

J. BOWERS.
 PHOTOGRAPHIC PRINTING, DEVELOPING, AND FIXING APPARATUS.
 APPLICATION FILED JAN. 9, 1911.

1,006,428.

Patented Oct. 17, 1911.

3 SHEETS—SHEET 1.

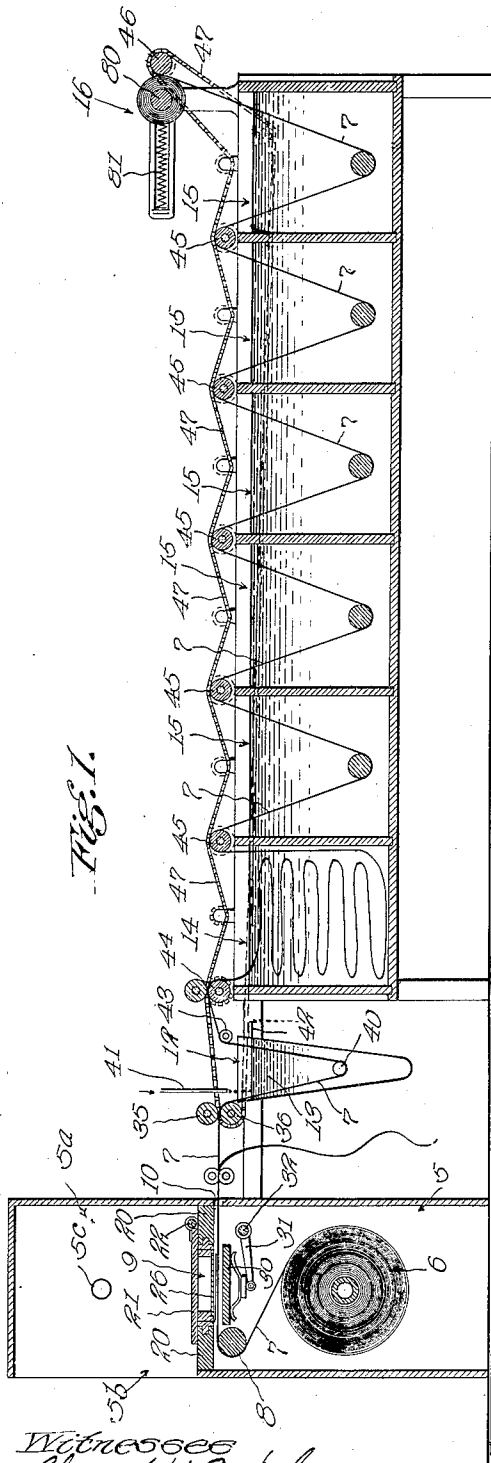


Fig. 1.

Witnesses
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 J. Miller

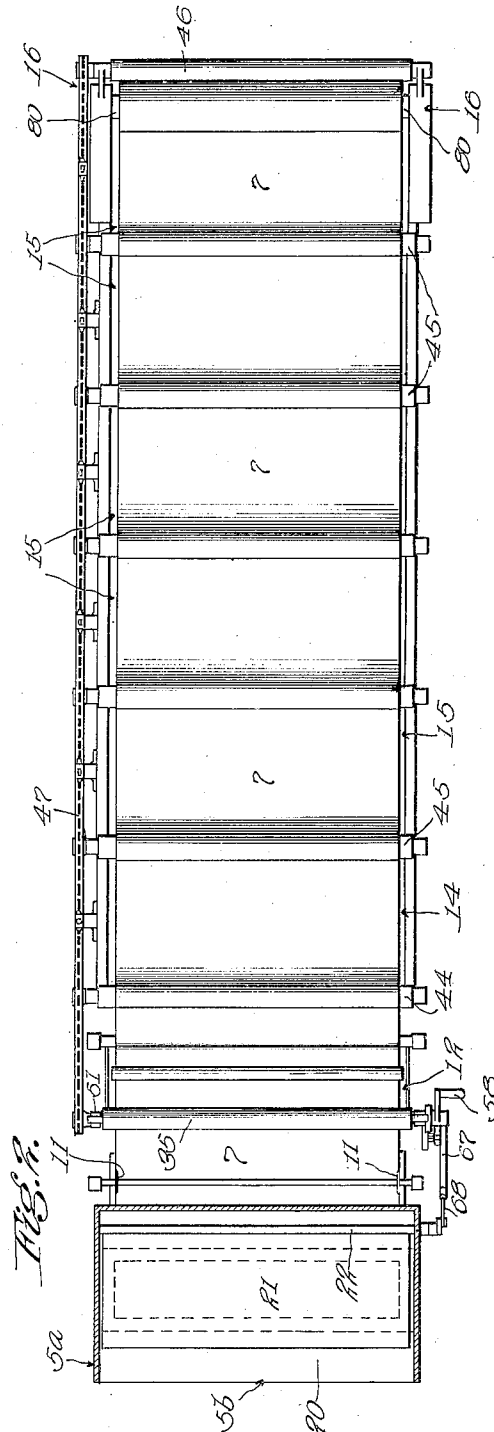


Fig. 2.

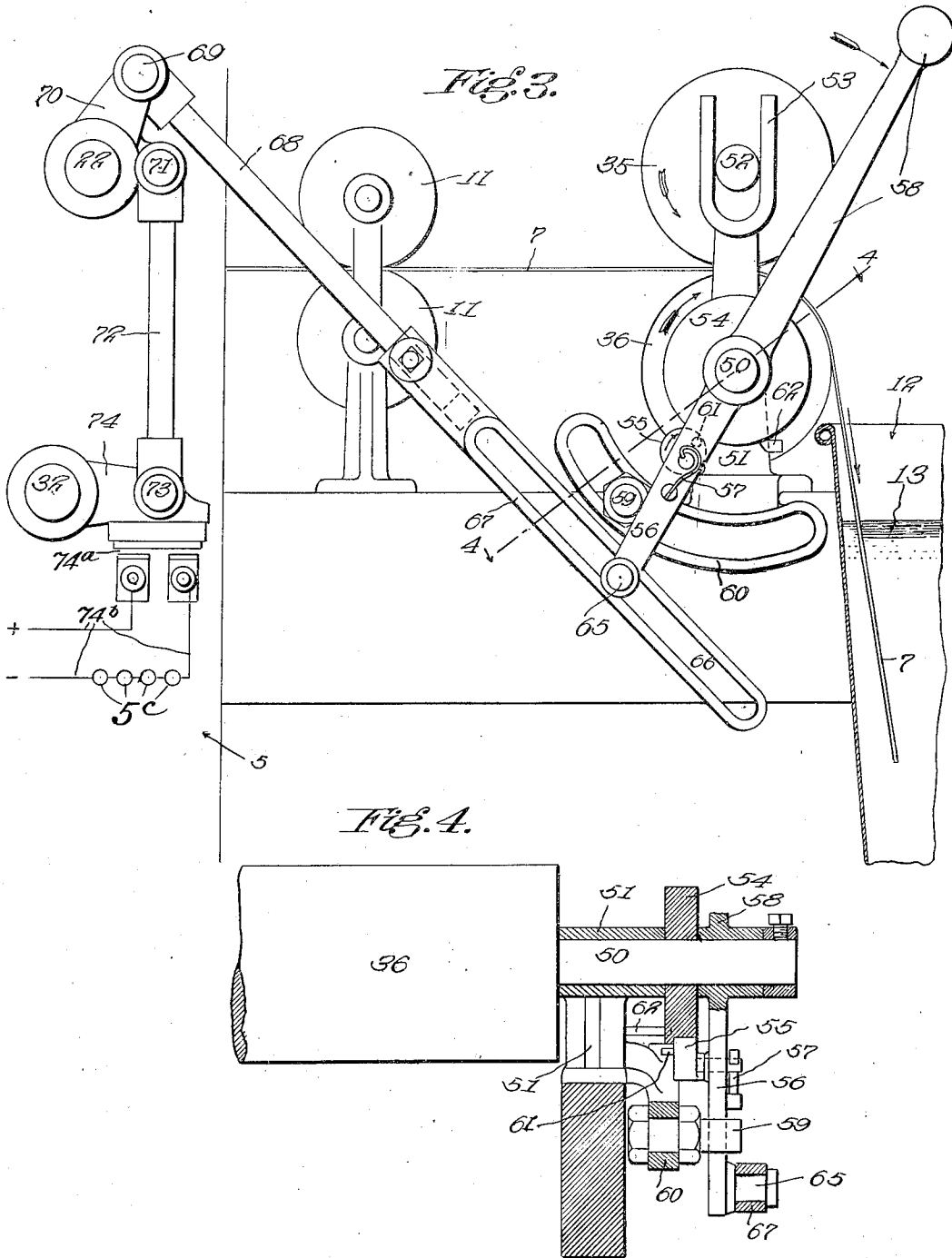
Inventor
 John Bowers
 by James T. Barkley
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3 SHEETS—SHEET 3.

Fig. 5.

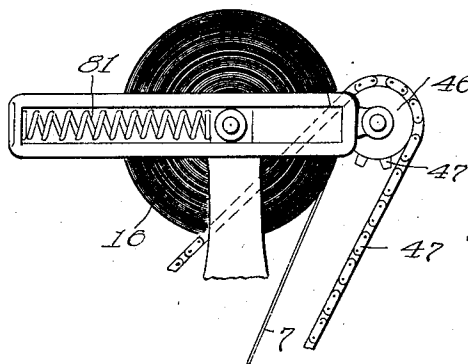
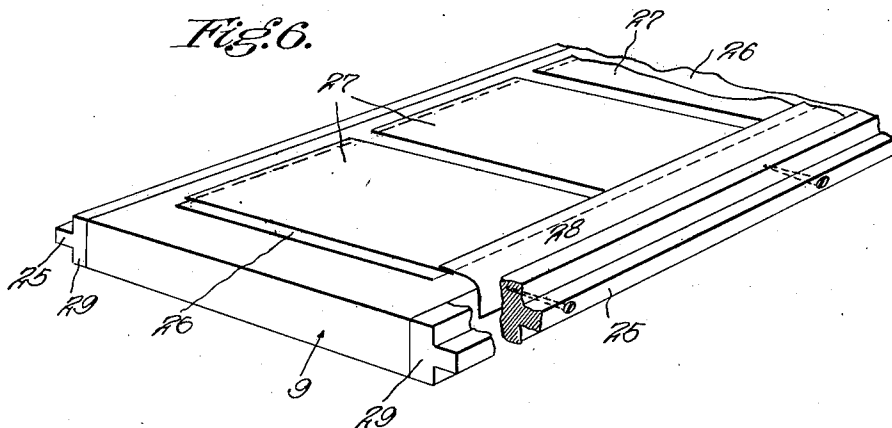


Fig. 6.



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UNITED STATES PATENT OFFICE.

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PHOTOGRAPHIC PRINTING, DEVELOPING, AND FIXING APPARATUS.

1,006,428.

Specification of Letters Patent.

Patented Oct. 17, 1911.

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To all whom it may concern:

Be it known that I, JOHN BOWERS, a citizen of the United States, residing at Longbeach, in the county of Los Angeles, State of California, have invented new and useful Improvements in Photographic Printing, Developing, and Fixing Apparatus, of which the following is a specification.

This invention relates to an apparatus for printing, developing and fixing photographs on a continuous roll of paper or other substance; and the invention consists particularly in mechanisms and arrangements for the exposure and development of the paper, the prime object being to provide such a device as to enable the paper to be easily and quickly handled and exposed and developed during proper intervals. In my invention all of these operations are accomplished from a single crank handle. The intervals of exposure and development may be entirely independent of each other, so that the prints may be finished more efficiently.

The details of my invention will become clearer from consideration of the following specification in connection with the accompanying drawings. In these drawings I have shown a preferred form of my device particularly adapted for printing post card pictures in large numbers from one or a few negatives; but it will be understood that the device may be used for printing from any class of negatives, being especially useful in any case where a large number of duplicate prints are desired.

In the accompanying drawings: Figure 1 is a longitudinal section of my improved apparatus. Fig. 2 is a plan of the same box 5 being shown in section. Fig. 3 is an enlarged fragmentary side elevation of the operating mechanism including a diagrammatic showing of the artificial light mechanism. Fig. 4 is a section taken on line 4—4 of Fig. 3. Fig. 5 is a fragmentary side elevation illustrating the method of rolling the paper at the completion of its treatment in my apparatus. Fig. 6 is a perspective view showing the under surface of the negative frame used in my apparatus.

In the drawings 5 designates a compartment in which roll 6 is mounted, paper 7 passing off the roll over a roller 8 and thence horizontally under negative frame 9 and through aperture 10 out of the compartment. Immediately outside the compartment a set of cutting or slitting rolls 11 is mounted to

cut off the edge portions of the paper or to otherwise trim or slit the paper as may be desired. From the cutting rolls the paper passes into the developing bath 12 where the developing mixture 13 is kept at a suitable height, as will be hereinafter explained. From the developing bath the paper then passes into the fixing bath 14 and thence into a series of washing baths 15 and finally to rolling apparatus 16 where the paper is re-rolled ready for subsequent handling or the paper may pass directly to the mechanisms of subsequent operation without the intervention of the rolling mechanism. This will be more fully explained later.

Compartment 5 is surmounted by a light compartment 5^a, this last either having an entirely open side 5^b or some other means for admitting sun light, or having a suitable equipment 5^c of artificial light for printing the pictures. A partition 20 is arranged horizontally between compartments 5 and 5^a to exclude all light from compartment 5 except that which passes through the negatives. Negative frame 9 is set in partition 20 and the aperture in the frame is normally covered by a swinging shutter 21 mounted on a shaft 22. This shutter is raised by an appropriate mechanism for any desired interval. The negative frame is preferably constructed as illustrated in Fig. 6, having tongues 25 adapted to fit in corresponding grooves in partition 20. A glass 26, preferably ground, is placed on the underside of the frame, affording a backing against which negatives 27 are pressed. Negatives 27 are preferably secured to the frame by being first secured along their edges to a strip 28 whose other edge is placed between strip 29 and the body of the frame, strips 29 forming the edge portions of the frame. In this manner the negatives are secured so that they will always be accurately in position when pressed against the glass backing and so that they may be lifted whenever desired. The arrangement also makes it possible to alter the negative by working directly on the upper surface of the ground glass 26. Paper 7 passes directly under negatives 27 and a pressure board 30 is situated directly beneath the paper, ordinarily being lowered so as to allow the paper to pass freely. At the same time the shutter 21 is opened, board 30 is pressed upwardly to press paper 7 against the negative. This operation is performed through the medium of arm 31 and

shaft 32, a spring being interposed to insure even contact and pressure. After the paper has passed out of the printing compartments and through the cutting rolls as before described, it passes between two rolls 35 and 36. Roll 36 is designed to be rotated directly through the medium of a mechanism about to be explained, while roll 35 is rotated by reason of frictional engagement with paper 7 passing over roll 36, roll 35 being pressed downwardly by its own weight or by any other suitable force. By rotating these rolls in the direction indicated, the paper 7 is drawn through the printing compartment and the cutting mechanism by an amount depending upon the amount of rotation of the rolls which will in turn depend on the size of the pictures. Immediately upon passing these rolls, the paper 7 drops into the developing bath as shown in Figs. 1 and 3. A small loose roller 40 is supported by the loop of paper passing down into the developing bath and up again, the weight of roll 40 being sufficient to keep the paper stretched in the bath and compel the equal exposure of succeeding portions of the paper. The liquid in the bath is kept at constant height by means of an inlet 41 and an outlet 42. These provisions for equal exposure are extremely important as, in the course of making a few thousand successive prints, the slightest difference between successive prints may grow into a large difference between the first and last prints. From the developing bath the paper passes over an idler roller 43 and then over a feed roller 44 of the same diameter as roller 36. Feed roller 44, in common with feed rollers 45 and winding roller 46, are rotated from roller 36 by means of a sprocket connection 47, so that the peripheral speed of all the rollers is the same. Roller 44 serves to draw the paper out of the developing bath and to discharge it into the fixing bath where it is allowed to accumulate to some extent and to be thoroughly fixed before it is drawn to the next roller 45 out of the fixing bath and into the first washing bath. It will be seen that the depth of passage of the paper into the developing bath may be roughly varied by drawing the paper over roll 44 and thereby increasing or decreasing the amount in the bath; but it will be understood that the amount of paper in the bath can only be varied in units equivalent to the length or width of one picture, as otherwise there would be periods when a part of a picture were in the bath and being developed further than a part which was without the bath. It is essential that each picture, and each part of each picture, shall remain in the bath during the same interval of time, and this is practically accomplished by having the pictures so arranged that each movement of the roll of paper places a complete

picture in the bath and removes a complete picture therefrom. The variation of the development interval is further accomplished with greater accuracy through the mechanism about to be described.

Roller 36 is mounted on a shaft 50 mounted in bearings 51, roller 35 being preferably mounted on a shaft 52 which slides vertically in ways 53. Mounted on shaft 50 is a disk 54, tightly secured to the shaft in some preferred manner, and cooperating with an eccentric pawl 55 to form a ratchet mechanism which will move shaft 50 only in the direction indicated. Eccentric pawl 55 is mounted on an arm 56 and pressed into engagement with disk 54 by a spring 57. Arm 56 forms a continuation of crank handle 58 which is loosely mounted on the shaft 50. By this arrangement, a movement of handle 58 in the direction indicated will rotate the rolls to move the paper. The movement of handle 58 in this direction is limited by means of a stud 59 adjustably secured on a sector 60 forming an extension from bearing 51. When handle 58 is moved to the left in Fig. 3, pawl 55 will drag over the disk 54 until the pawl reaches such a position that a pin 61 set in its face will engage with a stationary lug 62 and force the pawl completely out of engagement with the disk. It is designed that this action shall take place just before the end of the motion of handle 58 toward the left, the remainder of the motion being utilized to open shutter 21 and force up pressure plate 30. On the return movement of the handle toward the right, the shutter is again closed and pressure plate 30 dropped before pawl 55 is allowed to come into engagement with disk 54. In this manner it is provided that the shutter and pressure mechanisms shall be in condition to allow the movement of the paper before the paper is started, and also that the contact of pawl 55 with disk 54 shall furnish a definite starting point from which the stroke of the mechanism begins to pull the paper through the machine. Consequently, by adjusting the position of stud 59, the amount of paper pulled through at each stroke can be accurately gaged.

On the lower end of arm 56 is a stud 65 which slides in slot 66 in bar 67. Bar 67 and rod 68 form an adjustable connection to pivot 69 on arm 70 mounted on shutter shaft 22. A second pivot 71 is also provided in connection with shutter shaft 22 and a rod 72 connects this pivot with a pivot 73 on arm 74 mounted on shaft 32, the arrangement being such that a relatively large movement of shaft 22 will cause a small movement of shaft 32 sufficient to press pressure plate 30 up against the paper while the shutter 21 is being thrown open. When handle 58 is moved toward the left and pawl 55 has been thrown out of engagement with

disk 54, pin 65 will engage with the end of slot 66 and the subsequent movement of handle 58 toward the left will cause the movement of pivot 69 toward the right, causing the shutter to open and the pressure plate to take its upper position. Handle 58 is held in this position by the operator, or by any mechanical contrivance used for actuating the machine, until the paper beneath the negatives has been sufficiently exposed. Handle 58 is then moved toward the right, the shutter and pressure plate being first returned to their original positions and the paper being then drawn through the machine the desired distance. It will be seen that the length of exposure depends entirely upon the length of time the handle 58 is held in its extreme left position, while the developing interval depends directly upon the length of time ensuing between successive movements of paper through the machine. The development interval can be varied by merely lengthening or shortening the interval between successive movements of handle 58, independent of the length of time the handle is allowed to remain in its extreme left position. In practice I may employ a very weak developer so that the necessary development interval for the pictures is much greater than the interval of exposure. This provides for flexibility of action, the exposure intervals being then varied without varying the development interval. To illustrate I may take the following example: Suppose that the exposure interval is five seconds while the development interval is fifty seconds. If the developing bath is arranged to hold five complete pictures, then it is necessary that the pictures be moved in and out of the bath one every ten seconds. In this case, then, there would be ten seconds interval between successive arrivals of the handle 58 to the position illustrated. Say the movement of the handle required one second; then, taking away the five seconds exposure interval during which the handle is left in its left hand position, the handle would remain in the position shown for an interval of four seconds during each cycle of operations. An increase or decrease of the exposure interval would thus merely decrease or increase the interval of rest without affecting the interval of developing. On the other hand, it is possible to arrange the interval of development so that it will correspond exactly with the other intervals, so that the handle is not kept at rest in its right hand position. This saves a large amount of time and simplifies the operation of the mechanism; the handle being then merely moved to the right and immediately back to the left, being held to the left for the requisite time. When the handle is held to the left and arm 74 is pressed down, a switch 74^a mounted on the

arm and on box 5 is closed. If it is desired to use artificial light for printing, this switch 74^a is arranged in a circuit 74^b including a lamp or lamps 5^c placed in box 5 above the shutter 21. The lamps will thus be operated when the shutter is open.

The details of the above described mechanism are not essential to my invention, other and equivalent members and combinations being possible to effect the desired results in a similar manner.

In the fixing bath the paper is allowed to fall in overlying layers so that each portion of the paper is therein exposed during a time interval of some duration. From the fixing bath the paper passes through any desired number of washing baths, being typically taken from the last washing bath to be rolled up on a mechanism 16. Winding roller 46 is operated through the medium of sprocket connections 47, and roll 80 is pressed by spring 81 against winding roller 46. As the winding progresses, the roll of paper is pressed against winding roller 46 and roller 80 continues to recede from roll 46. When a whole strip of paper has been wound on roll 80, it is removed for the subsequent operations of drying and cutting.

From the foregoing it will be seen that the gist of my invention consists in the mechanism hereinbefore described and having for its purpose the movement of the paper through the machine at certain intervals and also its exposure at certain intervals. But I do not limit myself strictly to the mechanical details shown and described, believing that my invention is sufficiently broad to include other mechanical arrangements for effecting the described movements and exposures of the paper.

Having described my invention, I claim:

1. A device of the class described, comprising an exposure and a developing mechanism, means for feeding a sensitive strip through the exposure and developing mechanisms, an operating lever, means whereby the movement of the lever in one direction causes the operation of the feeding means, and means engaged by the lever near the end of its movement in the opposite direction to operate the exposure mechanism.

2. A device of the class described, comprising an exposure mechanism including a movable shutter, a feeding mechanism to feed a sensitive strip through the exposure mechanism, an operating lever, means whereby the movement of the lever in one direction causes the operation of the feeding mechanism, and means engaged by the lever near the end of its movement in the opposite direction to operate the exposure mechanism to open the shutter.

3. A device of the class described, comprising an exposure mechanism including a movable shutter, a feeding mechanism to

feed a sensitive strip through the exposure mechanism, an operating lever, ratchet means whereby the movement of the lever in one direction causes the operation of the feeding mechanism, and means engaged by the lever near the end of its movement in the opposite direction to operate the exposure mechanism to open the shutter.

4. A device of the class described, comprising an exposure mechanism including a movable shutter, a feeding mechanism including a set of feed rolls adapted to feed a sensitive strip through the exposure mechanism and beneath the shutter, an operating lever, ratchet connecting means between the lever and one of the feed rolls and adapted to transmit motion in one direction from the

lever to the feeding means, a member connected to the exposure mechanism and adapted to be engaged by the lever near the end of its motion in the direction opposite to that in which the ratchet mechanism operates, said member by movement with the lever adapted to operate the exposure mechanism and open the shutter, and means to disengage the ratchet mechanism while the lever is in engagement with said member.

In witness that I claim the foregoing I have hereunto subscribed my name this 30th day of December, 1910.

JNO. BOWERS.

Witnesses:

JAMES T. BARKELEW,
ELWOOD H. BARKELEW.