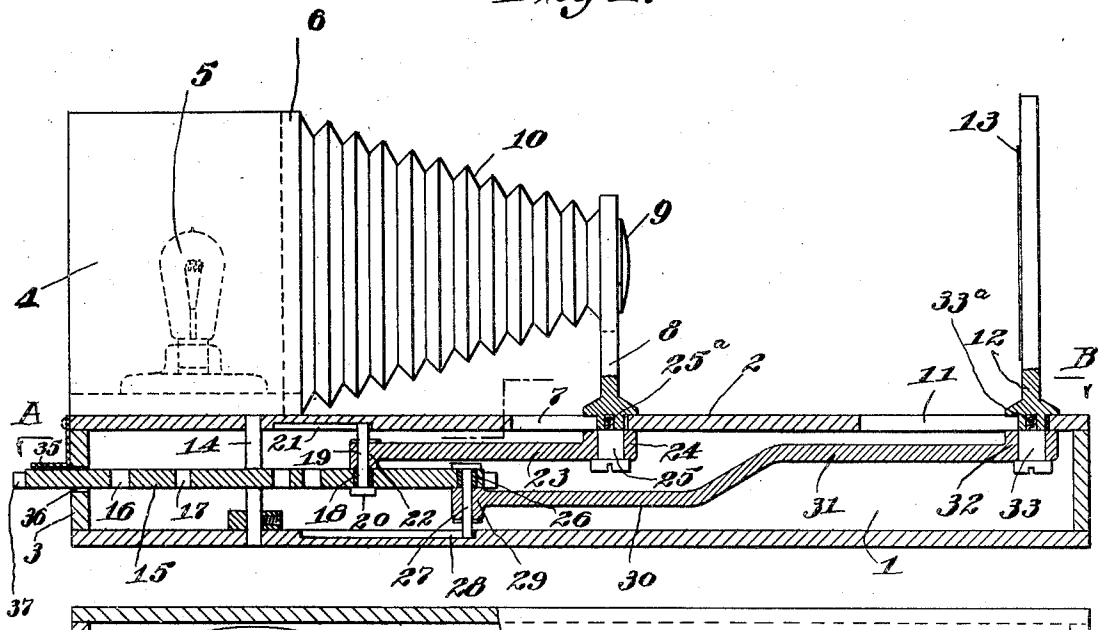
L. T. THURBER.

PHOTOGRAPHIC ENLARGER.

APPLICATION FILED JAN. 15, 1921.

1,418,690. Patented June 6, 1922.

Fig. 1.



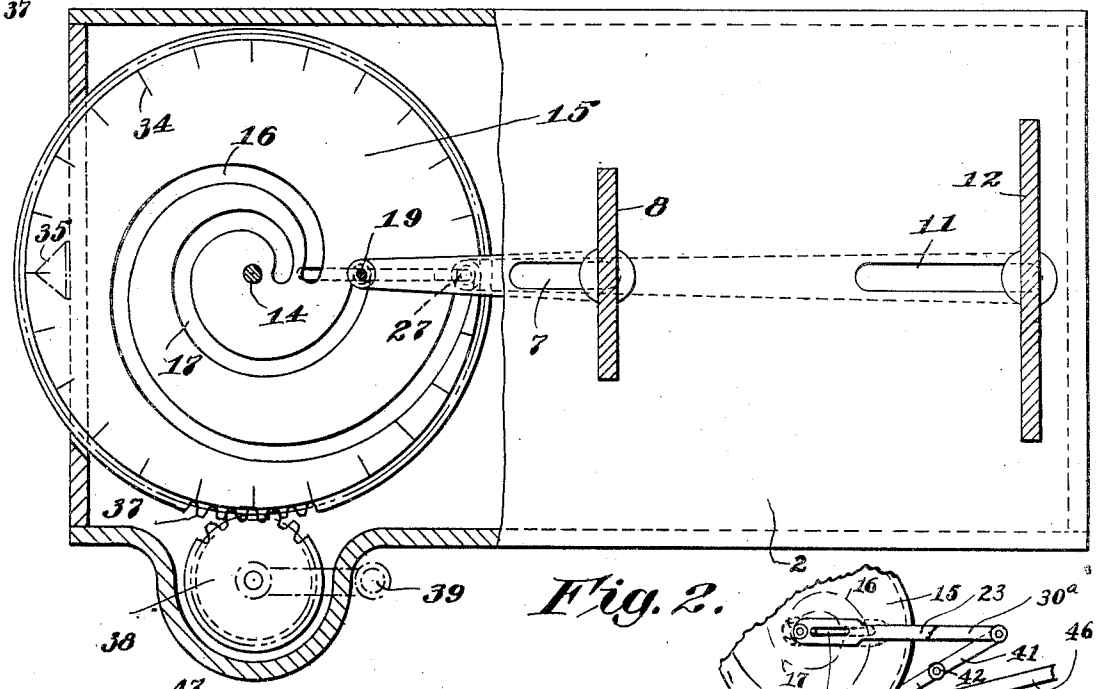


Fig. 2.

Fig. 4.

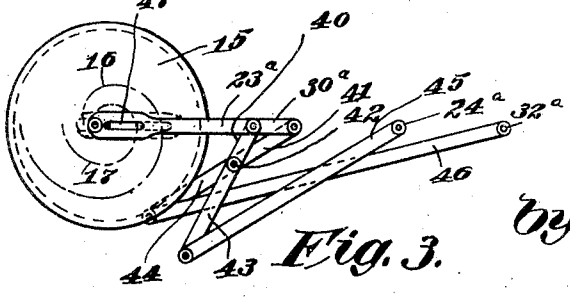


Fig. 3.

Inventor

Luman T. Thurber.

by Roberts, Roberts & Cushman.

his Attorneys

UNITED STATES PATENT OFFICE.

LUMAN T. THURBER, OF BROOKLINE, MASSACHUSETTS.

PHOTOGRAPHIC ENLARGER.

1,418,690. Specification of Letters Patent. Patented June 6, 1922.

Application filed January 15, 1921. Serial No. 437,444.

To all whom it may concern:

Be it known that I, LUMAN T. THURBER, citizen of the United States of America, and resident of Brookline, in the county of Norfolk and State of Massachusetts, have invented new and useful Improvements in Photographic Enlargers, of which the following is a specification.

This invention relates to photographic enlarging or copying devices and the like and more particularly to a device of this character in which a lens board and screen are arranged for relative adjustment toward and from a negative holder and light source.

In devices of this character it is necessary to adjust two of the three elements consisting of the screen, lens board and negative holder in varying the degree of enlargement of the image, but in order to obtain a properly focussed image upon the screen the two adjustable elements must be moved to different degrees as respects the stationary one.

The object of the present invention is to provide simple and effective means whereby the two adjustable elements, as for example the lens board and screen, may be moved simultaneously and to the proper relative degree for securing a sharp image without necessitating any particular care or skill on the part of the operator. If desired, in accordance with the present invention, suitable indicating means may also be provided, whereby to facilitate the setting of the adjustable elements for any desired degree of enlargement of the negative image.

The desired object may be attained by the employment of a rotatable cam device having a pair of cam elements of proper contour, such cam elements, by means of interposed links, serving simultaneously to impart the desired movement to the lens board and screen. If necessary, the connections between the respective cam elements and the parts moved thereby may comprise multiplying devices such for example as levers, whereby to secure an increased movement of one or both of the parts to be adjusted. The rotary cam device as thus provided lends itself to the application of graduations or any suitable indications whereby to permit it to be moved to a predetermined degree.

A preferred embodiment of the invention is illustrated in the accompanying drawings in which:

Figure 1 is a longitudinal, vertical section of the device,

Figure 2 is a horizontal section on the line A—B of Figure 1, and

Figures 3 and 4 are fragmentary plan views to smaller scale, illustrating modified forms of the device.

A support in the form of a shallow box-like receptacle 1 is preferably provided having the upper wall 2 and an end wall 3. Upon the upper wall 2 may be mounted the lantern 4 having within the same any desired source of illumination such for example as the incandescent lamp 5. One side of the lantern is provided with the negative holder 6 of any desired form. The wall 2 of the receptacle is longitudinally slotted as at 7 whereby to form guide means for a lens board or holder 8, in which may be secured a lens 9. Connecting the negative holder 6 and the lens board is a bellows 10 of the ordinary form. The upper wall 2 of the receptacle is also provided with a longitudinal slot 11 serving to guide the screen 12. Upon the screen 12 may be mounted a sheet of sensitized paper or a glass or celluloid negative indicated at 13.

Within the receptacle, at a point substantially below the lantern is mounted a shaft 14 suitably journalled to turn about a vertical axis. Fixed to the shaft 14 is a disk member 15 having therein a pair of substantially spiral cam grooves 16, 17 such grooves being of unlike contour. The cam disk may, if desired, be formed of sheet material by a punching or stamping operation thus very materially reducing the cost of construction, the grooves passing part or all the way through the disk as deemed preferable.

Engaging the groove 17 is a cam follower roll 18 turning on a pin 19 having an enlarged head 20 bearing against the under surface of the disk. The opposite end of the pin may if desired be extended for engagement with a longitudinal guide groove 21 in the under side of the wall 2. The pin 19 serves as a pivot for an enlargement 22 upon the end of a link member 23. The opposite end of the link member 23 is provided with an enlargement 24 having an opening through which passes a shoulder screw 25. The screw 25 forms a pivotal

connection between the link 23 and the lens board 8, having screw threaded engagement with the latter as indicated at 25a.

Engaging with the cam groove 16 is a cam roll 26 pivoted upon a pin 27 having an enlarged head resting upon the upper surface of the cam disk and having its lower end extended to engage a guide slot 28 in the bottom wall of the receptacle. The pin 27 serves as a pivot for the enlarged extremity 29 of a link 30. The link 30 may if desired be provided with an offset 31 lying closely adjacent the under surface of the wall 2, such offset portion terminating in an enlargement 32. A shoulder screw 33 passes through a suitable opening in the enlargement 32 forming a pivotal connection between the link and the screen 12 with which it has screw threaded engagement at 33a.

With the arrangement just described the cam disk 15 lies between the planes of the links 23 and 30 and while the disk has herein been shown as formed of sheet metal having its cam elements formed as grooves extending entirely through the same it is clearly evident that the cam disk might be formed in other ways and that if desired the cam grooves might be arranged to extend only part way through the substance of the disk, or if preferred the cam elements might be formed as ribs outstanding from the opposite faces of the disk. Moreover, while for convenience of illustration the lens board and screen have been indicated as the movable elements, it is evident that if desired one of said members might be fixed, and the negative holder arranged for adjustment in a similar manner. Furthermore under some circumstances it might be desirable to adjust all three of said elements which could readily be accomplished in the presence of a third cam element on the disk, with appropriate connections therefrom.

The upper surface of the cam disk may if desired be provided with graduations 34 cooperating with a pointer or indicator 35 secured to the outer surface of the wall 3 of the receptacle. For this purpose the wall 3 is provided with a slot 36 through which extends the edge of the disk 15. While it might be possible to rotate the disk by direct engagement of the fingers of the operator with the outstanding edge of the disk, it is preferred to provide the disk upon its edge with a series of gear teeth 37, such teeth meshing with teeth of a pinion 38 suitably mounted in the receptacle and having a handle 39 whereby it may be rotated.

In the operation of the apparatus above described the operator having placed the negative which it is desired to enlarge in the negative holder 6 and having placed the sensitized paper or negative upon the screen 12 will then adjust the disk 15 until the proper graduation has been brought opposite the pointer 35. These graduations may be of such character as to indicate the amount of enlargement of the negative image thrown upon the screen so that no further manipulation of the lens holder or screen is necessary to secure the desired result. It will of course be understood that the cam elements 16, 17 are so calculated as to secure the proper relative movement of the lens board and the screen in accordance with each desired degree of enlargement of the image. Thus by means of the apparatus herein provided it is unnecessary to employ a skilled operator for making perfect enlargements and thus the expense of making such enlargements is reduced while at the same time extreme accuracy in the focusing and an image of desired sharpness is assured.

As under some circumstances it may not be desirable to make the cam disk of sufficient diameter to produce the degree of movement in the lens board and screen necessary for the proper degree of enlargement, the modified apparatus shown diametrically in Figure 3 may be employed. In this case the disk 15 provided with the cam elements 16, 17 is substantially as in the previously described structure. In this case, however, the link members 23a, 30a, respectively are connected to the short arms 40, 41 of a pair of levers pivoted at 42. The longer arms 43, 44 of said levers are pivotally connected with links 45, 46 respectively, such links at their opposite extremities having enlargements 24a, 32a respectively provided with openings for engagement by shoulder screws such as 25, 33 for connecting them to the lens board and screen respectively. For properly guiding the links 23a, 30a such links may if desired be provided with longitudinal slots 47 taking over the shaft, upon which the disk 15 is mounted. With the arrangement just described it is clear that movement imparted to the links 23a, 32a by the cam elements 16, 17 is multiplied through the agency of the levers pivoted at 42 and thus the movement imparted to the lens board and screens is greater than with the apparatus shown in Figures 1 and 2. While as shown in Figure 3, the throw of the cam elements for actuating both the lens board and screen is multiplied to the same extent, it is contemplated that in some cases (Fig. 4) the cam may be employed for directly moving the lens board, (as in Figure 1) such movement being of relatively small extent, while a multiplying lever (as in Figure 3) may be used to increase the movement of the screen if desired.

Although the term lens board has herein been employed as a convenient mode of indicating the device for supporting the lens, it is to be understood that this word is used

in a generic sense and that any suitable means for supporting and guiding a lens in its movement may be employed. Likewise while the device 12 has been termed a screen, it is intended by such term to include any suitable arrangement whereby the sensitized paper may be properly held in position or whereby an unexposed negative might be supported. Furthermore if the device should be used for copying as well as for enlarging, the member 12 might be employed for supporting the picture to be copied, such picture being properly illuminated in any desired manner while in such case the negative holder 6 would be supplied with an unexposed negative or a holder for sensitized paper.

While the invention has been illustrated in a preferred embodiment of the same it is to be understood that various changes and modifications in shape and proportions of parts as well as immaterial rearrangements of the same might be made without departing from the spirit of the invention.

Having thus described the invention and the mode of operation thereof, what I claim and desire to secure by Letters Patent of the United States is:

1. A photographic device comprising a lens holder and a screen, a rotatable cam member having a pair of spiral cam elements of unlike contour, followers engaging said elements, and connections between the respective followers and said lens holder and screen respectively.

2. A device of the class described comprising a rotatable cam disk having a pair of unlike curvilinear cam grooves therein, a pair of relatively slidable members, cam followers engaging the cam grooves, and connections comprising link members between the respective followers and said slidable elements.

3. An enlarging device comprising relatively movable elements, and means for moving said elements simultaneously at different speeds consisting of a cam disk of sheet material having a pair of unlike cam grooves extending through the substance thereof, and pivotally connected elements for transmitting movement from said cam grooves to the respective movable elements.

4. An enlarging device comprising a lens board and screen, links for transmitting movement to said parts, said links being spaced apart, and a cam disk lying between said links and having cam elements available at its opposite sides for actuating the respective links.

5. An enlarging device comprising a support, a lens holder and screen slidably mounted upon said support for relative movement, a rotatable cam disk having a pair of unlike, substantially spiral grooves therein, cam followers engaging the grooves, a link member secured to one of said followers and arranged at one side of the cam disk, and a second link secured to the other cam follower and lying at the other side of said disk, said links having operative connection with said lens holder and screen respectively.

6. An enlarging device comprising a relatively movable lens holder and screen, a rotatable cam having a pair of independent cam elements, and connections between said lens holder and screen and the respective cam elements, the connections to one of said devices including motion multiplying means.

7. A device of the class described comprising a lens board and screen, a rotatable cam disk having a pair of cam grooves, a pair of links, a cam follower carried by each of said links and engaging the respective grooves, levers having short arms pivotally connected to the respective links, and link members connecting the longer arms of said levers with said lens board and screen respectively.

8. An enlarging device comprising a support having a source of illumination and a negative support, a lens board and screen slidably guided upon said support for relative movement toward and from said negative support, a shaft, a crank handle for rotating the same, independent cam elements rotatable by said shaft for simultaneously moving said lens board and screen to different relative degrees, and indicator means for determining the extent of such movement.

9. An enlarging device comprising a pair of movable members, a rotatable disk provided with a pair of unlike cam elements, connection between said cam elements and the respective members, means for turning said disk, and indicating means to determine the degree of movement of said disk.

10. An enlarging device comprising a shallow, box-like respectacle, a lantern mounted thereon and having a negative support at one side thereof, a lens board and a screen, said receptacle having slots in its upper wall for guiding said lens board and screen for relative movement, a disk within said receptacle and turnable about a vertical axis below the lantern, cam elements carried by said disk, connections in said receptacle between said cam elements and the lens board and screen respectively whereby to impart movement thereto, means for turning said disk, and an indicator member overlying the upper surface of the disk and cooperating with graduations thereon to indicate the degree of movement of the disk.

Signed by me at Boston, Massachusetts, this sixth day of January, 1921.

LUMAN T. THURBER.