J. E. WOODBURY.

SHEET FEEDING MACHINE.

APPLICATION FILED JULY 9, 1920.

1,374,130.

Patented Apr. 5, 1921.

4 SHEETS—SHEET 1.

Fig. 1

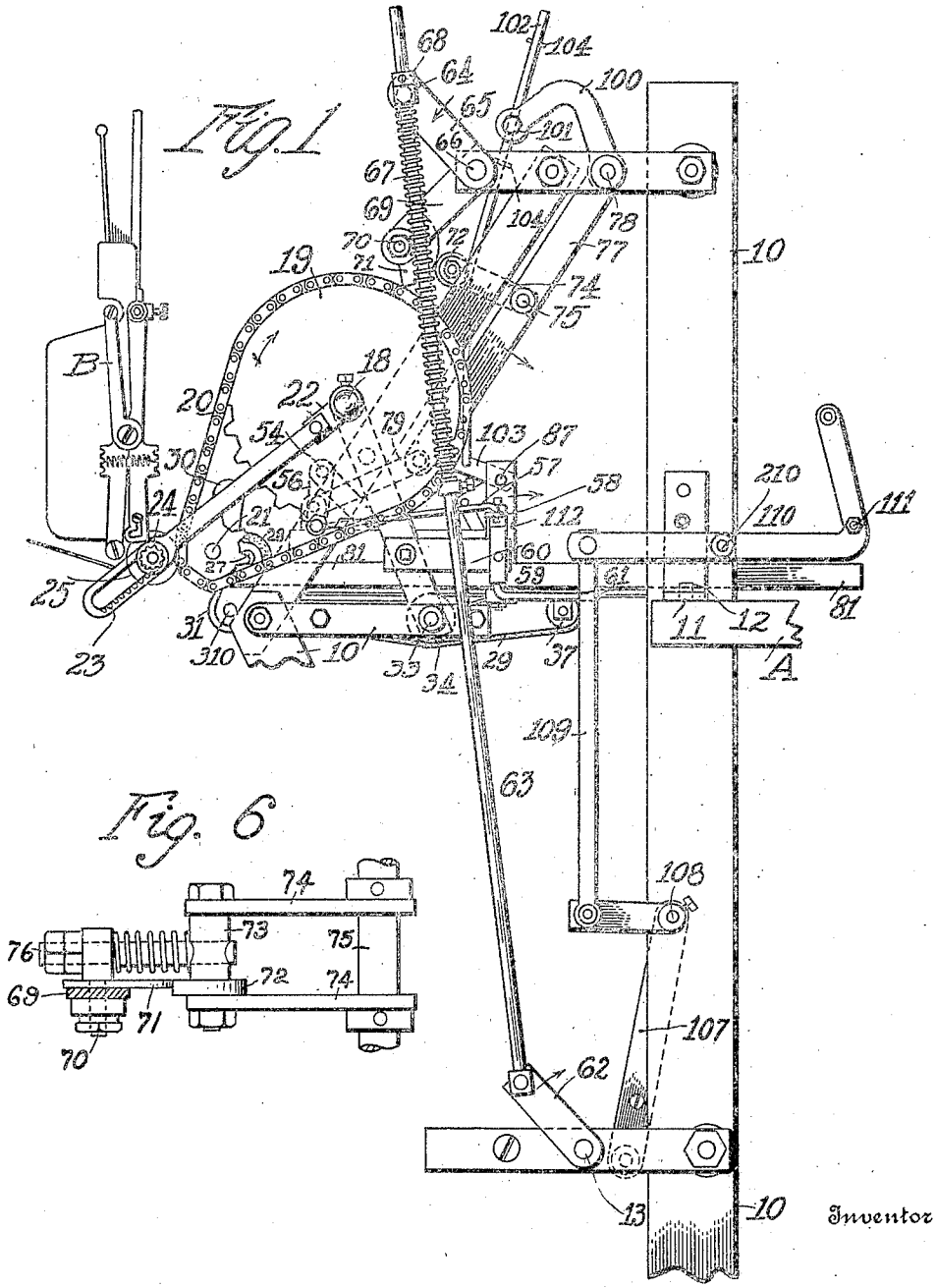


Fig. 6

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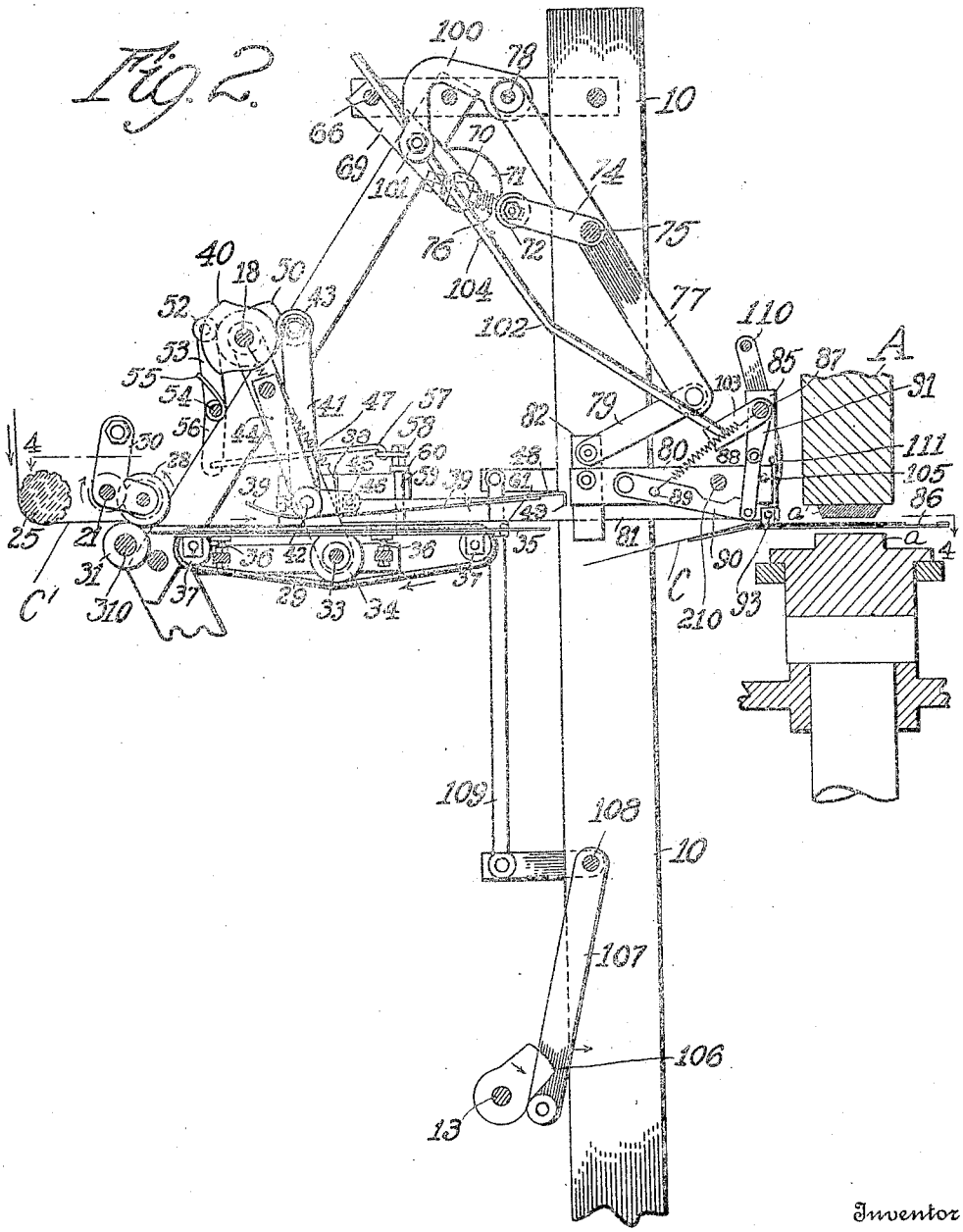
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4 SHEETS—SHEET 2.

Fig. 2.



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4 SHEETS—SHEET 3.

Fig. 3

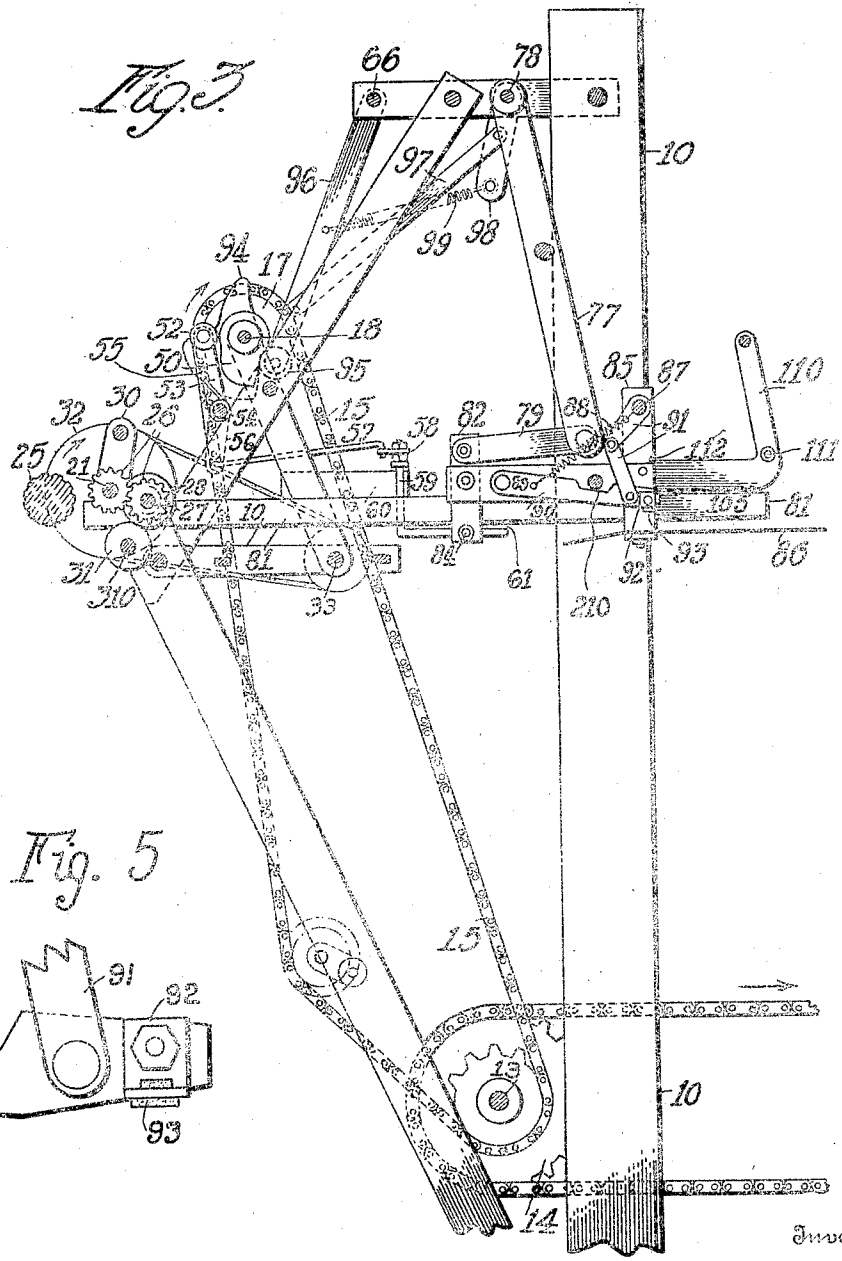


Fig. 5

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4 SHEETS—SHEET 4.

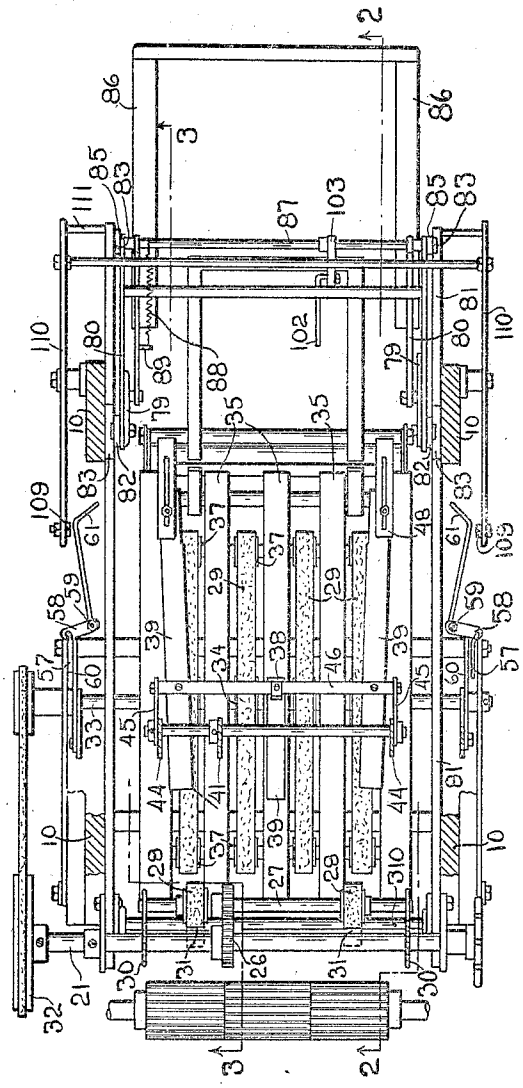


Fig. 4.

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UNITED STATES PATENT OFFICE.

JOHN E. WOODBURY, OF WORCESTER, MASSACHUSETTS.

SHEET-FEEDING MACHINE.

1,374,130. Specification of Letters Patent. Patented Apr. 5, 1921.

Original application filed October 26, 1916, Serial No. 127,960. Divided and this application filed July 9, 1920. Serial No. 395,107.

To all whom it may concern:

Be it known that I, JOHN E. WOODBURY, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Sheet-Feeding Machine, of which the following is a specification.

This is a division of my application for patent on automatic delivery for a die press, filed Oct. 26, 1916, Serial No. 127,960.

The principal objects of this invention are to provide a practical sheet feeding machine which can be applied to die printing presses of the type in which the die is inked and wiped automatically, and which can be used eventually as a link in a system in which sheets shall be fed mechanically to a machine of this type and then taken from it and placed in racks or the like, making automatic the entire routine operation of producing die stamped sheets, as for example letter headings; to provide for keeping the sheets separate, as is necessary in this class of printing; to provide feed grippers which will positively snap on and off, remaining locked in either position; to provide a novel combination of these and other features of the machine, including side and end registers, and means for feeding the sheets into the press, so as to necessitate the performance of the various functions in a positive and accurate manner throughout the operation of the machine.

Further objects and advantages of the invention will appear hereinafter.

Reference is to be had to the accompanying drawings, in which—

Figure 1 is a side view of a feeding device constructed in accordance with this invention and adapted to be applied to an ordinary die press detachably;

Fig. 2 is a sectional view on the line 2—2 of Fig. 4, showing the parts in another position;

Fig. 3 is a sectional view on the parallel line 3—3 in Fig. 4, showing the parts in a third position;

Fig. 4 is a sectional plan on the line 4—4 of Fig. 2, showing the parts in the position shown in Fig. 2;

Fig. 5 is an enlarged side view of the feeding-in gripper from the inside, and

Fig. 6 is a plan of part of the connections for operating the carriage.

Although cylinder and platen presses and similar types of printing machines are often provided with mechanical feeding devices, the die press of the above mentioned type is of such a nature that it is always fed by hand in practice and the sheets taken from it in the same manner, so that each sheet has to be handled twice by the operator. This is due to several reasons. On account of the very high pressure used in the printing, the press itself has to be of a heavy massive build, which reduces the opportunity to place the sheet in register and to hold it in place, and very much restricts the possible paths that the sheet may take in the operations of feeding in and withdrawing the same.

Referring now to the drawings, I will describe the mechanism shown herein, although it is to be understood that I do not limit myself to the particular features of construction herein shown and described.

The machine is shown in the drawings as having a stationary frame work 10, which is provided with brackets 11 by which it is supported on dowels 12 carried by an intaglio die press A, which is ordinarily fed by hand. The frame rests on these brackets, and its weight holds it against the press with no other support than that described.

The machine is provided with a main shaft 13, receiving power through a sprocket-wheel 14 located upon it, from the main shaft of the press or from any other suitable source. This main shaft, through a chain 15 and sprocket wheels 16 and 17, drives a parallel shaft 18 near the top of the frame which in turn is provided with a large sprocket wheel 19 and chain 20 driving a third shaft 21 also parallel with the other two.

The shaft 18 is provided with a crank 22 beyond the large sprocket wheel 19. The crank operates a sliding rack 23 and, by means of a pinion 24, drives a sheet-separating device B to deliver sheets therefrom under its rubber-surfaced grooved roller 25. This sheet-separating device is not described or illustrated in detail because it is not a part of this invention, a well-known machine being shown.

The shaft 21, by means of a pair of gears 26, drives a shaft 27 located closely adjacent thereto, on which are a pair of rubber rollers 28 for receiving the sheets from the sheet-feeding device and forcing them out

on the feed tapes 29. These rolls and the shaft on which they are mounted are carried by swinging brackets 30 pivoted on the shaft 21 and overhanging the same, so that they are held down against a pair of idler rolls 31 on parallel shaft 310 by gravity.

On the shaft 21 is a pulley 32 which, by means of a belt and pulley, drives another shaft 33, which is provided with rollers 34 thereon for driving the series of endless feed tapes 29, on which the sheets are delivered by the gravity rollers 28. These feed tapes are located between a series of slats 35 mounted in stationary position on stationary cross-bars which constitute part of the frame. They are connected with these cross bars by adjusting and supporting screws 36 and support idle rollers 37 carrying the tapes 29. These slats run beyond the ends of the tapes to support the front end of the sheet in the registering position. The tapes may be made of any suitable material. All the other mechanism of the machine is operated by the three shafts 13, 18 and 21.

On the shaft 18 is an end-register gage cam 40 which in its complete rotation oscillates an arm 41 and a shaft 42 to which it is fixed, the arm being provided with a roller 43 for engaging the cam. This shaft 42 is mounted in bearings on brackets 44 carried by studs 440 on the frame 10 and has a pair of arms 45 carrying a cross-bar 46. This is provided with an upwardly extending arms 38 from which a spring 47 is connected with the shaft 18 so as normally to hold up this cross bar 46 and the roller 43 yieldingly against the cam. The cross-bar 46 is provided with a plurality of sheet metal arms 39, which are upturned at their ends to guide the sheets of paper under them and are spaced above the slats 35. At their outer ends, two of these arms are provided with adjustable members 48 having downwardly extending hooked ends 49 constituting end gages for registering the sheets. It will be obvious that the cam 40 raises and lowers these end gages periodically.

The shaft 18 is also provided with a side-register gage cam 50 arranged to engage a cam roller 52 on an arm 53 fixed to an oscillating rod 54 carried by brackets 51 on the frame. A spring 55 coiled on this rod holds the roller toward the cam. This rod is provided with two radial fixed arms 56, which are connected by links 57 with arms 58 extending from two vertically oscillating rods 59 carried by brackets 60 on the frame. The bottom ends of these rods 59 are bent into horizontal position, and their ends are bent inwardly to form side registering gages 61. It will be obvious that the continued rotation of the cam 50 periodically moves these side gages simultaneously inwardly to register the paper sidewise.

The grippers which first grip the sheet and take it from the tapes will be described later on, as they constitute part of a mechanism which I will describe as a whole.

On the main shaft 13 is a carriage operating crank 62, which is pivotally connected with a rod 63 passing through a perforated lug 64 on an arm 65 fixed to the end of a shaft 66 carried at the top of the frame. This rod is provided with a spring 67 fixed to it and coiled around it and bearing against the bottom of the lug 64, and is provided with a collar 68 fixed to it above the lug to cause the arm 65 to move positively with it through a part of its motion.

On the shaft 66 is another arm 69 provided with a stud 70 fixed to it and having upon it a cam 71 provided with a concentric surface for engaging a roller 72 on a stud 73. This stud is carried by a pair of links 74 constituting a frame pivoted on a cross rod 75. This stud 73 is provided with a rod 76 projecting radially from it and having a spring upon it pressing against the stud 70. On the opposite side of this stud the rod has nuts tending to keep the roller against the cam 71 in all positions of the parts. This rod 75 is fixed to, and constitutes part of, a frame 77 which is pivoted on a rod 78 carried by the main frame 10. At its lower end, the two sides of this frame are connected with a pair of links 79, which are pivotally connected with two uprights 82 of a carriage 80 that slides on horizontal ways 81 supported by the machine frame. This carriage is provided with two pairs of uprights 82 and 85 carrying four supports 83 that ride on these tracks. The rear supports are pivoted and the front ones fixed. At the end of the carriage toward the sheet-separating device, two of these uprights 82 are provided with outwardly projecting studs 84 extending under the tracks to prevent this end of the frame from being lifted. It will be seen that the operation of the crank 62 reciprocates this carriage on its tracks.

At the end of this carriage toward the press, two of the uprights 85 are bent inwardly at the bottom near the front, and to them are riveted two members constituting a horizontal skeleton supporting frame 86 for supporting the sheet during part of its motion. These uprights 85 also carry a transverse shaft 87 to which a spring 88 is connected that is also connected with a pin or screw 89 on one of a pair of arms 90 pivoted to the carriage near the rear end of the same to assist in lifting these arms. The two arms are also connected with this shaft by two pairs of toggle levers 91, so that they necessarily move together. On the end of these arms they are provided with inwardly projecting plates 92 having rubber studs 93 upon them. These are adapted to come

down on the frame 88 and constitute feeding grippers for holding the paper and carrying it along with the carriage.

These toggle joints are operated by a feeding gripper cam 94 located on the shaft 18. This cam operates a roller 95 on a lever 96 pivoted on the shaft 66 and connected by a link 97 with an arm 98 on the shaft 78. This arm extends beyond the point at which it is connected with the link and is provided with a stud by which it is connected with the arm 96 through a spring 99 that keeps these two arms as near together as possible under its impulse. The shaft 78 is also provided with an arm 100 which has a headed stud 101 upon it that is perforated to receive a rod 102 pivoted at its lower end to an arm 103 on the shaft 87 to which the toggle levers are fixed. This rod is provided with two pins 104 above and below the stud and consequently is operated by the oscillation of this shaft toward the end of its motion in each direction, but is not operated by it at all through the intermediate part of its motion. This results in bringing the toggle levers down so as to hold the grippers 93 locked in their gripping position as the toggle joints are turned slightly beyond their straight position against stops 105. At the other end of its motion it pulls them back suddenly to fully-open position and they are held there against accidental closing.

On the shaft 13 there is a carriage lifting cam 106 which operates a spring-pressed arm 107 on a shaft 108 which, by means of arm and link 109, operates an oscillating frame 110 pivoted on a rod 210. This frame is provided with two inwardly extending pins 111 for the purpose of engaging in notches 112 on the uprights 85 and moving the reciprocating carriage transversely about the pivots of the rear supports 83 to bring the paper carried thereby into proper position in the press A to which the invention is applied and allow it to move up ahead of the die *a*, to prevent the soiling of the sheets.

The operation of the machine is as follows:—Starting with the parts in the position shown in Fig. 1, the rack 23 rises as the shaft 18 turns in the direction of the arrow and causes the feed roll 25 to feed the rear sheet of paper C out of the separating device under the rolls 28. The carriage 80 at this time goes to the extreme end of its stroke as indicated in Fig. 2, but let it be assumed that it does not carry a sheet as the machine is supposed to be just starting.

The continued rotation of the main shaft causes the sheet C to continue to feed out as the carriage starts back. The sheet having reached a position nearly under the front gages 49, these are lowered by the action of the cam 40 and the sheet C is end registered. These front or end gages engage its end and stop its continued motion forward, which at this time is not controlled positively but is caused by the operation of the tapes 29 on which it rests. It is stopped at this point, therefore, and all sheets coming into this position are thus brought to a definite position at this time.

As the main shaft continues to rotate the carriage comes back, and when its end uprights 85 have passed back of the side gages 61 the cam 50 acts to bring them in from the position shown in Fig. 4 so as to register the sheet at both sides and get it into a central position. As soon as this is accomplished, the carriage 80 now being in its extreme position at this end of the stroke, the gripper cam 94 acts to straighten out the toggle levers 91 and bring the feeding grippers 93 down into contact with the sheet and grip it to the flat frame 86 at a distance from its edges. Then the cam 40 raises the end gages, and the side gages draw back. The crank 62 on the shaft 13 now operates to pull down on the rod 63, positively moving the bell-crank 65—69, and causes the cam 71 to positively push the swinging arms 77 toward the press and take the carriage with it, also of course taking the sheet C. It is just at this instant that the next sheet C′ starts out of the sheet separating device.

Continuing this motion, the parts come to the position shown in Fig. 2, in which the first sheet C enters the press ready to receive the impression and the second sheet C′ gets well started out under the rolls 28. Just before the cam 71 turns so as to allow the roll 72 to drop from the high part of it, the uprights 85 come to their extreme position so that the pins 111 enter the notches 112 therein. This is shown in Fig. 2. Just at that instant the cam 106 pushes its cam roller out to the extreme end of its stroke and raises the frame 110 which carries the pins 111, thus lifting the end of the carriage about the pivots with which it is connected with the supports 83. Thus the sheet moves up against the counter *a′* just before the impression is made in the press. While the parts are in this position the second sheet C′ moves almost entirely out of the sheet-separating mechanism, and after the die moves away from the sheet the cam 94 comes around to a position to allow the spring 99 to pull the arm 100 up and thus draw up the rod 102 and break the toggles so as to raise the feeding in grippers and release the sheet C.

During the operation above described, the sheet C in the position shown in Fig. 2 as has been described, drops down at the rear into the open space that is now left between the sheet supports 35 and 86. It will be noted that the frame 86 is shorter than the sheet C and is bent down at its end so as to

let the end of the sheet drop down. So when the printing operation is completed and the sheet is released, this end projects down. The continued operation of the parts brings the second sheet up to printing position.

In this way it will be seen that the principle now used in hand feeding this class of machines is retained, namely, that one sheet is being fed into the press while another is being withdrawn; that the sheets are properly registered and positively gripped before the impression is made and the grip retained until impression is completed; that the rise of the die in making the impression in this type of die press is accommodated automatically by lifting the carriage. Furthermore a machine is provided in which the sheets are kept separate at all times, in which the feeding grippers positively snap on or off and remain locked in either position, in which the supports for the sheets are separated at the time of impression so as to allow the rear end of the sheet to drop down to a point at which it can be delivered by any desired kind of delivery.

It will be seen that this machine can be applied permanently to a die press as shown, although shown as detachably connected, and that it is so connected with it that it can serve as a link in an entirely mechanical plant in which the sheets are fed to the press, delivered, and then stacked up without hand operation of any kind.

Although I have illustrated and described a single form of the machine and shown it as adapted for a die-press of a particular type, I am aware of the fact that many modifications can be made in the construction and arrangement of parts, and that it will be designed differently when applied to die presses of other constructions. Therefore, I do not wish to be limited in these respects, but what I do claim is:

1. The combination with a die press, of means for conveying sheets, means for side and end registering the sheets, means for positively gripping the sheets after being registered and then advancing them to the press, means operated from the press for operating the registering, conveying, and gripping means, and means for moving transversely the conveying and gripping means.

2. In a machine of the character described, the combination with a die press, of a movable paper feeding carriage having a frame for transferring the sheet to the press in position for impression and leaving it with the rear portion of the sheet that is not to be printed extending therefrom in position to be engaged by a delivering means, and means for moving the carriage back toward receiving position after the impression is made and the sheet released and while said projecting part of the sheet remains in the position set forth.

3. In an automatic feeding machine for a die press, the combination of a feed table having means for holding a sheet in register and having a fixed position with relation to the space occupied when the impression is made, with means for positively transferring the sheet horizontally all the way from the feed table to the printing position on the press, so arranged with relation to each other that the feed table and transferring means coöperate to leave the sheet in a horizontal printing position with the end projecting from the plane of the main portion of the sheet so as to be easily removed by a delivery mechanism.

4. The combination with a die press, of means for conveying sheets toward the press in a straight line, means for side and end registering the sheets during their travel, means for positively gripping the sheets and advancing them to the press, means for withdrawing the side register gages sidewise, means for withdrawing the end register gages, means operated from the press for running the registering, conveying, and gripping means, and means for moving transversely the conveying and gripping means when a sheet is presented to the press.

5. The combination of means for registering the sheets, means for positively gripping them at a distance from their edges and advancing the sheets, means for operating the gripping means to locate the sheets in the press as the impression is made, and stationary means for supporting the sheets until they are gripped.

6. The combination with a die press, of means for conveying sheets, means for positively gripping the sheets and advancing the sheets to a press, means for moving the gripping means to change the elevation of the sheets in the press as the impression is made, and stationary means for supporting the sheets until they are gripped, the advancing means having a supporting frame for the sheets after they are gripped and adapted to hold the forward ends of the sheets.

7. In a machine of the character described, the combination of means operated to move the sheets along, a carriage movable over said means, means for moving said carriage forward to feed the sheets, and a sheet supporting frame adapted to hold up the front end of a sheet movable with the carriage to a position to allow the rear end of the sheet to drop between it and the end of said means.

8. In a machine of the character described, the combination of a series of feed tapes operating to move the sheets along, a carriage movable over said feed tapes, means for moving said carriage forward to

feed the sheets off the tapes, and a sheet supporting frame adapted to hold up the front end of a sheet movable with the carriage to a position to allow the rear end of the sheet to drop between it and the ends of the feed tapes.

9. In a machine of the character described, the combination of a carriage, grippers thereon arranged to grip sheets at a distance from their edges, and means for moving the carriage forward to feed the sheet.

10. In a machine of the character described, the combination of a feeding device for feeding sheets forward, a carriage reciprocable over said device and having grippers thereon for gripping a sheet at a distance from the edges and moving it therefrom with the carriage, a track for supporting the carriage, a shaft, a cam on said shaft, means for transmitting motion from the cam, a bell-crank construction operated by the cam and a side gage connected with the bell-crank to be moved thereby.

11. In a machine of the character described, the combination of a feeding device for feeding sheets forward, a carriage reciprocable over said device and having grippers thereon for gripping a sheet and moving it therefrom with the carriage, a track formed of two members on opposite sides of said feeding device for supporting the carriage, a shaft, a cam on said shaft, an oscillatable rod parallel with the shaft having means thereon for transmitting motion from the cam thereto to oscillate it, said rod having an arm, a bell-crank construction connected with and operated by the arm, and a side gage connected with the bell-crank to be moved thereby.

12. In a machine of the character described, the combination of a carriage, grippers for gripping a sheet and moving it with the carriage, a track for supporting the carriage, a shaft, a cam on said shaft, an arm, a pair of members having their rear ends up-turned to guide a sheet of paper beneath them, end gages, and means for lifting said end gages.

13. In a machine of the character described, the combination of a feeding device for feeding sheets forward, a carriage reciprocable over said device, grippers for gripping a sheet and moving it with the carriage, a track for supporting the carriage, a shaft, a cam on said shaft, an oscillatable rod parallel with said shaft having an arm fixed thereon adapted to be operated by the cam, a bar parallel with said rod and fixed thereto to move therewith, a pair of members located on and movable with said bar and arranged longitudinally having their rear ends up-turned to guide a sheet of paper beneath them, end gages mounted on the ends of said bars, and a spring for lifting said end gages and holding the arm in contact with the cam.

14. In a machine of the character described, the combination of a carriage having grippers thereon for gripping a sheet, means for moving said carriage forward to feed the sheets, a shaft, a bell-crank construction operated by said shaft having a cam, an oscillatable frame provided with a roller which said cam engages to oscillate the frame, and a spring holding the roller away from the low part of the cam, said carriage being connected with said oscillatable frame to be operated thereby.

15. In a machine of the character described, the combination of a sheet supporting device, a carriage movable over said supporting device and having grippers thereon for gripping a sheet supported thereby, means for moving said carriage forward to feed the sheets off the supporting device, a shaft, a crank thereon, a bell-crank construction operated by said crank having a cam, a rod connected thereto, said cam having a high concentric portion, an oscillatable frame provided with a roller which said cam engages to oscillate the frame, and a spring on said rod holding the roller away from the low part of the cam, said carriage being connected with said oscillatable frame to be operated thereby.

16. In a machine for the character described, the combination with a feeding device for the sheets, of a pair of tracks arranged adjacent thereto, a carriage mounted to move on said tracks, an oscillatable frame, means connected with said frame for reciprocating the carriage on its tracks, a pair of toggle levers mounted on said carriage having a gripper, and means independent of the carriage operating means for turning said toggle joint to open and closed position.

17. In a machine of the character described, the combination of a carriage, a pair of toggle levers mounted on said carriage having a gripper, a shaft having a cam, an oscillatable arm, a parallel shaft having an arm fixed thereto, a spring connected with both arms and adapted to pull the arms together and hold the first named arm against its cam, a link also connecting said arms, and means connected with the second shaft for operating the toggle joint independently of the carriage.

18. In a machine of the character described, the combination of a feeding device for the sheets, a pair of tracks arranged adjacent thereto, a carriage mounted to move on said tracks, an oscillatable frame, means for oscillating said frame, pivots on said carriage connected with said frame for reciprocating the carriage on its tracks, a pair of toggle levers mounted on said car-

riage having a gripper, a shaft having a cam, an oscillatable arm, a parallel shaft having an arm fixed thereto, a spring connected with both arms and adapted to pull the arms together and hold the first named arm against its cam, a link also connecting said arms, and means connected with the second shaft for operating the toggle joint independently of the carriage.

19. In a machine of the character described, the combination with a feeding device for the sheets, an oscillatable frame, means for oscillating said frame, means connected with said frame for reciprocating the carriage on its tracks, two pairs of toggle levers mounted on said carriage having grippers at their ends, a shaft having a cam, an oscillatable arm, a parallel shaft having an arm fixed thereto and connected with the first named arm by a spring adapted to pull the arms together and hold the first named arm against its cam, a link also connecting said arms, another arm on the second shaft having a perforated stud, a rod slidable through the perforation thereof and having stops on opposite sides of the stud, whereby when the last named arm moves toward its limiting position it will reciprocate the rod, and means connected with the rod for operating the toggle joints.

20. In a machine of the character described, the combination with a die press and a feeding device for the sheets, of a pair of tracks arranged adjacent thereto, a carriage mounted to move on said tracks, an oscillatable frame, means for oscillating said frame, means pivoted on said carriage and connected with said frame for reciprocating the carriage on its tracks, a pair of toggle levers mounted on said carriage having a gripper, means independent of the carriage operating means for operating said toggle levers to open and closed position, and means for swinging said carriage upwardly about said pivots at the end of its stroke to raise the sheet in the press while the sheet is held by the grippers and supported by the carriage.

21. In a machine of the character described, the combination with a die press and a feeding device for the sheets, of a carriage, means for reciprocating the carriage, a pair of toggle levers mounted on said carriage having a gripper, means for operating said toggle levers to open and closed position, and means for swinging said carriage at the end of its stroke to change the elevation of the sheet in the press while the sheet is held by the grippers and supported by the carriage.

22. In a machine of the character described, the combination with a die press, of a pair of tracks, a carriage mounted to slide toward and from the press on said tracks, said carriage having a pair of uprights at its end most remote from the press, supports pivoted to said uprights and resting on the tracks, means on the carriage for gripping a sheet and moving it with the carriage, and means for turning the front end of the carriage about the pivoted supports at the opposite end.

23. In a machine of the character described, the combination with a die press, of a pair of tracks, a carriage mounted to slide toward and from the press on said tracks, supports pivoted to said carriage and resting on the tracks, means on the carriage for gripping a sheet and moving it with the carriage, a movable frame having a projecting pin, said carriage having a notch in the end thereof adapted to engage said pin when the carriage moves forward, and means for raising said frame to move the pin and end of the carriage upwardly.

24. In a machine of the character described, the combination of a paper feeding carriage having a frame at its forward end for supporting the front end of a sheet, said frame being open at the rear and being adapted to allow the rear end of the sheet to hang down from it into position to be received by a delivering means.

25. The combination with a die printing press, of a paper feeding carriage therefor having a frame for supporting the front end of a sheet, said frame being open at the rear so as to allow the rear end of the sheet to project from it when the sheet is in the press in position to be engaged by a transversely operating delivering means.

In testimony whereof I have hereunto affixed my signature.

JOHN E. WOODBURY.