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Patented Mar. 29, 1921.

3 SHEETS—SHEET 1.

Arthur J. Freeman

Strong & Townsend

ATTORNEYS:

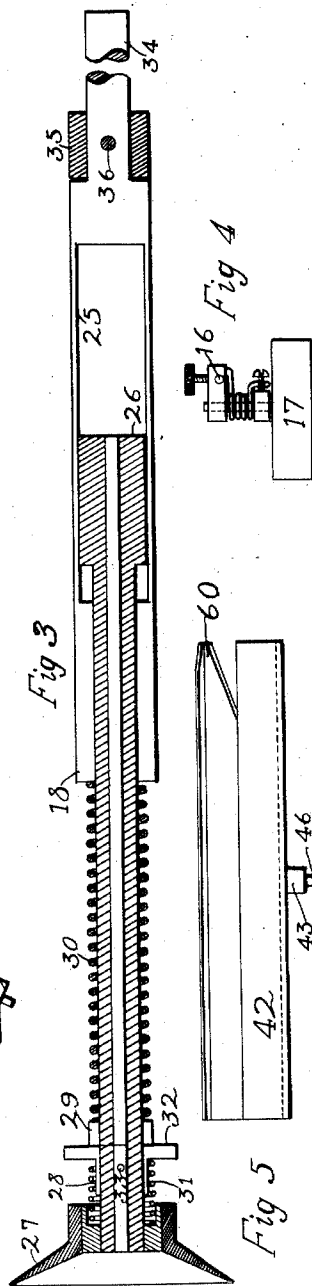
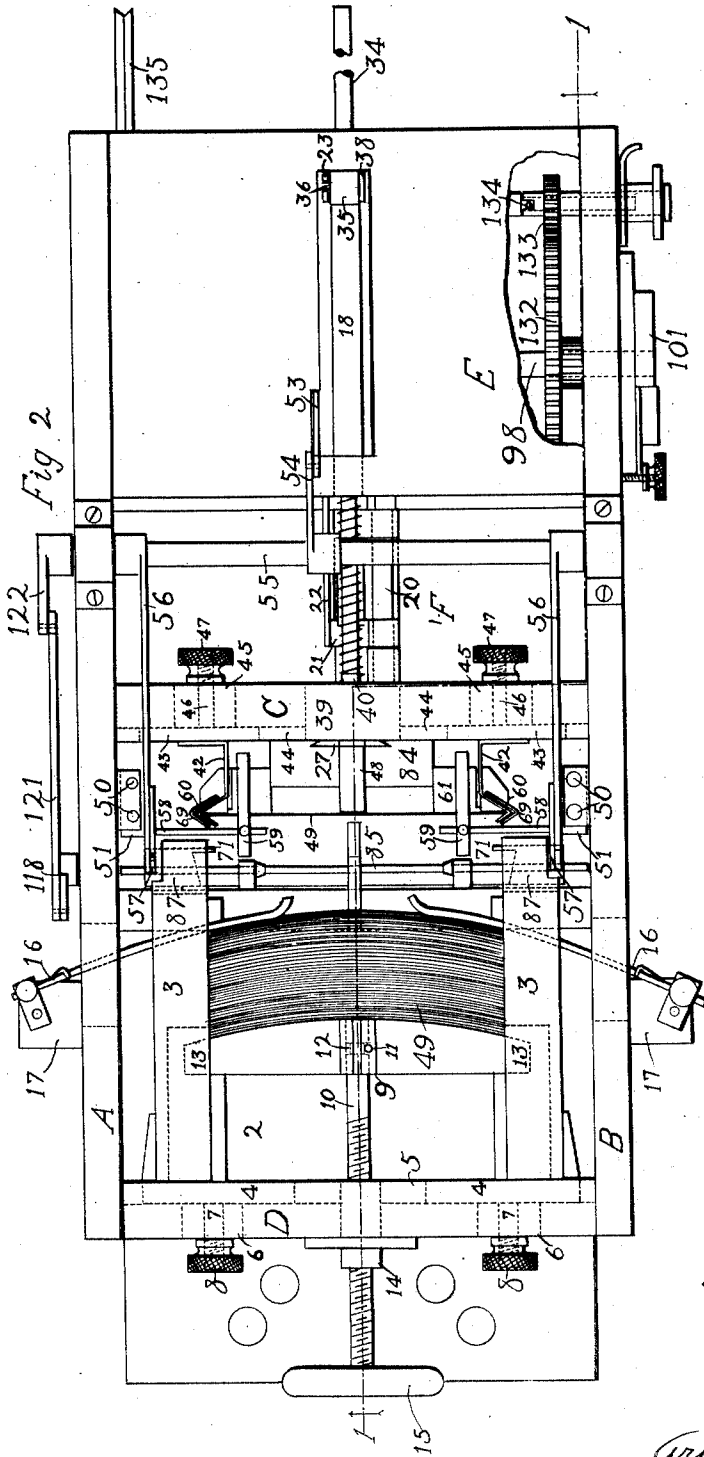
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Inventor
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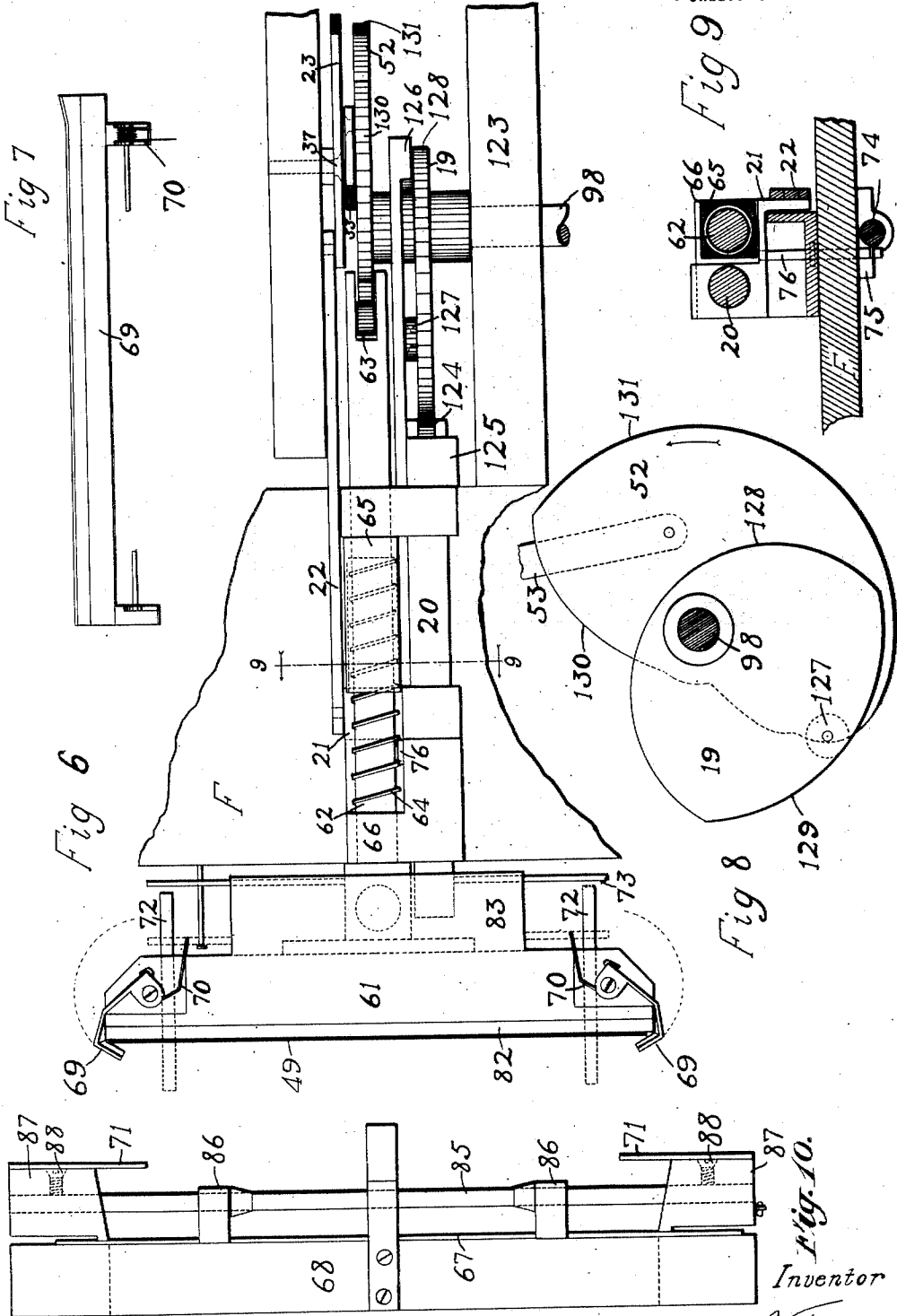
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Inventor
Arthur J. Freeman

UNITED STATES PATENT OFFICE.

ARTHUR J. FREEMAN, OF PETALUMA, CALIFORNIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO E. G. LEWIS, OF ATASCADERO, CALIFORNIA.

SHEET-FEEDING MECHANISM.

1,373,187.

Specification of Letters Patent.

Patented Mar. 29, 1921.

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To all whom it may concern:

Be it known that I, ARTHUR J. FREEMAN, citizen of the United States, residing at Petaluma, in the county of Sonoma and State of California, have invented new and useful Improvements in Sheet-Feeding Mechanism, of which the following is a specification.

This invention relates to a machine for automatically printing photographic sheets and loading the printed sheets into racks for development or other purposes.

It is the object of this invention to provide a machine for printing photographs, which embodies means for automatically delivering sensitized sheets to a negative, exposing the sheet and negative to the action of light rays for a predetermined length of time, removing the printed sheet from the negative and delivering it to a specially constructed rack wherein each sheet will be held in a separate compartment.

Another object is to provide means for picking up sheets of material, one at a time, and delivering them to a contact plate without touching the emulsion or sensitized side.

Another object is to provide means for delivering the exposed prints to a rack in which the sheets will be held separate from one another.

Another object is to provide means for combining the above features, in a machine to enable it to operate rapidly and accurately.

The invention consists of the parts and the construction and combination of parts, as hereinafter more fully described and claimed, having reference to the accompanying drawings in which—

Figure 1 is a section on lines 1—1, Fig. 2.

Fig. 2 is a plan view of the entire machine.

Fig. 3 is a longitudinal section of the pick-up device including suction cup and pump, parts being shown in elevation.

Fig. 4 is an elevation of the spring finger operating mechanism.

Fig. 5 is a side elevation of plate 42, Fig. 2 and Fig. 1.

Fig. 6 is a plan view showing the contact plate operating mechanism and contact plate.

Fig. 7 is an elevation of one of the wings on the contact plate.

Fig. 8 is a side elevation of the operating cams showing their relative positions.

Fig. 9 is a sectional view of Fig. 6 on line 9—9.

Fig. 10 is a side elevation of the negative holder.

Fig. 11 is a plan view of the rack loading mechanism.

In the drawings, the perpendicular sides A and B and cross-plates C, D, E, F and G constitute the framework of the machine.

In one upper corner, extending between plates A and B, is located a paper hopper 2, (Figs. 1 and 2), arranged so as to receive and retain various quantities of sheets of material and adjustable for holding various sizes of sheets. Adjustably mounted on the face of plate D are side plates 3, attached to one end and at about the perpendicular center of which are rods 4 disposed to ride in a longitudinal groove 5 which is formed in and situated at about an equal distance from the top and bottom of plate D. Attached to rods 4 and extending through and beyond longitudinal slots 6 in plate D are rods 7, threaded at their outer ends and carrying nuts 8. By this construction side plates 3 may be moved toward or away from one another and be held in any position by tightening nuts 8, thus adapting the hopper so that it may be adjusted to hold sheets of various lengths. Bottom plate 9 is carried by rod 10, the end of which extends into a hole through plate 9 and is held in a certain longitudinal position but permitted to turn, by a pin 11 that extends through the side of plate 9 and into a groove 12 turned near the end of rod 10. Bottom plate 9 is formed with lateral projections 13, which extend within longitudinal grooves formed in plates 3. Rod 10 is mounted in threaded bearings 14 and reciprocating movement is imparted thereto by turning the hand wheel 15 firmly mounted at its outer end. By rotating rod 10, plate 9 may be longitudinally adjusted to any desired position to keep the topmost sheet in the stack at about a certain forward position and within reach of suction cup 27 regardless of the number of sheets in the hopper. Hopper 2 is also provided with means for

holding the stack of sheet material back against bottom plate 9, which means consist of spring pressed fingers 16 pivoted to lateral projections 17 formed on the sides of plates A and B and the fingers extending in through longitudinal slots in plates A, B and 3 bear against the topmost sheet of the stack. The fingers 16 also prevent more than one sheet being removed at one time by the pick-up device which will later be more fully described.

Situated at about an equal distance from, and extending parallel to the sides A and B, on the under side of and parallel to plate E is the suction pump 18, mounted to have reciprocating movement and operated by eccentric cam 19 through rod 20, arm 21, link 22 and simple lever 23. Suction pump 18 is mounted in bearings 24, attached to the under side of plate E and comprises a cylinder 25 (particularly shown in Fig. 3) with a tubular piston and rod 26, on the outer end of which is mounted a flexible cup 27, a slide valve 28 and a collar 29. Wound on piston rod 26 is a helical spring 30 disposed between and bearing against collar 29 and the end of cylinder 25 to normally retain the piston in its forwardmost position. Wound on slide valve 28 is a helical spring 31, one end of which is disposed within and bears against the bottom of an annular groove in suction cup 27; the other end extends to and bears against flange 32 to normally hold slide valve 28 over hole 33 which extends through the wall of piston rod 26. Mounted on rod 34, which projects from the end of cylinder 25, is a block 35 with two planed parallel sides from one of which projects a pin 36, the outer end of which is disposed within a longitudinal slot formed in the upper end of lever 23, in such a manner as to impart to pump 18 a reciprocating motion when lever 23 is rocked on its pivot 37. Lever 23 has a plate 38 extending parallel therewith and spaced from and connected thereto as shown in Fig. 13. Block 35 extends between, and its planed sides bear against, plate 38 and lever 23 in such a manner as to prevent cylinder 25 from turning in its bearings. When pump 18 is in its outwardmost position, the outer end of piston rod 26 is within an opening 39 situated at about the longitudinal center of and extending through plate C. Mounted on the back side of and extending into the opening 39 in plate C are lugs 40 the ends of which are disposed to be in the path of travel of the flange 32 and engage it to open slide valve 28 when pump 18 is in its outwardmost position. When pump 18 is in its inwardmost position, suction cup 27 will be in contact with the topmost sheet in stack 49 and the end of cylinder 25 will be disposed within the opening 39. Adjustably mounted on and parallel to the face of plate

C are grooved plates 42 adapted to receive and retain for a period of time a sheet delivered to them by suction pump 18. Attached to the back side and at about the longitudinal center of plates 42 are rods 43 disposed to ride in a longitudinal groove 44, which is formed in the face and situated at about an equal distance from the top and bottom of plate C. Attached to rods 43 and extending through and beyond a longitudinal slot 45 in plate C are rods 46, threaded at their outer ends and carrying thumb nuts 47. By this construction, plates 42 may be horizontally adjusted in relation to each other and be adapted to receive and retain sheets of various lengths. Mounted near the lower side and at about the longitudinal center of plate C is a plate spring 48, the outer end of which is normally disposed in the path of downward travel of sheet 49, so as to engage its lower edge and to prevent it from dropping down and out from between plates 42. Spring 48 is weak enough to be pressed down and out of the path of travel of sheet 49 by the sheet when a slight downward pressure is delivered to the sheet. Situated on the inner face of, extending parallel to and across plates A and B are rods 50 on which are mounted, to have reciprocating motion, blocks 51 operated by cam 52 through link 53, arm 54, shaft 55, arms 56 and links 57. Firmly attached to blocks 51 are rods 58, which extend across and in front of plates 42 and carry fingers 59, which are disposed across a due line between grooves 60 in plates 42 and operated to engage the upper edge of a sheet 49 and force it down and out from between plates 42. Normally disposed directly below plates 42 with its face on a plane parallel to plate C and on a direct line with grooves 60 in plates 42 is a pressure plate 61 suitably mounted on rod 62 and adapted to have reciprocating movement and operated in one direction by cam 52 through roller 63 mounted in the end of rod 62 and brought back to its normal position as shown in Figs. 1, 2 and 6 by helical spring 64 which is wound on shaft 62 with one end extending within and bearing against spring case 65, firmly mounted on bearing 66. When plate 61 is in its outwardmost position, it is in close contact with plate 67 in holder 68. Pressure plate 61 has pivoted to its perpendicular sides wings 69 which are held in a normal forward position by torsion springs 70 and are swung to their backward position by coming into engagement with projecting plates 71 when plate 61 is moved to its outwardmost position. When in their normal position, a portion of wings 69 extend in front and across the face of plate 61 to receive and hold a sheet delivered to them from grooved plates 42, against the face of plate 61. At the bottom of and

near the two perpendicular sides and extending through plate 61 are pins 72 which are mounted to have reciprocating movement and when in a normal position a portion of the pins extend back of plate 61 and when in their forwardmost position a portion of the pins extend beyond the face of plate 61, (as shown by dotted lines in Fig. 6) in such a manner as to engage the lower edge of a sheet being delivered to the face of plate 61 and stop its downward movement at a certain and accurate position. Pins 72 are moved to a forward position by plate 73 mounted on rod 74. Rod 74 is mounted to have reciprocating movement in bearings 75 and is moved to its inwardmost position by lever 76 which is pivoted at 77 and the upper end disposed in the path of travel of arm 21. Rod 74 is moved to its outwardmost position by helical spring 78 wound thereon and bearing at one end against pin 79 which extends through rod 74 and at the other end against rigid bearing 75. Pins 72 are moved to their normal position when brought into contact with plate 67 when plate 61 is moved to its outwardmost position. Plate 61 is mounted to have reciprocating movement on shaft 62 and is held in a normal position by helical spring 80 and a set-screw 81 the end of said screw extending within a groove in and near the end of rod 62 to hold plate 61 on rod 62. This arrangement permits plate 61 to automatically adjust its position on rod 62 when in its outwardmost position, thus adapting the machine for handling plates and sheets of various thicknesses. On the face of plate 61 is attached a pad 82, of suitable resilient material to insure close contact of sheet 49 with plate 67. Plate 61 has a lateral projection 83 which bears against a similar projection 84 at the lower side of plate C. This serves to keep plate 61 in exact alinement with plates 42 and holder 68. Plate 61 is not adjustable to various sizes of sheets but may be removed from the end of rod 62 and replaced by a similar plate adapted for the size sheet desired.

Situated directly opposite and parallel to the face of plate 61 is negative holder or printing frame 68 mounted so that it may be readily removed from the frame of the machine. Extending parallel to and across the face of frame 68 is a rod 85 mounted to turn in its bearings 86. Adjustably mounted on either end of rod 85 are plates 87 which are normally disposed and held in a position approximately parallel to the face of frame 68 (particularly shown by Fig. 10). Plates 87 extend parallel to one another and may be moved inwardly on rod 85 and held securely in any position by set screws 88. This construction enables them to be adapted for holding negatives and masks of various sizes and receive pressure plates and sheets of

various lengths. The inward sides of plates 87 are slightly beveled as shown in Fig. 11 so that a printed sheet will not bind, but readily drop out of the frame after being released by the pressure plate.

Mounted in a suitable housing, back of frame 68, is an incandescent electric lamp 97, of a suitable character, which is turned on and off when plate 61 is in contact with negative 67, by an adjustable, automatic, electric switch 101, mounted on the outer face of plate B and operated by shaft 98.

Situated directly under frame 68 and connected therewith by a trough I is a rack 109 adapted to receive and hold in separate compartments printed sheets dropped from frame 68. The rack shown in Figs. 1 and 11 comprises no part of my invention and any suitable rack adapted for the purpose may be used. Attached to the underside of a carriage 110 are longitudinal ribs 111 adapted to and bearing in longitudinal grooves 112 formed in plate H. Secured to the underside of carriage 110 is a ratchet plate 113, the teeth of which extend over the edge of a longitudinal groove 114 formed in and on the underside of carriage 110. The teeth in ratchet 113 are spaced a distance exactly equal to the distance between the compartments in rack 109. Mounted in a suitable bearing on the underside of plate H is a rod 115 adapted to have rocking and longitudinal reciprocating movement. Firmly attached to rod 115 is an arm 116, the outer end of which meshes with the teeth in ratchet 113. Wound on shaft 115 and extending between and bearing against rigid bearing 117 and crank 118 is helical spring 119 adapted to hold arm 116 against the face of ratchet 113. When rod 115 is rocked arm 116 rides up the inclined face of a tooth in ratchet 113, moving shaft 115 in a longitudinal direction and compressing spring 119. Pawl 120 prevents any backward movement of ratchet 113. As the movement of the shaft is continued, arm 116 rides past the perpendicular face of the ratchet tooth and is brought into engagement therewith by the recoil action of spring 119. As shaft 115 is rocked back to its normal position, arm 116 bears against a tooth in ratchet 113 and moves carriage 110 forward an exact distance equal to the distance between the compartments in rack 109, thus bringing another compartment directly under trough I. Rod 115 is operated by crank 118 through link 121 and crank 122 attached to rod 55. Shaft 98 turns in a bearing 123 suitably mounted on plate G, and extends through and beyond a suitable journal in plate B. Attached to the outer end of shaft 98 is the arm 99 of the electric switch. Mounted on the inner end of shaft 98 are cams 19 and 52 through which the entire mechanism of the machine is oper-

ated. Cam 19 is mounted directly opposite the outer end, with its axis horizontal and at right angles to the longitudinal center line of rod 20 and so disposed that its face will bear against a roller 124, mounted in the end of rod 20. Rigidly attached to the end of rod 20 is a member 125 which extends either side of and beyond the hub of cam 52 and has attached to its outer end a plate 126 which is disposed parallel to the face of cam 19 and within the path of travel of roller 127 mounted on the side of cam 19 to cause shaft 20 to move to its outermost position when cam 19 is rotated. Cam 19 has an eccentric face 128 which bears against roller 124 mounted in the end of rod 20 to cause rod 20 to move to its inwardmost position when cam 19 is revolved. Cam 19 also has a concentric face 129 which occupies about 90° of its circumference and bears against roller 124 to hold shaft 20 at its inwardmost position for about 1/4 of the revolution of shaft 98. Cam 52 is mounted directly opposite the outer end, with its axis horizontal and at right angles to the longitudinal center line of rod 62 and so disposed that its face will bear against roller 63, mounted in the end of rod 62. Cam 52 has an eccentric face 130 which when cam 52 is revolved in a direction indicated by the arrow will bear against roller 63 and cause rod 62 to move to its outwardmost position. Cam 52 has a concentric face 131 which occupies about 175° of its circumference and bears against roller 63 to hold rod 62 at its outwardmost position for a period of time. Pivoted to cam 52 is a link 53 which connects at its outer end with an arm 54 to rock shaft 55 when cam 52 is revolved. Shaft 98 is rotated by gear 132 through pinion 133, clutch 134 and pulley 135 from any suitable source of power, preferably an electric motor driven by the same electric current with which the lamp is lighted.

The operation of the above described embodiment of my invention is as follows:

Assuming the parts to be in the position shown in Figs. 1, 2, 6, and 11. As shaft 98 is revolved link 53 pivoted to cam 52, is given an upward movement which, through arm 54, shaft 55, arms 56 and links 57, give blocks 51 a downward motion causing fingers 59, which are connected to block 51 by rod 58, to engage the top of sheet 49 and move it down and out from between plates 42 and onto the face of pressure plate 61, between wings 69 and against pins 72 which have in the meantime been brought to their forwardmost position by plate 73, operated by the recoil of spring 78. Spring 78 is released by the outward movement of rod 20 which carries the arm 21 out of engagement with the upper end of lever 76; the outward movement of rod 20 having

been caused by the roller 127 engaging with plate 126.

As shaft 98 further revolves, the face 130 of cam 52 bears against roller 63 and moves rod 62, carrying plate 61, to its outwardmost position, thus placing sheet 49 carried by plate 61 into contact with negative 67. As plate 61 was moved outwardly, the ends of wings 69 were engaged by plates 71 and wings 69 swung to the back of plate 61, thus permitting plate 61 to enter between plates 87 and place sheet 49 in close contact with negative 67. The face 131 of cam 52 will now bear against roller 63 and hold plate 61 in its outwardmost position nearly one half of the revolution of shaft 98. The instant that plate 61 is into contact with negative 67, the electric switch 101 will cause an electric current to flow through and light lamps 97. At about the time that the upper edge of sheet 49 reaches a position below the path of travel of suction cup 27, the roller 127 on cam 19 engages the face of plate 126 and moves rod 20 to its outward position and through arm 21, link 22 and lever 23, moves pump 18 to its inwardmost position. When pump 18 is about two-thirds of the way in, cup 27 will come into contact with the topmost sheet in stack 49, thus stopping the movement of piston 26. The pump 18 in traveling the remainder of the distance to its inwardmost position will move down on piston and rod 26, forcing the air out of cylinder 25 and compressing helical spring 30. As cam 19 continues to revolve its face 128 will bear against roller 124 mounted in the end of rod 20 and move rod 20 to its inwardmost position and through lever 23 move pump 18 to its outwardmost position. As pump 18 begins to move outward, spring 30 will exert a pressure against collar 29 and force piston 26 toward the front end of cylinder 25, thus producing a partial vacuum in the rear end of cylinder 25 and communicating through the tubular piston and rod to the inner side of cup 27, which lies in close contact with sheet 49, creates a suction sufficient to affix the sheet 49 to the cup 27.

As pump 18 moves to its outwardmost position, it will carry sheet 49 to a position between grooved plates 42, and projecting lugs 40 will engage the flange 32 of slide valve 28 and stop its outward movement, thereby uncovering hole 33 and thus breaking the suction in cup 27 and releasing sheet 49. Sheet 49, when normal and unconfined, lies approximately flat, but while being drawn between grooved plates 42 both ends will engage the outer edges of plates 42 and the sheet will be slightly curved until released by cup 27 when it resumes its normal shape and extends between grooved plates 42 its ends within and engaging the

grooves 60, its lower edge resting on and its weight being carried by plate spring 48. As soon as pump 18 reaches its outwardmost position, the concentric face 129 of cam 19 will reach roller 124 and hold pump 18 in its outwardmost position during about one-fourth of the revolution of shaft 98. At about the time that pump 18 reaches its outermost position the fingers 59 operated by cam 52, through link 53, will have reached their uppermost position and crank 122, through link 121, will operate the sheet receiving rack shifting mechanism (as previously described) to place another compartment of rack 109 under trough I. The concentric face 131 of cam 52 will now have passed roller 63 and the recoil action of spring 64 will move pressure plate 61 to its inwardmost position, thus releasing the now printed sheet 49 and allowing it to drop into trough I and thence into a compartment of rack 109.

It is manifest that while I have described the apparatus as applied to the printing of photographs, it is equally adapted to other purposes: For example, the negative 67 may be replaced by a hectograph plate on which lettering or a design has been drawn with ink or coloring material and sheets of paper or other material fed thereto and pressed into contact therewith and the printed sheets placed into separate receptacles of a rack for drying or other purposes. Negative 67 may be replaced by a clear glass and an image thrown thereon by a projection lens and enlarged or reduced photographic copies made therefrom and delivered to a rack for development or other purposes.

From the foregoing it will be seen that I have provided a machine for printing photographs and loading the printed sheets into racks where each sheet will be held in a separate compartment. This machine is entirely automatic in its operation and can be adjusted to handle sheets of various sizes and to print from negatives of different densities.

I claim:

1. A sheet feeding mechanism comprising means for holding a stack of sheets, pneumatic means for removing the sheets individually from the stack, spaced edge guides for the sheet between which the pneumatic means is operable, and means for shifting the removed sheet in said guides transversely from the pneumatic means.

2. A sheet feeding mechanism comprising means for supporting a stack of sheets whereby the uppermost sheet is bowed, pneumatic means for removing the uppermost sheet and holding it in its bowed condition while being removed, sheet guiding means for guiding the sheet in a flat form, said pneumatic means movable within the sheet-guiding means, and means for rendering the

pneumatic means inoperative when within the sheet-guiding means and thereby permit the bowed sheet to straighten out into operative relation with said guiding means.

3. A sheet feeding mechanism comprising means for supporting a stack of sheets whereby the uppermost sheet is bowed, pneumatic means for removing the uppermost sheet and holding it in its bowed condition while being removed, sheet-guiding means for guiding the sheet in a flat form, and pneumatic means movable within the sheet-guiding means, and means for rendering the pneumatic means inoperative within the sheet-guiding means to permit the sheet to flatten into operative relation with the latter, and means for pushing the sheet edgewise from said guiding means.

4. A sheet feeding mechanism comprising means for supporting a stack of sheets whereby the uppermost sheet is bowed, pneumatic means for removing the uppermost sheet and holding it in its bowed condition while being removed, sheet-guiding means for guiding the sheet in a flat form, said pneumatic means movable within the sheet-guiding means, and means for effecting a release of the sheet from the pneumatic means whereby the sheet may flatten out into the guiding means, sheet-advancing means for receiving the sheet from the guiding means and means for transferring the sheet from said guiding means to the advancing means.

5. A sheet feeding mechanism comprising a hopper for receiving a stack of sheets, said hopper having a convexed bottom to bow the sheets thereon, spring fingers engaging the uppermost sheet of the stack at spaced points and a sheet-gripping suction cup movable between the fingers to engage and remove the uppermost sheet.

6. A sheet feeding mechanism comprising means for holding a supply of sheets, and pneumatic means for removing the sheets individually therefrom and consisting of a cylinder having a spring-extended plunger operable therein said plunger provided with a hollow rod supporting a rubber cup on its outer end and communicating therewith, said rubber cup movable against the sheets to grip the same following a telescoping of the plunger in the cylinder, and means slidable on the plunger rod for controlling an air port therein.

7. A sheet feeding mechanism comprising means for supporting a stack of sheets horizontally, a horizontally slidable suction cup operable toward and from the stack to remove the sheets individually therefrom, spaced vertical guides between which the cup is movable to guide the sheet when released therefrom, and means for effecting a release of the sheet from said cup.

8. A sheet feeding mechanism comprising

means for supporting a stack of sheets horizontally, a horizontally slidable suction cup operable toward and from the stack to remove the sheets individually therefrom, 5 spaced vertical guides between which the cup is movable to guide the sheet when released therefrom, and sheet-advancing means normally disposed below the guides to receive a sheet therefrom, and means for 10 releasing a sheet from the cup when between the guides.

9. A sheet feeding mechanism comprising means for supporting a stack of sheets, means for engaging the uppermost sheet of 15 the stack and removing it therefrom in a bowed condition whereby when released the sheet will flatten out, and spaced guiding channels into which the edges of the sheet will move when the sheet is released from 20 the second means.

10. A sheet feeding mechanism comprising means for supporting a stack of sheets, means for engaging the uppermost sheet of 25 the stack and removing it therefrom in a bowed condition whereby when released the sheet will flatten out, a pair of opposing channels adapted to receive the edges of the sheet when released from said second means,

and means for removing the sheets edgewise through the channels. 30

11. A sheet feeding mechanism comprising means for supporting a stack of sheets, means for engaging the uppermost sheet of 35 the stack and removing it therefrom in a bowed condition whereby when released the sheet will flatten out, and a pair of opposing guide channels designed to receive the opposite edges of the sheet when released from the second means and means for releasing the sheet from said second means by 40 and during movement of the latter between the guide channels.

12. A sheet feeding mechanism comprising means for supporting a stack of sheets, means for engaging the uppermost sheet of 45 the stack and removing it therefrom in a bowed condition whereby when released the sheet will flatten out, and opposing guide means designed to receive the edges of the sheet upon being released from the second 50 means, means for effecting the release of the sheet from the second means by and during movement of the latter, and means for pushing the released sheet edgewise through the guide means.

ARTHUR J. FREEMAN.