

Nov. 13, 1945.

G. M. DYE

2,388,837

PRINT MAKING MACHINE

Original Filed Nov. 7, 1938

6 Sheets-Sheet 1

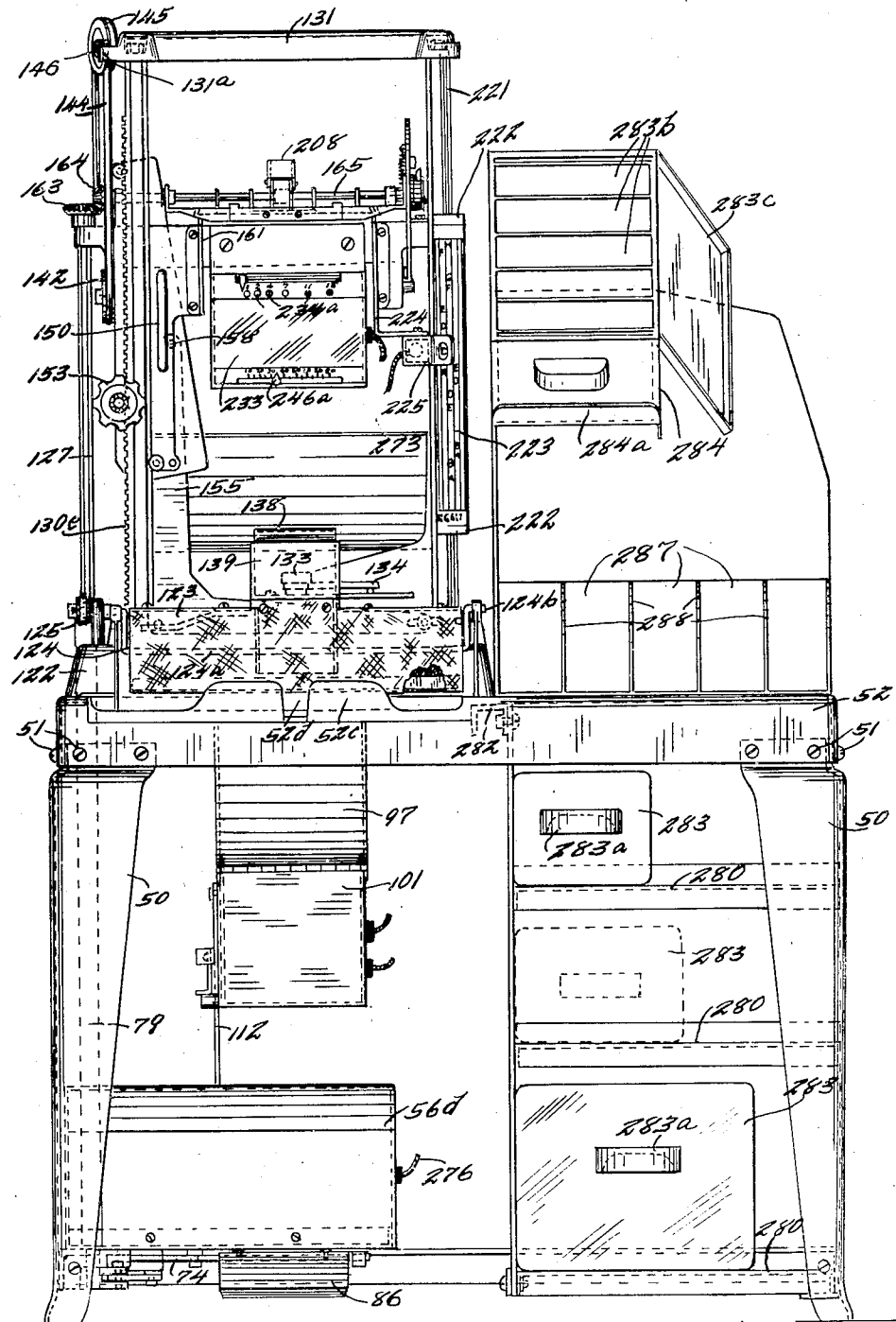


Fig. 1.

334

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6 Sheets-Sheet 2

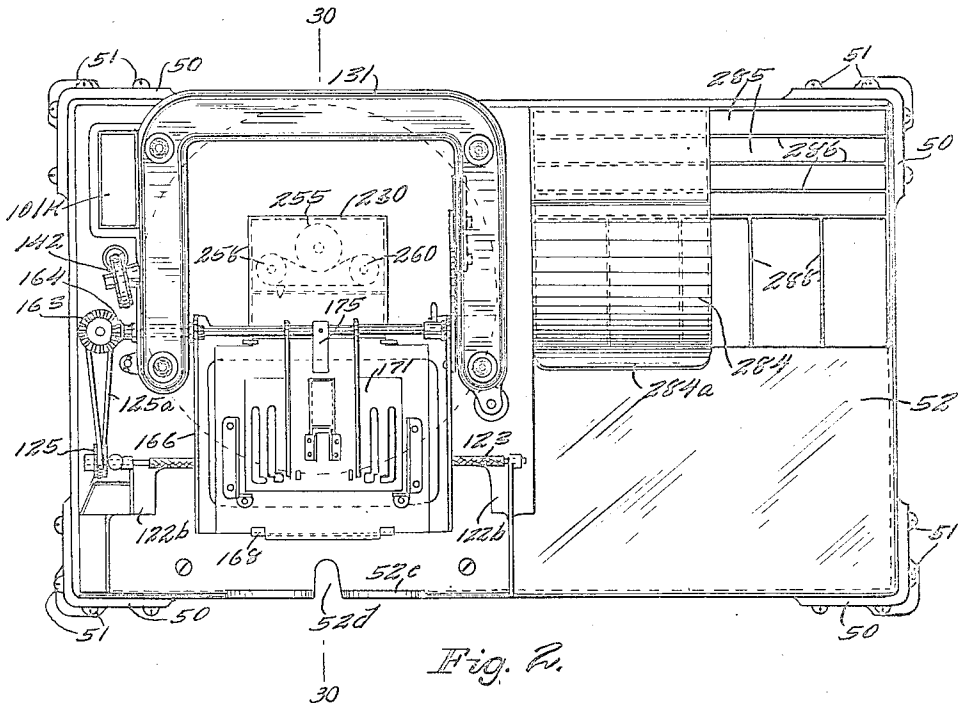


Fig. 2.

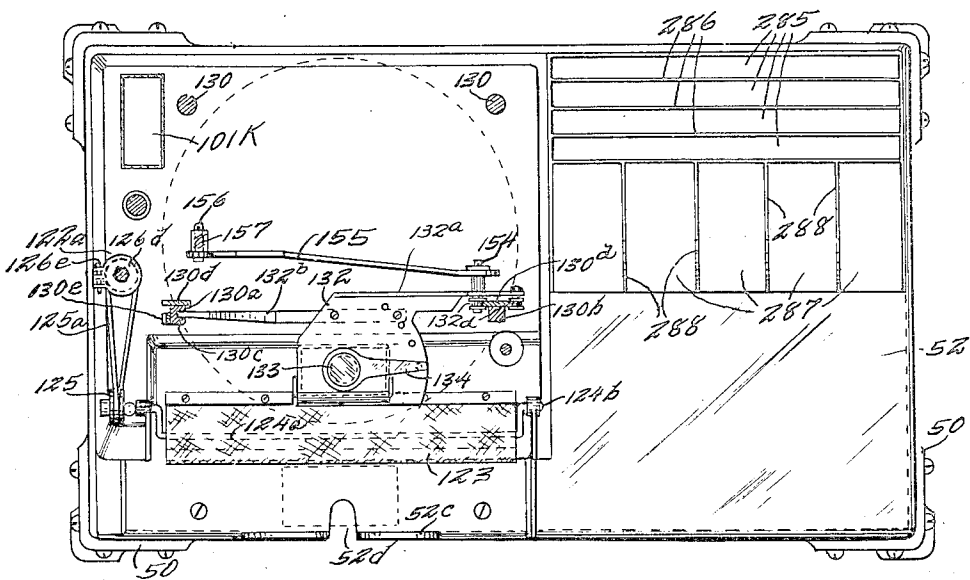


Fig. 3.

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6 Sheets-Sheet 3

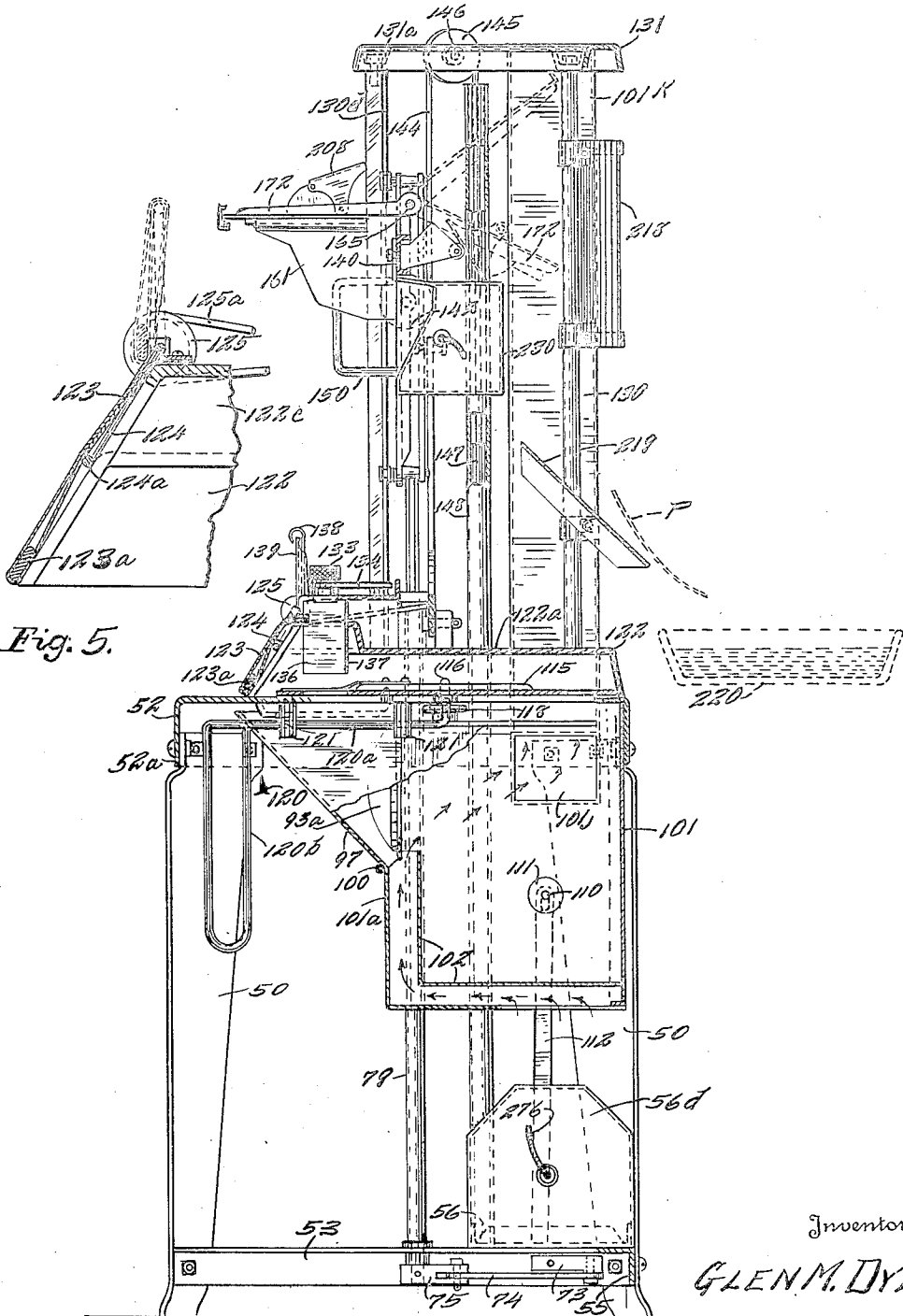


Fig. 5.

Fig. 4

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PRINT MAKING MACHINE

Original Filed Nov. 7, 1938 6 Sheets-Sheet 4

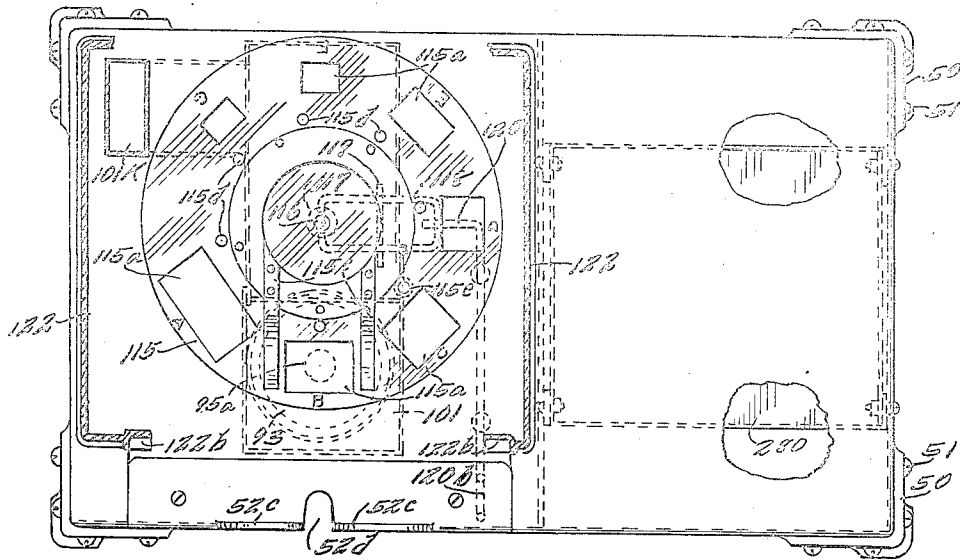


Fig. 6.

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PRINT MAKING MACHINE

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6 Sheets-Sheet 5

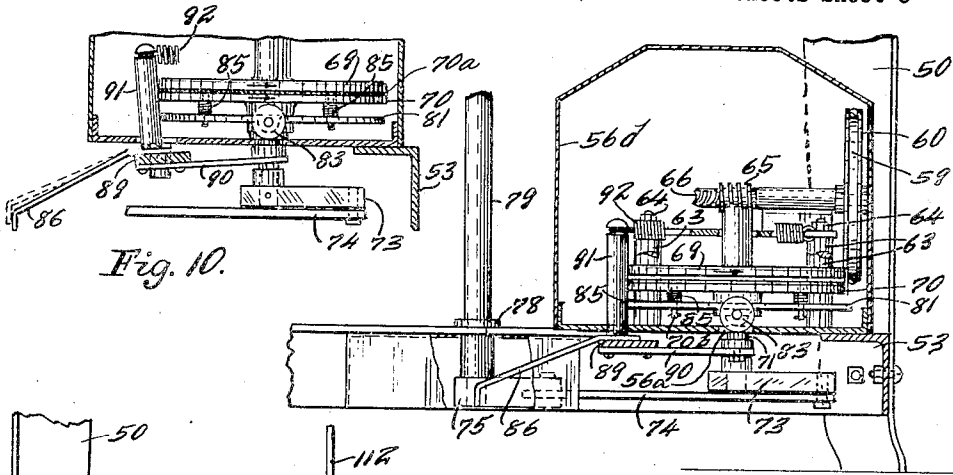


Fig. 10.

Fig. 9.

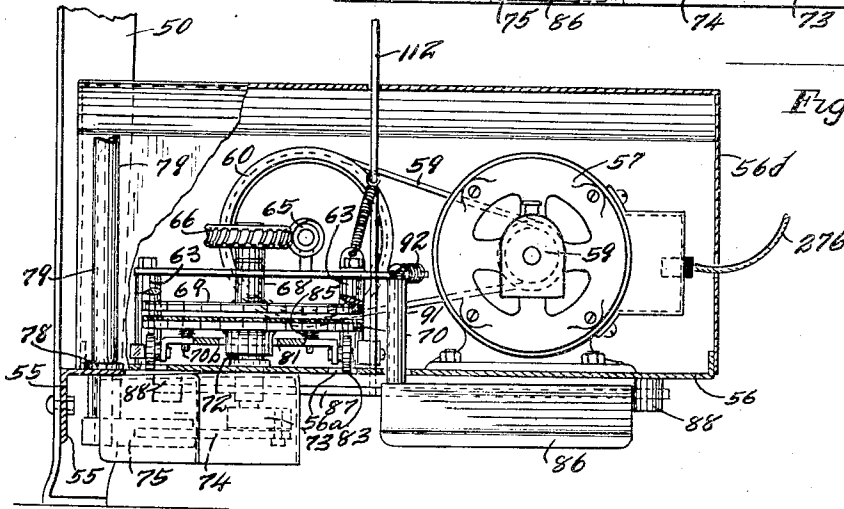


Fig. 7.

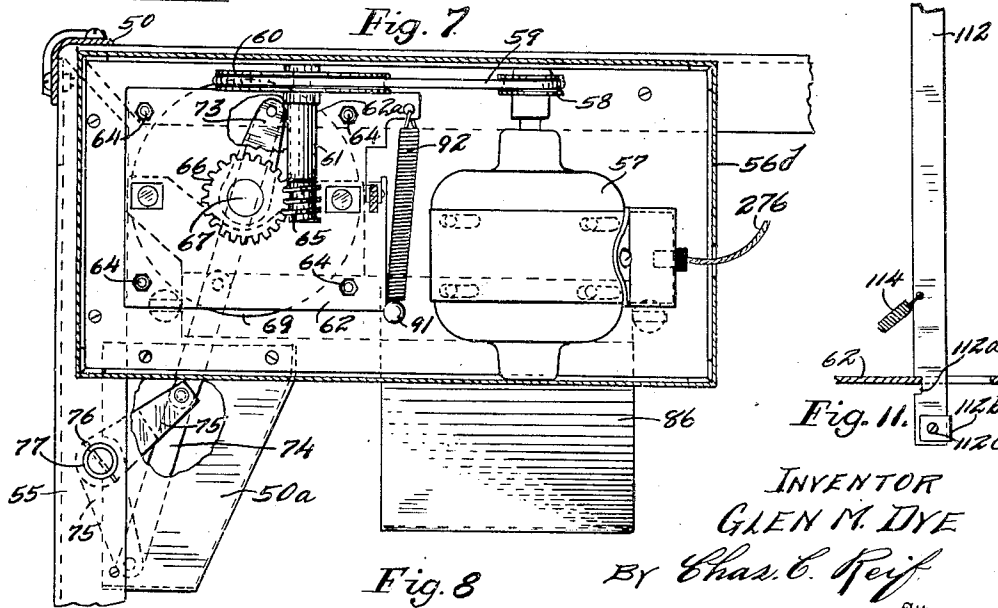


Fig. 8.

Fig. 11.

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6 Sheets-Sheet 6

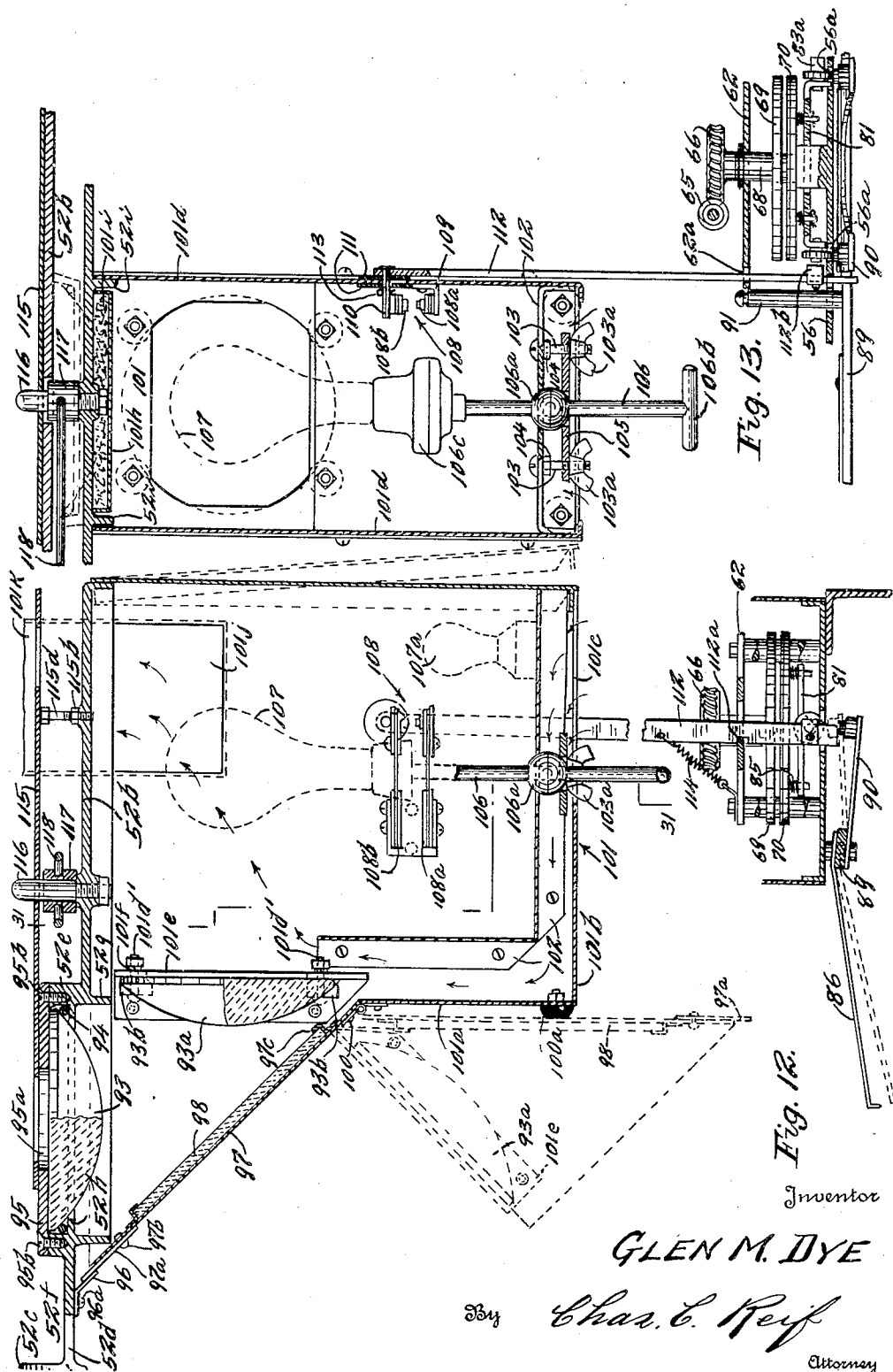


Fig. 13.

Fig. 12.

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UNITED STATES PATENT OFFICE

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PRINT MAKING MACHINE

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Original application November 7, 1938, Serial No. 239,269. Divided and this application July 10, 1942, Serial No. 450,395

12 Claims. (Cl. 88—24)

This invention relates to a projection printer for making photographic prints or to a machine for making over-sized prints. The machine is designed to make projection prints from negatives of different sizes, which prints will have a size range comprising a very large proportion of such projection prints or enlargements now commercially made.

This application is a division of applicant's co-pending application S. N. 239,269, filed November 7, 1938, now Patent Number 2,291,613, issued August 4, 1942, on "Projection printer." While other parts of the machine are illustrated, this invention is particularly directed to a portion of the machine comprising a chamber in which the negative is placed and movable means for giving access to said chamber and for closing the same during the printing operation.

It is an object of this invention therefore, to provide a projection printer having efficient light shielding means including an automatically operated curtain moving to light-obstructing position during the printing period.

It is a further object of the invention to provide a projection printer having a light-shielding means having an automatically operated curtain, which curtain is arranged to be also manually raised or lowered at any time without interfering with the timed operation of said curtain.

It is also an object of the invention to provide a light-shielding means including a flexible curtain movable over an opening through which the negative is placed in position together with means for moving said curtain and folding the same as it is moved to uncover said opening.

It is more specifically an object of the invention to provide a projection printer such as set forth in the preceding paragraph, said flexible curtain being weighted at its lower edge, the same being secured above said opening and the operating means for said curtain comprising an oscillatable rod engaging said curtain between its top and bottom to fold it upwardly when it is moved to uncover said opening.

These and other objects and advantages of the invention will be fully set forth in the following description made in connection with the accompanying drawings in which like reference characters refer to similar parts throughout the several views and in which:

Fig. 1 is a view in front elevation of the machine;

Fig. 2 is a plan view of the machine;

Fig. 3 is a horizontal section taken just above the lens carriage;

Fig. 4 is a view partly in side elevation as seen from the right of Fig. 1 and partly in vertical section taken through the lamp box and light casing;

Fig. 5 is a view in vertical section through the front of the printing casing and closing curtain shown on an enlarged scale;

Fig. 6 is a horizontal section taken just above the negative holding means;

Fig. 7 is a view partly in side elevation and partly in vertical section of the driving mechanism, a section being taken through the lower part of the clutch and the enclosing casing;

Fig. 8 is a horizontal section taken through the top of the casing enclosing the driving parts and showing the driving parts in plan;

Fig. 9 is a vertical section taken through the casing enclosing the driving parts showing the driving parts in side elevation, some parts being shown in section;

Fig. 10 is a vertical section through the casing enclosing the clutch showing the clutch and friction mechanism in side elevation;

Fig. 11 is a fragmentary view showing the tripping mechanism for the printing lamp switch;

Fig. 12 is a vertical section taken substantially centrally through the lamp box; and

Fig. 13 is a vertical section taken centrally through the lamp box in a plane at right angles of Fig. 12.

Referring to the drawings a machine is shown comprising a frame including legs 50 shown as four in number. These may be of any suitable construction and are illustrated as of angle shape in cross section tapering toward their lower ends, with the inside of their angles disposed inwardly and secured at their upper ends by screws 51 to a substantially horizontal plate or table 52 having a depending flange 52a extending thereabout with the inner side of which legs 50 engage. A bar 53 of angular cross section extends between legs 50 at one side adjacent their bottoms and another bar or plate 54 extends between the pair of legs at the opposite side adjacent the bottom thereof. A bar 55 shown as angular in cross section is also secured to and extends between the rear legs 50 adjacent their bottoms. A plate 56 having up-turned flanges at its edges is secured to bars 53 and 55 and an electric motor 57 is supported by and secured to plate 56. A pulley 58 is secured to the armature shaft of motor 57 and has a belt 59 running thereover which also runs over a pulley 60 secured to a shaft 61 journaled in a bearing 62a carried on a plate 62. Plate 62 forms part of a clutch frame and is supported upon posts 63 shown

as four in number and is secured thereto by headed screws 64. Posts 63 seat on plate 56 and are secured thereto by the screws 64. Shaft 61 has a worm gear 65 secured thereto which meshes with a worm wheel gear 66 secured to a shaft 67 journaled in a bearing 68 carried by plate 62. A clutch plate 69 is secured to the end of shaft 67 and when the machine is in operation it is continuously driven from motor 57. Plate 69 cooperates with another clutch plate 70 adapted to be brought into engagement therewith at certain times and to be driven thereby. Plate 70 will have some suitable friction material 70a thereon and is secured to a shaft 71 journaled in a bearing 72 carried by plate 56. An arm 73 is pivotally connected to a link 74, the other end of which is secured to an arm 75 having a hub secured in any suitable manner as by pin 76 to a shaft 77. Shaft 77 is journaled in a bearing 78 secured in plate 56 and has an enlarged portion above said plate extending into and secured in the lower end of a tubular shaft 79. Shaft 79 extends vertically adjacent one side of the machine and is secured to a pulley block 126 to be later described, which has a reduced portion journaled in an opening in a casing top 122a to be later described. The clutch comprising plates 69 and 70 is a half revolution clutch, and includes a third plate 81 having downturned ears at opposite sides and to which are secured studs 82 having journaled thereon rollers 83. Plate 81 has apertures at either side through which extend studs 70b secured to and depending from plate 81. Compression coiled springs 85 surround studs 70b engaging plate 70 at their upper ends and plate 81 at their lower ends. The plate 56 has spaced openings 56a thereon spaced the same distance as the rollers 83 and into which rollers 83 are adapted to drop to determine the half revolution period of the clutch. Said clutch is adapted to be actuated by a toe trigger or pedal 86 oscillatable about the axis of a rod or shaft 87 journaled in small blocks 88 secured to the underside of plate 56. A bar 89 is secured to shaft 87 by which the trigger plate 86 is carried, and an arm 90 is secured to and extends rearwardly from bar 89 and carries clutch actuating parts adapted to raise plate 81. The trigger plate also has upstanding therefrom a stud 91. A tensile coiled spring 92 is secured at one end to a projection on plate 62 and is secured at its other end to the upper end of stud 91 and said spring acts to hold trigger plate 86 in its raised or inoperative position. When trigger plate 86 is pressed downwardly by the toe of the operator to its lower position the clutch makes one-half a revolution and arm 73 also makes a half revolution or rotates through 180 degrees. A box-like cover 56d fits over the flange on plate 56 and forms an enclosure for the motor and clutch parts. The specific construction of the clutch need not be further described as it per se forms no part of the present invention. A casing 56a secured to plate 56 encloses arm 75.

A lamp box is provided, the top of which is formed by a plate or casting 52b which is secured in and in effect forms part of table top 52. Said plate 52b has a flange 52c at its forward end having therein a slot or opening 52d which is continued as a slot through the bottom of plate 52b for some distance. Said plate 52b has a raised portion 52e therein and a trough 52f is formed at the front portion of the plate 52b between flange 52c and portion 52e. Portion 52e is apertured and has a depending cylindrical flange 52g extending downwardly therefrom. An annular flange 52h

is formed in portion 52e and forms the support for a lens 93. Said lens may be positioned on a resilient annular strip 94 shown as circular in cross section. Said lens 93 is held in position by a plate 95 which may be made of any suitable material and in practice has been made of Masonite. Plate 95 is secured to portion 52e by countersunk screws 95b. A small bracket 96 is secured to the underside of plate 52b at its forward portion by small screws 96a and has a lip extending downwardly and inwardly substantially at a 45 degree angle. A front plate 97 is provided for the lamp box, the same having a latch 97a pivoted thereto by a pivot member 97b, said member 98 being adapted to be moved over the inner side of bracket 96 to hold plate 97 in closed position. Plate 98 has small brackets 97c secured thereto, the same being offset to form lips directed toward each other and to extend over a mirror 98 which is thus secured to the inner side of plate 97. Plate 97 is hinged by a hinge 100 to the vertical stationary front side plate 101a of the lamp box casing 101. Side plate 101a has secured thereto adjacent its bottom a resilient cushion block 100a against which plate 97 will engage should it be dropped. Casing 101 has a bottom plate 101b having an aperture 101c therethrough, one function of which is to admit cool air into the lamp box. The lamp box also comprises side plates 101d which engage the outer side of flanges 52i formed on plate 52b and to which they are secured. Brackets 102 illustrated as formed from angle members are secured to side plates 101d and extend across the lamp box adjacent the bottom thereof. Headed screws 103 extend through the lower part of bracket 102, being held therein by nuts 104, said bolts also extending through a plate 105 and being equipped with wing or thumb nuts 103a beneath plate 105, said nuts thus holding said plate in position. Plate 105 is centrally apertured and forms a seat for a ball member 106a formed on a rod 106 which extends through the bottom of the lamp box through opening 101c and carries at its upper end the lamp socket 106c in which the printing lamp 107 is secured. Rod 106 has a handle 106b at its lower end. A stationary contact member 108a forming one part of the printing lamp switch 108 is carried on a small angle bracket 109 secured to one side plate 101b. The movable contact 108b of switch 108 is carried on a pin 110 slidable vertically in a slot in side plate 101b, plates 111 of insulating material being disposed at the inner and outer sides of side plate 101b and moving with and forming in effect guide members for pin 110. Pin 110 extends through a vertically movable bar 112, said pin having a head formed thereon at the outer side of said bar and having a small cotter pin 113 extending therethrough at the inner side of inner plate 111. Bar 112 extends downwardly through a slot 62a in plate 62 and has formed therein a notch 112a adapted to engage with plate 62 at one side of slot 62a as shown in Fig. 12. Bar 112 has adjustably secured thereon a block 112b held in place by a screw 112c and said block is adapted to be engaged by a projection 83a on one of the rollers 83 in the revolution of plate 81. This disengages notch 112a from plate 62 and bar 112 is moved downwardly by a tensile coiled spring 114 secured to bar 112 at one end and at its other end to plate 62. A pilot lamp 107a is also provided in the bottom of lamp box casing 101. A second and condensing lens 93a is provided disposed at right angles to lens 93 and carried in an angle bracket 101e and secured therein by headed and nutted bolts 101d'. Spring

washers 101f are disposed under the nuts on bolts 101d' and clamping members 93b which may be of resilient material, are disposed under the heads of the nuts on bolts 101d' and engage lens 93a. It will be seen from Fig. 12 that lenses 93 and 93a are flat on one side and have convex surfaces at their other side, said convex surfaces being directed toward mirror 92. A flat casing 101h is disposed below plate 52b above lamp 107, the same containing insulating material 101i. Said parts are provided to prevent the heat from lamp 107 unduly heating plate 52b thereabove. An opening 101j leads from the upper part of the lamp box and communicates with a vertical flue 101k which extends upwardly to the top of the machine. While said flue may be of any form, in the embodiment of the invention illustrated it is shown as rectangular in cross section.

The member 95a has an opening therein through which the light for printing passes and the top surface of member 95 forms the supporting surface for the negatives such as films which are to be printed. A negative holding means is provided comprising a rotatable plate or turret 115. Plate 115 is rotatably mounted on a pin 116 secured in member 52b and is arranged to be raised by a sleeve 117 disposed therebeneath and slidable on pin 116. A rest for plate 115 is provided comprising a headed screw 115d adjustably threaded into member 52b and adapted to be held in adjusted position by a lock nut 115b. Sleeve 117 is adapted to be lifted by a lever 118 having end portions disposed in opposite sides thereof, said lever having parallel spaced portions joined at their ends remote from sleeve 117. Lever 118 is arranged to tilt about a fulcrum member 119 carried on member 52b. An operating means for plate 115 is provided and comprises a knee-operated lever 120 having a horizontal portion 120a journaled in bearings 121 secured to the underside of table 52, said portion being bent at its end substantially at a right angle, and disposed to override the closed or outer end of lever 118. Lever 120 also has an outer downwardly extending portion 120b formed with spaced parallel sides, which portion is contacted by the knee of the operator. While lever 120 may be of any suitable form, in the embodiment of the invention illustrated it is shown as made from a round rod. It will be seen that by pressing laterally on portion 120b plate 115 will be lifted and it can then be easily rotated about pin 116. Plate 115 has quite a number of circumferentially spaced openings 115a therethrough adjacent its circumference, which openings are of different sizes and shapes. Openings 115a are thus adapted for use with negatives of different sizes and are adapted to determine different areas to be printed. Flat spring members 115c are secured at either side of one of the openings 115a and press on plate 115 at the sides of said opening, said springs being adapted to hold certain small films or to engage a special holding means for a very small film such as a strip film from a motion picture camera. Plate 115 is adapted to be held or locked in position with one of the openings 115a over the light opening 95a and for this purpose said plate is provided with a plurality of holes 115d, there being one for each opening 115a. When the respective opening 115a is in proper position relative to the light opening the corresponding hole 115d receives a pin 115e which upstands from member 52b. When the plate 115 is lifted for rotation it is lifted clear of pin 115e. A casing 122 having a substantially horizontal top 122a spaced a short distance above

table 52 extends over holder 115, the same having outwardly and downwardly sloping sides. Said casing 122 is open at its front for the insertion and removal of the negatives and also has its top 122c offset upwardly at said front. The open front portion of casing 122 is closed during the printing operation by a flexible opaque curtain 123. Curtain 123 is weighted at its lower edge in any suitable manner as by having a metal rod secured thereto at said edge. In the embodiment of the invention illustrated curtain 123 is shown as formed of a folded piece of material and a bar 123a is disposed in the bight or lower folded portion of the curtain and forms the weight for the edge thereof. Said curtain and weighted edge overlap at their ends the downwardly and outwardly sloping front portions 122b of casing 122 which are disposed at each side of the opening in its front as shown in Fig. 6. Curtain 123 is moved to open and closed position by a crank rod 124 having the portion 124a extending across the underside of said curtain, said rod having portions 124b journaled in bearings in casing 122 at each side of said curtain. Portions 124a and 124b are parallel and spaced about half the vertical width of curtain 123. One portion 124b at the left of Fig. 3 is extended and has secured thereto a pulley 125. A belt 125a runs over pulley 125 and turns through a right angle to run in a groove 126b in pulley block 126. Block 126 is secured to the tubular shaft 79 by a set screw. A cap 126d is clamped to block 126 having ears depending at one side thereof to receive a clamping bolt 126e. A shaft 127 of polygonal shape in cross section illustrated as of hexagonal shape fits in a corresponding aperture in cap 126d and is driven thereby from tubular shaft 79 through block 126. Cap 126d may be adjusted to vary the position of shaft 127 relatively to shaft 79 for a purpose to be later described. The belt 125a is secured to pulley block 126. Crank rod 124 is oscillated through substantially 180 degrees at the beginning and end of each printing operation and moves through slightly more of a revolution than is necessary to operate crank rod 124 and raise and lower curtain 123. Belt 125a may slip on pulley 125. The curtain and crank 124 may be operated manually at any time if it is desired to look into the opening in casing 122. This can be done without throwing the operation of crank 124 and curtain 123 out of step or synchronism with the machine. The belt 125a will merely slip on pulley 125 and said pulley and crank rod will again be operated at the proper time in the operation of the machine by belt 125a from block 126.

Two rear rods 130 and forward rods 130a and 130b are secured at their lower ends in top 122a and extend vertically to a three sided yoke 131 having forwardly extending parallel sides spaced at their front ends. While yoke 131 could be variously made, in the embodiment of the invention illustrated it is shown as in the form of a channel with its open side directed downwardly. The forward rod 130a is rectangular in cross section and has a groove 130c rectangular in cross section at its inner side. Rod 130b is illustrated as rectangular or substantially square in cross section. Rods or posts 130, 130a and 130b form guides on which are slidable two assemblies, one of which carries the projecting lens and the other and upper of which carries the paper supporting and handling mechanism. The first of said assemblies includes a plate or lens carriage 132 having a rather long portion 132a carrying spaced

rollers 132*a* engaging opposite sides of a vertical flat bar 130*aa* secured to bar 130*b*. Carriage 132 has an arm 132*b* extending across to and having its end disposed and slidable in the groove 130*c*, said arm 132*b* thus constituting a steadying and guiding means. Carriage 132 carries the lens unit 133 which comprises the usual iris or diaphragm for exposing more or less of said lens or increasing or diminishing an opening close to said lens. This iris is arranged to be operated by an oscillating arm 134 movable to and adapted to be held in different positions indicated as 135 on plate 132. Plate 132 has secured thereto and depending therefrom spaced plates 136 extending forwardly and rearwardly, said plates being connected by a similar rear plate 137. Plates 136 and 137 move close to the sides of an opening in top plate 122*a* and prevent the passage of light outwardly from casing 122 when lens unit 133 moves upwardly. Also movable with the lens carriage at the front and above plates 136 and 137 is a plate 138 having a forwardly curved upper end which extends over a plate 139 fixed to the top plate 122*a*. Plate 139 has its side edges bent around and forming guides for plate 138. Plates 138 and 139 prevent the passage of light upwardly. The other of said two assemblies constitutes a paper carriage and comprises a member 140 slidable on rods 130*a* and 130*b*. Member 140 at one side has secured thereto a pulley 142. A cord or cable 144 is secured at one end to a lug 131*a* projecting from yoke 131 and extends downwardly around pulley 142 and then upwardly and over a pulley 145 rotatable on a stud 146 secured in yoke 131. From pulley 145 cable 144 extends downwardly and is connected to a rather long cylindrical counterweight 147 movable in a tube 148. Member 140 has projecting forwardly therefrom a bail handle 150. Rod 130*a* has a rack 130*e* formed on or secured to its outer side with which meshes a small pinion carried on a shaft journaled in member 140 which has secured thereto at the front of member 140 and small hand wheel 153. It will thus be seen that member 140 and parts supported thereon may be raised and lowered by handle 150 and that accurate adjustment may be had by turning hand wheel 153. The movement of the paper carriage is quite free and easy due to counterweight 147.

The lens carriage and paper carriage are interconnected and arranged for determined relation in movement so that the image projected by the lens will always be sharply focused on the paper by lens unit 133. To this end member 132 has a pin 154 projecting at its rear and disposed in an arcuate slot formed adjacent the end of one arm of a bell crank lever 155 pivoted on a pivot 156 supported in a small bracket 157 secured to top plate 122*a*. Lever 155 has its other arm 155*c* extending upwardly and said arm 155*c* has a pin 153 secured therein which pin is disposed in and arranged to move in a cam slot formed in a cam plate 159 secured to the paper carriage 140.

The paper carriage 140 has secured therein by plate brackets 161 a plate glass member 162. A platen carrier 172 is provided and is swingable about a shaft 165. Shaft 165 is driven from shaft 127 through bevelled gears 163 and 164. A mask carrier is disposed beneath the platen carried by carrier 172 and said mask carrier and platen are adapted to swing upwardly and rearwardly at the end of the printing period to discharge the print. The print is discharged and is guided by a deflector 218 and a plate 219 into any suitable receptacle such as a pan 220. A numbering device 208 is provided and is swung to place a number

on the print at each printing operation. An exposure guide or meter is provided and this comprises a casing 230 secured to the central part of paper carriage 140. A mirror 233 is supported on this casing in which the image on the negative is reflected so as to be viewed by the operator. A small casing in the rear of said mirror contains a lamp. The front casing 230 at its upper portion is provided with a plurality of holes or openings 234*a* and these will have extending thereover a diaphragm or sheet of material so that light will show through holes 234*a* in different degrees of density. These openings may be designated by certain characters as shown in Fig. 1. A pointer is adapted to move along holes 234*a*. A scale is shown below mirror 233 with which cooperates a movable pointer 245*a* to indicate the amount of a resistance which may be cut into the circuit of the lamp in casing 230.

An index member 223 is used along which moves a small casing 225 containing a lamp and supported by a bracket 224. Index member 223 is supported upon collars 222 revolvably mounted on a rod 221 secured in yoke 131. Member 223 has rows of vertically spaced characters thereon indicating the openings 115*a* in plate 115 and has numerals at the bottom of each of said rows indicating the masks used on the mask carrier. A main switch is provided for closing the circuit of motor 56 and of pilot lamp 107*a*.

The structure described in the last three paragraphs forms no part of the invention claimed in this application and need not be more specifically described, a general description being given on the parts shown in the drawings used.

The machine has a series of shelves 280 illustrated as three in number extending horizontally at one side thereof beneath table 52 and supported upon vertical bars secured at their upper ends to table 52 and a channel member extending across the same. Drawers 283 are adapted to be disposed on the shelves 280, the same having handles 283*a* on their front ends. A shelf 284 is formed at the right side of the machine, the same sloping downwardly and forwardly at an angle of substantially 45 degrees and having an upwardly and forwardly extending portion 284*a* at its lower end. The shelf 284 is adapted to support one of the drawers 283, which drawers as shown in Fig. 1, are provided with a plurality of compartments 283*b*, and are also provided with a cover 283*c*. Forwardly of the foremost partition 286 the machine is provided with a plurality of compartments 287 formed by partitions 288 having rounded forward corners. Beneath shelf 284 the machine is provided with a plurality of vertically extending compartments 285 divided by vertical partitions 286.

In operating the machine the main switch is moved to closed position and this through current supplied through conductor 276 starts the motor 57 and lights the pilot light 107*a*. The function of the pilot light is to furnish sufficient light for the operator to place the negative over the light opening 95*a*. It will be understood that the machine will be operated in a dark room. The operator now takes the negative to be printed and selects the proper mask to give the desired enlargement or the desired size of print. It will be understood that at this time the platen is in its rearward position shown in dotted lines in Fig. 4. The mask is quickly placed in position and the operator now presses laterally on the downturned portion 120*b* of lever 120, thus lifting negative holder 115. This holder is thus free for rotation

and is quickly turned to bring the desired opening 115a in forward position. A negative is placed beneath the opening 115a and lever 120 is released. Plate 115 then descends holding the negative firmly on the top of plate 95. The interconnection between the paper carriage 140 and the lens carriage 132 is so designed that the lens unit 133 is always brought to proper position so that the projected image will fill the mask opening. The paper is now placed in position. The operator now presses on the trigger plate 86. This, through arm 84, raises the plate 81, bringing the lower clutch plate 70 into engagement with upper clutch plate 69. The clutch is now engaged and rollers 83 have been raised out of the slots 56a and rotate about on the top of plate 56. When the lower plate 70 begins its movement arm 73 is rotated and this, through the link 74, rotates the arm 75. As above described, this rotates shafts 73 and 127 as well as shaft 165. The platen holder 172 is now swung down to paper holding position. At the same time the printing member is pressed against the paper on the non-emulsion side and the identifying character is printed on the paper. This character is usually the same for all of the prints on the particular order. This number of course, may vary as directed by the customer. As the platen reaches its position on the paper plate switch 108 is closed. The closing of switch 108 lights the printing lamp 107. As shaft 127 rotated during the operating of the platen block 126 was rotated and this, through belt 125a, rotated pulley 125, thus moving crank rod 124 and lowering curtain 123 to its closed position. Curtain 123 thus closed the opening of casing 122 before the printing lamp was lighted. When the printing lamp is lighted the image as stated, is sharply focused on the printing paper. When the clutch is engaged it makes a half revolution and arm 73 is again rotated, which through the mechanism described, operates shaft 127 and also as above described, shaft 165 is operated. This raises the mask carrier and platen together lifting the print and discharging it rearwardly. The mask carrier is returned to print receiving position and the platen remains in its rearward position. When platen holder 72 swings upward shaft 127 rotates and this through belt 125a as above described rotates pulley 125 moving crank rod 124 and swinging curtain 123 to position to uncover the opening in casing 122 and to the position shown in dotted lines in Fig. 5. The print slides from the platen against panel 218 and then drops onto deflecting plate 219 and is guided into tray 220. The operation is quite rapid and the making of prints is only a matter of seconds. The lighting system illustrated is that using a projection lamp and condenser lenses which are the lenses 93 and 93a. As stated, these are plano-convex lenses. The lens 93a directs the rays in substantially straight lines against mirror 98 by which they are reflected upwardly into lens 93 which focuses the rays for direction into the lens unit 133. The projection lamp is extinguished a sufficient time before the print is raised for discharge that no difficulty is experienced with after-glow from the lamp.

The lamp box is ingeniously made for easy access and cleaning. When the hinge side 97 is swung downwardly the lenses 93 and 93a may be cleaned or polished as can also the mirror 98 and access can be had into the casing 101 if desired. The rear side of the lamp box casing 101 is removable as indicated by the dotted lines in Fig. 12. This gives easy access to the inside of the

casing and lamp bulbs 107 and 107a may be replaced when necessary. Easy access is thus also had to the switch 108. It is necessary to accurately position the printing lamp 107 relatively to lens 93a. The bulbs used may be of different sizes and the filaments vary in different bulbs. Rod 106 is slidable frictionally through ball 106a and this movement together with the universal movement possible with ball 106a in the plate 105 gives all the necessary adjustment. The ball 106a is made in half sections which are clamped on rod 106 by bolts 103 and the nuts 102a. One section has a hole for rod 106 extending centrally therethrough while the other section has the hole for rod 106 extending to an acute angle to the flat side thereof. The adjacent flat surfaces are then at an angle to each other. When the sections are clamped together by nuts 103a the ball exerts a pinching effect on rod 106 thus holding the same and lamp 107 firmly in adjusted position.

The lamp box is ventilated to prevent excessive heating by cool air entering through the opening 101c and passing around the partition carried on brackets 102 as shown in Figs. 12 and 13. This partition forms a sort of a flue at the bottom and side of the box and the cool air then passes into opening 101j and into the flue 101k which extends to the top of the machine. There is enough height to the flue to get a good draft and the ventilating is quite effective.

The masks used can conveniently be kept in the compartments 285. The work order envelopes containing the films for each order can conveniently be placed in the compartments 287. The drawers 283 contain the print paper and paper of different speeds will be contained in the compartments 283b. The drawers can be conveniently positioned on the shelf 284 so that the paper is within easy reach of the operator. Another important feature of the machine is the trough formed in the rear of flange 52c. As the work is finished on each negative the operator can merely push the negatives forwardly so that they drop into said trough. When the particular order is finished the operator can reach into the trough with the thumb and finger through the opening 52d and grasp the pile of negatives between the thumb and finger so that they can be easily and quickly removed as a group. This adds to the rapidity of the operation.

The negative holder holds each negative in the exact center of illumination. The negative holder being operated by the knee-operated lever leaves the hands of the operator free for other uses.

From the above description it will be seen that I have provided a very efficient and compact machine by means of which enlargements or oversized prints can be made with great ease and speed. The machine has been amply demonstrated in actual practice and found to be very successful and efficient. It is being put into commercial production.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the parts, without departing from the scope of applicant's invention, which generally stated, consists in a device capable of carrying out the objects above set forth, in the parts and combinations of parts disclosed and defined in the appended claims.

What is claimed is:

1. A machine for making photographic prints having in combination, a frame, a member sup-

ported on said frame having a negative supporting surface and having an aperture therethrough for the passage of light, said frame comprising a casing having an opening therethrough adjacent said aperture, a lamp for printing and radiating light through said aperture, movable means for engaging a negative on said surface, means for illuminating said lamp, a curtain movable over said opening during the printing period, means for lowering said curtain for covering said opening during the printing period and for raising said curtain after the printing period, all of said means being operated in timed relation, said last mentioned means including a slipping driving element whereby said curtain may be manually raised or lowered at any time without interfering with the timed operation of said curtain.

2. A machine for making photographic prints having in combination, a chamber in which a negative is supported for printing, a source of light for printing from said negative, said chamber having an opening through which a negative may be placed in position, a flexible curtain movable to a position closing said opening and supported at its upper edge so as to depend over said opening, a rod extending across said curtain and means for oscillating said rod to engage the intermediate part of said curtain and fold it upwardly after the printing period.

3. The structure set forth in claim 2, said curtain having weighted means adjacent its lower edge.

4. A machine for making photographic prints having in combination, a chamber in which a negative is supported for printing, a source of light for printing from said negative, said chamber having an opening through which a negative may be placed in position, a flexible curtain movable to position to close said opening and supported at its upper edge, a crank rod having its intermediate offset portion extending across said curtain at the underside thereof and means for oscillating said crank to engage and fold said curtain upwardly.

5. A machine for making photographic prints having in combination, a chamber in which a negative is supported for printing, a source of light for printing said negative, said chamber having an opening through which a negative may be placed in position, a member of flexible sheet material constructed and arranged to be moved to cover and uncover said opening, means for energizing said source of light and means operated in timed relation to said means for moving said curtain to cover said opening, said last mentioned means including a slipping element whereby said curtain may be manually moved without interfering with the subsequent timed relation.

6. A machine for making photographic prints having in combination, a frame, a member having a negative supporting surface and having an aperture therethrough for the passage of light, said frame having an opening therein adjacent said aperture through which a negative is placed in position over said aperture, a lamp for printing and radiating light through said aperture, means for illuminating said lamp, a flexible curtain movable over said opening and means for moving said curtain before and while said first mentioned means is actuated, said curtain being flexible and said last mentioned means being constructed and arranged to fold said curtain as it is moved to uncover said opening.

7. A machine for making photographic prints

having in combination, a frame, a member having a negative supporting surface and having an aperture therethrough for the passage of light, said frame having an opening therein adjacent said aperture through which a negative is placed in position over said aperture, a lamp for printing and radiating light through said aperture, means for illuminating said lamp, a flexible curtain movable over said opening and means for moving said curtain before and while said first mentioned means is actuated, said curtain being flexible and weighted at its lower edge, the same being secured above said opening, said second mentioned means comprising an oscillatable rod engaging said curtain between its top and bottom to fold it upwardly when it is moved to uncover said openings.

8. A casing having a chamber therein, a negative supporting member within said chamber, said chamber having an opening therein at one side through which a negative may be entered into said chamber, said casing sloping downwardly at the sides of said opening, a flexible curtain supported above said opening and adapted to depend thereover and rest against said sides by gravity during the printing period and means for moving said curtain to position above said opening to uncover said opening after the printing period, said last mentioned means comprising a swinging member engaging the underside of said curtain and moving it to position above said opening.

9. A machine for making photographic prints having in combination, a stationary casing having a chamber therein, said casing having an opening at one side into said chamber having downwardly sloping side walls, a negative supporting means in said chamber for supporting a negative entered therein through said opening, means for projecting light through said negative and into said chamber during the printing operation and means for closing said opening during said printing operation comprising a flexible foldable curtain arranged to cover said opening and engage said side walls in extended position and means engaging said curtain lifting the same and holding it in folded position above said opening when a negative is to be entered through said opening.

10. A machine for making photographic prints having in combination, a stationary casing having a chamber therein, said casing having an opening at one side into said chamber, a negative supporting means in said chamber for supporting a negative entered therein through said opening, means for projecting light through said negative and into said chamber during the printing operation and means for closing said opening during said printing operation comprising a flexible foldable curtain secured at one edge above said opening and constructed and arranged to extend at full length across said opening during the printing operation and means engaging said curtain between the ends thereof lifting the same and folding it substantially into half its width above said opening to uncover said opening when a negative is to be entered through said opening.

11. A machine for making photographic prints having in combination, a casing having a chamber therein having side walls, said casing having an opening at one side into said chamber, a negative supporting means in said chamber for supporting a negative entered therein through said opening, means for projecting light through said negative and into said chamber during the print-

ing operation and means for closing said opening during said printing operation comprising a flexible foldable curtain secured along one edge across the top of said opening and having a weighted edge at its opposite side, said curtain being constructed and arranged to drape at full length across said opening and engage said side walls during the printing operation and a swinging member engaging said curtain substantially midway between said edges, lifting and folding said curtain and moving it to a position above said opening when a negative is to be entered through said opening.

12. A machine for making photographic prints having in combination, a chamber in which a

negative is supported for printing having side walls, a source of light for printing from said negative while in said chamber, said chamber having an opening therein between said walls through which a negative may be placed in printing position, a member of flexible foldable material constructed and arranged to be moved over said opening, said curtain extending along and being swingingly attached at one side of said opening, and means for moving said member about said side and folding the same at the opposite side of said opening to expose said opening and moving the same into extended condition across said opening to close said opening.

GLEN M. DYE.