

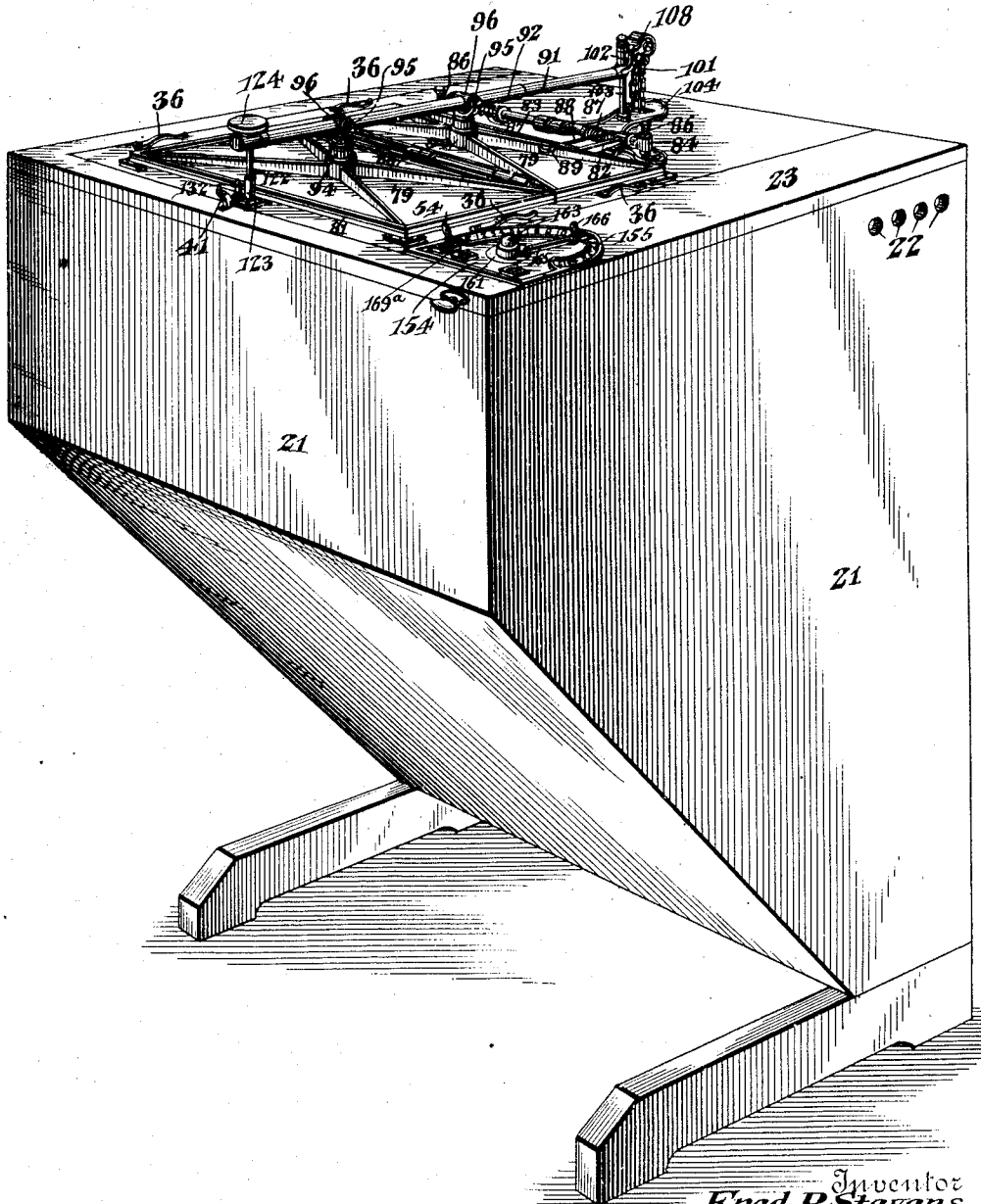
F. P. STEVENS.
 PHOTOGRAPHIC PRINTING MACHINE.
 APPLICATION FILED JULY 16, 1907.

978,955.

Patented Dec. 20, 1910.

7 SHEETS—SHEET 1.

Fig. 1



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 APPLICATION FILED JULY 18, 1907.

978,955.

Patented Dec. 20, 1910.

7 SHEETS-SHEET 2.

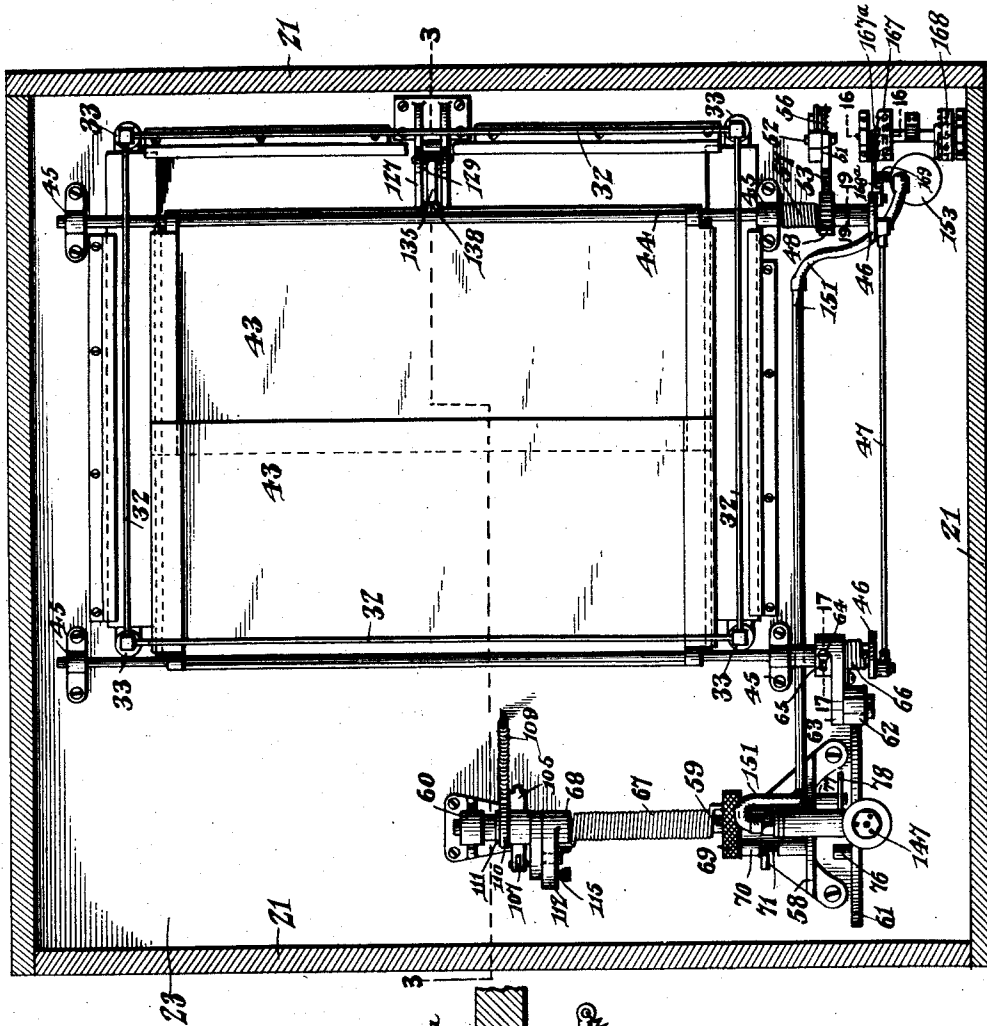
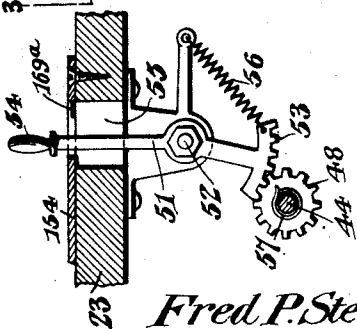


Fig. 2.

Fig. 18.



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By

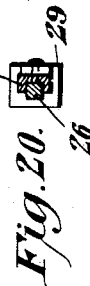
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7 SHEETS—SHEET 3.



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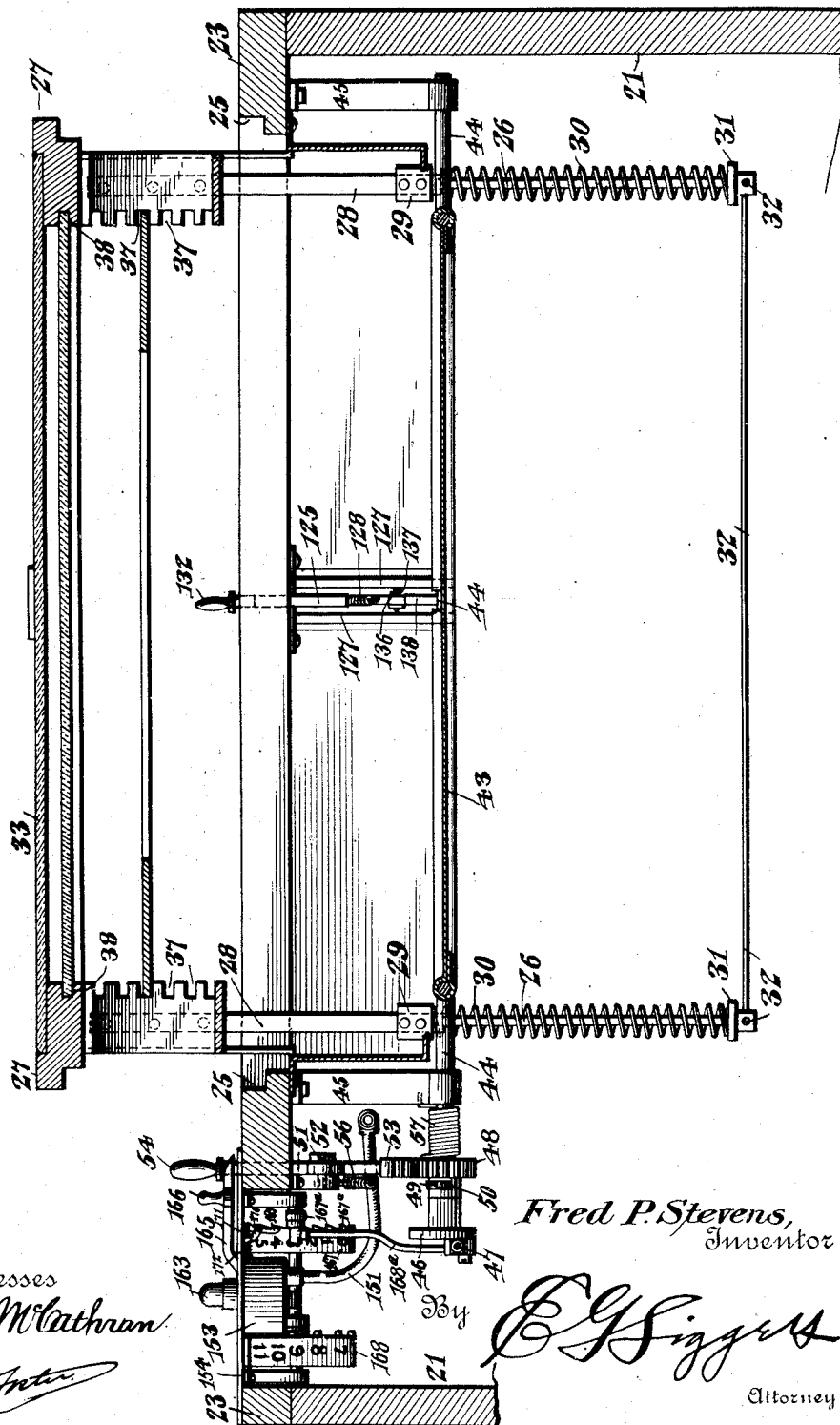
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7 SHEETS—SHEET 4.

Fig. 4.



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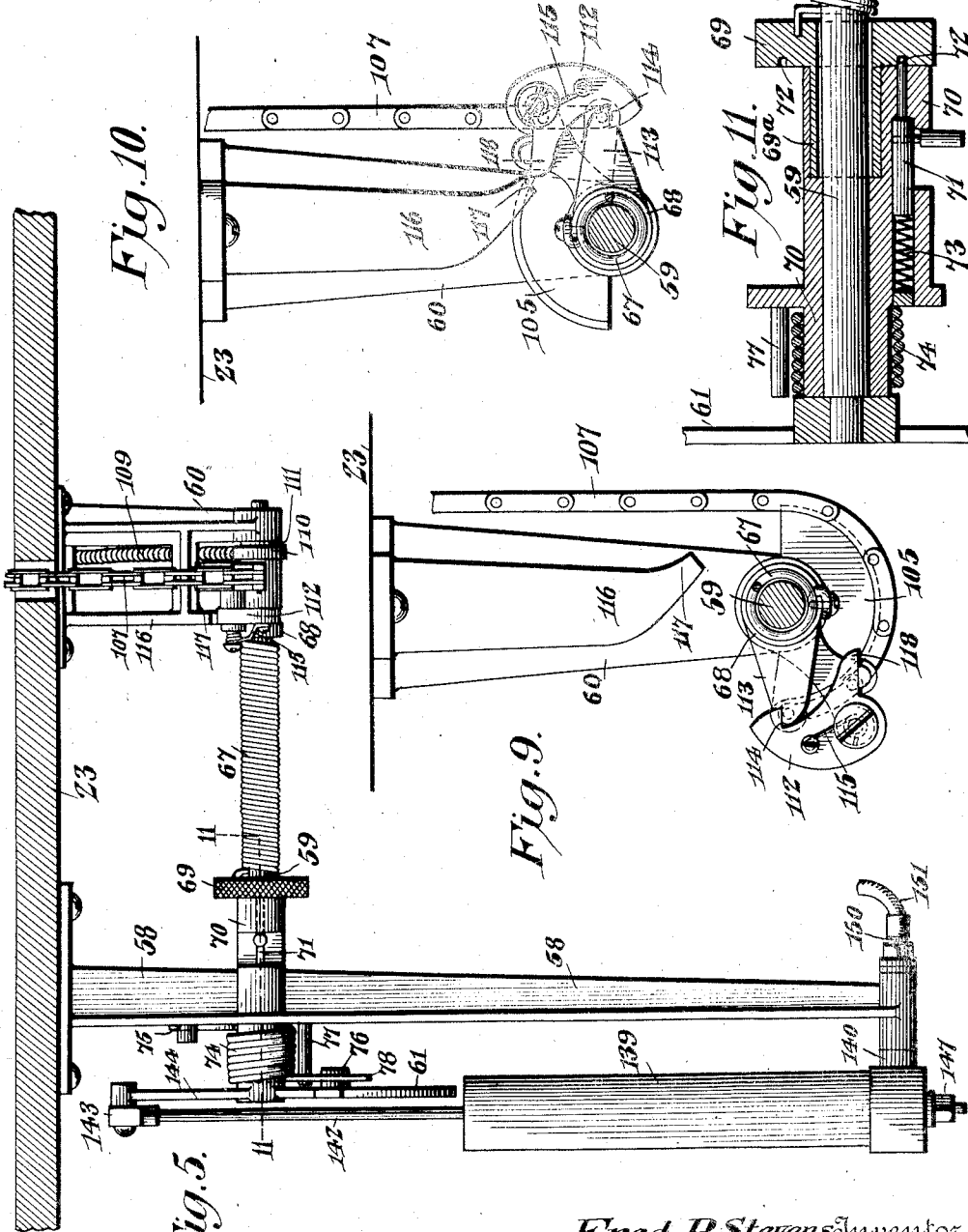
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7 SHEETS—SHEET 5.



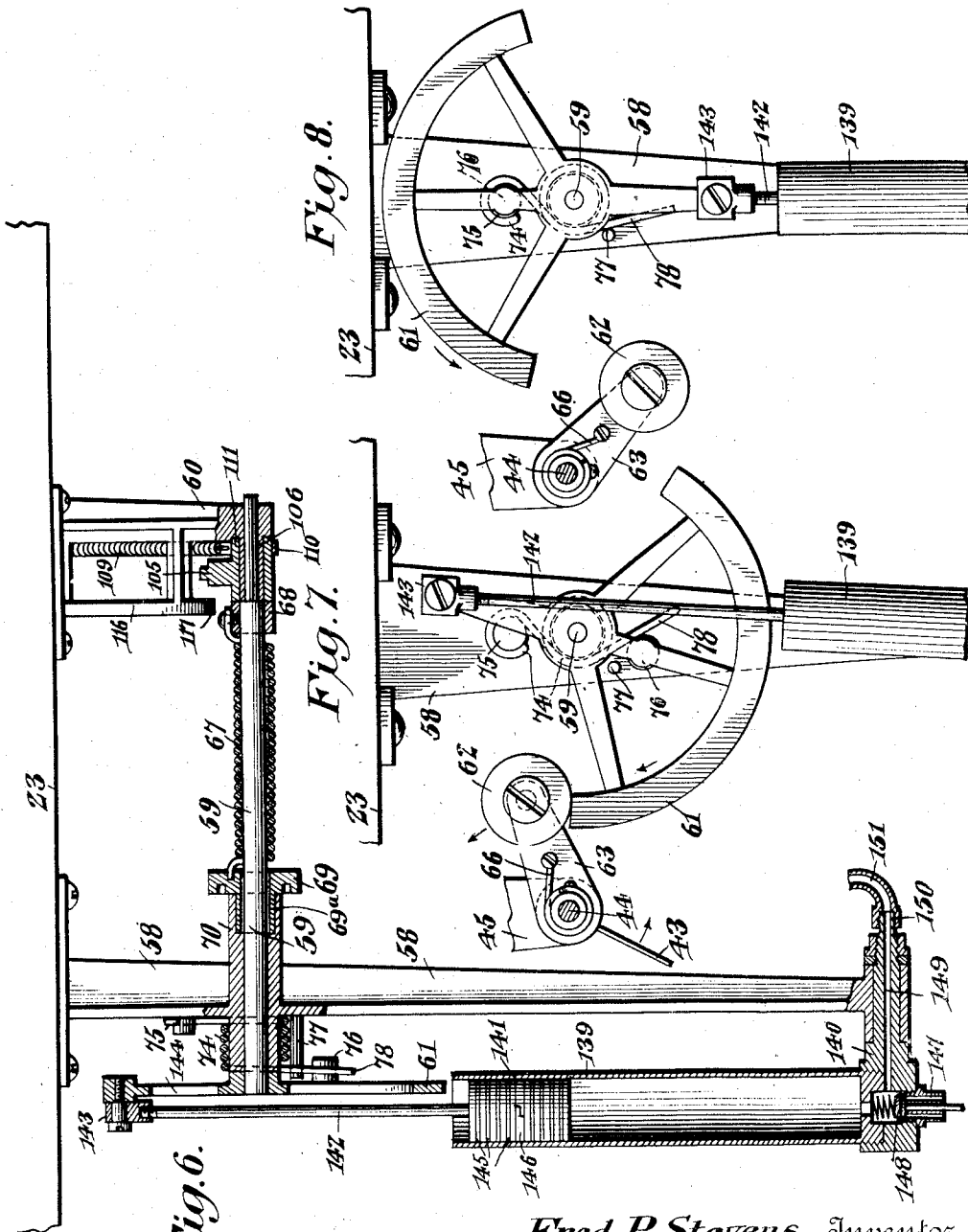
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978,955.

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978,955.

Patented Dec. 20, 1910.

7 SHEETS—SHEET 7.

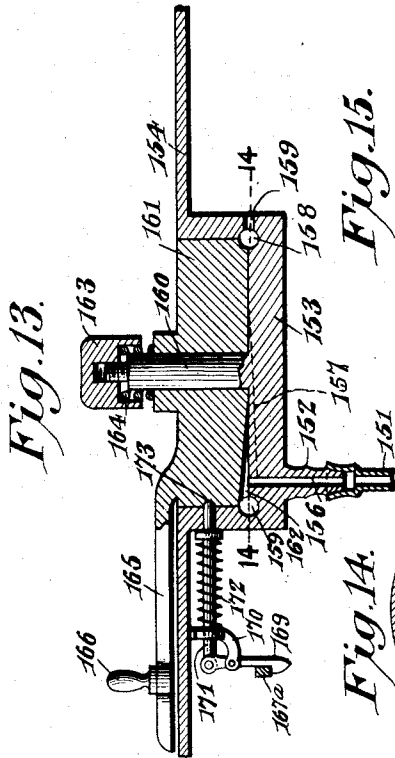


Fig. 13.

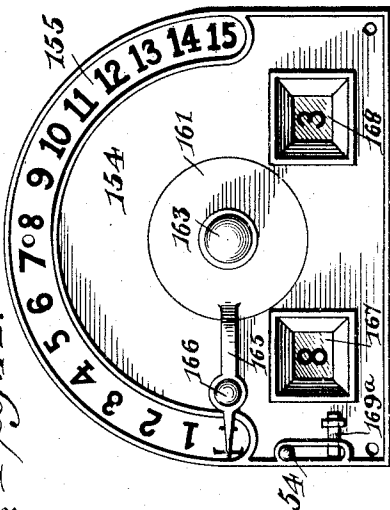


Fig. 12.

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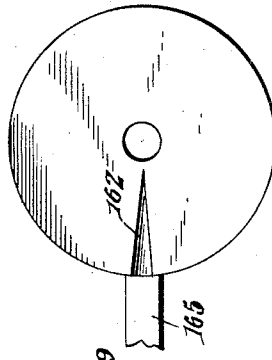


Fig. 15.

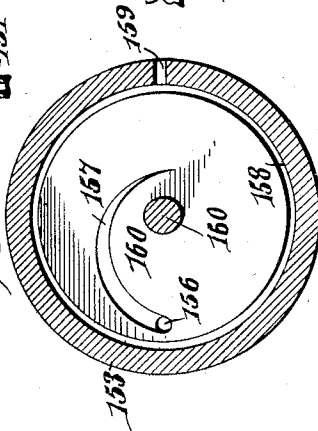


Fig. 14.

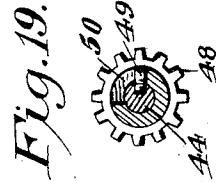


Fig. 19.

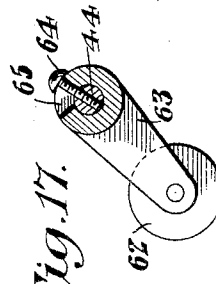
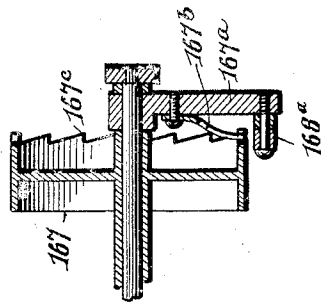


Fig. 17.

Fig. 16.



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UNITED STATES PATENT OFFICE.

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PHOTOGRAPHIC-PRINTING MACHINE.

978,955.

Specification of Letters Patent. Patented Dec. 20, 1910.

Application filed July 18, 1907. Serial No. 383,984.

To all whom it may concern:

Be it known that I, FRED P. STEVENS, a citizen of the United States, residing at Denver, in the city and county of Denver and State of Colorado, have invented a new and useful Photographic-Printing Machine, of which the following is a specification.

This invention relates to means for making photographic prints from negatives, and one of the important objects is to provide novel, simple, practicable and accurate mechanism, whereby a negative and paper applied thereto can be exposed for a predetermined period of time, and when said time has expired, the light will be cut off, and the paper released.

Another and exceedingly important feature of the invention resides in the provision of simple and reliable mechanism for varying the lengths of exposures.

Still other features relate to the construction and arrangement of the parts, whereby the machine can be manufactured at relatively small cost, the elements can be easily assembled, and are not liable to injury or displacement, while the mechanism is entirely accessible.

Another object of the invention is to provide in connection with the negative holding means, means for holding vignettters and other devices for varying the character of the print, said negative holding means being so associated with the other mechanism of the machine that it can be readily reached, and after a negative has been positioned on the negative holding means, the devices can be manipulated and adjusted with ease and expedition to secure the desired effects from said negative.

An embodiment of the invention that is at present considered the preferable one is illustrated in the accompanying drawings, wherein:—

Figure 1 is a perspective view of the complete machine. Fig. 2 is a horizontal sectional view therethrough showing the mechanism in bottom plan. Fig. 3 is a sectional view on the line 3—3 of Fig. 2. Fig. 4 is a vertical sectional view at right angles to Fig. 3. Fig. 5 is a rear elevation of the shutter operating means. Fig. 6 is a longitudinal sectional view therethrough. Fig. 7 is an end elevation of the shutter actuating and holding mechanism, showing the shutter during its opening movement. Fig. 8 is a

similar view, but illustrating the parts when the shutter is closed. Fig. 9 is a detail view illustrating the motor resetting means when in normal position. Fig. 10 is a similar view, but illustrating the parts when the motor is reset and just prior to its release. Fig. 11 is a detail sectional view on the line 11—11 of Fig. 5. Fig. 12 is a plan view of the indicator for the speed controlling means. Fig. 13 is a vertical sectional view therethrough and through the valve mechanism. Fig. 14 is a detail section on the line 14—14 of Fig. 13. Fig. 15 is a bottom plan view of the valve. Fig. 16 is a detail sectional view on the line 16—16 of Fig. 2. Fig. 17 is a detail sectional view on the line 17—17 of Fig. 2. Fig. 18 is a detail view of the hand operating mechanism for the shutter. Fig. 19 is a detail sectional view on the line 19—19 of Fig. 2. Fig. 20 is a detail sectional view on the line 20—20 of Fig. 3.

Similar reference numerals designate corresponding parts in all the figures of the drawings.

In the embodiment illustrated, a light inclosing casing 21 is employed that may be of any desired character, and preferably incloses an electric lamp (not shown) as is usual in this type of machine. The casing is provided in its side walls and contiguous to its upper end with suitable vent openings 22, and a top 23 closes the upper end of the casing, and is hinged thereto, as illustrated at 24. This top is provided with an angular opening 25 therein. Guide posts 26 depend from the under side of the top 23 at the corners of the opening, and a vertically movable frame 27, operating in said opening, has guides 28 slidably engaged with the posts 26 and partially surrounding the same, the lower ends of the guides being provided with ears 29 that embrace the posts, and coiled springs 30, located on said posts, have their upper ends bearing against the ears 29 to urge the frame 27 upwardly. The lower ends of the springs rest upon collars 31, and the lower ends of the posts are preferably connected by tie rods 32.

The upper end of the frame constitutes negative holding means, and for this purpose, a plate 33 of comparatively heavy glass is mounted thereon, said plate thus constituting a support for negatives, one of which is shown at 34. The negative when smaller than the plate is held in place by

a suitable mat 35 that is maintained against lateral displacement by springs 36 secured to the upper end of the frame, and shown in Fig. 1. The lower portion of the frame constitutes the means for holding vignettters, masks, light diffusing devices and other articles of an analogous nature. For this purpose, guideways 37 and 38 are formed in the side walls of the frame and permit plates, sheets and the like to be inserted when the frame is elevated to a projecting position above the top of the casing. A latch 39, pivoted as shown at 40 to the front portion of the top, engages over the top of the frame, when the same is in its depressed position, to hold it in said position, this latch being provided with an upstanding thumb-piece 41 and having a spring 42 bearing thereagainst to hold it in its operative position.

The means for controlling the supply of light to the negative holding means, in the present embodiment of the invention, consists of a shutter that is composed of oppositely swinging sections 43, the said sections preferably consisting of material that will permit the passage of approximately non-actinic rays of light, while preventing those which are highly actinic. These sections are mounted on suitable frames, which include rock shafts 44 journaled at their ends in depending brackets 45 that are secured to the under side of the top 23 independently of the vertically moving frame 27. The rock shafts at one end have crank disks 46 secured thereto, and are connected by a rod 47, the connections being such that when one of the shafts is turned in one direction, the other will be turned in an opposite direction, and thus the opposite opening and closing movements of the shutter sections is assured.

Both automatic and manual means are provided for actuating the shutter. The latter is disclosed more particularly in Figs. 2, 18 and 19. It will be observed that one of the shafts 44 carries a pinion 48 and has a limited movement thereon, this limited movement being secured by a pin 49, fixed to the shaft and having its projecting portion located in a slot 50 in the pinion. A lever 51, fulcrumed between its ends, as illustrated at 52 in Fig. 18, has its lower end provided with a rack 53 that meshes with the pinion 48. The upper arm 54 of the lever projects through a slot 55 in the casing top 23, and constitutes an actuating handle. A spring 56, secured to the rack and to a suitable portion of the casing or supporting bracket, normally holds the rack 53, and consequently the pinion in a predetermined position. With this mechanism, when the handle 54 is operated, the pinion engaging the pin 49 will cause the shaft 44 to be turned, thereby swinging the shutter

to open position. But if said shutter is moved to open position by the automatic means hereinafter described, the pin 49 being freely movable in the slot 50, will not effect the operation of the handle. A suitable spring 57, coiled upon one of the shafts 44 and having one end secured thereto while the other end is secured against movement, serves to return the shutter sections to closed position.

The automatic mechanism now employed for effecting the actuation of the shutter or light controlling means is as follows. A hanger 58 is rigidly affixed to the under side of the top 23, and journaled therein is a shaft 59, one end of the shaft being also journaled in a bracket 60 likewise secured to the under side of the top. A cam track 61, is fastened to one end of the shaft on one side of the hanger 58, and coöperates with a roller 62 journaled on an arm 63 that has a limited movement on one of the rock shafts 44 of the shutter. The movement is limited by a pin 64 secured to the shaft and engaged in a slot 65 formed in the hub of the arm 63. A spring 66, secured to said arm and to said shaft, normally holds the hub with one end wall of the slot against the pin, as will be evident by a comparison of Figs. 7, 8 and 17. The shaft 59 is actuated by a motor in the form of a coiled spring 67 surrounding a portion of said shaft, and as illustrated in Figs. 5 and 6, having one end secured to a collar 68 that is fast to said shaft, or it may be secured directly to said shaft, while the other end is engaged with a tension varying wheel 69 surrounding but spaced from the shaft and having a hub 69^a journaled in the bearing 70 for said shaft, said bearing constituting an integral part of the hanger 58. As illustrated particularly in Fig. 11, the tension varying wheel 69 is held against movement and in different positions by a sliding bolt 71 having one end arranged to engage in any of a series of sockets 72 formed in the wheel 69, a spring 73 bearing against the opposite end of the bolt to urge it into said socket. The spring 67 constitutes the principal actuating motor for the shaft 59, but an auxiliary motor is employed for assisting the initial movement of the shaft in opening the shutter, and this auxiliary motor comprises a spring 74 coiled upon the outer end of the bearing 70 and having one end fastened as shown at 75 to the hanger 58. The other end is arranged to bear against a projection 76 on the inner side of the cam track 61, but this bearing is limited by a pin 77 projecting outwardly from the hanger 58 into the path of movement of the free arm 78 of the spring 74, which bears against the projection 76, as is hereinafter explained in the description of the operation of the machine. This automatic shutter operating

mechanism is movable from a set position to open the shutter. In other words, the shaft 59 must be turned to wind up the springs 67 and 74 in order to place tension thereupon. When so wound up, the parts, are as illustrated in Figs. 3 and 6. When said shaft 59 is released, the springs 67 and 74 operate to return the same and the cam track 61 striking the roller 62 will cause the arm 63 to swing, and the shutter to open. When said cam track has passed the roller 62, the spring 57 will return the shutter to closed position. The means for setting the motor or resetting it after an operation is hereinafter described. Coöperating with the negative holding means, above described, is a paper holding means in the form of a pressure back, and this pressure back comprises sections 79 hinged together, as shown at 80, and having cushioning material 81 upon their under faces. The pressure back is also hinged to the top 23 of the casing independently of the vertically movable frame 27, and to this end, the rear section 79 is provided with rearwardly extending ears 82 journaled upon a cross bar 83, said cross bar having vertical collars 84 at its ends that are slidable upon posts 85 projecting above the upper face of the top. Springs 86, mounted on the posts and bearing upon the collars 84 serve to urge the cross bar to its lowermost position. Other springs 87, coiled upon the cross bar 83, have lifting arms 88 that are engaged in undercut notches 89 formed in strengthening webs 90 of the pressure back, and these springs serve to elevate the pressure back away from the negative holding means.

A lever comprising slidably telescoped sections 91 and 92 is disposed above the pressure back, and transversely of the sections thereof. The outer section 92 has connections with the pressure back sections 79, and for this purpose, slidably telescoped boxings 93 and 94 are employed. The boxings 93 preferably constitute integral parts of the pressure back sections 79, while the boxings 94 are provided with upstanding spaced ears 95. Journaled in these ears are collars 96 that are mounted on the outer lever section 92, the front collar being secured against movement thereon by screws 97. The operative movements of the boxings are limited by screws 98 that are threaded through the outer boxings and engage in slots 99 formed in the inner boxings. Springs 100, located within the boxings, serve to urge the same outwardly away from each other. The inner section 91 of the lever is provided at its rear end with spaced ears 101 pivotally mounted on a sleeve 102. The sleeve is slidable upon a standard 103 fixed at its lower end to a plate 104, said plate being secured to the casing top 23 and having the posts 85 mounted thereon.

The motor resetting means is connected to the lever, and consequently through the same to the pressure back. This motor resetting means consists of a carrier 105 rotatably mounted on an integral projecting portion 106 of the bracket 60, and having a cable connection 107 with the rear end of the lever. This cable, which is preferably, though not necessarily in the form of a chain, wraps upon the carrier 105 when the pressure back is elevated, and it is slightly extensible, a bowed spring 108 constituting the connection between the chain and the rear end of the lever. A spring 109, fastened at one end to the under side of the casing top 23, has its other end connected to a strap 110 that wraps upon the hub 111 of the carrier. This carrier has pivoted thereto a dog 112, and the collar 68 of the shaft 59 is provided with an outstanding finger 113 that has a shoulder 114. These parts are shown particularly in Figs. 3, 9 and 10. A spring 115, engaged with the dog, urges the same into interlocking engagement with the shoulder 114 of the arm 113 of the shaft 59 when the pressure back is elevated, and the shaft is in its normal position, as illustrated in Fig. 9, but a depending arm 116 has its lower end 117 disposed in the path of movement of the tail 118 of the dog 112, and serves to swing said dog against the action of the spring so as to disengage it from the shoulder 114, and release the shaft after said shaft has been moved to its set position, or in other words, rotated against the action of the springs 67 and 74.

The pressure back 79—79, as already explained, is elevated by the springs 88, but inasmuch as this operation takes place with considerable force, it has been found expedient to employ cushioning means for stopping the pressure back in its upward movement. In the present embodiment, this cushioning means consists of a plunger 119 carried by the inner end of the lever section 91 and operating in the front end of the lever section 92. A spring 120 is interposed between the plunger 119, and a head 121 that closes the front end of the lever section 92. When the pressure back is applied, the section 92 will slide outwardly upon the section 91, and air will find its way past the plunger 119. When the pressure back is released, and swings upwardly, the section 91 will slide into the section 92, and this air will slowly pass the plunger as the plunger moves toward the head 121, thus producing a cushioning effect, which effect is heightened by the spring 120 engaged by said plunger 119. The said head furthermore has threaded therein the upright stem 122 of a depending hook 123, said stem having a knob 124 screwed upon its upper end. A latch 125, pivoted as shown at 126 to the inwardly extending arm of a bracket 127 that

is fastened to the under side of the top 23, is arranged to interlock with the hook 123 when the pressure back is in position upon the negative holding means. It is to be noted, however, and particularly by reference to Fig. 3 that the interlocking shoulders of the hook 123 and latch 125 are inclined, and this inclination is sufficient to effect the movement of the latch 125 to an inoperative position even against the spring 128 which urges the latch 125 to its interlocking position. A lock, however is employed for said latch, and said lock consists of a bell crank 129 fulcrumed as shown at 130 to the bracket 127 and having an upstanding arm 131 that projects through the top of the casing, and has a suitable handle knob 132. This upright arm 131 is provided with a recessed seat 133 in which a finger 134 of the latch 125 engages. It will be observed that the spring 128 connects the latch and the arm 131, thus drawing them toward each other. It will also be evident that when the finger 134 is engaged in the seat 133, the latch will be locked against rearward movement by the hook 123. The bell crank 129 is furthermore provided with a rearwardly extending arm 135, and pivotally mounted thereon is a swinging dog 136 having a spring 137 for normally holding it in a predetermined position. A projection 138, carried by the adjacent rock shaft 44, has its path of movement intersected by the lower end of the dog, as will be evident by reference to Fig. 3.

The operation of the mechanism as thus far described, is substantially as follows. The pressure back being in its elevated position, the chain 107 will be wound upon the carrier 105, as illustrated in Fig. 9, in which case, the dog 112 will be engaged with the shoulder 114 of the arm 113 that is fixed to the shaft 59. The operator places a negative, as 34 in position upon the support 33 and if he desires to alter the printing effect of the same in any manner well known to the art, he disengages the latch 41 from the frame 27, whereupon the springs 30 will elevate said frame. He can thereupon introduce the vignettes, light diffusing devices or other well known expedients, and after having prepared everything to his satisfaction, the frame 27 is forced downwardly against the action of the springs 30. In connection with the preparation of the negative, it will be observed that the shutter may be readily opened by manipulating the handle 54 shown in Fig. 18. The shutter being again closed, a sheet of sensitized paper is placed upon the negative and the pressure back is then brought down by depressing the knob 124 on the front end of the lever 91-92. During this downward movement, and because of the mechanism disclosed, the rear section 79 of the pressure back will be

first engaged with the paper, and consequently said paper will be effectively clamped. The operator may then remove his hand from the front portion of the paper and continue the downward movement of the lever, thus bringing the front section of the pressure back into operative position. It will be evident that as the front end of the lever moves downwardly, the rear end will be moved upwardly, and consequently the chain 107 will be correspondingly moved. This will effect the rotation of the carrier 105, carrying the arm 113 with it, and rotating the shaft against the action of the springs 67 and 74. As the front section of the pressure back reaches its above described operative position, the hook 123 of the stem will yield sufficiently to engage with the latch 125, and thus as the engagement takes place to lock the pressure back in its operative position, the tail of the dog 118, as shown in Fig. 10, will reach the lower end 116 of the arm 117. This will cause said dog to swing and disengage from the arm 113, releasing the motor from its set position, and permitting it to rotate the shaft in a reverse direction. With the downward movement of the lever and the rotation of the shaft 59 against the action of the spring 67 and 64 as just described, the cam track 61 will be moved in the direction of the arrow shown in Fig. 8, and will pass by the roller 62. It will be remembered that the arm 63 carrying said roller 62, has a slight movement with respect to the rock shaft 44 carrying said arm. Consequently this movement will now take place and the shutter will not be affected. As the lever, however, reaches its horizontal position, the roller will ride over the end of the cam track and will be in the position shown in Fig. 3. Remembering now that the shaft 59 is released at this point as above described, and that the springs will react, it will be evident that the cam track 61 will now be moved by said springs in an opposite direction or in other words, in the direction of the arrow shown in Fig. 3. The result is that the arm 63 will be swung in an opposite direction, and as it can have no movement independently of the rock shaft 44 in this direction, the shutter will be opened. This opening movement of the shutter requires considerable force because of the leverage and the action of the springs tending to close the shutter. Therefore the auxiliary spring 74 assists the principal spring 67 in this movement. When, however, the roller 62 rides upon the periphery of the cam track, the additional power is not required and at this point, the arm 78 of the spring 74 strikes against the stop pin 77, and consequently the force of said spring 74 is removed from the shaft 59. The spring 67 continues the operation of the shaft, and when the cam track 61 passes

the roller 62, the arm 63 being free, the spring 57 will act to reclose the shutter. Referring to Fig. 3, it will be observed that when the shutter opens, the finger 138 of the front rock shaft 44 of the shutter passes the dog 137, said dog moving to permit such passage, but when the shutter returns to its closed position, the finger 138 striking the dog 137 will cause a slight elevation of the arm 135 of the bell crank 129. This movement will effect a forward movement of the upright arm 131 of said bell crank 129 sufficient to release the finger 134 from its seat 133. The elevating springs 88 of the pressure back will consequently have sufficient force to raise said pressure back and force the latch 135 rearwardly. The parts are now in their normal or first position. All that is necessary to again place the machine in operation is to remove the printed sheet, place a new sheet in position, and depress the lever 92, whereupon the action above described will be repeated.

The mechanism as thus far described is entirely operative for any predetermined time, but in order to vary the time of exposure, the following simple but entirely effective and accurate mechanism is employed. A swinging cylinder member 139 has a gudgeon 140 journaled in the lower end of the hanger 58, and a piston 141 operating in the cylinder member, is provided with a rod 142 that has a crank connection 143 with an arm 144 projecting from the opposite side of the shaft 59. The piston is preferably provided with a series of annular dirt collecting grooves 145, and a packing ring 146. An inlet 147 through the lower portion of the piston, is controlled by an inwardly opening check valve 148 and an exhaust channel 149 extends through the gudgeon 140 of the cylinder member. The outer end of said gudgeon terminates in a nipple 150, and an exhaust conduit 151, connected to the nipple 150, is connected to a depending nipple 152 formed on a valve casing 153. This casing, as shown in Figs. 12, 13 and 14, preferably constitutes an integral part of a dial plate 154, secured upon the top 23, and having a scale 155 on its marginal portion. The exhaust conducting nipple 152 has a bore 156 therethrough that is in communication with a channel 157. This channel is formed in the bottom of the casing 153, and as shown in Fig. 14, is disposed eccentrically to the axis of the casing, and is tapered. The casing furthermore is provided in its inside lower corner with an annular channel 158 from which leads an exhaust port 159. The casing has a central upstanding stem 160 on which is journaled a rotatable valve 161. The valve, as shown in Figs. 13 and 14, is provided in its under side with a tapered channel 162, which channel rides over the channel 157,

and is in communication with the annular channel 158. A cap 163 is threaded upon the upper end of the top or stem 160, and a spring 164 interposed between the cap and valve serves to hold the latter to its seat. The particular construction of the valve is not claimed in this application, as it forms the subject-matter of a co-pending case. An outstanding pointer 165, connected to the valve 161 and forming an integral part thereof, operates over the scale 155, and is preferably provided with a handle knob 166. It will be evident that by turning the pointer 165 the valve 161 will be turned and different cross sectional areas of the channel 162 in the under side of said valve, will be brought into register with different cross sectional areas of the channel 157 of the valve casing or seat. Thus the area or size of the exhaust can be varied to vary the amount of air or fluid permitted to escape in a predetermined time from the cylinder member 139.

With this mechanism, it will be evident that when the motor and shaft 59 are moved to their set position by the operation of the pressure back, the piston 141, as shown in Fig. 6, will be moved to the outer end of the cylinder member 139, air being thus drawn into the cylinder member through the inlet 147. When the springs 67 and 74 react to open the shutter and hold it open, the speed of movement of the shaft 59 is limited by the speed at which the piston 141 can return to the inner end of the cylinder member. The speed of this piston is determined, as will be evident, by the position of the rotary valve 161 and the scale and pointer are so arranged that such speed can be readily determined. For instance, if the pointer 165 is set over the numeral 1 of the scale, the exhaust from the cylinder will take place with sufficient rapidity to permit the motor to operate so as to hold the shutter open one second. The length of exposure in the present embodiment can thus be varied from one to fifteen seconds. It may occur, however, that a very dense negative will require a much greater exposure and mechanism is therefore employed for holding the shutter open an indefinite period. This mechanism includes in its make-up, a counter or register, which need not be herein specifically described, inasmuch as it constitutes the subject-matter of a Patent No. 888,667, dated May 26, 1908. Suffice it to state that it consists of a number wheel 167, and another number wheel 168, the former being operated upon every movement of the shutter to register the number of prints made and having twelve numbers thereon, which are exposed through the dial plate 154. The other wheel 168, designates the number of dozens of prints made, and is therefore operated one increment upon each

revolution of the wheel 167. The operating means for the register comprises a swinging arm 167^a having a dog 167^b that engages teeth 167^c on the rim of the wheel 167. A link 168^a, connected to the swinging arm, is also connected to one of the crank disks 46 (see Figs. 2, 4 and 16). Thus upon every opening movement of the shutter, whether operated by the automatic means or the manual means, the register will be operated. It often occurs, however, that the shutter is opened when no print is made, and this opening movement is secured by the lever 54. It therefore is important to make the register mechanism inoperative and to accomplish this, a sliding stop plate 169^a is mounted on the dial plate, and is movable into the path of movement of the lever 54. This plate therefore when in operative position, limits the movement of the lever 54. Therefore while said lever will open the shutter it will prohibit the movement of the rock shaft 44 a sufficient distance to carry the dog of the arm past a tooth. Consequently said dog will ride up and down upon the tooth and will not effect the operation of the registering mechanism. A swinging latch 169, pivoted between the ends to a bracket 170 that depends from the dial plate 154, has a lower hooked end that is movable into and out of the path of movement of the arm 167^a. A plunger stem 171 has one end connected to the upper end of the latch 169, while its other end slidably passes through the valve casing 153, and bears against the periphery of the rotary valve 161. It is urged against the same by a suitable spring 172 and the periphery of the valve is provided at one point with a notch or recess seat 173 to receive the adjacent end of the stem. When therefore this notch is alined with the inner end of the stem, said end will be seated therein, as shown in Fig. 13, whereupon the latch 169 will be disposed in the path of movement of the arm 167^a. The notch, is so arranged that it will be thus alined when the pointer 165 is over the letter T on the dial plate 154, as shown in Fig. 12. To make a time exposure therefore all that is necessary is to turn the valve 161 until the pointer 165 is over the lettered key of the dial. The pressure back is then pressed down and latched in the ordinary manner, whereupon the motor will be set, released and will operate to open the shutter. As said shutter opens the arm 167^a will be moved upwardly, as will be evident by reference to Fig. 4, whereupon it will engage over the hooked latch 169, and when the motor finishes its movement, although the shutter arm 63 is released from the cam track, it cannot close, inasmuch as the arm 167^a cannot move downwardly. An exposure of any desired length may thus be made,

and all that is necessary to release the shutter and permit its closing movement is to turn the pointer 165 a slight distance or until the plunger 171 is forced outwardly and the hook 169 disengaged from the arm 167.

With this machine, it will be evident that the operator can prepare a negative for printing with the greatest ease and expedition, inasmuch as said negative can be placed in the negative holding means, as already described. Furthermore after having ascertained the proper length of an exposure, he has only to set the machine for the period, and can make any number of prints from the negative without the necessity of paying close attention to the time of each exposure. Moreover the exposure operating means is automatic in its nature, and all that an operator has to do is to properly place the paper on the negative and clamp it whereupon the exposure is automatically made, and the paper automatically released. The mechanism disclosed has proven to be entirely accurate after the first adjustment of the parts is secured. This adjustment may be readily made by varying the tension of the spring 67 which, as already described, is obtained by turning the wheel 69 and locking it in its different positions. A further advantage of some moment is the mounting of the entire mechanism upon the top of the casing. It is thus readily accessible, that upon the upper face being always exposed, and the remainder which is mounted on the under face being exposed when the cover or top is swung to open position. The registering mechanism automatically operated as described is an advantageous feature of the machine, inasmuch as it accurately registers the prints made, thus relieving the operator of this care.

From the foregoing, it is thought that the construction, operation and many advantages of the herein described invention will be apparent to those skilled in the art, without further description, and it will be understood that various changes in the size, shape, proportion, and minor details of construction, may be resorted to without departing from the spirit or sacrificing any of the advantages of the herein described invention.

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

1. In a printing machine of the character set forth, the combination with negative holding means, of means for admitting light thereto, a mechanism operatively connected with the negative holding means to be automatically set into operation thereby for controlling the light-admitting means and including separate elements both active only during the opening of the light-admitting

means and after which only one element operates during the exposure to hold said means open, and adjustable means for determining the period during which the single element operates on the light-admitting means to produce exposures of different lengths.

2. In a printing machine of the character set forth, the combination of negative holding means, means for controlling the admission of light thereto, a motor device including a plurality of elements operating together to open by their combined power the last-mentioned means and one operating longer than the other to hold the light admitting means open during an exposure, and an adjustable retarding device against which only the longer acting element operates during the period of admitting light for each exposure.

3. In a printing machine of the character set forth, the combination of negative holding means, a light controlling shutter associated therewith, separate motor elements operatively connected with the negative holding means to be simultaneously set thereby and operating together for opening the shutter, means for automatically throwing one of the elements out of operation as soon as the shutter is fully opened, and an adjustable retarding device operating against the other motor element during the period of an exposure.

4. In a printing machine of the character set forth, the combination of a negative-holding means, a light-controlling shutter, an oscillatory device, a member connected with the shutter to coact with the device for opening the shutter during the initial movement of the device and for holding the shutter open thereafter for the whole period of an exposure, and a motor means having greater power at the beginning of its movement to effect the opening of the shutter and less power after the opening of the shutter for maintaining the latter open during an exposure.

5. In a printing machine of the character set forth, the combination of a light-controlling shutter, a negative-holding means, a motor device controlling the shutter, means for setting the motor device by the operation of the negative-holding means, means for automatically reducing the power of the motor device after the latter has opened the shutter, and a controllable retarding mechanism for varying the period of action of the motor device and thereby the length of an exposure.

6. In a printing machine of the character set forth, the combination of a light-controlling shutter, a negative-holding means, a motor device controlling the shutter, means for setting the motor device by the operation of

the negative-holding means, means for automatically reducing the power of the motor device after the latter has opened the shutter, a controllable retarding mechanism for varying the period of action of the motor device and thereby the length of an exposure, and a latch mechanism for retaining the negative-holding means in operative position during the exposure and for releasing said means upon the closing of the shutter.

7. In a printing machine of the character set forth, the combination with negative holding means, of paper holding means movable to and from an operative position with respect to the negative holding means, a light controlling shutter, a motor operatively connected with the shutter and having a fixed range of movement, the first part of which opens the shutter and the remaining part holds the shutter open to admit light to the negative holding means, and means operating with the paper holding means to move the motor to a set position when the paper holding means moves to its operative position and while the shutter is in closed position, said means releasing the motor to permit it to open the shutter when the paper holding means reaches its said operative position.

8. In a printing machine of the character set forth, the combination with negative holding means, of a light controlling device, a motor movable from a set position to open the light controlling device and returnable to said set position, paper holding means movable to an operative position with respect to the negative holding means, and mechanism automatically operated on the movement of the paper holding means toward said operative position to move the motor to its set position and immediately release the motor when said paper holding means reaches its operative position for opening the said device.

9. In a printing machine of the character set forth, the combination with negative holding means, of a movable light controlling shutter coöperating therewith, a motor for opening the shutter, movable paper holding means, and mechanism for automatically setting the motor in operation upon the movement of the paper holding means to a position over the negative holding means.

10. In a machine of the character set forth, the combination of a negative-holding means, a light-controlling shutter, a rock shaft, a cam carried thereby, a member on the shutter over which the cam rides in both directions, the length of the cam being less than the arc of movement thereof to move past the said member, the member being yieldingly connected with the shutter to prevent movement of the latter as the cam moves in one direction, and a motor device

for actuating the cam in the direction for opening the shutter through the said member.

11. In a machine of the character set forth, the combination of a negative-holding means, a light-controlling shutter, a rock shaft, a cam carried thereby, a member on the shutter over which the cam rides in both directions, the length of the cam being less than the arc of movement thereof to move past the said member, the member being yieldingly connected with the shutter to prevent movement of the latter as the cam moves in one direction, a motor device for actuating the cam in the direction for opening the shutter through the said member, and an adjustable retarding device for prolonging or shortening the period of action of the device.

12. In a machine of the character set forth, the combination of a swinging light-controlling shutter, a rock shaft, an arm having a lost motion connection with the shutter, a cam mounted on the rock shaft, a motor for turning the rock shaft in a direction to open the shutter through the cam and arm, means for moving the device and simultaneously re-setting the motor, the device swinging the arm without moving the shutter during the re-setting movement, and a retarding means for the motor including a movable element operatively connected with the cam, and also including a device for varying the rate of movement of the retarding means.

13. In a printing machine of the character set forth, the combination with a negative-holding device, a light-controlling shutter, a rock shaft, a cam rotating with the rock shaft, a swinging arm actuated by the cam in opposite directions, means for connecting the arm with the shutter to move therewith when the latter swings in only one direction, a spring connected with the rock shaft, a pressure back, a device connecting the pressure back with the shaft for tensioning the spring and including means for automatically releasing the shaft at the instant the pressure back reaches its final position, a latch mechanism for holding the pressure back in operative position, and means movable with the shutter for releasing the latch at the end of an exposure.

14. In a printing machine, the combination of a pressure back, a negative-holding means cooperating therewith, means for mounting the pressure back for swinging movement, a lever yieldingly connected with the pressure back, a standard on which the lever rises and falls during the opening and closing of the pressure back, a light controlling means, a motor therefor, a connection between the said movable end of the lever and motor for re-setting the same

and automatically released when the lever reaches the end of its upward movement to permit the motor to act, and an automatically released latch device for holding the pressure back in operative position.

15. In a printing machine, the combination of a negative holder, a pressure back composed of hingedly-connected sections, means for mounting the pressure back to swing open and closed, means tending to open the pressure back, a lever extending across the pressure back and including telescoping sections, tensioning means between one of the lever sections and both of the pressure back sections, a member on which one end of the lever slides, a light controlling means rendered operative by the movement of the lever in a direction to close the pressure back, and a latch mechanism automatically released when the light is cut off to permit the pressure back to open.

16. In a printing machine, the combination of a negative holder, a pressure back composed of hingedly-connected sections, means for mounting the pressure back to swing open and closed, means tending to open the pressure back, a lever extending across the pressure back and including telescoping sections, tensioning means between one of the lever sections and both of the pressure back sections, a member on which one end of the lever slides, a light-controlling means rendered operative by the movement of the lever in a direction to close the pressure back, a latch mechanism automatically released when the light is cut off to permit the pressure back to open, and a shock absorbing and motion-retarding device carried by the lever for gradually stopping the opening movement of the pressure back.

17. In a printing machine, the combination of a negative holder, a pressure back composed of hingedly-connected sections, a lever extending across the sections and composed of slidably connected telescoping parts, connecting means between one of the parts and both pressure back sections and each including spring-pressed slidably connected elements, means for rigidly securing one of the connecting means to the lever, the other connecting means being slidably attached to said lever, a shiftable fulcrum for the lever, and a light-controlling means actuated by the lever.

18. In a printing machine of the character set forth, the combination with negative holding means, of light controlling means, and mechanism for operating the light controlling means, said mechanism comprising a shaft, a spring coiled about the shaft and having one end connected thereto for rotating the same in one direction, and mechanism for rotating the shaft against

the tension of the spring, said mechanism including a device rotatable independently of the shaft, a dog pivoted on the device for detachably connecting the latter, and shaft, and means for automatically operating the dog to release the shaft when said dog reaches a predetermined position.

19. In a printing machine, the combination of a negative holder, a pressure back composed of hingedly connected sections, a hinge for mounting the pressure back to swing as a whole, a lever extending across the axis on which the pressure back swings, a support forming a shiftable fulcrum for the lever, yielding connections between the lever and the sections of the pressure back, a light controlling means, a motor, means for connecting the motor with the fulcrumed end of the lever to re-set the motor when the lever is moved in one direction, and means for automatically releasing the lever from the motor to permit the latter to actuate the light-controlling means.

20. In a printing machine of the character set forth, the combination with cooperating negative and paper holding means, of a light controlling device associated therewith, a rock shaft, means connected to the rock shaft for operating the light controlling device, a motor connected to the rock shaft while the light controlling device is closed, and means for rotating the rock shaft in one direction to wind the motor and permit it to operate and rotate the rock shaft in an opposite direction to open and hold open said light controlling means during an exposure.

21. In a printing machine of the character set forth, the combination with cooperating negative and paper holding means, of a light controlling device associated therewith, a rock shaft, means connected to the rock shaft for operating the light controlling device, a motor connected to the rock shaft, means detachably engaging with the rock shaft for rotating the same in one direction to wind the motor, and means for detaching the rock shaft from said rotating means before beginning an exposure to permit the rock shaft to operate in an opposite direction to actuate the light controlling device.

22. In a printing machine of the character set forth, the combination with cooperating negative and paper holding means, of a light controlling device associated therewith, a rock shaft, means connected to the rock shaft for operating the light controlling device, a spring connected to the rock shaft, means for rotating the shaft against the action of the spring to place tension thereon, said means including a detachable dog, and means for detaching the dog before an exposure begins and at a time when the

shaft reaches a predetermined position to permit the spring to react and reverse the rock shaft to actuate the light controlling device.

23. In a printing machine, the combination of a negative holder, a pressure back, a lever yieldingly connected with the back and having a fulcrum at one end which moves within fixed limits during the swinging of the lever, a cable releasably connected with the said fulcrumed end, a light-controlling means, a motor movable automatically in one direction to open the light-controlling means, and means for positively connecting the cable with the motor to energize the latter when the lever moves to close the pressure back, said cable being released automatically when the pressure back reaches its final position to permit the motor to operate.

24. In a printing machine, the combination of a negative holder, a pressure back, a spring for raising the same to open position, a lever operatively connected with the pressure back to move therewith under the pressure of the spring, a fixed standard on which one end of the lever rises and falls and tilts, a flexible element, a spring connecting one end of the element with the said end of the lever, an oscillatory carrier connected with the opposite end of the element, a dog pivoted on the carrier, a motor, means for engaging the dog with the motor for setting the same, a fixed stop for releasing the dog when the carrier reaches the end of its movement in one direction to permit the motor to act, and a shutter device actuated by the motor.

25. In a printing machine of the character set forth, the combination with negative holding means, of a paper holder movable to an inoperative position and an operative position with respect to the negative holding means, light controlling means, a motor for operating the light controlling means, said motor being movable to and from a set position, means for connecting the paper holder and motor including a dog, automatic means for operating the dog to connect the paper holder and motor when said paper holder reaches the end of its movement from operative to inoperative position, and means for automatically operating the dog to release the motor from the paper holder when the latter is in its operative position.

26. In a printing machine of the character set forth, the combination with negative holding means, of light controlling means, a swinging pressure back, a shaft for operating the light controlling means, a coiled spring connected to the shaft, an oscillatory carrier device having a connection with the pressure back, a dog pivoted on the carrier device and having a detachable engagement with the shaft to rotate the same against

the spring upon the movement of the pressure back to closed position, means for engaging the dog with the shaft when the two are in a predetermined position by the pressure back reaching the end of its opening movement, and means for releasing the dog from the shaft when the pressure back is moved in one direction.

27. In a printing machine of the character set forth, the combination with negative holding means, of a swinging pressure back coacting therewith, light controlling means, a shaft for actuating the light controlling means, a spring coiled upon the shaft and connected thereto, means for varying the tension of the spring, a rotatable carrier device loose on the shaft, a shouldered element fixed to the shaft, a dog pivoted on the carrier device and movable therewith into and out of engagement with the shoulder of the element, a spring for moving the carrier device in one direction, a cable connection between the swinging pressure back and carrier device, a spring for urging the dog into engagement with said shoulder, and means for disengaging the dog from the shoulder when the pressure back is moved into cooperation with the negative holding means.

28. In a printing machine of the character set forth, the combination with negative holding means, of a light controlling shutter coöperating therewith, an oscillatory actuating device movable from set position for opening the shutter, means for permitting the movement of the device in one direction to set position without actuating the shutter and effecting the actuation of said shutter on the movement of the device in an opposite direction, a motor for moving the actuating device from set position and mechanism for moving the device in an opposite direction and against the action of the motor.

29. In a printing machine of the character set forth, the combination with negative holding means, of a light controlling shutter coöperating therewith and having an arm, an oscillatory cam track that engages the arm to move the shutter, automatic means for moving the track in one direction to swing the arm and operate the shutter, and mechanism for moving the track in an opposite direction without moving said shutter.

30. In a printing machine of the character set forth, the combination with negative holding means, of a swinging shutter co-operating therewith, an arm carried by the shutter, an oscillatory cam track that operates against the arm, a spring for moving the cam track in one direction to swing the shutter to open position and hold it open, mechanism for moving the cam track against the action of the spring, and means for releasing the cam track and spring from said mechanism.

31. In a printing machine of the character set forth, the combination with negative holding means, of a swinging shutter co-operating therewith, an arm carried by the shutter and having a limited movement with respect thereto, a shaft, a cam track fixed to the shaft and operating against the arm, a spring connected to the shaft for rotating it in one direction, a pressure back, means detachably connecting the pressure back and shaft for rotating it against the action of the spring, and means for releasing the shaft from the pressure back to permit its actuation by the spring.

32. In a printing machine of the character set forth, the combination with negative holding means, of movable light controlling means, a principal motor for moving the light controlling means and holding it in a predetermined position, and an auxiliary motor for assisting the initial movement of the light controlling means.

33. In a printing machine of the character set forth, the combination with negative holding means, of a movable shutter co-operating therewith, yielding means for normally holding the shutter closed, a principal motor for moving the shutter to and holding it in open position, an auxiliary motor for assisting in the opening movement of the shutter, and a stop for arresting the auxiliary motor prior to the stoppage of the principal motor.

34. In a printing machine of the character set forth, the combination with negative holding means, of a swinging shutter co-operating therewith and having an arm, a cam track engaging the arm for swinging the shutter to and holding it in open position, a principal spring motor for moving the cam track, an auxiliary spring for assisting in the initial movement of the cam track, means for stopping the auxiliary spring when the shutter is opened, and mechanism for throwing the principal spring and auxiliary spring into action.

35. In a printing machine, the combination of a swinging shutter, a negative holder, a pressure back, an adjustable latch carried by the pressure back, a swinging member engaging the latch, a spring for yieldingly holding the member in engaging position, a lock for releasably holding the member against movement and held in locked position by the said spring, and a device operated by the shutter for releasing the lock.

36. In a printing machine, the combination of a pressure back carrying lever, an adjustable latch on the free end thereof, means tending to move the lever in a direction to open the pressure back, a member automatically engaged with the latch to hold the lever in operative position, a bell crank lever having means for preventing movement of the said member, and a shutter having a pro-

jecting portion movable out of engagement with the bell crank lever as the shutter opens and adapted to strike the lever on the returning movement of the shutter to successively release the bell crank from the member and the member from the latch.

37. In a printing machine, the combination of a casing including a source of light and having an opening, a movable negative holder in the opening, a pressure back mounted on the casing to swing to one side of the opening, a lever extending across the pressure back and mounted on the casing, tensioning devices between the lever and pressure back, a latch on the free end of the lever, a shutter movably mounted under the negative holder, and a mechanism mounted on and movable with the negative holder for interlocking with the latch to hold the pressure back down and automatically released by the movement of the shutter.

38. In a printing machine, the combination of a casing including a source of light and having an opening, a movable negative holder in the opening, a pressure back mounted on the casing to swing to one side of the opening, a lever extending across the pressure back and mounted on the casing, tensioning devices between the lever and pressure back, a latch on the free end of the lever, a shutter movably mounted under the negative holder, a mechanism mounted on and movable with the negative holder for interlocking with the latch to hold the pressure back down and automatically released by the movement of the shutter, means tending to move the negative holder out of the opening, a latch for holding the negative holder in normal position, and a device associated with the negative holder and disposed between the latter and shutter for constituting vignette holding means.

39. In a printing machine, the combination of a casing having an opening, guides within the casing, a box-like structure movable on the guides and normally flush with the top of the casing, a negative holder carried by the structure, shutters disposed under the structure, shutter-operating means mounted in the fixed part of the casing, a latch mechanism mounted on the structure, and a pressure back mounted on the casing and held in locked position on the structure by the latch mechanism.

40. In a printing machine, the combination of a casing having an opening, guides within the casing, a box-like structure movable on the guides and normally flush with the top of the casing, a negative holder carried by the structure, shutters disposed under the structure, shutter-operating means mounted in the fixed part of the casing, a latch mechanism mounted on the structure, a pressure back mounted on the casing and held in locked position on the structure by

the latch mechanism, springs tending to project the structure out of the casing, and means for releasably holding the structure in normal position.

41. In a printing machine, the combination of a casing having an opening, guides within the casing, a box-like structure movable on the guides and normally flush with the top of the casing, a negative holder carried by the structure, shutters disposed under the structure, shutter-operating means mounted in the fixed part of the casing, a latch mechanism mounted on the structure, and a pressure back mounted on the casing and held in locked position on the structure by the latch mechanism, said structure being open at one side and having a plurality of grooves for receiving vignettes.

42. In a printing machine of the character set forth, the combination with negative holding means, of a movable shutter cooperating therewith, means for moving the shutter to open position and holding it open, a motor for actuating said means to thus actuate and hold the shutter, and a variable speed governor for resisting the movement of the motor.

43. In a printing machine, the combination of a pair of oppositely-swinging shutters, a spring tending to close the shutters, cranks on the shutters, a link connected with the cranks for moving the shutters simultaneously, a pinion connected with one of the shutters, a handle including a sector meshing with the pinion for manually operating the shutters, an automatic motor mechanism operatively related with the shutters, and means for controlling the mechanism for holding the shutters open during different periods.

44. The combination of simultaneously-movable shutters, rock shafts to which they are rigidly connected, a swinging arm, a lost motion connection between the arm and rock shaft, a spring connected with the arm for holding the same in a predetermined position, means for connecting the rock shafts to move together, and a device for manually moving the rock shafts for opening and closing the shutters independently of the movement of said arm.

45. The combination of oppositely-movable shutters, a closing motor therefor, cranks connected with the shutters, a link connected with both cranks, an automatically-actuated mechanism for opening both shutters and releasable therefrom automatically to permit the closing motor to act, and a manually-actuated device operating in opposition to the closing motor and independently of the said mechanism for opening the shutters.

46. The combination of oppositely-movable shutters, a closing motor therefor, cranks connected with the shutters, a link

connected with both cranks, an automatically-actuated mechanism for opening both shutters and releasable therefrom automatically to permit the closing motor to act, a manually-actuated device operating in opposition to the closing motor and independently of the said mechanism for opening the shutters, a negative holder, a pressure back, a latch mechanism for holding the pressure back in operative position, and means movable with one of the shutters for releasing the latch mechanism at the end of the closing movement of the shutters.

47. In a printing machine, the combination of a casing, a box-like structure mounted therein and forming a carrier, oppositely-swinging shutters, a negative holder spaced from the shutters, vignette holding means between the negative holder and shutters and mounted on the carrier, a pressure back, means for opening the shutters and operatively related with the pressure back, and a mechanism disposed between the shutters and pressure back for automatically releasing the latter by the movement of the shutters.

48. The combination of a negative holder, light controlling means, a motor therefor, a fluid-controlled retard device, a manually actuated controller therefor for varying the duration of the exposures, and means thrown into and out of operation by the controller for prolonging the length of the exposure beyond the range of the retarding means.

49. In a printing machine, the combination of a shutter, a motor for moving the same, a retarding device for the motor, means for varying the action of the retarding device, and a latch mechanism thrown into or out of operation by the said means for prolonging an exposure beyond the range of the retarding device.

50. In a printing machine, the combination of a shutter, a motor for opening the same, a fluid retarding device for the motor, a valve for controlling the device and including a rotatable element, a lock for automatically locking the shutter open for long exposures, and means for releasing the lock by the rotation of the valve.

51. In a printing machine, the combination of a shutter, a single device for opening the shutter and holding it open during an exposure and finally releasing it after the exposure, a motor for the device, and means for completely re-setting the motor before the opening of the shutter and automatically releasing the motor at the final part of the resetting movement.

52. In a printing machine, the combination of a swinging shutter, a spring motor for opening the same, a controllable retarding device for the motor, and means for energizing the motor for each opening movement of the shutter, said means being

movable in one direction to first reset the motor, and finally release the same before the shutter starts to open for suddenly opening the shutter by the return movement of the motor and maintaining the shutter releasably in open position.

53. In a printing machine, the combination of a swinging self closing shutter, a spring motor for opening the same, a controllable retarding device for the motor, means for energizing the motor for each opening movement of the shutter, said means being movable in one direction to first reset the motor, and finally release the same before the shutter starts to open for suddenly opening the shutter by the return movement of the motor and maintaining the shutter releasably in open position, with a pressure back, a negative holder, and a latch mechanism for the pressure back released directly by the shutter.

54. In a printing machine of the character set forth, the combination with negative holding means, of a swinging shutter cooperating therewith, a motor for operating the shutter, comprising independent springs thrown into operation simultaneously and having different periods of action, and a shutter-actuating device operated by the springs, a pressure back having detachable connections with the motor for winding it, means for automatically releasing the motor from the pressure back, a cylinder member, and a piston member operating therein, one of said members being connected to the motor, an exhaust conduit connected to the cylinder member, and a valve controlling the exhaust conduit.

55. In a printing machine of the character set forth, the combination with light controlling means, of a motor for moving the light controlling means, said motor being movable from and to a set position and including a plurality of springs operating conjointly to open the light-controlling means, one of the springs being automatically thrown out of operation after the opening of the said means while the other spring continues to act, means for moving the motor to its set position and releasing it to permit it to move and operate the light controlling means, a cylinder member and a piston member operating in the cylinder member, one of the members being connected to the motor to permit the inflow of fluid to the cylinder member when the motor is moved to its set position, said cylinder member having an exhaust, and means for varying the size of the exhaust to vary the relative speed of the cylinder and piston members and thereby vary the speed of the motor.

56. In a printing machine of the character set forth, the combination with negative holding means, of a shutter, a pressure

back, automatic mechanism operated by the pressure back to effect the opening of the shutter, a handle, and gearing connecting the handle and shutter, said handle constituting means for opening the shutter independently of the automatic mechanism and of the pressure back.

57. In a printing machine of the character set forth, the combination with negative holding means, of light controlling means, automatic mechanism for moving the light controlling means to inoperative and operative positions, and manual controlling means for securing the light controlling means in one of said positions independently of the position of the automatic means.

58. In a printing machine of the character set forth, the combination with negative holding means, of a movable shutter, automatic mechanism for opening and closing the shutter, and manually controlled means for locking the shutter in opened position when opened by the automatic mechanism and against being closed by said automatic mechanism.

59. In a printing machine of the character set forth, the combination with negative holding means, of a shutter, automatic mechanism for moving the shutter to open position and returning it to closed position, a latch movable to a position to lock the shutter open when opened by the automatic mechanism, and manual means for moving the latch to an inoperative position.

60. In a printing machine of the character set forth, the combination with negative holding means, of a shutter, a pressure back, a lock for the pressure back, automatic means controlled by the pressure back for opening the shutter, and manually operated means independently of the pressure back for locking the shutter open.

61. In a printing machine of the character set forth, the combination with negative holding means, of a shutter, means for automatically opening the shutter and closing it, and manually controlled means for locking the shutter in open position when opened by said automatic mechanism.

62. In a printing machine of the character set forth, the combination with negative holding means, of a shutter, a pressure back, automatic means controlled by the pressure back for opening the shutter and closing the same, a lock for the pressure back, means for automatically operating the lock to release the pressure back when the shutter closes, and manually controlled means for locking the shutter open when opened by said automatic means.

63. In a printing machine of the character set forth, the combination with negative holding means, of a shutter, automatic means for operating the shutter including a motor,

speed varying mechanism for the motor including a controller, and means for locking the shutter open, said controller constituting an actuator for the locking means.

64. In a printing machine of the character set forth, the combination with a negative holder, of a shutter, automatic means for operating the shutter including a motor, speed varying mechanism for the motor including a cylinder and a piston operating therein, an exhaust conduit connected to the cylinder, a controlling valve for the exhaust conduit, and a latch movable into and out of a position to lock the shutter in open position, said valve constituting actuating means for the latch.

65. In a printing machine of the character set forth, the combination with a swinging pressure back, of means for swinging the same, a latch detachably engaging the pressure back and moved to an inoperative position thereby, a lock engaging the latch for holding it against such movement, and means for operating the latch.

66. In a printing machine of the character set forth, the combination with a swinging pressure back, of means for swinging the same, a latch detachably engaging the pressure back and moved to an inoperative position thereby, a lock engaging the latch for holding it against such movement, a movable shutter, and means operated by the shutter for moving the latch.

67. In a printing machine of the character set forth, the combination with negative holding means, of a swinging pressure back cooperating therewith and having a shoulder, a latch that engages the shoulder to hold the pressure back upon the negative holding means, said latch being moved to an inoperative position by the shoulder, a finger projecting from the latch, a lock for the latch comprising a bell crank lever, one arm of which is provided with a seat that engages the finger to hold the latch against movement, a swinging shutter, and means operated by the shutter and engaging the other arm of the bell crank to move said bell crank and release the finger.

68. In a printing machine, the combination of a pressure back, a lever, slidably connected parts between the pressure back and lever, means for limiting the separating movement of the parts, a spring tending to separate the parts, a negative holder, and a latch device associated with the lever for holding the pressure back against the negative holder and under the pressure of the said spring.

69. In a printing machine, the combination of a negative holder, a pressure back, means for hingedly mounting the same, a movable element extending across the pressure back, said pressure back being composed of sections jointed together, a lever having a

shiftable fulcrum, a guide for the fulcrum mounted in fixed position, tension devices between the lever and sections of the pressure back, means for rigidly securing the tension device nearest the free end of the lever to the latter, and means for slidably connecting the other tensioning device nearer to the fulcrum of the lever.

70. In a printing machine of the character set forth, the combination with negative holding means, of a pressure back cooperating therewith, an actuating lever connected to the pressure back, a shutter, a motor movable from a set position to operate the shutter, and means, including a cable connected to the lever, for resetting the motor upon the movement of the pressure back to an operative position over the negative holding means.

71. In a printing machine of the character set forth, the combination with negative holding means, of a swinging shutter cooperating therewith, a motor movable from a set position to open the shutter, a pressure back comprising sections movable into and out of cooperation with the negative holding means, and motor resetting mechanism having a cable connection with and operated by the pressure back on its movement to an operative position over the negative holding means.

72. In a printing machine of the character set forth, the combination with a support, of negative holding means mounted thereon, a pressure back comprising relatively movable sections, a hinge connecting the pressure back and the support, and permitting the vertical movement of said pressure back, and a lever comprising telescoping sections having a connection with the support independently of the hinge and having yielding connections with the pressure back sections.

73. In a printing machine of the character set forth, the combination with negative holding means, of a pressure back cooperating therewith and comprising sections, a lever, telescoping guide boxings connecting the lever and pressure back sections, and springs housed in said boxings.

74. In a printing machine of the character set forth, the combination with a support, of a lever connected to the support and comprising slidably telescoped sections, a pressure back comprising hingedly connected sections, means for elevating the pressure back, and cushioning mechanism for taking up the jar upon the parts when the pressure back is elevated, said mechanism being located in one of the lever sections and operated by the other.

75. In a printing machine of the character set forth, the combination with a support, of negative holding means mounted thereon, a shutter comprising swinging sections, an

arm connected to the shutter for swinging the same and having a roller, a shaft having a cam track that operates against the roller, a main spring for rotating the shaft in one direction, an auxiliary spring connected to the shaft for assisting in the initial movement of the shaft by the main spring, a rotatable carrier device having a movement independent of the shaft, a dog pivoted on the carrier device and movable into engagement with the shaft to move the same against the action of the springs, means for disengaging the dog from the shaft, when said dog has reached a predetermined position, a swinging pressure back, a lever connected to the pressure back, a cable connection between the lever and the carrier device, a latch for holding the pressure back in a predetermined position, a lock for said latch operated by the shutter on its closing movement, a cylinder, a piston operating in the cylinder and connected to the shaft, an exhaust conduit leading from said cylinder, and a controlling valve for varying the size of the exhaust conduit.

76. In a printing machine of the character set forth, the combination with a light inclosing casing, of a movable wall closing one side of the same, negative holding means mounted on said wall, light controlling means, and paper holding means movably mounted on the wall, and operating mechanism for the controlling and paper holding means mounted wholly on said wall, said means and mechanism being removable in assembled condition with said wall.

77. In a printing machine of the character set forth, the combination with a light inclosing casing, of a top for the same hinged thereto, negative holding means mounted wholly on the top, a shutter cooperating with the negative holding means and mounted wholly on the under side of the top, a pressure back mounted wholly on the upper side of the top and cooperating with the negative holding means, and operating means for the shutter connected to the pressure back and mounted wholly on the under side of the top, said shutter, pressure back and operating mechanism being movable with the top when the same is swung upon its hinges.

78. In a printing machine of the character set forth, the combination with a light inclosing casing, of negative holding means movably mounted thereon, and vignette holding means movable with the negative holding means and lying normally within the casing.

79. In a printing machine of the character set forth, the combination with a light inclosing casing, of negative holding means mounted thereon and vertically movable with respect thereto, and vignette holding

means located below the negative holding means and also vertically movable to permit the introduction and removal of the vignette devices the vignette holding means lying normally within the casing.

80. In a printing machine of the character set forth, the combination with a light inclosing casing having an opening, of a frame movably mounted in the opening, and negative holding means carried by the outer portion of the frame, the inner portion of said frame constituting vignette holding means.

81. In a printing machine of the character set forth, the combination with a light inclosing casing having a top, said top being provided with an opening, of guides depending from the top on different sides of the opening, a vertically movable frame slidably mounted on the guides and movable to a projecting position above the top, negative holding means carried by the upper portion of the frame, and guideways formed in the lower portion of the frame.

82. In a printing machine of the character set forth, the combination with a light inclosing casing, of negative holding means movably mounted thereon, vignette holding means movably mounted in the casing, and mechanism for moving the negative holding means and vignette holding means to expose the latter.

83. In a printing machine of the character set forth, the combination with a light inclosing casing, of negative holding means movably mounted thereon, vignette holding means movably mounted in the casing, means for locking the negative and vignette holding means in their innermost positions, and automatic mechanism for moving said negative and vignette holding means outwardly when unlocked.

84. In a printing machine of the character set forth, the combination with a light inclosing casing having an opening, of a frame movably mounted in the opening, negative holding means carried by the upper portion of the frame, the inner portion of said frame constituting vignette holding means, a lock for holding the frame in its innermost position, and springs for moving the frame outwardly when unlocked.

85. In a printing machine of the character set forth, the combination with a light inclosing casing including a top having an opening, of guide posts depending from the top, a vertically movable frame operating in the opening and slidably mounted on the guide posts, springs mounted on the posts and bearing against the inner end of the frame for raising the same, a latch for holding the frame depressed, negative holding means mounted on the upper end of the frame, and guideways formed in the frame beneath the negative holding means, said

guideways being exposed when the frame is elevated.

86. In a printing machine of the character set forth, the combination with a support having an opening, of negative and vignette holding means movably mounted in the opening, a shutter mounted on the support, separate from the holding means but coacting therewith, and paper holding means movably mounted on the support independently of the negative and vignette holding means and coacting with the former.

87. In a printing machine of the character set forth, the combination with a light inclosing casing having a top provided with an opening, of a vertically movable frame mounted in the opening, negative holding means carried by the upper end of the frame, vignette holding means carried by the lower portion of the frame, means for raising the frame, a shutter pivotally mounted within the casing and coöperating with the under side of the frame, and a pressure back mounted on the top and coöperating with the negative holding means, said shutter and pressure back permitting the elevation and depression of the frame.

88. In a printing machine of the character set forth, the combination with a light inclosing casing having a top hinged thereto, said top being provided with an opening, of guide posts depending from the underside of the top, a frame slidably mounted on the guide posts and operating through the opening, negative holding means carried by the upper portion of the frame, vignette holding means carried by the lower portion of the frame, means for raising the frame, a shutter hinged to the under side of the top independently of the frame, a pressure back hinged to the upper side of the top independently of the frame, said pressure back coöperating with the negative holding means, operating means for the shutter carried by the under side of the top, controlling mechanism for said operating means connected to the pressure back and extending through the top, and speed varying mechanism for the shutter operating means mounted on the top and including a scale and an indicator located on the upper side of said top.

89. In a printing machine of the character set forth, the combination with negative holding means, of light controlling mechanism, automatic means for operating the light controlling mechanism, manual means for operating the light controlling mechanism, registering mechanism, means automatically actuated upon the operation of the light controlling mechanism for operating the registering mechanism, and means for making inoperative the registering mechanism when the light controlling means is manually operated.

90. In a printing machine of the character set forth, the combination with negative holding means, of light controlling mechanism, automatic means for operating the light controlling mechanism, manual means for operating the light controlling mechanism, registering mechanism actuated upon the operation of the light controlling mechanism for operating the registering means and means coacting with the manually operated means for holding the register operating means inoperative when the light controlling mechanism is manually operated.

91. In a printing machine of the character set forth, the combination with negative holding means, of a shutter coöperating therewith, automatic means for operating the shutter, manual means for operating the shutter, a counter, means automatically operated upon the movement of the shutter to operate the counter, and means coacting with the manual operating means for holding the counter operating means inoperative when the shutter is manually operated.

92. In a printing machine of the character set forth, the combination with a swinging shutter, of an arm connected thereto and capable of a limited movement independently of the shutter, an oscillatory cam track that swings the arm and shutter when moving in one direction and swings the arm with respect to the shutter when moving in an opposite direction, and means for oscillating the cam track.

93. In a printing machine of the character set forth, the combination with a swinging shutter, of an arm connected thereto, a rock shaft, a cam track fast to the rock shaft and operating on the arm of the shutter, a spring coiled about the shaft and having one end secured thereto, means for varying the tension of the spring, and means for rotating the shaft against the tension of the spring and releasing said shaft to permit the spring to operate it and thereby the cam track.

94. In a printing machine of the character set forth, the combination with a movable shutter, of means for operating the same including a shaft and a motor connected to the shaft for actuating it, a cylinder member and a piston member operating in the cylinder member, one of said members having a crank connection with the shaft, a cam device connected with the motor for first opening the shutter and then holding the shutter open during the exposure, and finally releasing the shutter, all after the motor is started, and means for varying the passage of fluid through the cylinder member.

95. In a printing machine of the character set forth, the combination with a swinging shutter having a crank arm, of a rock

shaft, a cam track secured to the shaft and operating against the arm of the shutter, a motor connected to the rock shaft for actuating it, means for rotating the shaft against the action of the motor and releasing said shaft to permit its actuation by the motor, a cylinder member, a piston member operating in the cylinder member and connected to the cam track, said cylinder member having an exhaust, and means for varying the exhaust to vary the speed of the rock shaft under the action of the motor.

96. In a printing machine of the character set forth, the combination with negative holding means, of a paper holding device movable into and out of coaction therewith, and mechanism for admitting light to the negative holding means and maintaining the paper holding device in coaction therewith, said mechanism including a shutter and a variable speed motor and means for varying the speed of said motor operatively related thereto for opening the shutter after the motor starts.

97. In a printing machine of the character set forth, the combination with negative holding means, of a paper holding device movable into and out of coaction therewith, light-controlling means including a rock shaft, a motor for moving the rock shaft in a direction to cut off the light, a latch for maintaining the paper holding device in coaction with the negative holding means, and connections between the rock shaft and latch to effect the movement of the latter when said rock shaft is operated by the motor.

98. In a printing machine of the character set forth, the combination with negative holding means, of a paper holding device movable into and out of coaction therewith, means for locking the device in coaction with the negative holding means, light-controlling means, a motor for moving the light-controlling means to cut off the light from the negative, mechanism for operating the light-controlling means against the action of the motor and thus setting said motor to operate said light controlling means when the paper holding device is locked, and means operated by the motor to actuate the latch and release the paper holding device when the motor operates the light controlling means to cut off the light.

99. In a printing machine of the character set forth, the combination with negative holding means, of a paper holding device movable into and out of coaction therewith, means for locking the device in coaction with the negative holding means, light-controlling means, and a common motor for operating the light-controlling means to cut off the light and for operating the locking means to release the paper holding device.

100. In a printing machine of the character

ter set forth, the combination with negative holding means, of a paper holding device movable into and out of coaction therewith, a latch for holding the device in such coaction, light-controlling means, a rock shaft connected to the light-controlling means, mechanism operated by the rock shaft for actuating the latch, a spring coiled upon the rock shaft for operating said shaft, means for rotating the rock shaft to wind the spring, and means for maintaining the rock shaft against movement by the spring for a predetermined period after said spring is wound.

101. In a printing machine of the character set forth, the combination with negative holding means, of a paper holding device movable into and out of coaction therewith, a latch for holding the device in such coaction, light-controlling means, mechanism for actuating the light controlling means to cut off the light said light-controlling means constituting an actuator for the latch to release the paper holding device, and mechanism for holding said actuating means against movement, including a controlling device having a variable rate of speed.

102. In a printing machine of the character set forth, the combination with negative holding means, of a paper holding device movable into and out of coaction therewith, a latch for holding the device in such coaction, light-controlling means, mechanism for actuating the light controlling means to cut off the light and for actuating the latch through the said controlling means to release the paper holding device, and mechanism for holding said actuating means against movement including a movable controlling device, and means for varying the speed of the same to vary the length of time the actuating means is held idle.

103. In a printing machine of the character set forth, the combination with negative holding means, of swinging pressure back, a latch controlling shutter, a motor for closing the shutter and actuating the latch, by the shutter, means for setting the motor when the pressure back is positioned on the negative holding means, means for holding the motor against reaction, a variable speed device for determining the length of time said motor is held inactive, and means for varying the speed of said device.

104. In a printing machine of the character set forth, the combination with negative holding means, of a swinging pressure back, a latch controlling shutter, a motor for closing the shutter and actuating the latch by the shutter, means for setting the motor when the pressure back is positioned on the negative holding means, means for holding the motor against reaction, a variable speed device for determining the length of time said

motor is held inactive, said device comprising a cylinder and a piston operating therein, and means for varying the amount of discharge from the cylinder during a given length of time to vary the speed of the piston in said cylinder.

105. In a printing machine of the character set forth, the combination with negative holding means, of a paper holding device movable into and out of coaction with the negative holding means, means for automatically moving said device out of coaction, a latch for holding the device in coaction with the negative holding means movable prior to and independently of said means, a motor for automatically operating the latch, means for holding the motor inactive, and a variable speed device for releasing the motor to permit the same to actuate the latch.

106. In a printing machine of the character set forth, the combination with negative holding means, of a shutter for controlling the admission of light thereto, a motor for closing the shutter, means for completing the setting of the motor before the shutter begins to open, mechanism for holding said motor against reaction and in set position, a variable speed device for releasing the motor to permit it to act and close the shutter, and means for varying the speed of said device.

107. In a printing machine of the character set forth, the combination with a casing, of negative holding means mounted thereon, an upwardly swinging pressure back coacting with the negative holding means and having a hook at its free end that depends within the casing, a latch within the casing that detachably engages the hook, light-controlling mechanism arranged within the casing, automatic means operated by the light-controlling mechanism for actuating the latch to release the pressure back when the light is cut off from the negative holding means, and a motor automatically brought into play upon the releasing of the latch for lifting the pressure back.

108. In a printing machine of the character set forth, the combination with a casing and negative holding means, of an upwardly swinging pressure back mounted thereon, a spring tending to raise the pressure back to full open position and a shock absorbing and motion arresting device comprising a cylinder and a piston operating in the cylinder, one being pivotally mounted on the casing and the other being connected to the pressure back.

109. In a printing machine of the character set forth, the combination with a casing and negative holding means, of an upwardly swinging pressure back associated with the negative holding means and comprising pivotally connected sections and said pressure back being hinged to the casing at its rear

end, and a swinging shock-absorbing device comprising a cylinder member and a piston member operating therein, one of said members being pivotally mounted on the casing
5 in rear of the pressure back, the other being connected to said pressure back.

In testimony, that I claim the foregoing as

my own, I have hereto affixed my signature in the presence of two witnesses.

FRED PARK STEVENS.

Witnesses:

C. G. NORTHUP,

H. B. TELLER.