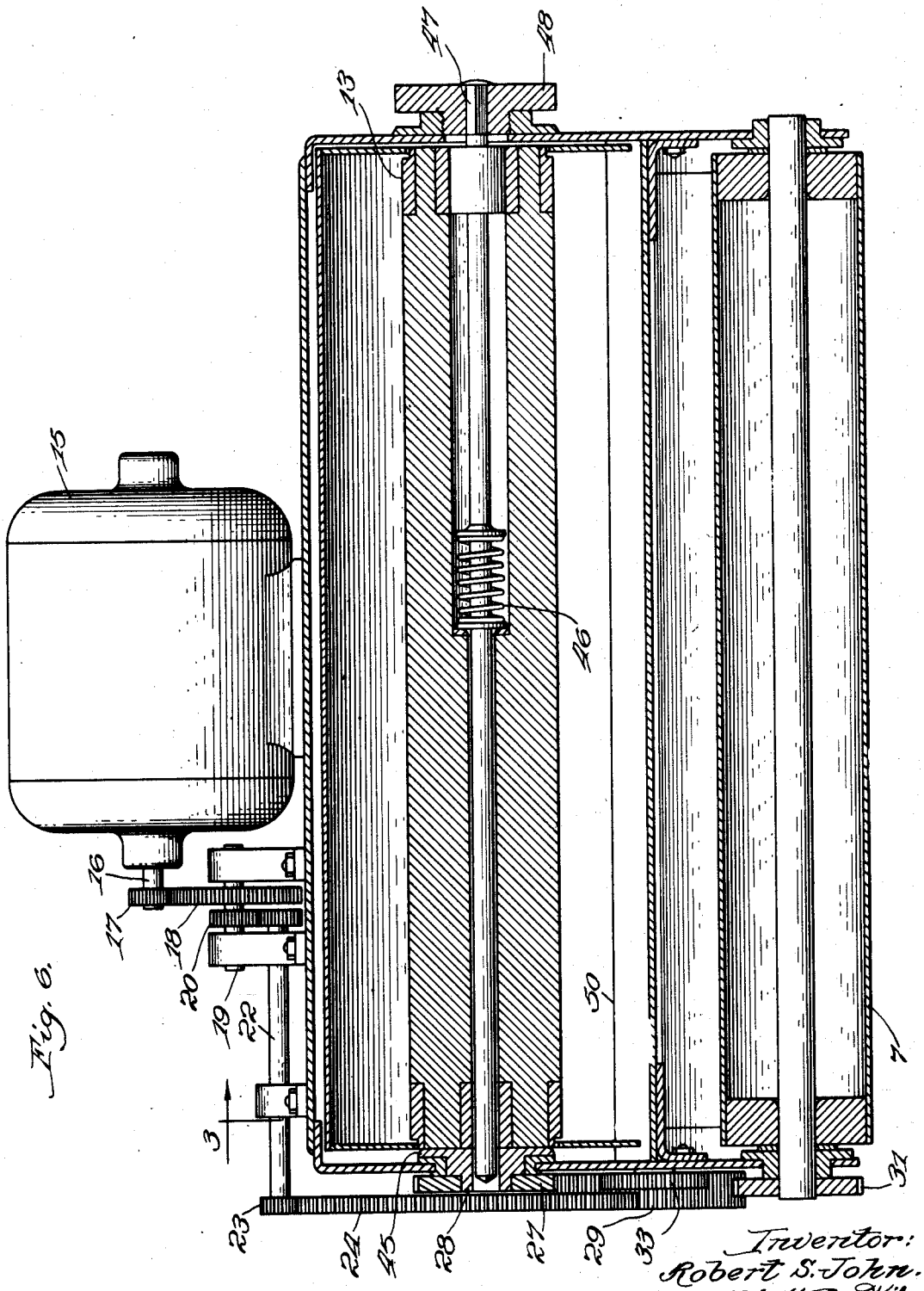


Fig. 6.

Inventor:
Robert S. John.
By Dyer, Tyrrell, Lee, Chilton & Miles
Att'ys.

April 23, 1940. R. S. JOHN 2,198,115

METHOD OF PHOTOGRAPHY

Filed April 2, 1936 4 Sheets-Sheet 4

Fig. 8.

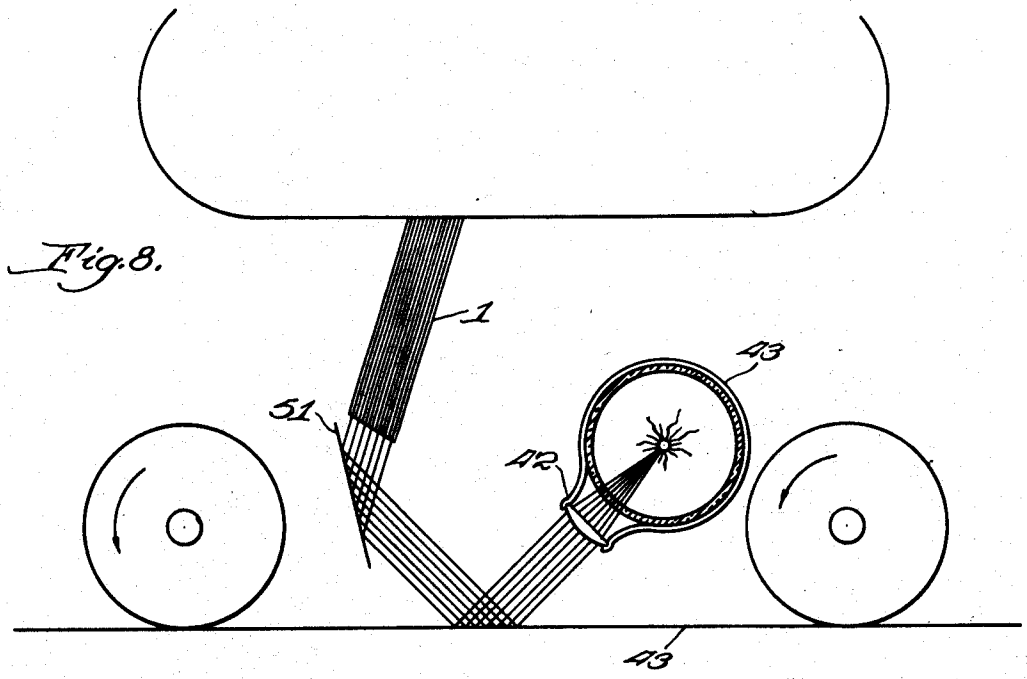
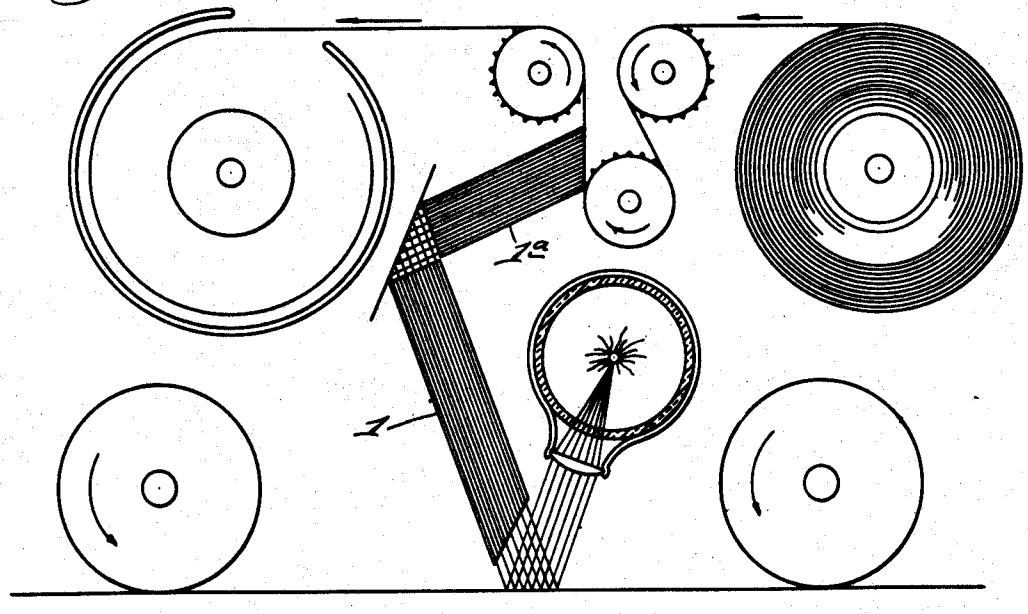


Fig. 7.



Inventor:
Robert S. John.
By Dyer, Tuttle, Lee, Shelton & Miles.
Attys.

UNITED STATES PATENT OFFICE

2,198,115

METHOD OF PHOTOGRAPHY

Robert S. John, Waukegan, Ill.

Application April 2, 1936, Serial No. 72,415

6 Claims. (Cl. 88—24)

This invention relates to a method of photography, and more particularly to a method of optically reproducing large surfaces without the use of a lens or other expensive equipment.

Photographic methods have heretofore been confined principally to the use of lenses and pinhole cameras. Neither of these methods is satisfactory for indoor photographing of large surfaces such as printed pages in books and magazines. By means of the present invention, it is possible to reproduce inexpensively, printed records of all types.

The invention is illustrated in the drawings, in which—

Fig. 1 is an end elevation partly in section of a photographic apparatus; Fig. 2 is a longitudinal elevation of a device; Fig. 3 is a transverse sectional elevation taken along the line 3 in Fig. 6; Fig. 4 is a plan view partly broken away of the paper driving rolls; Fig. 5 is a plan view partly broken away of a parallelizer assembly; Fig. 6 is a longitudinal sectional elevation taken along the line 6 in Fig. 3; and Figs. 7 and 8 are diagrammatic elevations similar to Fig. 1 showing modified forms of photographic apparatus in which the image is reversed.

As indicated in Fig. 3, the parallelizer 1 is mounted in a carriage 5 supported by the wheels 6 and 7. A supply roll 8, carrying sensitized paper 14 is enclosed in a light-proof housing 9 from which paper is fed under the rolls 10 and 12 parallel to the object photographed and onto the roll 13 where the exposed paper is accumulated.

As shown in Fig. 5 the parallelizer unit 1 consists of a plurality of spacing plates 2 and crimped members 3 between the plates. The plates 2 are preferably as thin as possible, shim material, say one thousandth inch in thickness being preferred. The crimp members 3 are of similar material, generally metal, which has been crimped as indicated in the drawing. The crimping preerably is done to produce 45 degree angles and thus give maximum light opening for the structure. In the structure shown the distance from peak 55 to peak 56 is of the order of .02 inch. A parallelizer unit so built up will pass as much as 80% of the light presented to it. The peaks are preferably staggered from row to row so that light will be passed from all points as the parallelizer is moved over an object.

It is preferred to use a heavy strap or plate 57 at intervals of 15 to 50 plates in order to provide strength for the device. Normally this will be used about every 25 spaces. A strap as heavy as .04 inch may be employed.

The driving mechanism is best illustrated in Figs. 2 and 3 in which a motor 14, which may be either electrical or clock mechanism or otherwise, is mounted on top of the carriage 5. The end of the drive shaft 16 of the motor carries a gear 17 driving a gear 18 mounted on the shaft 19. A second gear 20 is likewise carried on this shaft and drives the gear 21 on shaft 22. This shaft extends to the end of the carriage and on the end of it is mounted gear 23 which drives gear 24 on the shaft 25. This shaft also carries gear 26 which drives gear 27 in an opposite direction from 24. Gear 27 is mounted on the square shaft 28 which is operatively connected to the roll 13 upon which the exposed paper is wound.

The gear 24 also drives gears 29 and 30, and these in turn operate the wheels 6 and 7 by means of the gears 31 and 32.

Gear 29 is a double width gear and likewise drives the roll 12 through the gear 33 which is set behind gear 24. Idler gear 11, which is not in contact with the paper, is driven by wheel 12 and itself drives wheel 10. The arrangement of these rolls is shown in detail in Fig. 4, the drive being communicated from 12 through 11 and 10 through the gears 34, 35 and 36. The sprocket wheels 37 and 38 are mounted on the ends of rolls 12 and 10, respectively, to drive the paper. All three rolls are journalled in the metal strip 39 depending from the strap 40.

A light 41 is mounted within the housing and is preferably a tungsten light of the elongated filament type. The lens 42 is shown focussing the light upon a page 43 to be copied. With the proper filament, however, a lens is not required. The lens also serves as a heat and air baffle.

The light is reflected from the object 43 through the parallelizer 1 and onto the sensitized paper below the rolls. The paper is then passed into the housing 43 where it comes in contact with the rubber flaps 44 mounted on the roller 13. These flaps, which are thin and flexible, grasp the paper and wind it tightly upon the roll 13, the rubber flaps collapsing thereunder. As shown in Fig. 6, the roll 13 is in frictional contact with the wheel 45 mounted on the square shaft 28 and is pressed into frictional engagement therewith by the spring 46 mounted on the shaft 47, carried on the knob 48. In order to remove paper from the housing, the screw knob 48 is removed after which the plate 49, which is held in frictional engagement in the housing 43, is removed and the entire roll 13 withdrawn therefrom. A tear-off edge 50 is provided within the housing to tear off the sensitized paper.

In the device it is important that both the light 41 and the parallelizer shall be mounted as close to the paper as possible. This is particularly true of the parallelizer unit, which should be mounted within half an inch of the paper. If this distance is materially exceeded, enough light will be picked up in diverging rays to materially damage the image.

The machine moves across the paper, as indicated by the arrows in Fig. 3, in the opposite direction that the sensitized paper moves through under the rolls 10 and 12. The image given by this machine, however, is laterally reversed—that is, it will give the same type of image as a mirror. It is therefore employed with thin sensitized paper and after development the image is read through the paper.

In Figs. 7 and 8 are shown various arrangements for obtaining a direct image through the employment of a mirror. As shown in Fig. 8, the light 41 is focussed through the lens 42 on the paper 43, is reflected against the mirror 51 and through the parallelizer 1. The arrangement shown is diagrammatic, the mirror and parallelizer actually being kept close to the paper. For this arrangement a direct image can be produced where desired, providing the angle of the mirror and of the parallelizer are kept within exact limits. The arrangement shown in Fig. 7 produces a similar result by the use of two parallelizers 1 and 1a and a mirror 52. In these devices where the image is reversed with the mirror, the paper is passed through the apparatus in the same direction as the movement thereof.

In all instances, of course, the speed of the paper and the speed of the apparatus are correlated so that the photograph is the same size as the object.

It is possible by means of the apparatus to produce enlarged images by advancing the sensitized paper at an angle with respect to the object photographed instead of parallel, as shown in Fig. 3. In such an instance an enlargement, proportional to the secant of the angle at which the paper is passed with respect to the object, is secured. Of course, where this is done the speed of movement of the paper must be increased accordingly.

The parallelizer unit 1 must be of a depth greater than any cross-sectional diameter of an opening, and preferably is very considerably deeper. The cross-sectional dimension of any opening should not greatly exceed .01 inch. While the device has been shown in the form of straight line openings, in straight line units, the parallelizer may be bent either longitudinally or transversely; but in the first case the openings are still straight and parallel, whereas in the second case, they will be curved and parallel. In this latter instance, the light is passed through the openings by reflection along the wall, the curves not interfering materially therewith.

The term "parallel" as used herein includes therefore its ordinary geometrical meaning and also its spacial meaning, thus two concentric circles are considered parallel. Likewise, the convolutions of a spiral are considered substantially parallel.

While an arrangement has been shown herein in which a single light and an inclined parallelizer has been used, a vertical parallelizer with lights on each side may be desirable in certain instances where more illumination is required. In such a case the parallelizer will be preferably bevelled on the lower end to provide a space for the light to enter from the side.

The foregoing detailed description has been given for clearness of understanding only and no unnecessary limitations should be understood therefrom, but the appended claims should be construed as broadly as permissible, in view of the prior art.

I claim:

1. A photostating apparatus comprising a bundle of thin plates spaced from each other and crimped to provide a multitude of parallel small passageways therethrough, a light, means for passing said bundle and said light over a surface to be photographed with one end of said bundle closely adjacent to said object whereby it picks up reflected light therefrom transmitting substantially parallel rays only of said light through said passageways, and means for passing sensitized paper over the opposite end of the bundle whereby the transmitted rays of light producing on the sensitized paper an image of the surface to be photographed.

2. Apparatus as set forth in claim 1, in which the means for moving the plates and the means for moving the sensitized paper are correlated to produce the same rate of speed for both.

3. Apparatus as set forth in claim 1, in which the light-receiving end of the thin plates is not over one-half inch above the bottom of the apparatus.

4. Apparatus as set forth in claim 1, in which a mirror is provided between the object to be photographed and the light-sensitized paper to reverse the image thereof.

5. The method of photographing which comprises advancing a multitude of closely associated parallel passageways over an illuminated object, with one end of the passageways in close proximity thereto, and the other end in close proximity to a sensitized medium, and moving the sensitized medium at a speed to produce a reproduction the same size as the image.

6. The method of photographing which comprises advancing a multitude of closely associated parallel passageways over an illuminated object, with one end of the passageways in close proximity thereto, and the other end in close proximity to a sensitized medium, the sensitized medium being held at an angle to the object and moving the sensitized medium at a speed greater than the speed of movement of the illuminated object with respect to the passageways, the sensitized medium being moved in substantially the proportion of the secant of the angle between the sensitized medium and the object.

ROBERT S. JOHN.