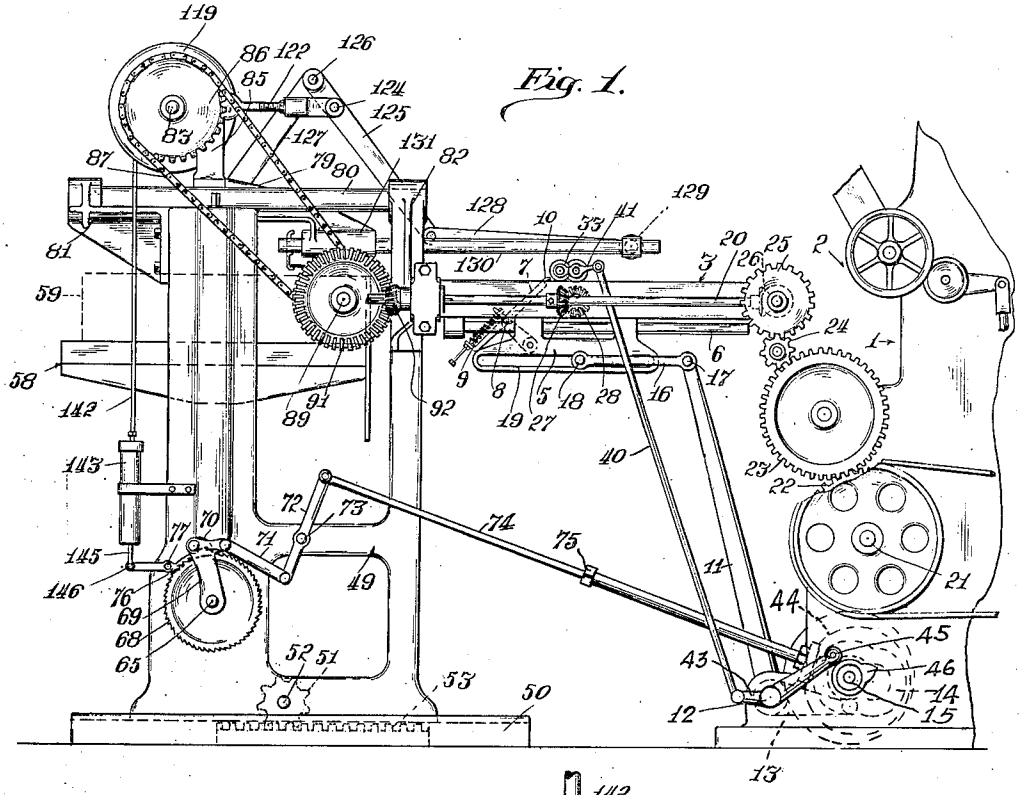
May 12, 1931. J. A. JOHNSON ET AL. 1,805,246

FEEDING DEVICE FOR PRESSES

Filed Nov. 10, 1924 4 Sheets-Sheet 1

Fig. 1.



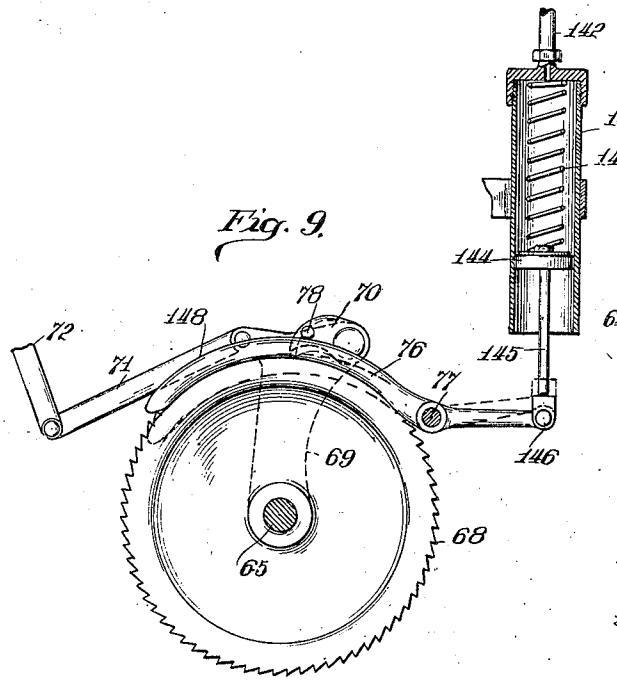
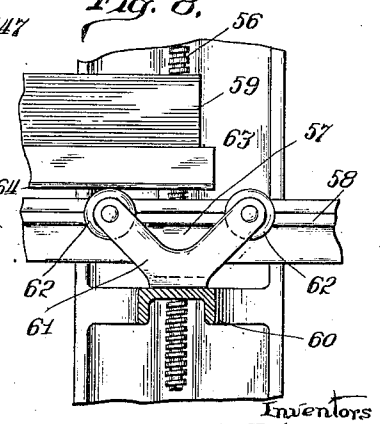


Fig. 9.

Fig. 8.



Inventors
and Joseph A. Johnson
George W. Chalmers
By Barnett & Truman
Attorneys

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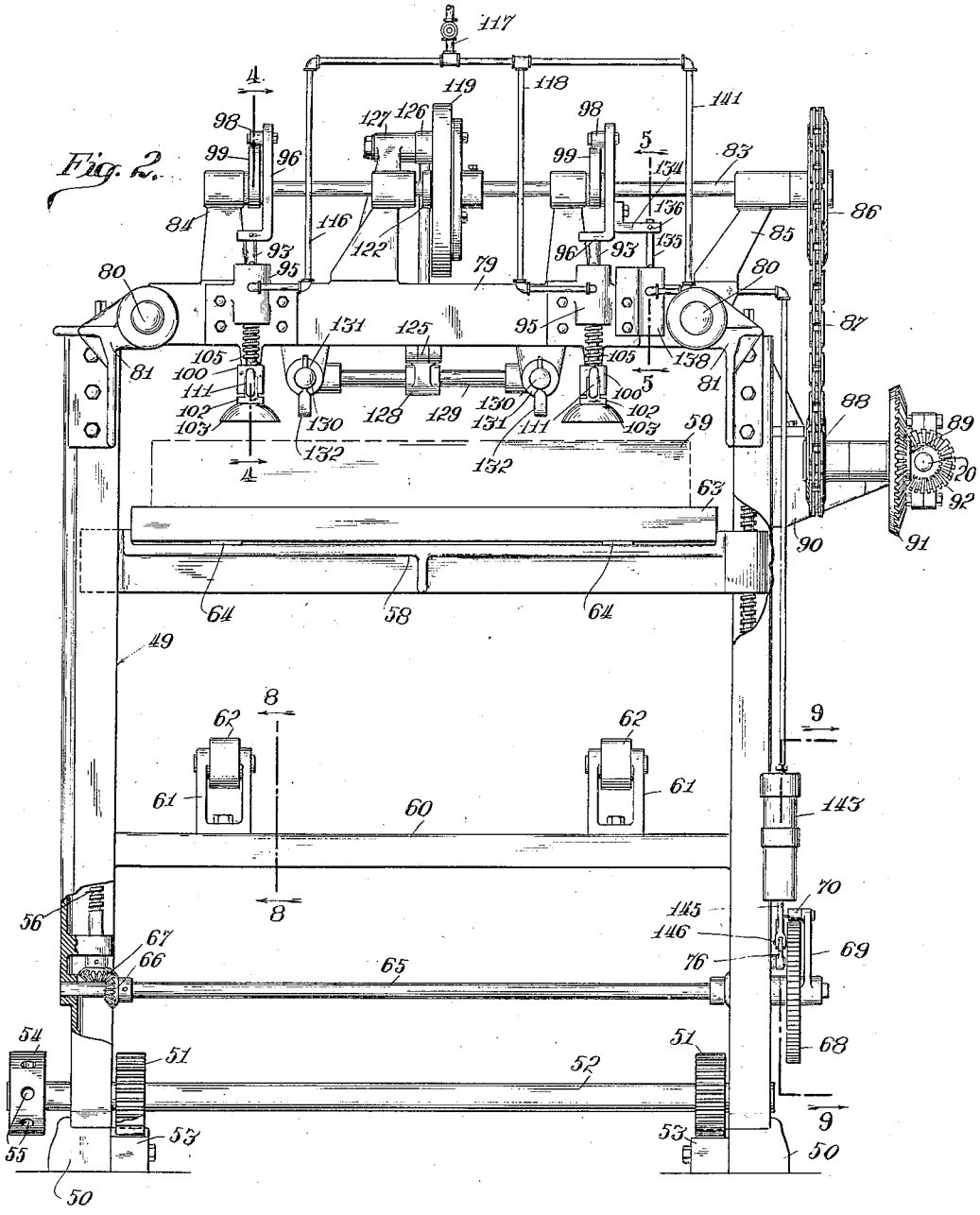
FEEDING DEVICE FOR PRESSES

Filed Nov. 10, 1924 4 Sheets-Sheet 2

Fig. 2.



Inventors.

Joseph A. Johnson

and

George W. Chalmers

By Barnett & Truman

Attorneys

May 12, 1931. J. A. JOHNSON ET AL 1,805,246

FEEDING DEVICE FOR PRESSES

Filed Nov. 10, 1924 4 Sheets-Sheet 3

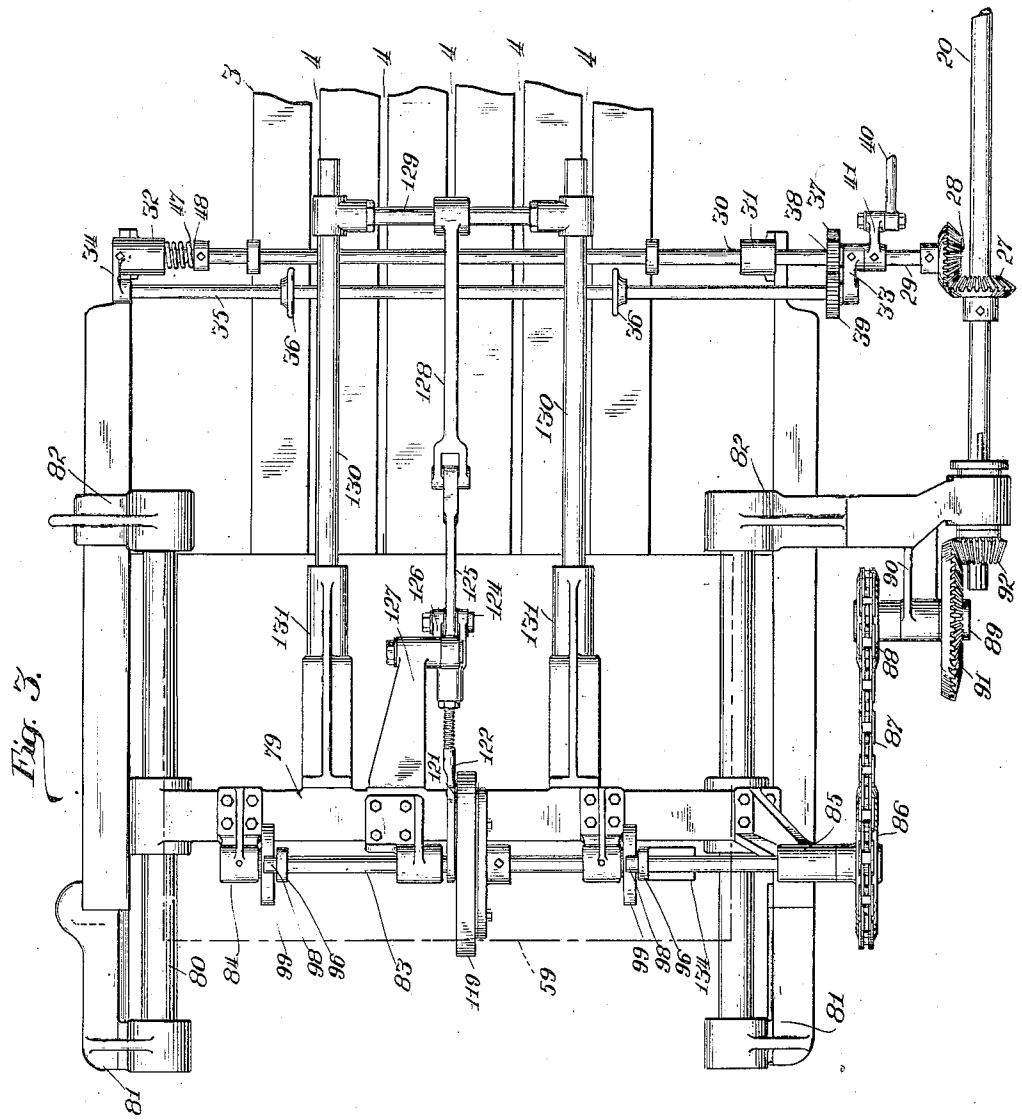


Fig. 3.

Inventors.
Joseph A. Johnson
and George W. Chalmers
By Barnett & Truman
Attorneys

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FEEDING DEVICE FOR PRESSES

Filed Nov. 10, 1924 4 Sheets-Sheet 4

Fig. 4.

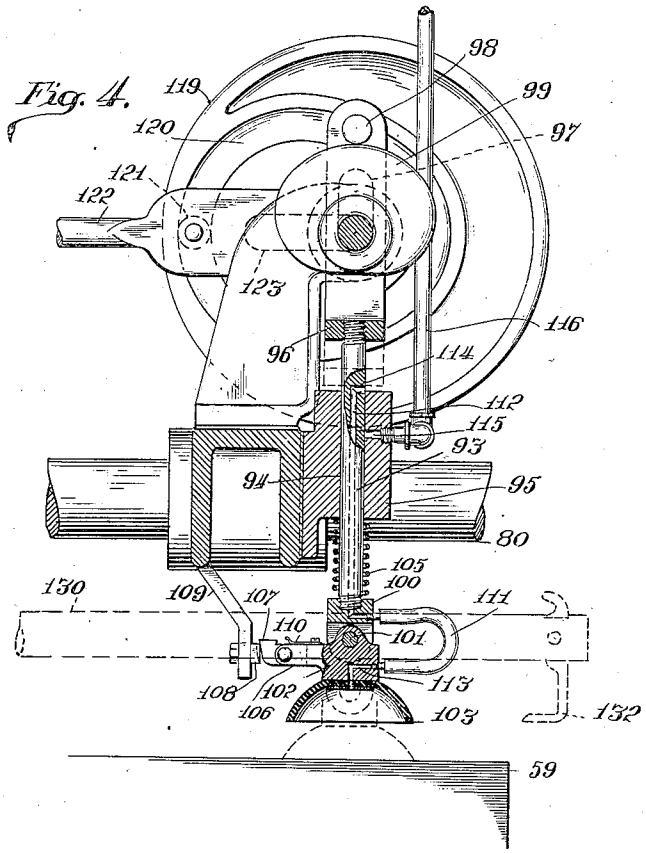


Fig. 5.

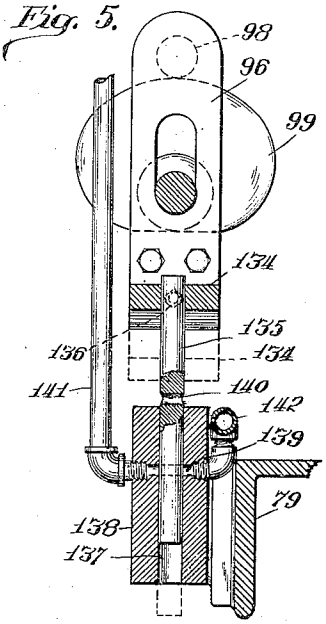


Fig. 7.

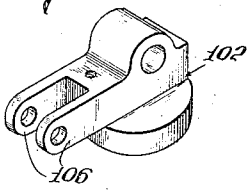
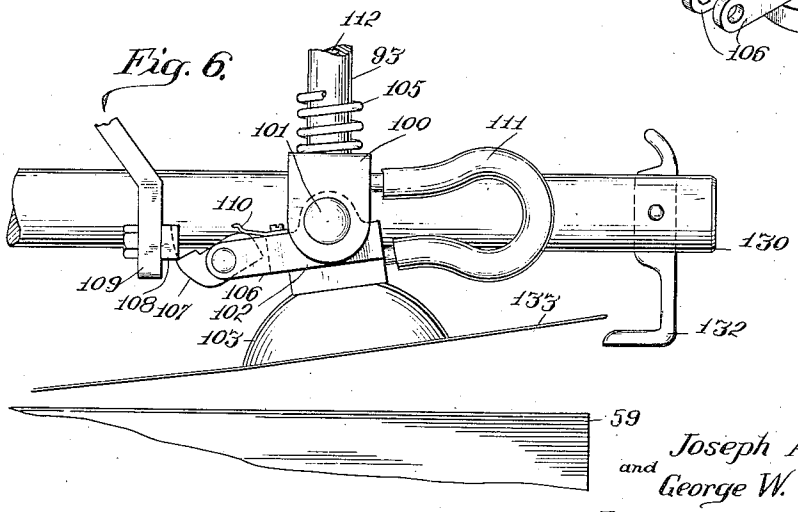


Fig. 6.



Inventors
Joseph A. Johnson
and
George W. Chalmers
By Barnett & Truman
Attorneys

Patented May 12, 1931 1,805,246

UNITED STATES PATENT OFFICE

JOSEPH A. JOHNSON, OF CHICAGO, AND GEORGE W. CHALMERS, OF SUMMIT, ILLINOIS, ASSIGNORS TO INTERNATIONAL PATENTS DEVELOPMENT COMPANY, OF WILMINGTON, DELAWARE, A CORPORATION OF DELAWARE

FEEDING DEVICE FOR PRESSES

Application filed November 10, 1924. Serial No. 749,088.

This invention relates to a feeding device for a press, and more particularly to an apparatus for feeding the flat sheet metal blanks, from which cans or other containers are subsequently made, into a printing press, where designs, or legends, are printed upon the metal sheets. Often a plurality of containers are made from a single sheet, in which case the several blanks for the containers subsequently to be made are simultaneously printed by a single printing operation. As is usual in these printing processes, the sheet blanks are stacked at one side of the press, and the sheets are fed into the press one by one.

The main object of this invention is to provide a new and improved machine for automatically feeding these sheets, one by one, into the press at desired intervals.

A further object is to provide an improved apparatus for lifting the sheets, one by one, from the stack, and then moving the lifted sheet laterally towards the press.

A further object is to provide an improved means for projecting this sheet, at the proper time, into the press.

A further object is to provide an improved means for automatically raising the stack of sheet blanks when necessary, so that the level of the uppermost sheet will remain substantially constant.

A further object is to provide an improved means for facilitating the positioning of a new stack of sheet blanks in this feeding mechanism.

A further object is to provide a machine of the type outlined above, which is capable of adjustment to handle sheets of various sizes.

The above, and other objects and advantages of this invention will be apparent from the following detailed description of one approved form of apparatus involving the principles of this invention.

In the accompanying drawings:

Fig. 1 is a side elevation of the feeding apparatus, and a portion of the press with which it cooperates.

Fig. 2 is an end view of the feeding apparatus on a larger scale, the view being taken looking from the left at Fig. 1.

Fig. 3 is a plan view of the feeding apparatus, on substantially the same scale as Fig. 2.

Fig. 4 is a vertical section on an enlarged scale, the view being taken substantially on the line 4—4 of Fig. 2.

Fig. 5 is a vertical section on an enlarged scale, taken substantially on the line 5—5 of Fig. 2.

Fig. 6 is an enlarged detail view illustrating the operation of tilting the vacuum cup and the sheet carried thereby.

Fig. 7 is a detail perspective of a portion of the pivotal mounting for the vacuum cup.

Fig. 8 is a vertical section taken substantially on the line 8—8 of Fig. 2, showing the sheet supporting carriage in its extreme lower position, and a new stock of sheets being positioned within the machine.

Fig. 9 is a vertical section on an enlarged scale, taken substantially on the line 9—9 of Fig. 2.

At 1 is shown a portion of the printing press, of any usual type, the blanks or sheets being fed in between the platen and the printing roller at 2. The sheets are slid into position within the press along the upper surface of a stationary slide table 3, provided with a series of longitudinal slots 4.

Beneath stationary table 3, a carriage 5 is slidable toward and from the press along guide rods 6. A plurality of yieldably mounted fingers 7, on carriage 5, project upwardly through the slots 4. As here shown, each finger 7 may swing downwardly about its pivot 8, against the action of springs 9, to allow one of the sheets to be passed thereover along table 3 from the left of Fig. 1, but when the sheet has moved past these fingers 7, the springs 9 will move the upper ends 10 of the fingers up to the position shown in Fig. 1, whereby they will engage behind the rear edge of the sheet and push the sheet into the press when the carriage 5 is moved towards the right. An upwardly extending lever 11 is pivoted in the press at its lower end 12, and has a laterally extending arm 13, the end 13′ of which engages a slotted cam 14 on rotary shaft 15 driven from the press operating mechanism. As shaft 15 is con-

tinuously rotated the lever 11 will be oscillated back and forth at proper intervals, by the engagement of cam 14 with arm 13. A link 16 is connected at one end 17 with the upper end of lever 11, and is adjustably connected at its outer end 18 in a slot 19 in the end of carriage 5. By the means just described the carriage 5 is moved towards the press to push a sheet into printing position. The carriage 5 is returned to its initial position, as shown in Fig. 1, by a spring, not here shown.

A horizontal shaft 20, mounted along one side of table 3, is constantly rotated from drive shaft 21 of the press, through the train of spur gears 22, 23, 24 and 25, and the beveled gears 26. A bevel gear 27 adjustably mounted on shaft 20 meshes with and drives a bevel gear 28 on the end of a shaft 29 extending transversely beneath table 3. A rock-shaft 30 is mounted in bearings 31 and 32 above table 3. A pair of crank arms 33 and 34 secured to shaft 30 carry a constantly rotating shaft 35, on which are mounted rollers 36 adapted to engage the metal sheet and push same along the top of table 3, towards the right (see Fig. 3). Shaft 35 and rollers 36 are constantly rotated from shaft 29 through gear 37 on shaft 29, gear 38 mounted loosely on shaft 30, and gear 39 secured to shaft 35. A link 40 is connected at its upper end with crank arm 41 secured on shaft 29, and at its lower end with a lever 43 intermediately pivoted at 12 in the press frame, lever 43 carrying at its other end a roller 45 engaging with cam 46 on shaft 15. As shaft 15 constantly rotates, the cam 46 will intermittently operate the system of levers and links 43, 40, 41, 33, and 34, to lift the shaft 35 and rollers 36 away from table 3 against the resistance of torsion spring 47 secured at one end to bearing 32 and at its other end to a collar 48 on rock-shaft 30. Spring 47 normally tends to hold the rollers 36 down into driving relation with one of the metallic sheets which may be placed upon the table 3. In the operation of this portion of the mechanism, a sheet or blank will be laid upon table 3 with its forward edge beneath the lifted rollers 36 and when these rollers are lowered by spring 47 they will push the sheet toward the press until the rear edge of the sheet has passed beyond the upper ends 10 of fingers 7, which will then spring up to engage behind the sheet. Carriage 5 and fingers 7 will then be moved towards the press to push the sheet into printing position, and rollers 36 will be elevated prior to the engagement with the next following sheet. The cams 14 and 16 on shaft 15 are so proportioned and timed as to cause these movements of rollers 36 and fingers 7 in the proper sequence.

The apparatus now to be described operates to deliver the sheets or blanks, one by one, into position beneath the feed rollers 36. A standard or housing 49 rests at its lower end on tracks or slideways 50, and the housing may be adjusted toward or from the press by means of pinions 51 on shaft 52, journaled in the lower portion of housing 49, the pinions meshing with stationary racks 53 secured to the inner side of tracks or rails 50. The rack and pinion adjusting mechanism is manipulated by means of wheel 54 secured to one outer end of shaft 52, the wheel 54 being provided with a peripheral series of holes 55. By placing a rod or other suitable tool in any one of the holes 55, the desired rotation may be imparted to pinion shaft 52. Normally the housing 49 remains in fixed position upon the rails 50.

A pair of vertical screw shafts 56 are mounted at the opposite sides of housing 49, and mesh within nuts 57 at the two sides of a carriage or support 58, for the stack of sheets or blanks indicated at 59. On a cross beam 60 in housing 49 are mounted brackets 61, each carrying a pair of rollers 62, as best shown in Fig. 8. The support or carriage 58 is of open construction, so that when in its extreme lowered position the rollers 62 will be allowed to project up through and above the upper surface of the carriage, as shown in Fig. 8. When a new stack 59 of the metal sheets or blanks is to be placed within the apparatus, they will usually be brought up on a suitable truck already stacked upon a supporting base or plate 63. The stack 59 and base 63 will then be shoved in from the truck onto and over the rollers 62. Preferably the supporting base 63 is provided with a pair of metal wear strips 64 for engagement with the rollers 62. When carriage 58 is elevated it will lift the base 63 and stack 59 away from rollers 62 as shown in Fig. 2. A cross shaft 65 mounted in the lower portion of housing 49, carries bevel gears 66 meshing with bevel gears 67 at the lower ends of screw shaft 56. One outer end of shaft 65 carries ratchet wheel 68. A swinging arm 69 mounted loosely on the outer end of shaft 65, carries pawl 70 which engages with ratchet 68 to rotate shaft 65 when moved in the direction of the arrow Fig. 9. A link 71 connects the swinging pawl carrier 69 with one end of a lever 72 intermediately pivoted at 73 on the outer side of housing 49. A link 74 adjustable in length at 75, connects the other end of lever 72 with an eccentric 44 on shaft 15 in the press whereby link 74 is constantly reciprocated back and fourth. By means of the mechanism just described the screws 56 would be constantly driven to feed the carriage 58 and stack of sheets 59 upwardly, were it not for the pawl-lifter 76, intermediately pivoted at 77 on standard 49, and engageable with pins 78 on pawl 70 to lift the

pawl out of engagement with the ratchet 68. Mechanism hereinafter described, and controlled by the sheet lifting and feeding mechanism, is provided to move the pawl lifter 76 at desired intervals and thereby lift pawl 70 out of engagement with ratchet 68 or allow the pawl to again fall into engagement with this ratchet.

An upper carriage 79 is adjustably mounted on horizontal guide rods 80 mounted in brackets 81 and 82 at the top of housing 49. A rotary horizontal shaft 83, extending transversely of the apparatus, is mounted in upstanding brackets 84 and 85 on carriage 79. A sprocket wheel 86 on one end of shaft 83 is driven through sprocket chain 87 from a sprocket 88 on short-shaft 89 mounted in bracket 90 near the front of housing 49. A bevel gear 91 on the other end of shaft 89 meshes with and is driven by a bevel pinion 92, keyed near the end of horizontal drive shaft 20 hereinabove described. It will thus be seen that the shaft 83 is constantly rotated from the driving mechanism of the press through the train of gears already described for rotating shaft 20, bevel gears 92 and 91, sprockets 88 and 86, and sprocket chain 87.

A pair of similar devices mounted on carriage 79 and actuated from rotary shaft 83 are employed to lift at intervals the top sheet from the stack of sheets 59. Since these two devices are substantially identical with one another, and one might be sufficient in some machines, we will describe a single unit with the understanding that the other unit is substantially identical therewith. A plunger 93 has a sliding fit within a vertical passage 94 in bracket 95 mounted on one side face of carriage 79. At the upper end of plunger 93 is mounted a yoke 96 having a vertical slot 97 positioned about shaft 83, and carrying at its upper end a pin or roller 98 engaging with the periphery of a cam 99, mounted on shaft 83. At the lower end of plunger 93 is mounted yoke 100, in which is pivoted at 101, the block 102, carrying on its lower face the vacuum cup 103. An expansion spring 105 is mounted around plunger 93 between the bracket 95 and the yoke 100. This spring tends to move the plunger 93 and parts carried thereby downwardly as far as will be permitted by the engagement of pin or roller 98 with the periphery of cam 99. As the cam 99 is continuously rotated by shaft 83, the plunger 93 and vacuum cup 103 carried thereby will be intermittently raised against the action of spring 105 and then lowered by this spring into engagement with the uppermost sheet in stack 59. Between the pair of ears 106 on the cup-carrying block 102, is pivoted the spring-pressed finger 107, which comes into engagement with lug 108 on bracket 109 extending downwardly from carriage 79, when the plunger 93 and cup 103 are moved upwardly. At such time, after the block 102 and cup 103 and the sheet carried thereby have been tilted to a predetermined extent, as shown in Fig. 6, spring 110 mounted on block 102 and bearing against the upper rear portion of finger 107, will allow this finger 107 to move about its pivot sufficiently to snap past the lug 108, so that block 102 and cup 103 may return to their original horizontal positions. A flexible pipe coupling 111 connects a passage 112 formed within the plunger 93 with a passage 113 formed in block 102 and communicating with the interior of vacuum cup 103. The resiliency of coupling 111 is sufficient to allow the cup to be tilted as indicated in Fig. 6, and also to return the cup positively to its original horizontal position when the finger 107 has snapped past the lug 108. At its upper end passage 112 leads out through one side of the plunger as indicated at 114. When the plunger is in its extreme elevated position, this passage 114 will be in communication with the open air above the bracket 95 as indicated in Fig. 4. When the plunger is in extreme lower position, with the cup 103 in contact with the uppermost sheet of stack 59, (as indicated in dotted lines Fig. 4), passage 114 will be in communication with a lateral passage 115 in bracket 95, from which passage 115 leads a pipe 116, connected with the pipe 117, which is in communication with a vacuum pump or other exhausting apparatus. A similar pipe 118 leads from pipe 117 to the other lifting unit.

A large cam 119, mounted on a central portion of rotary shaft 83, has a cam slot 120 in which travels a pin or roller 121 on push rod 122, the end of which has a guide slot 123 operating about shaft 83. The other end of rod 122 is pivoted at 124 to a lever 125 pivoted at its upper end 126 to a bracket 127 extending upwardly and outwardly from carriage 79. The other end of lever 125 is connected through link 128 with a cross rod 129 connecting the forward ends of a pair of slide rods 130, slidable through bearings in brackets 131 extending from the lower portion of carriage 79. A hook 132 is secured in the rear end of each rod 130 in position to engage under the rear up-tilted edge of the uppermost sheet 133, which has been lifted from stack 59 by vacuum cups 103.

In the operation of this lifting and sheet-projecting mechanism, as the shaft 83 is continuously rotated the cams 99 will permit the springs 105 to lower the plungers 93 and vacuum cups 103 until the cups are in engagement with the uppermost metal sheet or blank on stack 59. At this time passages 114 will come into communication with passages 115 so that the air will be exhausted from vacuum cups 103 and the sheet 133 will be held to these cups by atmospheric pressure. As the

plungers 93 are now raised by the further rotation of cams 99, the passages 114 will be moved out of communication with passages 115, but not immediately into communication with the open air, so that cups 103 will remain exhausted and the sheet 133 will be lifted by these cups 103 as they move upwardly. When fingers 107 engage with the lugs 108, the cups 103 and consequently the lifted sheet 133 will be tilted as shown in Fig. 6. This will raise the rear edge of sheet 113 into position to be engaged by hooks 132. About this time the passages 114 will come into communication with the open air above the bracket 95 and release the vacuum within the cups 103. Simultaneously the fingers 107 will snap past the lugs 108 and permit the cups 103 to be returned to their original horizontal position by the flexible couplings 111. In the meantime the hooks 132 will have been moved forward by the system of links and levers previously described and operated from cam 119, so that these hooks have engaged under the rear edge of sheet 133 so as to support the same and positively slide this sheet from stack 59 and along the table 3 until the forward edge of the sheet is in position to be engaged by the feed rollers 36 when they are next swung downwardly as heretofore described. The hooks 132 will then return to their original position before the next sheet is lifted from pile 59 in the following cycle of operations.

As best shown in Fig. 5, a bracket 134 extends outwardly from one side of one of the yokes 96, so as to travel up and down therewith. A plunger 135 is adjustably secured by set screw 136 in bracket 134, the plunger having a snug sliding fit within a vertical passage 137 in a bracket 138 mounted at the side of carriage 79. A horizontal passage 139 formed in the bracket 138 is normally closed by the plunger 135, but when this plunger 135 is sufficiently lowered, a cross passage 140 within the plunger will come into communication with and form a continuation of the passage 139 through bracket 138. One end of passage 139 is connected by a pipe 141 with the main vacuum pipe 117. The other end of passage 139 is connected by pipe 142 with a cylinder 143, mounted near the base of housing 49 and best shown in Fig. 9. A piston 144 operating in cylinders 143 is connected by piston rod 145 with the outer end 146 of the pawl-lifter 76 previously described. A spring 147 mounted within cylinder 143 and bearing at its respective ends against the top of the cylinder and the piston 144, normally forces the piston downwardly whereby pawl-lifter 76 is raised against pin 78, thus holding pawl 70 out of engagement with the ratchet 68. At such times the pin 78 will simply slide back and forth along the upper arc 148 of pawl-lifter 76, and the ratchet 68, and consequently the lifting screws 56, will remain stationary. As sheets are successively lifted from the stack 59, the level of the uppermost sheet will become constantly lower and the cups 103 will have to be moved further down in order to engage therewith. Eventually this downward movement of the cups and plungers 93 will be sufficient to bring the passage 140 (which shares this up and down motion), into line with the two portions of passage 139 in bracket 138. This will complete a connection between the vacuum supply and the cylinder 143 which will then be exhausted. Atmospheric pressure will then lift the piston 144 against the resistance of spring 147 and lower the pawl-lifter 76 so that pawl 70 will come into driving engagement with ratchet 68. The screws 56 will now be operated to gradually raise the carriage 58 and stack of sheets 59 carried thereby. As the level of the uppermost sheet on stack 59 is raised, the cups 103 will no longer travel down far enough to bring passage 140 into communication with passage 139, and the vacuum supply will again be cut off from cylinder 143. The vacuum will then gradually be lost within cylinder 143, and spring 147 will force piston 144 downwardly until the pawl 70 is again lifted from driving engagement with ratchet 68. The lifting operation will then be discontinued until such time as the uppermost sheet on stack 59 is again at too low a level, when the lifting mechanism will again be thrown into engagement to elevate carriage 58 and stack of sheets 59.

It will now be seen that the operation of this feeding apparatus is continuous and entirely automatic. It is only necessary for the operator to replenish the supply of sheets or blanks when the same have been exhausted. This supply of sheets is automatically fed upward as necessary into proper position to be engaged by the lifting mechanism. The vacuum cups automatically and at regular intervals lift the uppermost sheet from the stack of sheets, and tilt same so that it may be engaged at its rear edge by the hooks which project the sheet laterally toward the press. These hooks carry the sheet forward until it may be engaged at its forward edge portion by the feed rollers 36, which continue to move the sheet toward the press until the fingers 7 may engage behind its rear edge and project the sheet into the printing press at the proper moment. All of these parts are driven from the driving mechanism of the press, and require no attention except such adjustments as are necessary to adapt the apparatus to the handling of different sized blanks or sheets.

Obviously, many changes could be made in the design and proportions of the various parts and equivalents might be used, without departing from the scope of this invention as covered by the following claims.

The mechanism for progressively raising

the stack of sheets as the sheets are removed from the top thereof is not claimed herein nor the combination of such mechanism with the apparatus for removing the sheets from the stack; such mechanism and combination being claimed in a copending application Serial No. 204,617, filed July 9, 1927, as a division hereof; this application claiming only the apparatus whereby the sheets are lifted from the stack and moved laterally with respect thereto.

We claim:

1. A sheet feeding apparatus, comprising a support for the stacked sheets, a vacuum cup for lifting the uppermost sheet, a plunger at the lower end of which the cup is carried, means for raising and lowering the plunger, there being a passage in the plunger communicating with the cup at its lower end and opening out through the side of the plunger at its upper end a guide block through which the plunger is reciprocated, there being a port in the guide block communicating with an exhausting apparatus, the passage in the plunger being brought into communication with the port when lowered and into communication with the open air when raised, and means for tilting the cup when raised.

2. A sheet feeding apparatus, comprising a support for the stacked sheets, a vacuum cup for lifting the uppermost sheet, a plunger at the lower end of which the cup is pivoted, means for raising and lowering the plunger, there being a passage through the plunger adapted to communicate with an exhausting apparatus, a flexible pipe connecting this passage with the cup, and means for tilting the cup when raised, the flexible pipe acting to turn the cup to normal position when released from the tilting means.

3. A sheet feeding apparatus, comprising a support for the stacked sheets, a vacuum cup for lifting the uppermost sheet, a plunger at the lower end of which the cup is pivoted, means for raising and lowering the plunger, a vacuum supply pipe, a passage through the plunger adapted to be brought into connection with the supply pipe when the plunger is lowered, a flexible pipe connecting the passage with the cup, and means for tilting the cup when raised, the flexible pipe acting to return the cup to normal position when released from the tilting means, the vacuum also being released at this time.

4. A sheet feeding apparatus, comprising a support for the stacked sheets, a vacuum cup for lifting the uppermost sheet, a plunger at the lower end of which the cup is pivoted, a spring for lowering the plunger, a rotary cam for lifting the plunger against the pressure of the spring, a pipe leading from a vacuum supply, there being a passage formed in the plunger which is brought into communication with the vacuum pipe when the plunger is lowered to a certain point, and is brought into open communication with the outer air when the plunger is raised to another predetermined point, a flexible pipe connecting the passage with the interior of the cup, and means for tilting the cup as it is raised.

5. A sheet feeding apparatus, comprising a support for the stacked sheets, and means for removing the uppermost sheet from the stack comprising a hook and a slide rod for reciprocating the hook above the stack, a vertically reciprocating plunger, a vacuum cup pivoted at the lower end of the plunger, means for producing a vacuum within the cup when lowered into engagement with a sheet and for releasing the vacuum when the cup is elevated, a rotary driving shaft, cams on the shaft, and connections engaging the cams for reciprocating the slide rod and plunger.

6. A sheet feeding apparatus, comprising a support for the stacked sheets, and means for removing the uppermost sheet from the stack comprising a hook and a slide rod for reciprocating the hook above the stack, a vertically reciprocating plunger, a vacuum cup pivoted at the lower end of the plunger, means for producing a vacuum within the cup when lowered into engagement with a sheet and for releasing the vacuum when the cup is elevated, a rotary driving shaft, cams on the shaft, connections engaging the cams for reciprocating the slide rod and plunger and means for tilting the cup when it is raised.

7. A sheet feeding apparatus, comprising a support for the stacked sheets, and means for removing the uppermost sheet from the stack comprising a hook and a slide rod for reciprocating the hook above the stack, a vertically reciprocating plunger, a vacuum cup pivoted at the lower end of the plunger, means for producing a vacuum within the cup when lowered into engagement with a sheet and for releasing the vacuum when the cup is elevated, a rotary driving shaft, cams on the shaft, connections engaging the cams for reciprocating the slide rod and plunger, a fixed lug, and a finger on the cup which engages the lug when the cup is raised to tilt the cup and the sheet carried thereby.

8. A sheet feeding apparatus, comprising a support for the stacked sheets, a plunger, means for raising and lowering the plunger, a vacuum cup pivoted to the lower end of the plunger, a passage partially contained in the plunger through which the air is exhausted from the cup when lowered into engagement with the uppermost sheet of the stack, and means for tilting the cup when it is raised.

9. A sheet feeding apparatus, comprising a support for the stacked sheets, a plunger, means for raising and lowering the plunger, a vacuum cup pivoted to the lower end of the plunger, a passage partially contained in the plunger through which the air is ex-

hausted from the cup when lowered into engagement with the uppermost sheet of the stack, a fixed lug, and a finger on the cup which engages the lug when the cup is raised to tilt the cup and the sheet carried thereby.

10. In sheet feeding apparatus the combination of a support for a stack of sheets, a vertically reciprocating vacuum cup arranged above said support adapted to be exhausted when in contact with the sheet and to be open to the atmosphere when in elevated position, mechanism for raising the cup and thereafter releasing the same, and a spring which presses the cup when released into contact with the upper sheet of the stack.

11. In sheet feeding apparatus the combination of a support for a stack of sheets, a vertical reciprocating vacuum cup arranged above said support adapted to be exhausted when in contact with the sheet and to be open to the atmosphere when in elevated position, mechanism for raising the cup and thereafter releasing the same, a spring which presses the cup when released into contact with the upper sheet of the stack, and a horizontally reciprocating element adapted to engage the edge of the sheet on the cup when raised and give said sheet movement laterally away from the stack.

12. In sheet feeding apparatus the combination of a support for a stack of sheets, a vertically reciprocating resilient vacuum cup arranged above said support adapted to be exhausted when in contact with the sheet and to be open to the atmosphere when in elevated position, mechanism for raising the cup and thereafter releasing the same, and a spring which presses the cup when released into contact with the upper sheet of the stack.

13. In sheet feeding apparatus the combination of a support for a stack of sheets, a plunger vertically arranged above the support and provided with an air port therethrough and with a resilient vacuum cup at its lower end, means providing a vacuum duct, a rotating cam which raises the plunger putting said port in communication with the atmosphere, a spring operative when the plunger is released by said cam for forcing the cup into contact with the stack of sheets and bringing said port into register with said vacuum duct, and a horizontally reciprocating element adapted to engage the edge of the sheet on the cup when raised and give said sheet movement laterally away from the stack.

JOSEPH A. JOHNSON.
GEORGE W. CHALMERS.