Sept. 20, 1932. R. S. HOPKINS 1,878,702

PHOTOGRAPHIC PRINTING MACHINE

Filed Oct. 31, 1930 3 Sheets-Sheet 1

Fig. 1.

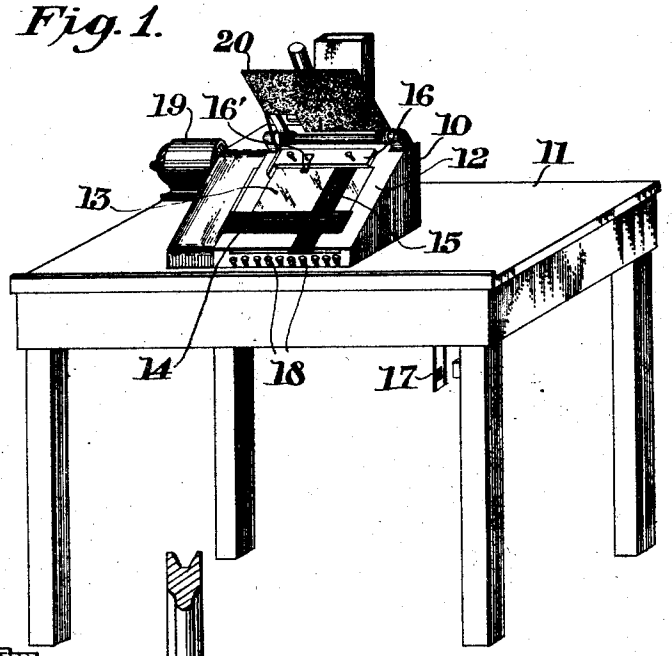
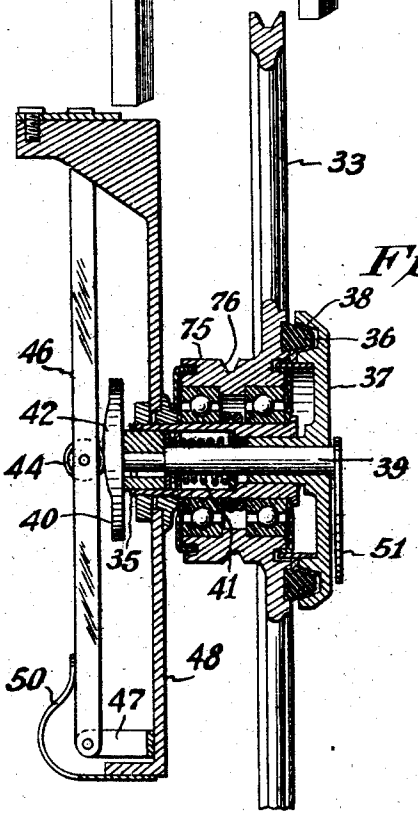


Fig. 6.



Roy S. Hopkins,
Inventor,

By Newton M. Powers
Ella M. Carter
Attorneys.

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Fig. 2.

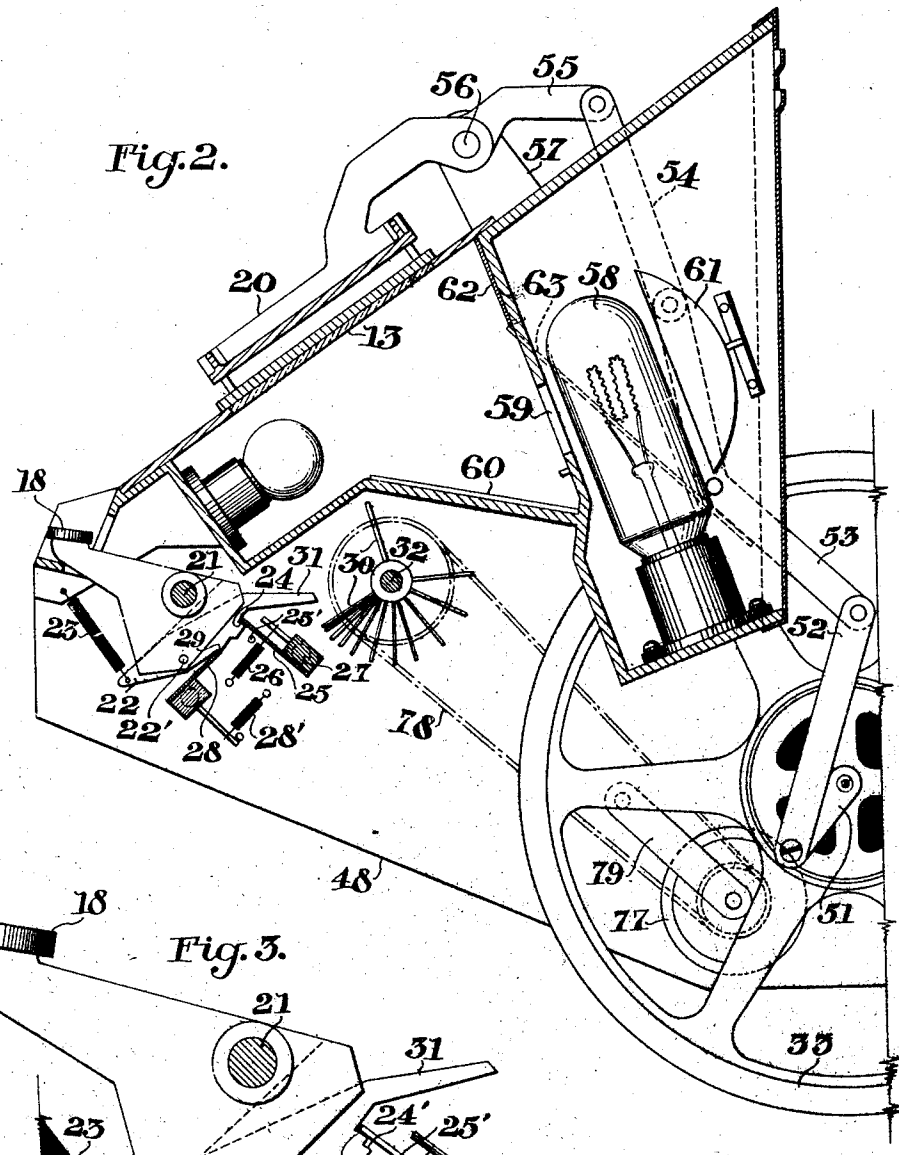
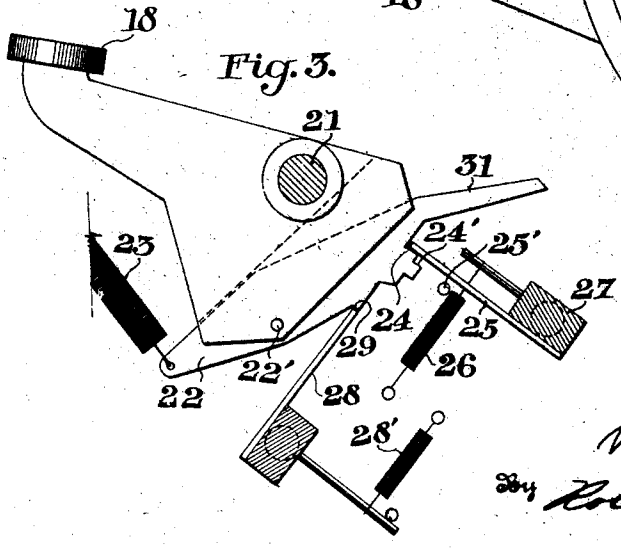


Fig. 3.



Inventor

Roy S. Hopkins,

Newton M. Perrins

By Rolla N. Carter

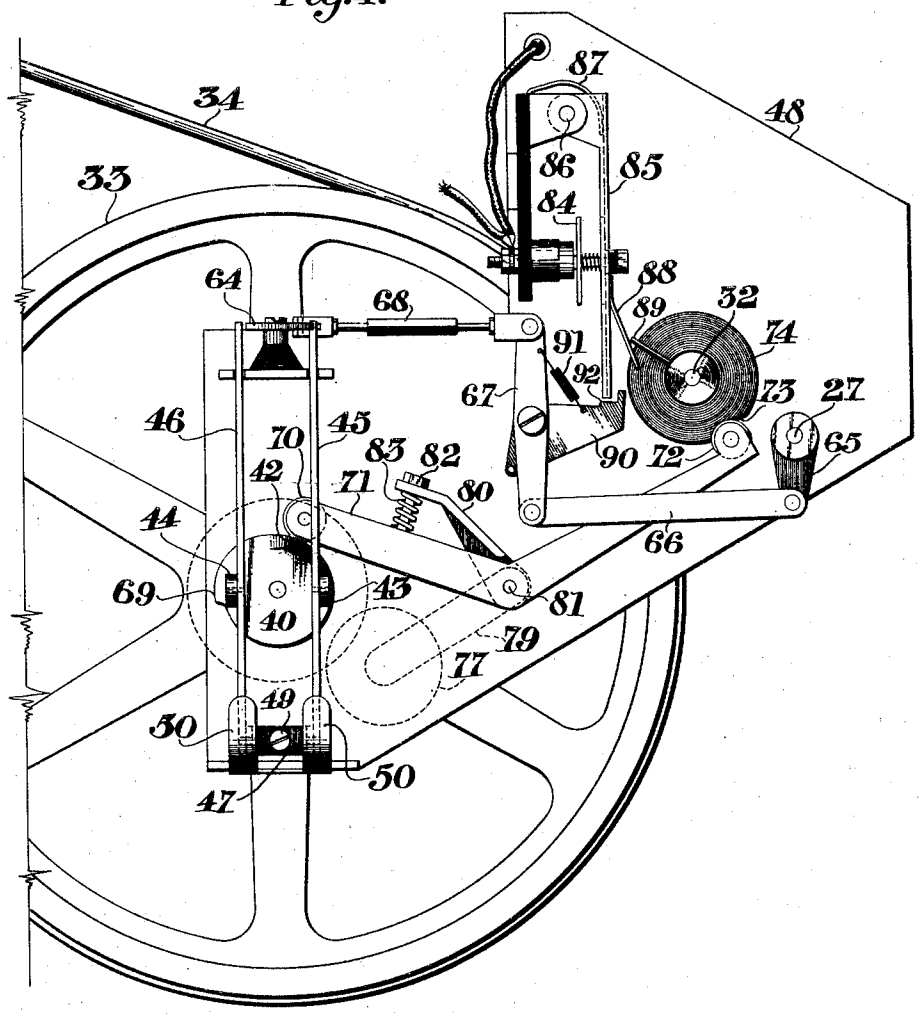
Attorneys

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PHOTOGRAPHIC PRINTING MACHINE

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Fig.4.



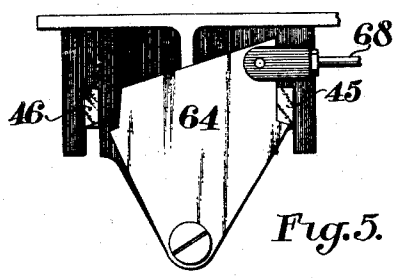


Fig.5.

Inventor
Roy S. Hopkins,
Newton. Perkins
By Bella N. Carter
Attorneys.

Patented Sept. 20, 1932 1,878,702

UNITED STATES PATENT OFFICE

ROY S. HOPKINS, OF ROCHESTER, NEW YORK, ASSIGNOR TO EASTMAN KODAK COMPANY, OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK

PHOTOGRAPHIC PRINTING MACHINE

Application filed October 31, 1930. Serial No. 492,427.

My invention relates to photographic printing apparatus, and particularly to power driven apparatus using artificial light and has for an object the provision of a machine with which the operator may select a pre-determined printing period suitable for the negative and paper used.

Another object of my invention is the provision in an apparatus of the above character of a plurality of keys and cooperating mechanism whereby depression of any one key will automatically start and complete a printing operation the printing or exposure period of which will vary according to the key depressed, each key being adapted to give a printing period different from every other key.

Other objects and advantages of my invention will appear from the following description when read in connection with the accompanying drawings, all of which are partly diagrammatic and the scope will be pointed out in the appended claims.

Referring to the drawings wherein like reference characters denote like parts throughout:

Figure 1 is a perspective view of the printer mounted on a suitable table.

Figure 2 is a partial side view of the essential mechanism.

Figure 3 is a detailed view showing a special key latch arrangement.

Figure 4 is a side view showing the clutch and switch operating mechanism.

Figure 5 is a detail of the latch for controlling the clutch, and

Figure 6 is a sectional view of the clutch and its actuating mechanism.

In the illustrated embodiment of my invention, the printer may consist of a housing or box 10 mounted on a base or table 11. The top 12 of the housing is preferably inclined and provided with a glass covered opening 13 of sufficient size so that negatives of the usual dimensions may be easily accommodated. Hinged metal strips 14 and 15 are slidably mounted along the edges of the glass covered opening 13 to form a mask for margining the print on these sides, while the margins on the opposite edges are determined by the limits of the glass opening 13.

The film is adapted to be held on the printing panel 13 by a suitable clamp 16 which may be operated in any well-known manner as by the knee lever 17. The printing paper may be held on the film by the spring clip 16′ after which any one of the keys 18 may be pressed to connect the motor 19 to bring the platen 20 into position to hold the paper and film firmly on the printing panel 13 and at the same time turn on the printing light as will be hereinafter more fully described.

The keys 18 (Fig. 2) are mounted on the shaft 21 and carry a pivoted latching member 22 biased in a clockwise direction by spring 23. When a key 18 is manually depressed, the shoulder 24 on the latch 22 engages the arm 25 and moves it against the tension of the spring 26 to rotate the shaft 27 in a clockwise direction, as shown in Figure 2. At the same time the pivoted finger 28 under the control of a spring 29 constraining the finger in one direction about its pivot, but yielding to forces tending to move it in another direction is first rotated on its pivot by the latch 22 and then slips into engagement with the shoulder 29 to hold the latch 22 and the key 18 in depressed position shown. Key 18 is adapted to be tripped by the engagement of an arm 30 with the projection 31 on the latch 22.

The arms or pins 30 are mounted on a shaft 32 adapted to be rotated in a clockwise direction and as the arm 30 engages the projection 31 of the corresponding key, the latch 22 is rotated about its pivot 22′ against the tension of the spring 23 which disengages the shoulders 24 and 29 from their cooperating members 25 and 28, respectively, permitting the spring 23 to return the key 18 to raised position and the spring 26 rotates the shaft 27 until the member 25 engages with the stop 25′.

The large wheel 33 is constantly rotated by the motor 19 through the belt 34 and is adapted to furnish the power for the various operations of the apparatus through clutch mechanism similar to the clutch illustrated

and described in detail in my co-pending application Serial Number 393,427, filed September 18, 1929, and will be described herein briefly.

Referring particularly to Figures 4, 5 and 6, the constantly driven wheel 33 rotates on the sleeve shaft 35, ball bearings permitting the wheel to turn freely.

Wheel 33 carries an annular clutch face 36 which may be of any suitable frictional material, such as rubber, leather, or the like, and is preferably somewhat triannular in cross section, as shown in Figure 6. The clutch plate 37 has a complementary annular groove 38 adapted to engage the friction material 36 when the clutch is engaged.

The clutch plate 37 is carried upon a shaft 39 which may move a limited distance back and forth through the sleeve shaft 35 in the following manner. The shaft 39 carries at its end opposite the plate 37 a cam plate 40 and a spring 41 tending to thrust the shaft 39 in a direction to engage the clutch surfaces 36 and 38, as fully described in my co-pending application above referred to.

The cam plate 40 controls the position of the shaft 39 and consequently the engagement of the clutch faces, and comprises a cam surface 42 formed on the face of the plate 40.

As will be noted, when the clutch is tripped, the frictional surfaces will engage and the parts will turn together for one-half revolution, after which the clutch will automatically throw out until it is tripped again to complete the revolution. This is accomplished in the following manner.

The rollers 43 and 44 of the rocker arms 45 and 46 control the movements of the clutch through engagement with the cam plate 40. Rocker arms 45 and 46 are pivotally mounted on the U-shaped member 47 attached to the frame 48 of the apparatus by the screw 49 and are biased by means of the flat springs 50 to hold the rollers 43 and 44 in contact with the surface of the plate 40. The springs 50 are weaker than the spring 41 so that the clutch is engaged when the rocker arms 45 and 46 are free to move. By preventing movement of the rocker arm 46 for example, shaft 39 will rotate with the wheel 33 and when the cam 42 comes into engagement with the roller 44, the clutch plate 37 will be thrust from engagement with the friction material 36. If now the rocker arm 46 is released and the arm 45 held against movement, the spring 41 will overcome the bias of the spring 50 to engage the clutch and the parts will move together until the cam 42 engages the roller 43 at which time the clutch will release as above described.

From the above it is seen that by alternately restraining the rocker arms I can obtain a series of half revolutions of the shaft 39 and I use these controlled half revolutions to operate the platen in the following manner.

The shaft 39 is attached to the clutch plate 37 and carries a crank 51 which is operatively connected to the platen 20 through the link 52, the bell crank 53, the link 54 and the platen arm 55 adapted to rotate on the pivot 56 carried by the projection 57 which is suitably mounted on the frame 48. One half revolution of the crank 51 from the position shown in Figure 2 will raise the platen 20 and the other half revolution will lower the plate 20 to the printing position illustrated.

The printing lamp 58 is positioned in a suitable housing provided with an aperture 59 through which light is adapted to pass and fall upon the surface 60 which reflects it to the printing panel 13. A suitable reflector 61 is positioned behind the lamp 58 for concentrating the light. The shutter 62 is adapted to normally cover the aperture 59 and is removed during the printing operation by means of the rod 63 secured to an arm of the bell crank 53 which raises the shutter 62 when the platen 20 is lowered and permits the shutter to return to aperture covering position when the platen is raised.

When a key 18 is depressed by the operator the shaft 27 is rotated in a counter clockwise direction as viewed in Figure 4, and the rocker arm latch 64 is moved to the left through the crank 65, link 66, pivoted lever 67 and link 68 to release the rocker arm 45 and engage the rocker arm 46. The link 68 may be adjustable lengthwise as indicated for securing proper movement of the latch 64.

As above described, the releasing of the arm 45 engages the clutch for one half revolution to lower the platen 20. During this half revolution the peripheral cam 69 carried by the cam plate 40 engages with the cam follower 70 and raises it to rotate the bell crank 71 through a small angle. This rotation of the bell crank 71 removes the roller 72, carried at its opposite end, from the depression 73 in the cam disk 74, leaving it free to rotate in a manner now to be described.

The hub 75 of the wheel 33 is provided with a groove 76 into which the edge of a disk 77 is adapted to be pressed to frictionally drive the disk 77 which in turn drives the shaft 32 through the belt or chain 78. The disk 77 is carried on a crank arm 79 which is rigidly connected through the arm 80 to the shaft 81. A set screw 82 secures the arm 80 to the bell crank 71 and the spring 83 permits a certain amount of resilience in their movements. When the arm 71 is raised by the cam 69 the spring 83 forces the disk 77 into the groove 76 and shaft 32 rotates as above described.

As soon as the shaft 32 starts to rotate the roller 72 rides on the circumference of the cam disk 74 which keeps the disk 77 in contact with the groove 76 until the disk 74 has completed one complete revolution, thus in-

suring that the longest time interval provided for in the positioning of the arms or pins 30 will have been completed.

Simultaneously with the lowering of the platen 20 the lamp 58 is energized by closing the contact 84 which completes a circuit in any well known manner. The contact 84 is carried on a switch lever 85 pivoted at 86 and is biased to open circuit position by the spring 87. A resilient extension 88 is secured to the switch lever 85 in any suitable manner and is adapted to cooperate with the pin 89 carried by the shaft 32 to close the contact 84 when shaft 32 is rotated.

It will be remembered that prior to the rotation of the shaft 32 the pivoted lever 67 had been rotated through a small angle in a counter clockwise direction. This rotation of the lever 67 carried with it the switch latch 90 due to the tension of the spring 91. With the pivoted lever 67 rotated to this position, the shoulder 92 of the latch 90 will engage the lower end of the switch lever 85 and hold the contact 84 in closed circuit position as long as the lever 67 remains in this position, that is, until the key 18 is tripped by an arm or pin 30 engaging with the projection 31 at which time the lever 67 will return to the position illustrated, and the spring 87 will open the contact 84. From this it will be seen that the lamp 58 will be energized only between the time a key is depressed and an arm 30 trips the key latching mechanism.

Different time intervals for different keys is obtained by placing the arms 30 for the various keys angularly about their shaft 32 and the time interval for any one key will be the time required for shaft 32 to make the portion of a revolution corresponding to the angle at which the pin 30 is positioned thereon.

In using my improved printer, the required exposure for the negative to be printed is determined in any desired manner, as by holding to the light to determine its density. The negative is now placed on the printing panel 13, and the margining strips 14 and 15 adjusted as desired, after which the positive paper is placed over the negative and held in place by the clamp 16'. The key corresponding to the required exposure is pressed and automatically latched by the member 28. Depression of the key rotated the shaft 27 which released the rocker arm 46, permitting the spring 41 to engage the clutch which rotates the shaft through one-half revolution and lowers the platen 20 to printing position. During this half revolution the disk 77 is moved to driving relation with the groove 76 in the hub of the wheel 33 and the shaft 32 is rotated which energizes the lamp 58 and the printing is commenced, shutter 62 having been removed from the aperture 59 when the plate was lowered.

After the shaft 32 has rotated through a sufficient angle the pin 30 corresponding to the depressed key engages the arm 31 and the key is released, permitting the shaft 27 to return to its former position, which releases the rocker arm 46 and restrains the rocker arm 45, causing another half revolution of the shaft 39 and the raising of the platen 20. At the same time the shutter 62 returns to aperture covering position and the pivoted lever 67 trips the switch latch 90 to allow the spring 87 to move the contact 84 to open circuit position. The shaft 32 continues to rotate for a complete revolution after which the roller 72 drops into the depression 73 in the disk 74 and disengages the disk 77 from driving connection with the hub of the wheel 33.

The key latching mechanism so far described is such that it will trip even if the key is held depressed and in order that a manually controlled time exposure may be given, I provide one of the keys with a special latching mechanism which may take the form illustrated in Figure 3 where in addition to the shoulder 24 I provide an auxiliary shoulder 24' of such length that the tripping of the arm 31 by the pin 30 does not raise the latch high enough for the arm 25 to clear the shoulder 24', although it does clear shoulder 24 which frees the latch 28 from shoulder 29 so that as soon as pressure is removed from the key spring 23 will return it to normal position and discontinue the printing operation.

While I have described in detail the preferred embodiment of my invention, I wish it understood that I do not intend to be limited to the exact apparatus described inasmuch as, in view of the disclosure, obvious modifications will readily suggest themselves to those familiar with this art without departing from the spirit of my invention or the scope of the claims herein.

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

1. In a photographic printing apparatus, the combination of a printing light, a translucent printing panel above said light, a platen movable to and from a work holding position on said panel, a source of power, means normally disconnected from said source of power adapted to move the platen to and from work holding position, a clutch adapted to operatively connect said platen moving means and source of power, a plurality of keys adapted to be latched in a depressed position, means controlled by the depression of any one of the said keys for operating said clutch to move said platen to work holding position, means for releasing said depressed keys after a pre-determined interval of time, means controlled by the release of said key for operating said clutch to move said platen from work holding position and means actuated by the movement

of said platen for rendering said printing light effective only during the interval said platen is in work holding position.

2. A photographic printing apparatus including a source of light, a printing panel, a platen, a source of power, means normally disconnected from said source of power to move the platen to and from a printing position, a plurality of keys each operable when depressed to connect the platen moving means and said source of power, means adapted to hold the key depressed and mechanism adapted to release the key after a pre-determined interval of time, the time interval being different for each key.

3. A photographic printing machine comprising a printing box provided with a translucent panel, clamps for holding a negative and printing paper on said panel, a platen, a source of power, means normally disconnected from the source of power to move the platen toward and away from said panel, means for varying the exposure and means for actuating in unison said last named means and the connection of said platen to said source of power.

4. In a photographic printing machine the combination with a printing panel of an electric lamp, a platen movable to printing position on said panel, means for retaining said platen in printing position, means automatically actuated by the movement of said platen to printing position to close a circuit to said lamp, and means for automatically releasing said platen and opening said circuit after a pre-determined interval.

5. In a printing machine, the combination with a printing panel, of a platen mounted to move to and from said panel, a source of power, a clutch between said source of power and said platen, a plurality of manually operable keys for tripping said clutch, and mechanism operated by the different keys for giving differently timed exposures, said mechanism and clutch being operable by pressure on a single key.

6. In a printing machine, the combination with a printing panel, of a platen mounted to move to and from said panel, a source of power, a clutch between said source of power and said platen, a plurality of manually operable keys each of which when depressed is adapted to operate said clutch to move said platen to the panel, means adapted to hold said keys depressed and mechanism operable by said source of power to release said depressed keys after a predetermined time interval, the time interval being different for each key.

Signed at Rochester, New York, this 28th day of October, 1930.

ROY S. HOPKINS.