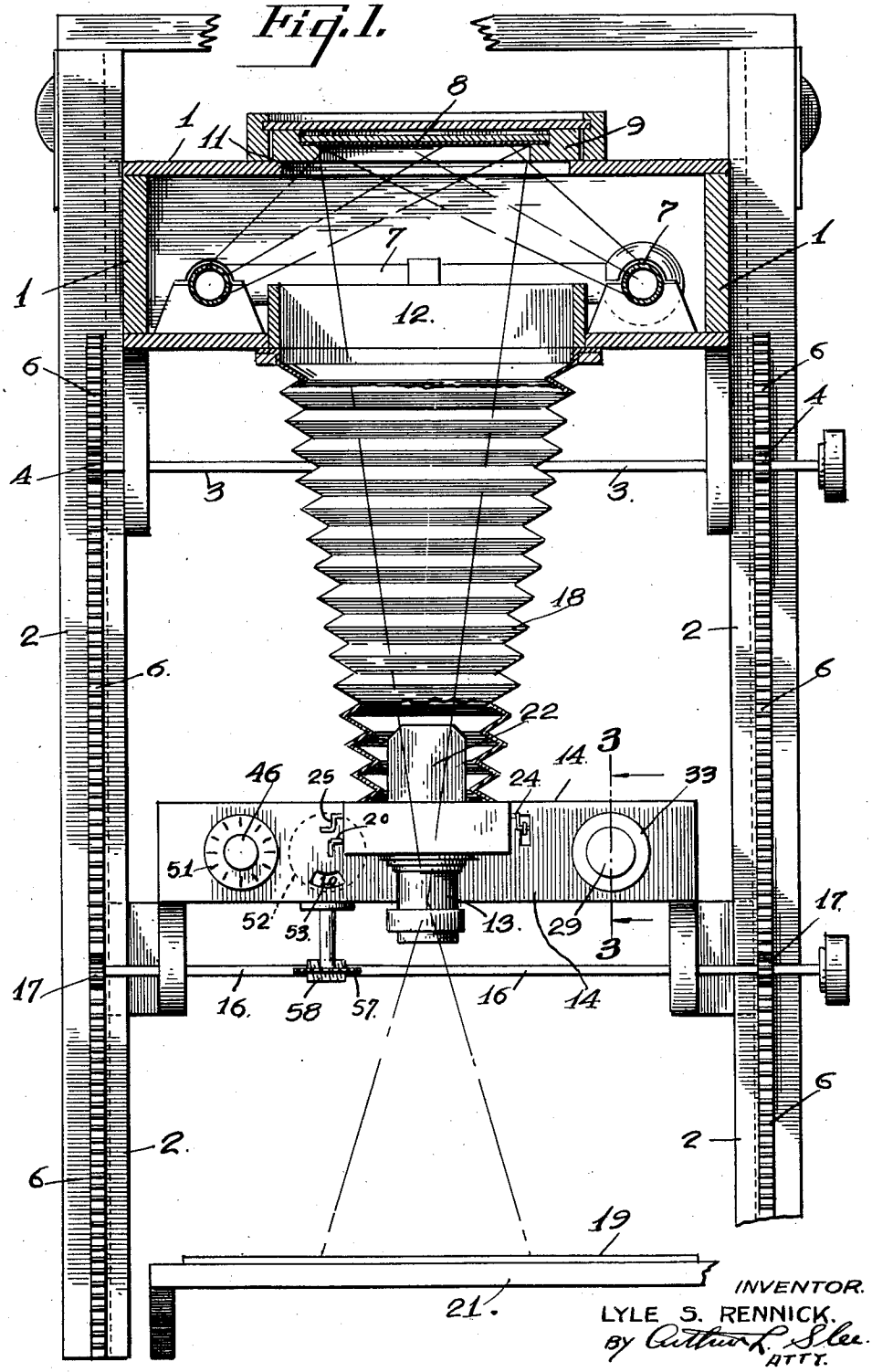
Feb. 9, 1932. L. S. RENNICK 1,844,179

TIMING DEVICE FOR PHOTOGRAPHIC PRINTING MACHINES

Filed Dec. 1, 1928 2 Sheets-Sheet 1

Fig. 1.



INVENTOR.
LYLE S. RENNICK.
By Arthur L. Slee.
ATTY.

Feb. 9, 1932. L. S. RENNICK 1,844,179

TIMING DEVICE FOR PHOTOGRAPHIC PRINTING MACHINES

Filed Dec. 1, 1928 2 Sheets-Sheet 2

Fig. 2.

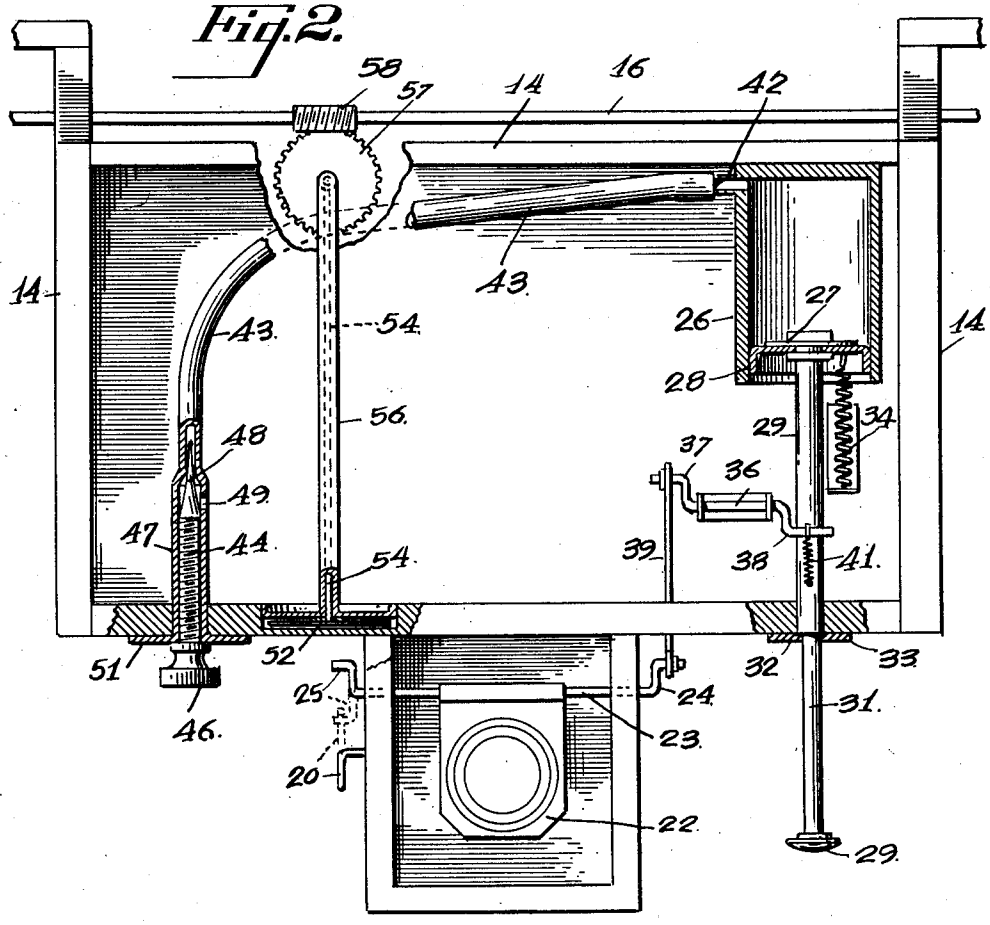
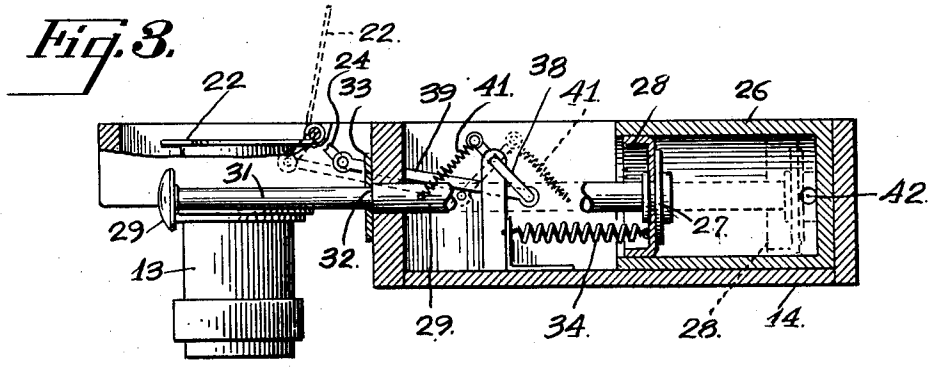


Fig. 3.



INVENTOR.

LYLE S. RENNICK

BY Arthur L. Slee.

ATTY.

Patented Feb. 9, 1932 1,844,179

UNITED STATES PATENT OFFICE

LYLE S. RENNICK, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR TO HARTSOOK-RENNICK, INC., OF LOS ANGELES, CALIFORNIA, A CORPORATION OF DELAWARE

TIMING DEVICE FOR PHOTOGRAPHIC PRINTING MACHINES

Application filed December 1, 1928. Serial No. 323,162.

My invention relates to improvements in timing devices for photographic printing machines wherein a shutter mounted in connection with focusing means is arranged to be opened and automatically closed after a measured interval of exposure to obtain accurately timed and uniform exposure of photographic prints.

The present invention is directed primarily to an improved timing mechanism for use in connection with printing machines of the form disclosed in my co-pending applications, Serial No. 270,635, filed April 17, 1928, and Serial No. 323,161, filed December 1, 1929, wherein light, reflected from the inner face of a negative, is focused and projected upon the sensitized surface to be exposed and printed, said timing mechanism comprising a shutter arranged to normally intercept actinic light reflected from the negative and to permit the projection of said actinic light through the focusing means for measured intervals of exposure.

The primary object of my invention is to provide an improved timing device for regulating the interval of exposure in printing photographic prints.

Another object is to provide an improved timing device which will permit the lighting means to be operated without interruption and which operates to normally intercept actinic light except for desired intervals of exposure.

A further object is to provide an improved device which will automatically close the timing shutter and which may be accurately regulated to obtain an exposure of a desired duration when the shutter is opened.

Another object is to provide an improved mechanism having means for automatically indicating the change in the interval of exposure necessary for various adjustments of the printing machine to produce images of various sizes.

A further object is to provide an improved timing mechanism of simple construction and which is accurate and efficient in its operation.

A still further object is to provide an improved mechanism which will obtain a very quick movement of the shutter, and which may be adjusted through a wide range to regulate the period of exposure.

I accomplish these and other objects by means of the improved device disclosed in the drawings forming a part of the present application wherein like characters of reference are used to designate similar parts throughout the specification and drawings and in which—

Fig. 1 is a broken front elevation, partly in section, of a printing machine equipped with my improved timing means;

Fig. 2 is a broken plan view of the timing means as mounted in connection with the focusing means of the printing machine, parts being broken away and shown in section and the figure being drawn upon a larger scale; and

Fig. 3 is a transverse section taken upon the line 3—3 of Fig. 1 in the direction indicated, the figure being drawn on a scale corresponding to Fig. 2.

Referring to the drawings, the numeral 1 is used to designate a housing mounted upon supporting guides 2 and provided with a shaft 3 having pinions 4 secured thereon and meshing with racks 6 secured upon the guides 2 for adjusting the position of the housing along the guides. The housing 1 is provided with suitable lighting means 7 arranged to project light upon the inner surface of a negative 8 supported in a suitable holder 9 across an opening 11 formed in the top of the housing, light reflected from the face of said negative being projected through an opening 12 formed in the housing 1 opposite said negative.

Suitable focusing means 13 are mounted upon a supporting member 14 in alinement

with the openings 11 and 12, said member 14 being mounted upon the guides 2 and provided with a shaft 16 having pinions 17 meshing with the racks 6 whereby the member 14 and the focusing means may be moved to desired positions independently of the housing 1. An extendible bellows 18 made from light impervious material is mounted between the opening 12 and the focusing means 13 to retain light reflected from the negative 8 and to exclude light from the outside.

The housing 1 and the focusing means 13 are arranged to be moved to various positions along the guides 2 to vary the size of image projected through the focusing means, the light being focused upon a sensitized member 19 placed upon a suitable support 21 to expose and print said member in a manner fully explained in the co-pending applications above referred to.

My improved timing device is mounted upon the supporting member 14 and in association with the focusing means 13. The timing device comprises a shutter 22 arranged to normally cover the focusing means and intercept actinic light reflected from the face of the negative 8. The shutter preferably consists of a member formed from material adapted to transmit non-actinic light and to prevent the projecting of actinic light therethrough, said member preferably being pivotally mounted adjacent the top of the focusing means 13 by means of a shaft 23. The ends of the shaft 23 extend outwardly through the sides of the supporting member 14 and are provided with crank arm portions 23 and 25.

A suction cylinder 26 is mounted within the supporting member 14. A plunger 27 is slidably mounted within the cylinder 26, said plunger being provided with an outwardly faced cup washer 28 and having a stem 29 extending outwardly through the front of the supporting member 14. The stem 29 is provided with a reduced portion 31 forming a shoulder 32 arranged to engage a stop plate 33 to limit the outward movement of the plunger and stem. The cup washer 28 is adapted to be displaced to permit the escape of air therepast when the plunger is moved inwardly into the cylinder 26, and to cling tightly to the sides of the cylinder and prevent the entrance of air past the washer when the plunger is moved outwardly, thereby causing a partial vacuum to be formed within the cylinder when the plunger is moved outwardly. A spring 34 is connected to the plunger and arranged to normally move the plunger outwardly to its extreme outer position.

A crank member 36 is mounted adjacent the plunger stem 29 and provided with crank arms 37 and 38 upon opposite ends thereof. The arm 37 is connected to the crank arm 24 by a connecting link 39. The arm 38 is connected to the plunger stem 29 by means of a spring 41 arranged to exert a resilient pull upon the crank arm 38 so that when the spring is carried past the center line of the crank in either direction the spring will operate to pull the crank quickly through an angle of approximately ninety degrees from one extreme position to its opposite extreme position. As the crank arm 38 is thus shifted, the link 39 actuates the arm 24 to move the shutter 22 through slightly more than ninety degrees between its closed and open positions.

An air inlet 42 opens into the cylinder 26 adjacent its extreme inner end, said inlet being provided with a tubular connection 43 extending to the front of the supporting member 14. A needle valve 44 is mounted in the end of the connection 43, said needle valve being operable by means of a knob 46 to restrict the passage of air through the tubular connection 43. The needle member is preferably threaded into a sleeve portion 47 carried by the connection 43 and provided with a reduced tapered portion 48 engaging the reduced passage portion of the connection 43, an air vent 49 being provided in the sleeve portion 47 adjacent the tapered portion to admit air to the connection 43. The knob 46 is provided with a dial 51 calibrated in units of time to indicate the settling of the valve necessary for a desired interval of exposure.

The operation of my improved timing device is as follows:—The shutter 22 normally rests across the top of the focusing means 13 to intercept actinic light reflected by the negative 8. Non-actinic light passing through the shutter or screen 22 is projected through the focusing means whereby the image projected may be observed and the printing machine adjusted to provide the desired size of image and the correct focus. When the machine has been adjusted to produce the desired image, a piece of sensitized paper 19 or the like is placed in proper position upon the support 21, said paper being unaffected by the non-actinic light passing through the shutter 22.

To expose the sensitized paper 19 and print the image thereon, the plunger 27 is pressed inwardly to its extreme inner position by means of the outwardly extending portion of the stem 29. As the plunger is thus moved inwardly, the crank member 36 is moved from its normal shutter closing position to the shutter opening position as indicated in dotted lines in Fig. 3 of the drawings.

As the plunger is moved into the cylinder 26, the air therein is forced outwardly past the edges of the cup washer 28. When the plunger is released, the spring 34 operates to pull the plunger back to normal shutter closing position. The action of the spring is opposed by suction due to the partial vacuum formed in the back of the suction cylinder 26, and the speed of the return movement of the

plunger is regulated by adjusting the needle valve 44 to admit only a limited supply of air through the inlet 42.

When the valve 44 is fully closed, the vacuum formed within the back of the cylinder 26 will hold the plunger against the pull of the spring 34, and in the absence of any leakage past the valve 44 or the cup washer 28, the plunger will be held in shutter opening position. By slightly opening the valve 44, air is slowly admitted to the cylinder 26 to break the vacuum, and the plunger will be moved slowly outwardly, and as the plunger nears its outer extreme position, the spring 41 will be carried past the center of the crank 38 and said crank will be shifted to close the shutter. The speed of the return movement of the plunger may be regulated closely by a suitable adjustment of the needle valve 44 so that the shutter may be automatically closed after an interval of exposure ranging from a very few seconds to several minutes as desired. The dial 51 is calibrated to indicate the setting of the valve necessary to obtain a desired interval of exposure. A latch 20 is arranged to be moved to engage the arm 25 to retain the shutter 22 in open position independently of the valve 44 when desired.

The interval of exposure is dependent upon the distance between the focusing means and the sensitized sheet 19 as said focusing means is adjusted to various positions to obtain a desired enlargement or reduction of the size of image printed. Thus if the image is enlarged to double the area of the negative, the light reflected from said negative and focused through the focusing means is distributed over double the area, and the interval of exposure must be made twice as long as the interval required where the image printed is of the same size as the negative. The interval of exposure thus varies proportionately to the size of the image which in turn varies proportionately to the variation in position of the focusing means.

To facilitate the calculation of time necessary to expose a print when the focusing means is adjusted from one position to another to obtain a print of a different size, I have provided an indicator 52 mounted within the front of the supporting member 14, said indicator comprising a dial having calibrations 53. The dial is arranged to be rotated by means of a flexible shaft 54 extending through a tubular casing 56 between the dial and a gear 57 mounted in meshing relation with a worm 58 secured upon the pinion shaft 16. The calibrations 53 are arranged to indicate the relative amount of time required to make an exposure at any particular position of the focusing means with respect to the normal time required for making an exposure when the image is of an assumed standard size, as for example, the same size as the negative. To illustrate, if the image is of half size, the dial will indicate 0.5 showing that only one-half the time of a normal exposure will be required. If the image is double the size, the dial will indicate 2.0, thereby showing that the normal exposure must be doubled. The timing valve 44 may thus be accurately set to obtain the proper timing without wasting time and material in testing to determine the required time. The gear 57 is moved to actuate the dial 52 automatically as the focusing means is raised or lowered, thereby automatically indicating the time ratio required in any particular adjustment.

While I have illustrated and described my improved device only in what I now regard as its preferred embodiment, the specific details of construction and arrangement are of course subject to modification in numerous ways without departing from the spirit of my invention, and I therefore desire to avail myself of all modifications which may fall within the scope of the appended claims.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. The combination with a photographic printing device provided with means for illuminating a negative to be printed and focusing means for focusing light reflected by said negative to form an image, of a shutter mounted in connection with the focusing means and normally covering the same to prevent the passage of actinic light therethrough; a suction cylinder; a plunger slidably mounted in said cylinder; means connecting the plunger with the shutter for moving the shutter to an open position when the plunger is moved inwardly into the cylinder and to close the shutter when the plunger is moved outwardly; a spring normally moving the plunger to a shutter closing position; an air inlet opening into the cylinder in back of the plunger; and a valve mounted in connection with the inlet and adjustable to regulate the air inlet whereby the closing movement of the plunger may be retarded to obtain a measured period of exposure.

2. The combination with a photographic printing device provided with housing having lighting means mounted therein for illuminating the face of a negative supported by the housing and focusing means for focusing light reflected from the face of the negative to form an image thereof upon a sensitized member to be exposed, said housing and focusing means being adjustable relative to each other and to the plane of the sensitized member for adjusting the focus and the size of the image, of a shutter mounted in connection with the focusing means; means for moving the shutter to open position; means for automatically returning the shutter to closed position after a desired in-

terval of exposure; means for regulating and indicating the interval of exposure; and means operated automatically by the adjustment of the focusing means relative to the plane of the sensitized member for indicating the variation in the interval of exposure necessary when the focusing means is moved from one position to another to obtain an image of a different size.

3. In a photographic printing machine, the combination with focusing means movable to various positions to vary the size of an image projected thereby, of a shutter mounted in connection with the focusing means; means for opening the shutter; means for automatically closing the shutter after a desired interval of exposure; means for regulating said interval; and an indicator actuated by the movement of the focusing means for indicating the change in the interval of exposure necessary when said focusing means is moved to project an image of a different size.

4. In a photographic printing machine, the combination with focusing means movable to various positions to vary the size of an image projected thereby, of means automatically actuated by the movement of said focusing means for indicating the relative change in the interval of exposure necessary for various positions of said focusing means.

5. In a photographic printing machine, the combination with focusing means movable to various positions to vary the size of the image projected thereby, of a shutter mounted in connection with the focusing means and normally covering the same; means for moving the shutter to an open position; adjustable means for automatically returning the shutter to a closed position after a predetermined period of time; and means automatically actuated by the movement of said focusing means for indicating the relative change in the interval of exposure necessary for various positions of the focusing means.

6. In a photographic printing machine, the combination with focusing means movable to various positions to vary the size of an image projected thereby, of a shutter mounted in connection with the focusing means and normally covering the same; means for moving the shutter to an open position; adjustable means for automatically returning the shutter to a closed position after a predetermined period of time; a calibrated dial; and means actuated by the movement of the focusing means for automatically moving the dial to indicate the relative change in the interval of exposure necessary for various positions of the focusing means.

7. In a photographic printing machine, the combination with focusing means movable to various positions to vary the size of an image projected thereby, of a shutter mounted in connection with the focusing means and normally covering the same; means for moving the shutter to an open position; adjustable means for automatically returning the shutter to a closed position after a predetermined period of time; a calibrated dial and gear actuated means actuated by the movement of the focusing means for automatically moving the dial to indicate the relative change in the interval of exposure necessary for various positions of the focusing means.

In witness, I hereunto set my signature.

LYLE S. RENNICK.