Jan. 8, 1929.

1,698,187

J. CLATWORTHY

SHEET FEEDING MECHANISM AND DUPLICATING AND OTHER MACHINES COMPRISING THE SAME

Filed Aug. 16, 1926 6 Sheets-Sheet 1

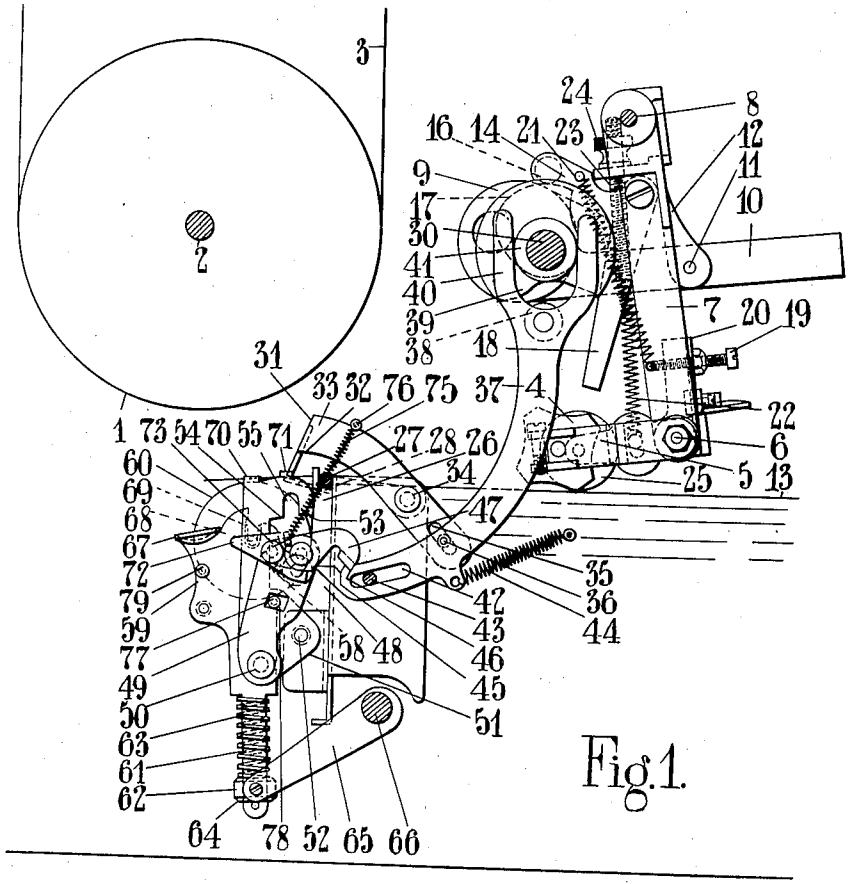


Fig. 1.

J. Clatworthy
Inventor

By: Marks & Clark
Attys.

Jan. 8, 1929. 1,698,187

J. CLATWORTHY

SHEET FEEDING MECHANISM AND DUPLICATING AND OTHER MACHINES COMPRISING THE SAME

Filed Aug. 16, 1926 6 Sheets-Sheet 2

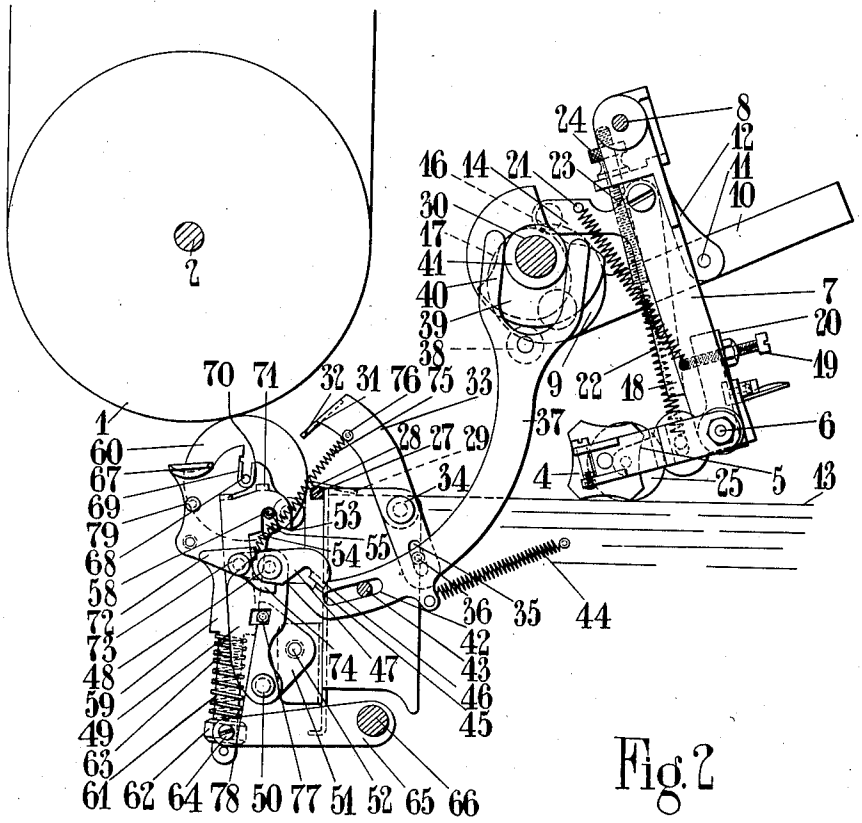


Fig. 2

J. Clatworthy
inventor

By: Marks & Clerk
Attys

Jan. 8, 1929. 1,698,187

J. CLATWORTHY

SHEET FEEDING MECHANISM AND DUPLICATING AND OTHER MACHINES COMPRISING THE SAME

Filed Aug. 16, 1926 6 Sheets-Sheet 3

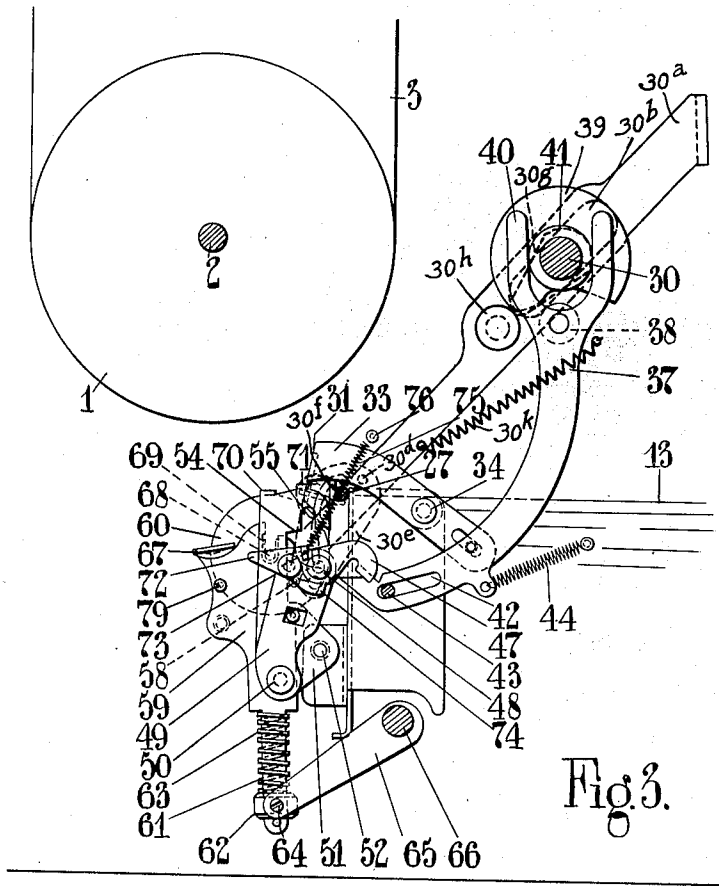


Fig. 3.

J. Clatworthy
Inventor
By: Marks & Clerk
Attys

Jan. 8, 1929. 1,698,187

J. CLATWORTHY

SHEET FEEDING MECHANISM AND DUPLICATING AND OTHER MACHINES COMPRISING THE SAME

Filed Aug. 16, 1926 6 Sheets-Sheet 4

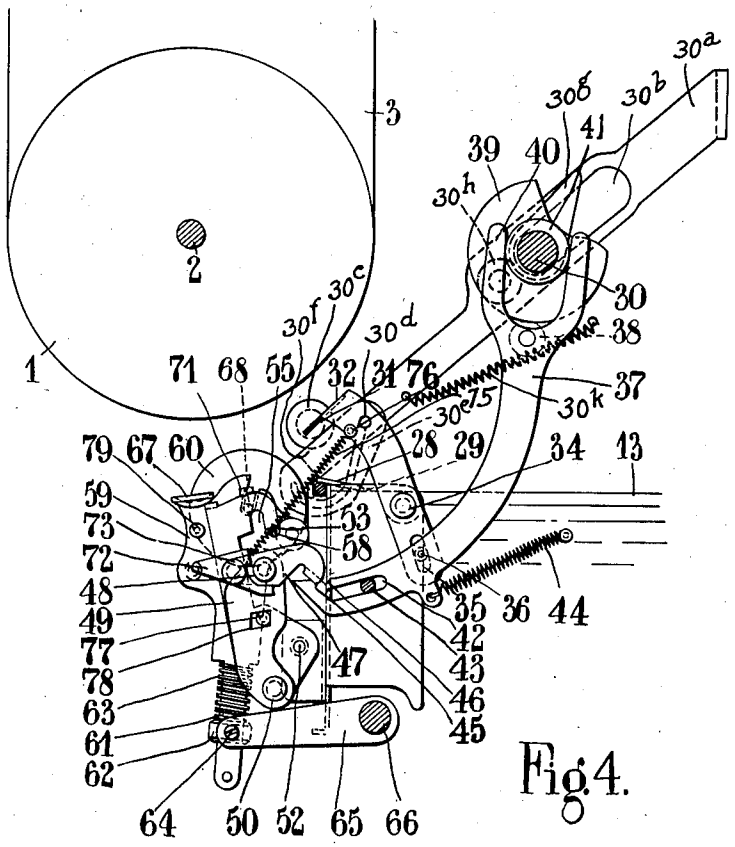


Fig. 4.

J. Clatworthy
inventor

By: Marks & Clerk
Attys.

Jan. 8, 1929. 1,698,187

J. CLATWORTHY

SHEET FEEDING MECHANISM AND DUPLICATING AND OTHER MACHINES COMPRISING THE SAME

Filed Aug. 16, 1926 6 Sheets-Sheet 5

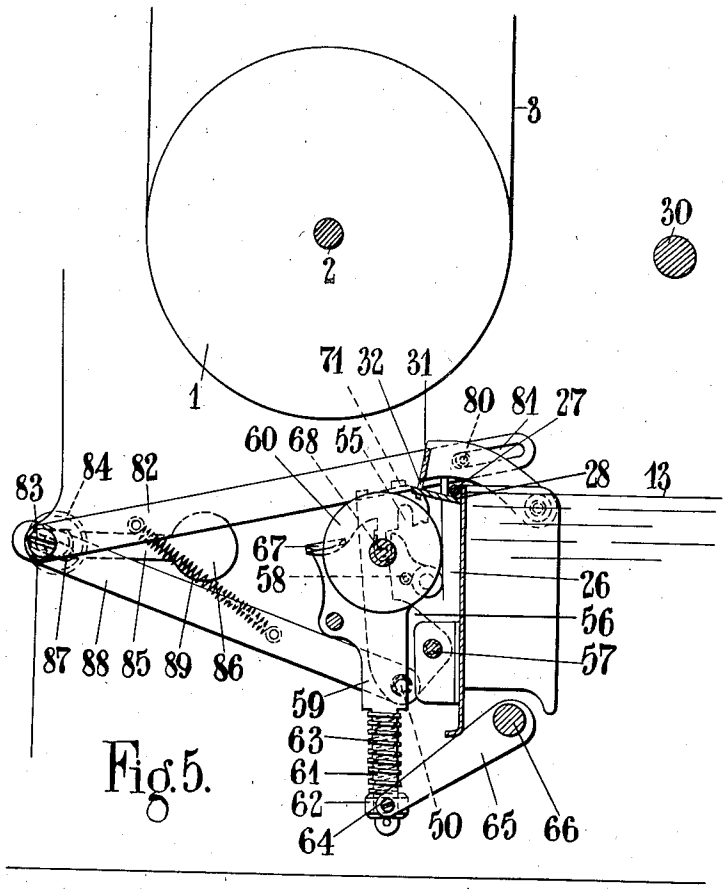


Fig. 5.

J. Clatworthy
Inventor

By: Marks & Clark
Attys.

Jan. 8, 1929. 1,698,187

J. CLATWORTHY

SHEET FEEDING MECHANISM AND DUPLICATING AND OTHER MACHINES COMPRISING THE SAME

Filed Aug. 16, 1926 6 Sheets-Sheet 6

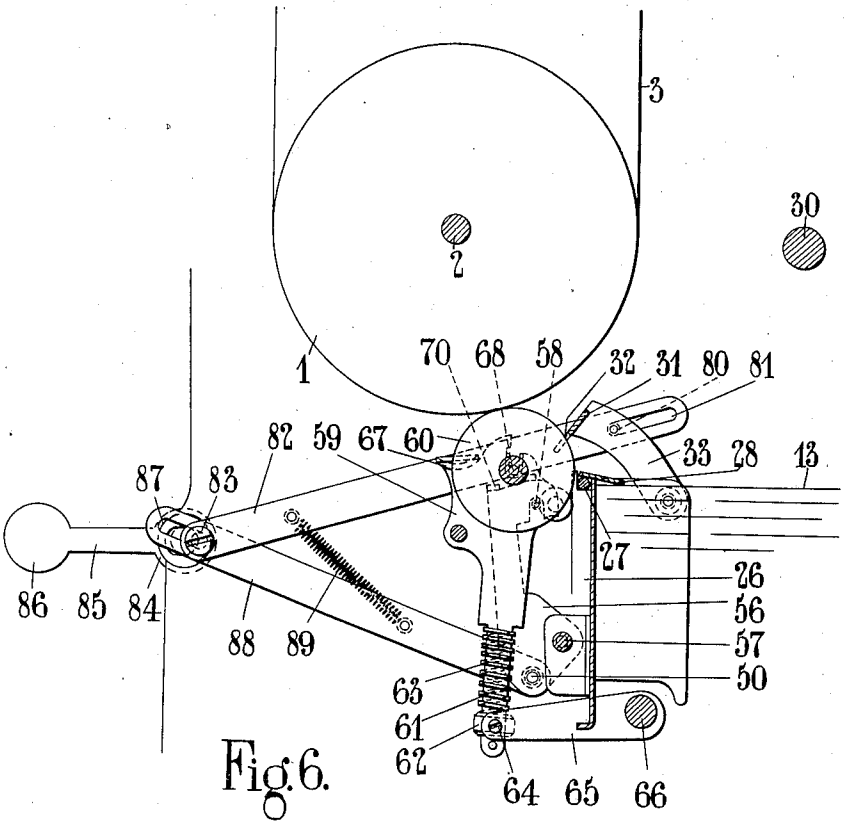


Fig. 6.

J. Clatworthy
inventor

By: Marks & Clerk
Attys.

Patented Jan. 8, 1929. 1,698,187

UNITED STATES PATENT OFFICE.

JOHN CLATWORTHY, OF LONDON, ENGLAND, ASSIGNOR TO D. GESTETNER, LIMITED, OF LONDON, ENGLAND.

SHEET-FEEDING MECHANISM AND DUPLICATING AND OTHER MACHINES COMPRISING THE SAME.

Application filed August 16, 1926, Serial No. 129,616, and in Great Britain October 8, 1925.

This invention relates to sheet-feeding mechanism and machines, such for instance as duplicators, comprising the same.

In a number of machines adapted to operate upon successive sheets of paper or like material the individual sheets are fed forward between members designed simultaneously to contact with the sheet.

Should, however, a sheet not be fed forward it is in many cases undesirable that these members should be brought into contact one with another. This is the case for example in duplicating machines where a pressure member is employed for forcing the sheet into contact with the stencil carrier for in the event of a sheet not being fed forward the pressure member will be brought into the operative position and owing to the absence of a sheet it will contact with the stencil through the openings in which ink will be delivered on to the surface of the pressure member, the removal of which for cleaning will be necessitated to avoid a number of sheets subsequently fed forward being spoiled owing to the ink taken up by the pressure member being transferred to their rear faces.

A number of mechanisms have been proposed in machines comprising sheet-feeding mechanism and some in connection with duplicating machines for preventing two members, which co-operate one with another in the manner of a pressure member and stencil carrier, coming into contact should a sheet not intervene between them and the object of the present invention is to provide an improved mechanism for securing a similar result.

The object of the present invention is to provide an improved construction of sheet-feeding mechanism of the type including a trip bar which is adapted to be brought to bear upon the topmost sheet of the pile of sheets which are to be fed in succession in order to cause the said sheet to be buckled by the operation of fingers or the like adapted to impart forward motion to the sheet, and by its periodic motion to release the sheet, thus permitting its fore edge to spring forward over the trip bar into the position in which it will be engaged between the means, for instance, a stencil carrier and pressure roller, adapted simultaneously to contact with it.

The invention consists broadly in a sheet-feeding mechanism of the type furnished with a trip bar in which feeler mechanism co-operates with the trip bar to permit or inhibit the bringing into the operative position of the members adapted simultaneously to operate upon the sheets which are fed.

For instance, in accordance with the invention, gaps may be provided in the edge of the trip bar while the feeler mechanism may comprise a member on which are formed fingers registering with the gaps, the said member having lugs or arms by which connection between the member and some fixed points on the machine may be secured in such manner that the arms may be moved about the axis of these points.

The means adapted to permit or inhibit the bringing into the operative position of the members adapted to operate upon the sheet may, as in known constructions, be positively actuated by some moving part of the machine, for example through the intermediary of a member from a spindle, the motion of which functions to feed forward the individual sheets, to bring it into the operative position.

Conveniently in accordance with the invention the member through the intermediary of which is actuated the means adapted to permit or inhibit the bringing into the operative position of the members adapted to operate upon the sheet is furnished with a plurality of notches, one or other of which, according to the position which the feeler has been allowed to take up, engages a pawl through which motion is imparted to means adapted to inhibit or permit the raising of the pressure roller or equivalent device.

To release the pawl from engagement with the notched member on the return motion of the same, a trip device may be associated with the pawl.

The member operated from the spindle, the motion of which actuates the feed mechanism, is conveniently slidably mounted, as for instance by providing in the member a slot engaging a pin, on some fixed point on the machine.

For imparting motion to this member a cam may be provided on a spindle adapted periodically to move the member in opposition to a spring.

The feeler mechanism may be pivotally

connected with some fixed point on the machine and the connection between it and the member operating to release the feeler mechanism may be effected by providing a slot in the latter and a pin on the former.

The means adapted to permit or inhibit the bringing into the operative position of the pressure member may conveniently be in the form of a lever furnished with two shoulders with a recess or gap between them, the shoulders and recess being so dimensioned and arranged that according to whether one or other of the shoulders is in the path of a pin on a carriage in which a pressure roller is mounted the motion of the carriage to bring the roller into the operative position relative to the stencil carrier will be prevented while in the event of the recess being in the path of the pin the motion of the carriage for the pressure roller to the extent in question will be permitted.

The carriage for the pressure roller or equivalent member may be resiliently connected with a lever or equivalent device whereby the carriage will be periodically constrained to move toward the member, such for instance as a stencil carrier, with which it co-operates. For example, the carriage for the pressure roller may be provided with pins engaging collars secured to the ends of levers which are periodically moved to secure the raising of the carriage, a spring being arranged about each of these pins and between the collar and an abutment on the carriage in such manner that when the raising of the carriage to bring the pressure roller into the operative position is inhibited the springs will be compressed.

When the carriage for the pressure roller is so arranged, finger-pieces may be provided on the carriage adapted to enable the pressure roller to be forced downward by hand in opposition to the springs, should such be desirable for any reason, as for instance in order to remove the pressure roller.

The member furnished with shoulders and an intervening recess may be pivotally connected at one end with some point fixed relative to the frame of the machine while the pawl may be pivotally connected with a member mounted on a pivot provided on the member furnished with shoulders and an intervening recess. Between these two members a degree of relative motion may be secured by forming a slot in the one and providing a pin on the other.

A trip member, which may be in the form of a lever associated with a spring operating to constrain the pawl, the member on which it is mounted, and the means operating to permit or inhibit the raising of the pressure member, to move into the forward position in which the pawl may engage one or other of the notches, when the member in which they are formed is retracted, may be pivotally connected with the pawl. One end of the lever associated with the spring may operate as a trip finger and on the pressure roller carriage a pin may be provided adapted to co-operate with this trip finger in such manner that downward motion of the carriage causes the pin to contact with the trip finger, thus moving it about its pivot and causing the opposite end thereof, which for this purpose may be provided with a lateral extension, to engage the pawl and release the same from its engagement with the notched member, thus permitting the spring operating on the pawl to move the members with which it is associated into the retracted position.

On the upward motion of the carriage the pin will strike the trip finger and will move the lever of which it forms part about its pivot but such motion of the lever will not release the pawl from its engagement with the notched member.

Where a pressure roller mounted in a carriage is employed, it will be found convenient to furnish in the sides of the carriage open bearings in which the ends of the spindle of the pressure roller may be engaged, and in such case, in order to prevent the roller being displaced from the carriage by shocks arising in the operation of the machine, the member formed with shoulders or recesses may be provided with lateral projections adapted to be brought into the path of the ends of the spindle of the pressure roller.

Conveniently the mains adapted to engage the carriage of the pressure roller in order to inhibit or permit it being raised into the operative position is rigidly connected by a spindle extending across the machine with a member similarly provided with shoulders and a recess co-operating with a pin functioning on the adjacent portion of the carriage for the pressure roller.

In a duplicating machine it is desirable to print on the backing sheet of the stencil when it is freshly mounted on the machine. The purpose of this is to avoid passing a number of sheets of paper in succession through the machine until in the normal operation of the machine the desired quantity of ink will pass through the openings in the stencil on to a sheet of impression-receiving material passed between the stencil carrier and pressure member.

A further feature of the invention comprises the provision of means adapted to put the feeler device out of operation to enable the pressure member to be raised periodically for the purpose above referred to.

Thus, in accordance with the present invention, the feeler device may be connected through a link permitting lost motion between the feeler and the link with an eccentrically disposed pin mounted upon a

rotatable member secured to some fixed point on the machine in such manner that when the pin is in one position the feeler is maintained in an elevated position, that is to say, a position in which it will not descend sufficiently to control the operation of means adapted to permit or inhibit the raising of the pressure roller into the operative position, and with this pin a second lever is associated, this second lever being connected also with the means adapted to permit or inhibit the raising into the operative position of the pressure roller in such manner that when the rotatable member is in the position in which it maintains the feeler out of operation the second link causes the means adapted to inhibit or permit the raising into the operative position of the pressure roller to move into the position in which it will permit the raising of the pressure roller when the stencil carrier may be rotated a desired number of times, the pressure roller being periodically moved into and out of contact with the reverse side of the backing sheet.

The invention is more particularly concerned with duplicators of the kind comprising a plurality of inking cylinders over which a stencil supported on a flexible carrier is caused to travel and with which inks of a pasty consistency are employed.

The invention will be further described in detail as applied to a duplicator of the above-mentioned character and with reference to the accompanying drawings in which are shown such of the elements of a duplicator of the known construction as are necessary for the understanding of the invention.

Figure 1 of the drawings is a fragmentary view in end elevation of a duplicating machine with one of the side frames of the machine removed in order to expose the details of construction, the safety device being shown in this figure in the position it will assume when a sheet of paper is being fed and before it is being operated upon by the stencil;

Figure 2 is a similar view showing the several elements of the feed device and safety device in the positions they will assume at a later stage, namely when the paper is being operated upon by the stencil;

Figures 3 and 4 are similar views showing the position the several elements respectively assume at the commencement of the feeding motion should a sheet of paper not be fed forward and at a later stage;

Figures 5 and 6 are views illustrating the mechanism located at the side of the machine opposite to that illustrated in Figures 1 to 4.

In all of the figures 1 indicates the lower inking cylinder of a duplicating machine, 2 the spindle on which the said cylinder is mounted and 3 the flexible member traveling over the inking cylinders and to which is secured the stencil; 4 is one of a plurality of rubber pads connected to the frame 5 which is pivotally connected by the spindle 6 with the arms 7 of a frame which is in turn pivotally mounted on the pivots 8; this frame is oscillated about its spindle by the eccentric 9 through the intermediary of a strap provided with a prolongation 10 pivotally connected by the pin 11 with the lugs 12 on the frame.

Periodically the feed fingers and their associated pads are elevated from the pile of sheets of paper, represented by 13, when they have completed their forward stroke and the frame carrying them is returning into its rearmost position. For raising the fingers a frame, one end of which is in the form of a bell-crank lever 14, is pivotally connected with the frame carrying the remaining elements of the feed mechanism. One end of one of the bell-crank levers is provided with a roller 16 which travels over a cam 17 and thus oscillates the lever about its pivotal connection, causing the arm 18 periodically to bear against the set-screws 19 which are secured in the limbs or extensions 20 of the members carrying the feed fingers. A spring 21 operates to keep the roller 16 in contact with the cam while the spring 22 connected with the screw 23 on which the nut 24 is mounted is arranged in tension and by means of the nut the tension on the spring may be varied in order to vary the pressure of the fingers upon the pile of sheets.

In addition, the feed mechanism comprises a roller 25, the action of gravity on which causes it to maintain a substantially constant pressure on the pile of sheets.

The feed mechanism in its operation pushes the sheets from the pile forward against the plate 26 adjacent to the upper edge of which is mounted on the pivot 27 a trip bar 28 which is provided with a lip 29. The lip in question operates to prevent the fore edge of the topmost sheet of the pile moving forward and the sheet is therefore buckled until at an appropriate time the trip bar is rotated about the axis of its pivot.

The rotation of the trip bar is effected from the feed spindle 30 through the intermediary of the bar 30^a which is slotted at 30^b and engages the feed spindle by which and by the roller 30^c it is guided. On the bar 30^a is provided a pin 30^d engaging the slot 30^e in the slotted cam 30^f connected with the trip bar, the cam 30^g on the feed spindle 30 bearing upon the roller 30^h and moving the bar 30^a at suitable intervals in opposition to the spring 30^k, one end of which is connected to a fixed point on the frame of the machine. When it assumes the position shown in Figures 3 and 5 the fore edge of the sheet of paper will spring for-

ward into the position in which it may be operated upon by the stencil.

It may be remarked that feed mechanism of the above character is known but reference to it in some detail is necessary for the purpose of describing a suitable manner of carrying the invention into effect.

A bar 31 provided with fingers 32 acting as feelers which register with gaps or recesses in the lip of the trip bar when the latter is rotated into the position illustrated in Figures 3 and 5 is connected by the arms 33 with some fixed point on the machine by the pivot 34. One end of one of the arms is provided with a slot 35 engaging a pin 36 on the member 37 which bears through the intermediary of the roller 38 on the periphery of the cam 39 which, as will be seen, is mounted on the feed spindle of the machine. The member in question is provided with a forked end 40 engaging the disc 41 and serving as a guide for one end of the member, a slot 42 in the member engaging the pin 43 on some fixed point of the machine, such engagement providing a guide for the lower end of the member. Motion of the member under the action of the cam causes it to move in opposition to the spring 44, the latter causing the member when it is released by the cam to move to the right of Figures 1 to 4 and slightly upward, thereby permitting the fingers acting as feelers to descend freely when in the normal operation of the machine they will assume the position shown in Figure 3 unless a sheet of paper has been fed forward in which case the sheet bridging over the gaps in the trip bar will cause the feelers to assume the position shown in Figure 1. In the former case the member 37 will be retracted to a greater extent than in the latter and in the one case the notch 45, as shown in Figures 3 and 4, and in the other the notch 46, as shown in Figures 1 and 2, will engage the pawl 47 which is pivotally mounted on the pin 48 provided on the link 49 which in turn is pivotally connected by the pin 50 to the lever 51, the latter being pivotally connected at 52 with a fixed point on the machine. This lever is provided with two shoulders 53 and 54 with a recess 55 between them and is rigidly connected with a correspondingly formed lever 56 on the opposite side of the machine (see Figures 5 and 6) by the rod 57; according to which of the notches the pawl above referred to has engaged the motion of the member 37 under the action of the cam 39 will bring the shoulder 53, as shown in Figures 3 and 4, or the recess 55, as shown in Figures 1 and 2, into register with the pin 58 on the carriage 59 in which the pressure roller 60 is mounted. This carriage is provided with pins 61 passing through collars 62 between which and shoulders on the frame springs 63 are located. The collars are pivotally connected by the pin 64 with the lever 65 mounted upon the spindle 66 which is periodically oscillated in such manner as to tend to force the frame carrying the pressure roller toward the lower inking cylinder. Depending on whether the pin 58 is in register with the shoulder 53 or the recess 55, the raising of the carriage for the pressure roller is permitted or precluded, the springs 63 in the latter case being compressed. In the construction illustrated the carriage for the pressure roller is provided with finger-pieces 67 by which it may be depressed by hand in opposition to the springs for the purpose of removing or replacing the pressure roller which is formed with pivots 68 engaging slots 69 in the sides of the carriage. In order to prevent the pivots being displaced from the slot, lugs 70 and 71 are provided on the lever 51, one or other of these lugs being brought into position above the pivots of the roller according to the position assumed by the lever.

A trip member in the form of a lever 72 is pivotally connected by the pin 73 with the lever 51. One arm of the lever 72 is provided with a lug 74 engaging below the pawl 47 and is connected by the spring 75 with a fixed point 76 on the machine frame. This spring operates to constrain the members 49 and 51, between which a certain degree of relative motion is provided for by engaging a pin 77 on the latter in a slot 78 of suitable size in the former, to move to the right of Figures 1, 2, 3 and 4, such motion being secured by releasing the pawl from engagement with the notches in the member 37. Such release is secured by the downward motion of the carriage for the pressure roller, causing the pin 79 thereon to strike the end of the lever 72, thus causing it to be released from whichever of the said notches in which it was engaged. As the result of such release the link 49 and lever 51 take up the position indicated in Figures 1 and 3 and according to the position assumed by the feeler mechanism the pawl 47 will engage one or other of the notches 45 or 46 on the succeeding motion of the feed mechanism to feed forward a sheet and in consequence the raising of the carriage for the pressure roller to the full extent will be permitted or precluded according to whether or no a sheet has been fed forward and bridges over the gaps in the trip bar.

In order that the backing sheet of the stencil when it is freshly mounted on the machine may be printed on, for the purpose explained earlier in this specification, means are provided adapted to put the feeler device out of operation. For this purpose one arm of the feeler device is provided with a pin 80 engaging the slot 81 in the link 82 which by the pin 83 is eccentrically connected with

the disc 84 to which a lever 85 provided with a counterweight 86 is connected. By means of the pin 83 engaging the slot 87 the link 88 which is connected also by the spring 89 with the link 82, when the lever 85 is moved into the position illustrated in Figure 6 the feeler mechanism is put out of operation and the means adapted to permit or preclude the raising of the carriage for the pressure roller to the full extent is brought into the position indicated in the said figure, and consequently the pressure roller will be brought periodically into contact with the backing sheet.

In the normal operation of the machine the lever 85 will be in the position shown in Figure 5 when consequently the feeler mechanism will be in position to operate in the manner above described in detail.

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

1. A machine adapted to operate upon successive sheets of paper or like material which are fed forward between members designed simultaneously to contact with the sheet, comprising means adapted to accommodate a pile of sheets, means adapted to feed forward the topmost sheet of the pile, a trip bar adapted temporarily to restrain the fore edge of the sheet from forward motion and thereby to cause the sheet to buckle, means adapted to move the trip bar to release the fore edge of the sheet, and feeler mechanism associated with the trip bar adapted to permit or inhibit the bringing into the operative position of the members adapted simultaneously to operate upon the sheets which are fed according to the position assumed by the feeler mechanism.

2. A machine adapted to operate upon successive sheets of paper or like material, comprising members adapted to be brought to bear simultaneously upon opposite sides of a sheet fed between them, means adapted to accommodate a pile of sheets, means adapted to move the topmost sheet of the pile relatively to the other sheets thereof toward said members, a trip bar adapted temporarily to restrain the fore edge of the topmost sheet from forward motion, means adapted to actuate the trip bar to release the fore edge of the sheet and means coacting with the trip bar to permit or inhibit motion of the members designed simultaneously to contact with a sheet according to whether or no a sheet is located between the said members.

3. A machine adapted to operate upon successive sheets of paper or like material, comprising an impression-producing member and a platen member co-operating therewith, means adapted to accommodate a pile of sheets, means adapted to engage the topmost sheet of the pile and move the rear edge of said sheets in a forward direction, a trip bar adapted to restrain the fore edge of the sheet from corresponding motion, thereby causing the sheet to buckle, means adapted to actuate the trip bar to permit the fore edge of the sheet to move forward and rest upon said member, and feeler mechanism co-operating with the trip bar adapted according to whether or no it contacts with a sheet to permit or preclude the bringing together of the impression-producing member and the platen member.

4. A machine adapted to operate upon successive sheets of paper or like material comprising members adapted to be brought to bear simultaneously upon opposite sides of a sheet fed between them, means adapted to accommodate a pile of sheets, means adapted to move the topmost sheet of the pile relatively to the other sheets thereof toward said members, a pivotally mounted trip bar, a projecting lip on the trip bar adapted to be brought to bear on the topmost sheet of the pile of sheets to restrain the fore edge of the topmost sheet from forward motion, means adapted to oscillate the trip bar about the axes of its pivots to release the fore edge of the sheet and feeler mechanism co-operating with the trip bar adapted according to whether or no a sheet is supported on the trip bar to permit or preclude the bringing together of the members adapted to be brought to bear simultaneously on the sheet.

5. A machine adapted to operate upon successive sheets of paper or like material comprising an impression-producing member and a platen member adapted to be brought to bear simultaneously upon opposite sides of a sheet, means adapted to accommodate a pile of sheets, means adapted to engage the topmost sheet of the pile and move the rear edge of said sheet in a forward direction, a pivotally mounted trip bar, a projecting lip on the trip bar adapted to be brought to bear on the topmost sheet of the pile of sheets to restrain the fore edge of the topmost sheet from forward motion, means adapted to oscillate the trip bar about the axes of its pivots to release the fore edge of the sheet and feeler mechanism co-operating with the trip bar adapted according to whether or no a sheet is supported on the trip bar to permit or preclude the bringing together of the impression-producing member and the platen member.

6. A machine adapted to operate upon successive sheets of paper or like material comprising an impression-producing member and a platen member co-operating therewith, means adapted to accommodate a pile of sheets, to engage the topmost sheet of the pile and move the rear edge of the said sheet in a direction towards the impression member and the platen member, a pivotally

mounted trip bar having a lip adapted to be brought to bear on the face of the topmost sheet adjacent to the fore edge thereof and in this position to restrain the fore edge from forward motion, means adapted to oscillate the trip bar about the axes of its pivots to release the topmost sheet of the pile of sheets, feeler mechanism including a member having arms, a pivotal connection between said arms and some fixed point on the machine, means adapted to cause said member to move about its pivotal connections when the trip bar is actuated to release the fore edge of the topmost sheet of the pile and means associated with the feeler mechanism whereby according to the position assumed by the feeler mechanism the bringing together of the impression-producing member and the platen member will be permitted or precluded.

In testimony whereof I have signed my name to this specification.

JOHN CLATWORTHY.