L. C. KRUMMEL.

AUTOMATIC FEEDING MECHANISM FOR PRESSES.

APPLICATION FILED AUG. 24, 1907.

938,876.

Patented Nov. 2, 1909.

3 SHEETS—SHEET 1.

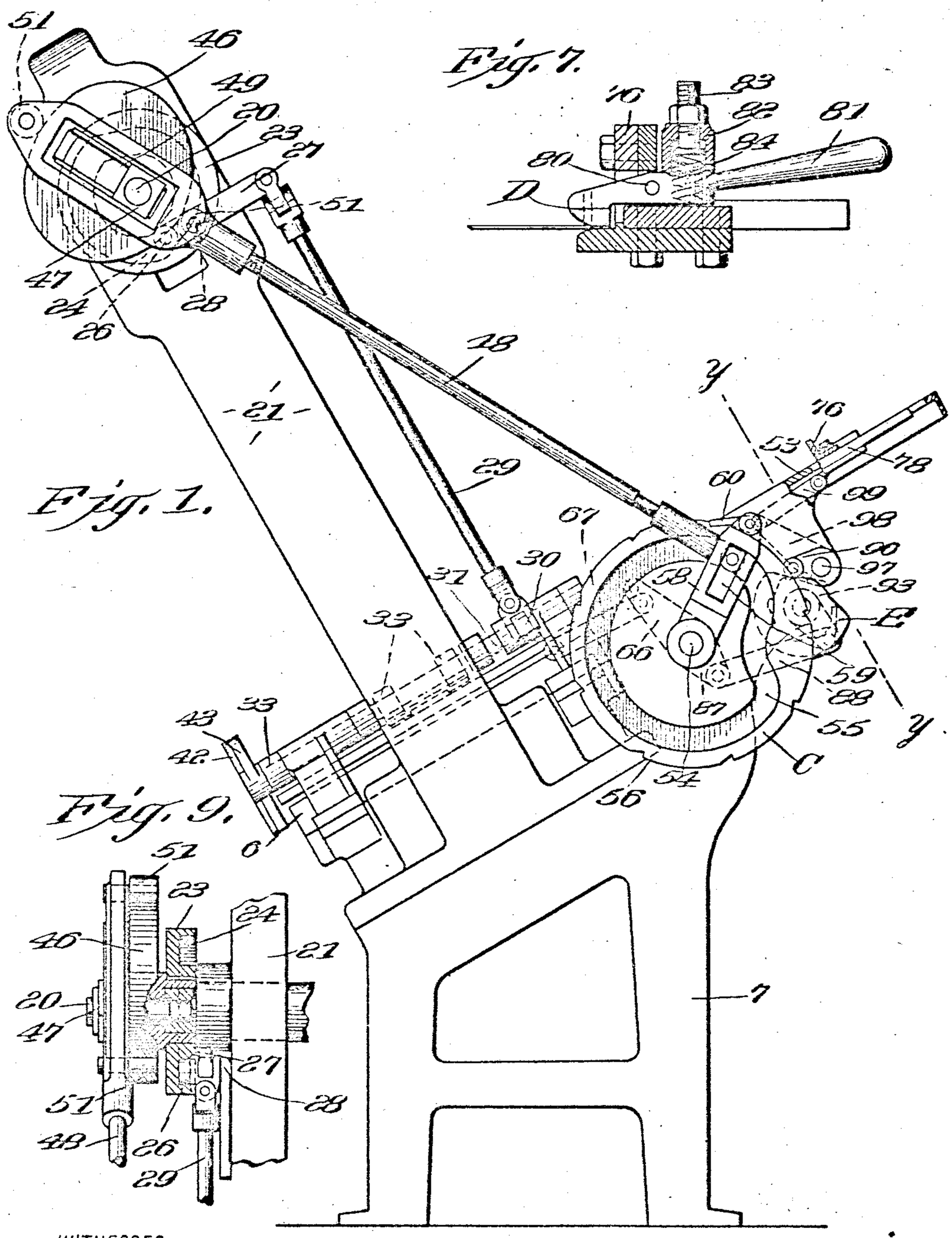

Fig. 1.

Fig. 7.

Fig. 9.

WITNESSES

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3 SHEETS—SHEET 2.

Fig. 2.

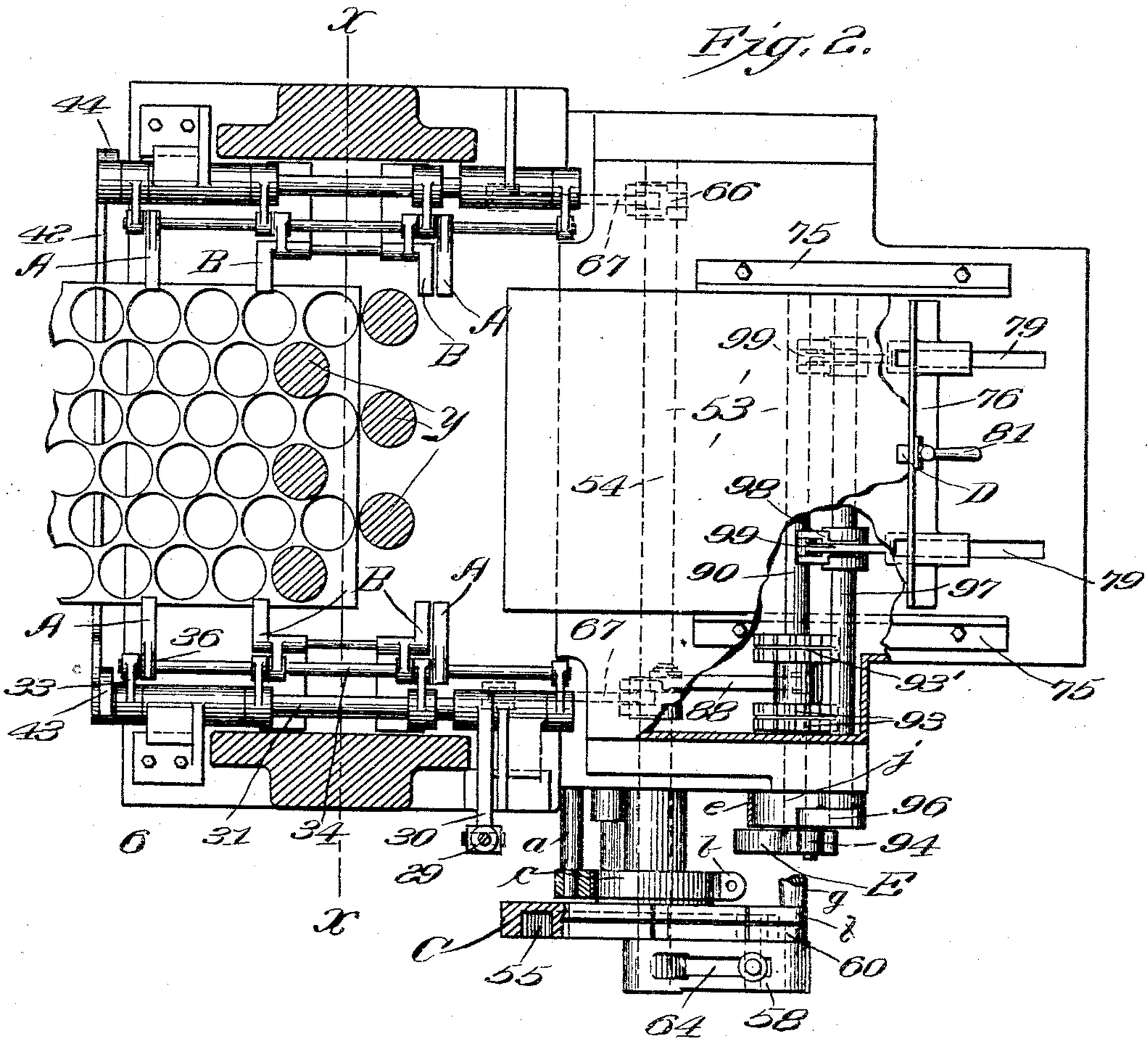
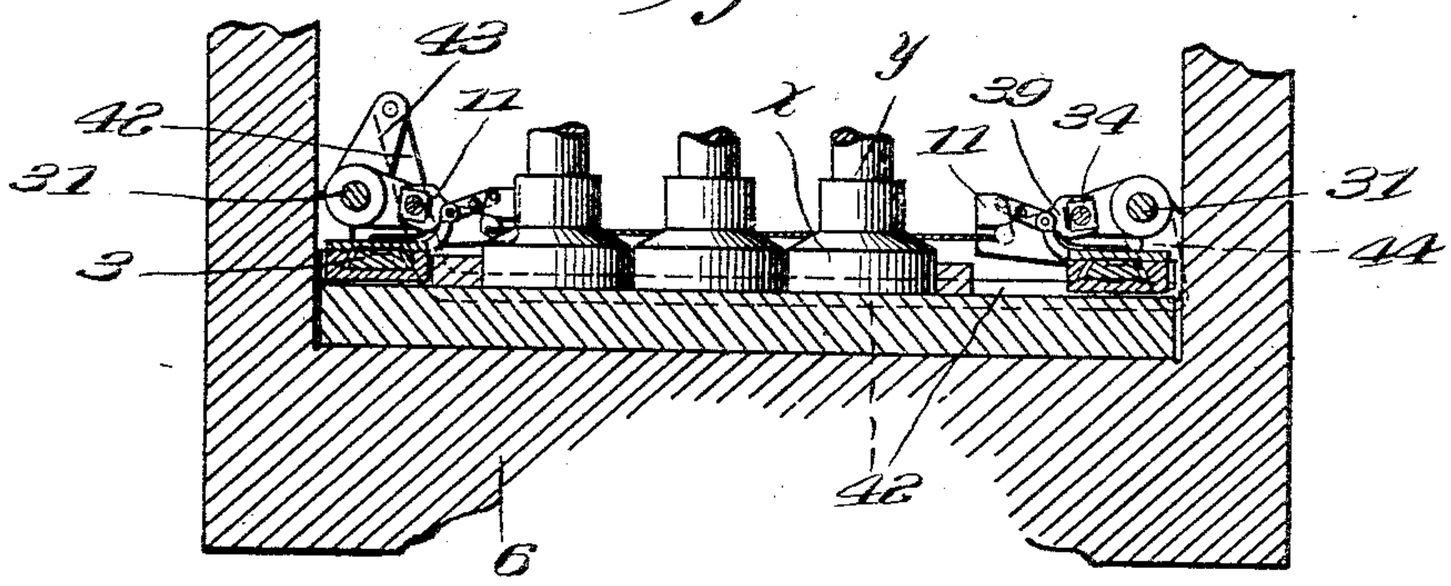


Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 5.

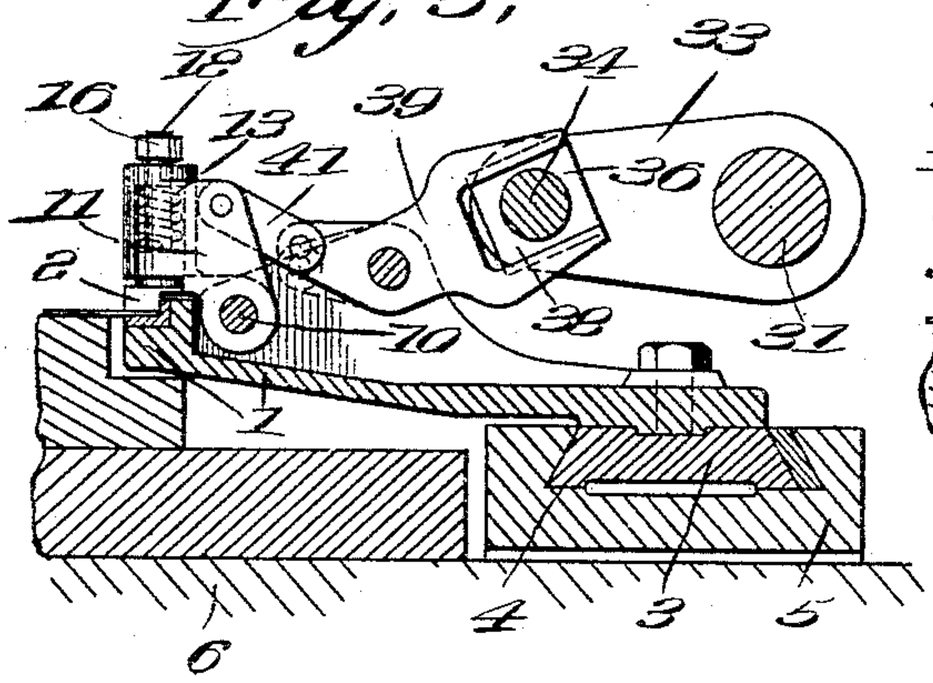


Fig. 6.

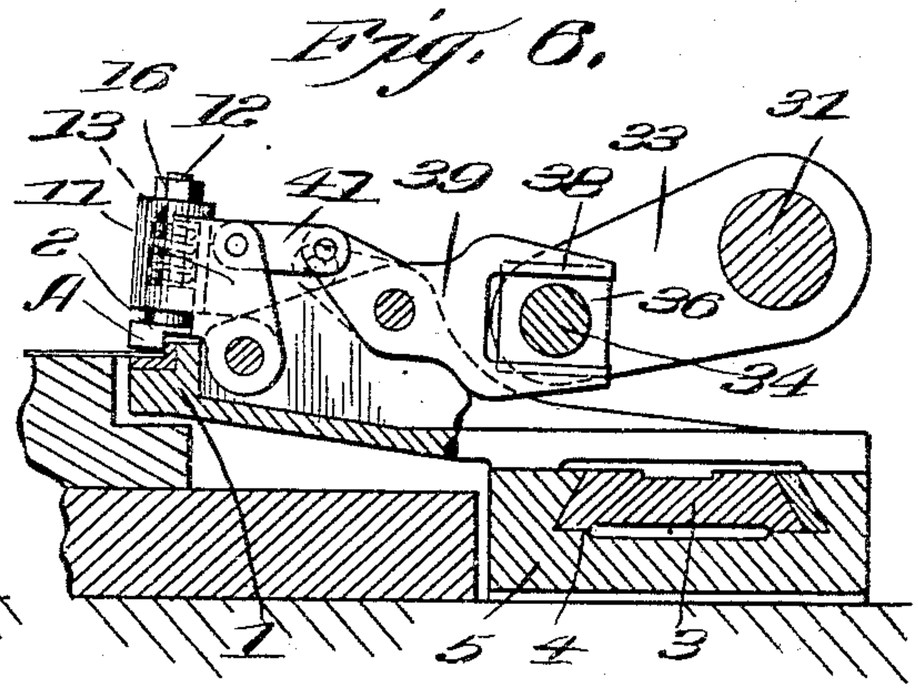


Fig. 8.

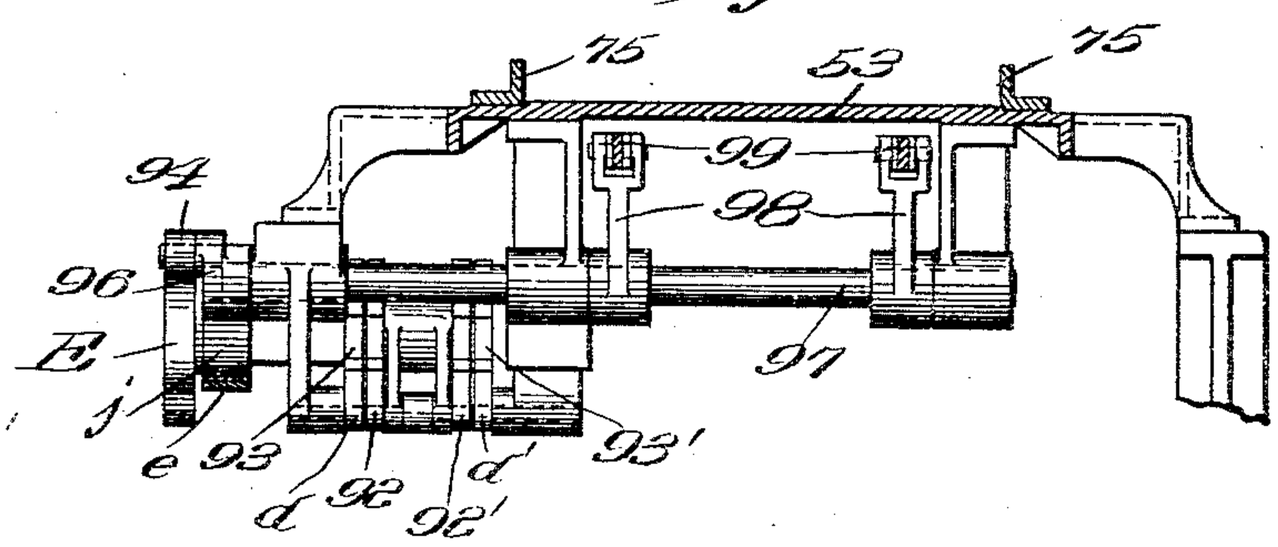
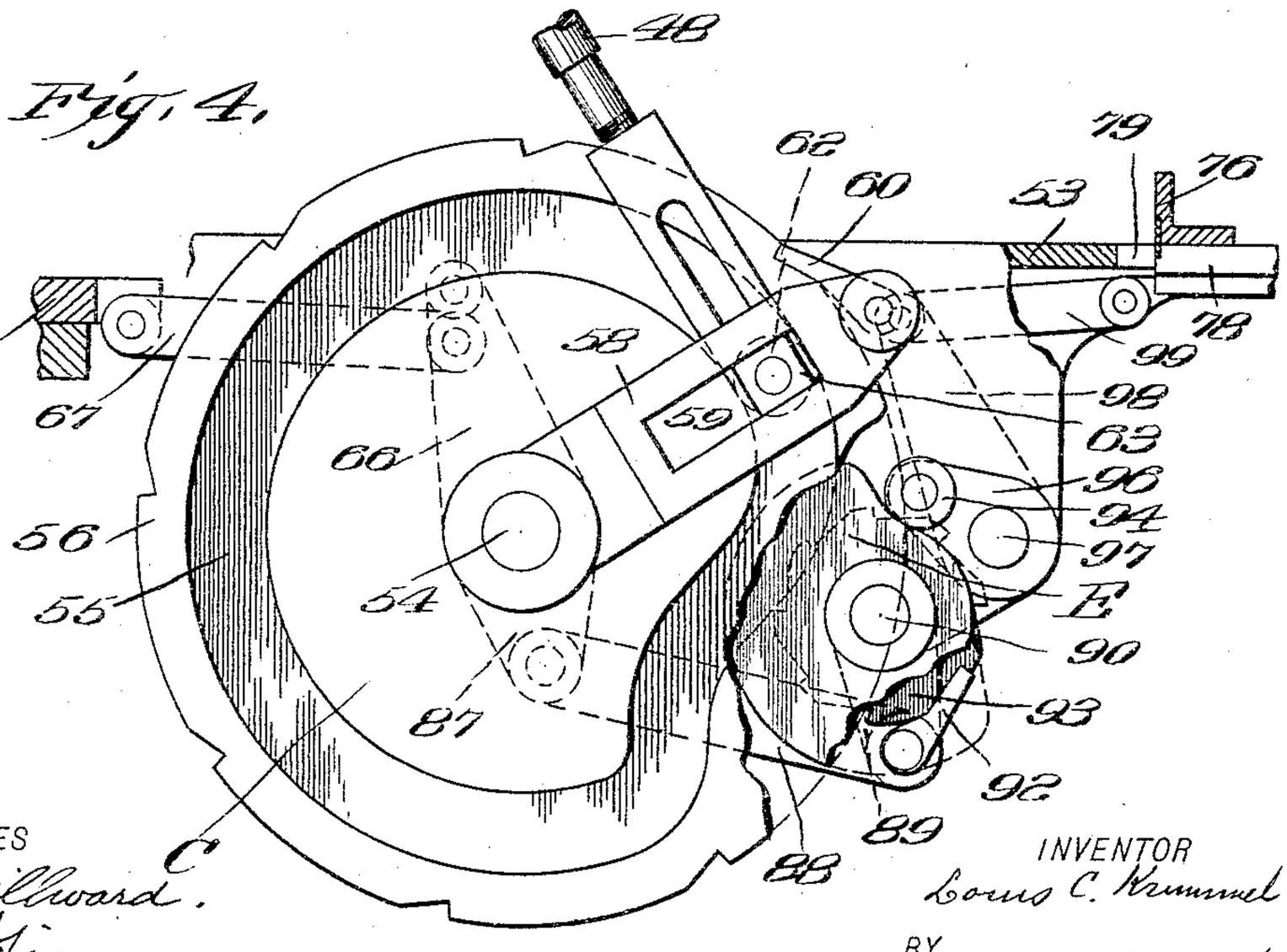


Fig. 4.



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AUTOMATIC FEEDING MECHANISM FOR PRESSES.

938,876. Specification of Letters Patent. Patented Nov. 2, 1909.

Application filed August 24, 1907. Serial No. 390,028.

To all whom it may concern:

Be it known that I, LOUIS C. KRUMMEL, a citizen of the United States, residing at Clinton, in the county of Middlesex and State of Connecticut, have invented new and useful Improvements in Automatic Feeding Mechanism for Presses, of which the following is a specification.

My invention relates to a feeding machine adapted to be used in connection with power cutting presses, whereby sheets of metal are fed forwardly step by step to permit series of parts to be stamped from the sheets. This mechanism is adapted to operate continuously and automatically so that the second sheet is in position to be taken or gripped by the feeding mechanism as soon as the operation on the first sheet is completed.

The operation is automatic in that the workman does not deliver the sheets directly to the feeding mechanism, but merely places them on a suitable table, or delivers them to a preliminary clamp, or clamping finger, which is operated to deliver the sheets, downwardly or forwardly, at the proper time to the feeding mechanism.

My machine consists essentially of one or more clamps to which the sheets are delivered in succession by the operator, of one or more opposite pairs of feed-jaws adapted to receive and withdraw the sheets from the clamp, and to feed them downwardly to the press. Suitable mechanism is provided to reciprocate these feed-jaws and at the same time to open and close them so that they first open and return rearwardly, then close on the sheet, then advance to feed the sheet forward step by step a suitable distance at each movement. Corresponding pairs of retaining-jaws and operative mechanism therefor are also provided, whereby the sheet is gripped and held firmly in position while the feeding fingers are moved back to grip the sheet at a new point or to grip a new sheet.

The clamp is preferably mounted on a push gage to hold the sheet true, and this is operated by an auxiliary mechanism, connected to the main operative mechanism, to deliver a fresh sheet to the feed-jaws when the preceding sheet has been completely cut up into parts, and the waste portion delivered out of the machine.

My invention is fully shown in the drawing herewith in which the reference numerals and letters of the description are used to indicate the corresponding parts.

Figures 1 and 2 are respectively a side elevation and a top plan of a complete machine. Fig. 3 is a vertical, cross section on line X of Fig. 2. Fig. 4 is a portion of Fig. 1 enlarged better to show the main-cam and clamp-cam and the adjacent parts. Figs. 5 and 6 are a portion of Fig. 3 enlarged to show the different positions of the mechanism by which the feed fingers and the retaining fingers are opened and closed. Fig. 7 is a side elevation of the clamping finger enlarged, showing the adjacent parts in section. Fig. 8 is a cross section on line Y of Fig. 1 to show the push-gage operating mechanism. Fig. 9 is a front elevation of the eccentric crank and operating cam with parts in section.

A A represent the feed-jaws; there are two pairs, preferably, with the jaws of each pair arranged opposite. These feed-jaws consist of lower and upper jaws 1 and 2. The lower jaw is bolted to a feed-slide 3 fitting a dovetail groove 4 in a plate 5 bolted to the bed-plate 6 of the machine, which is supported on a suitable inclined standard and legs 7. To the lower jaw 1 is pivoted at 10 the upper-jaw support 11 provided with bearings, to which is fitted the jaw pin 12 carrying the upper jaw 2, and provided with a spring 13 engaging with a shoulder on the upper jaw to afford a yielding but firm grip on the sheets, whereby the sheets slightly varying in thickness may be handled conveniently.

16 is a nut fitted to the upper end of the jaw pin to engage with the top of the jaw support, and adapted to adjust the upper jaw. This spring 13 is slightly compressed while the jaws are gripping the sheets, to permit a sufficient dwell, while the toggle-links are passing the center for the purpose to be described. These feed-jaws are first opened, then moved back, then closed to grip the sheet, then returned to feed the sheet forward one space by the following mechanism.

20 is the driving-shaft journaled in suitable bearings in the standards 21 of the frame, and carrying the cam 23 having a cam-groove 24, with which engages the roller-stud 26 on the lever 27 journaled to the frame at 28 and connected by the connecting rod 29 to the crank arm 30 on the rock-shaft 31. On this rock-shaft are fixed

the rock-levers 33 carrying in their inner ends the cross-pin 34. On this cross-pin are mounted the blocks 36, free to slide on the cross-pin, as the feed jaws move and fitted to grooves in the forked ends 38 of the toggle-links 39, so that, when the rock-shaft 31 and the rock-levers 33 are rocked, these blocks slide in and out slightly in said forked ends. The toggle-link is connected by a short link 41 to the upper finger support 11. The foregoing are the connections by which the upper jaws are opened and closed. Simultaneously these feed-jaws are reciprocated forward and back on their cross-pins 34 to feed the sheets step by step, as aforesaid, by the following mechanism. On the driving-shaft 20 is secured the positive cam 46 so constructed that all lines drawn from one side to the other side thereof through the center of the shaft are of the same length. Said shaft also carries the block 41 fitting the slot 49 in the connecting-rod 48. This connecting-rod is provided with roller-studs 51 engaging with the periphery of the eccentric. Any other suitable connection between the shaft and the connecting-rod might be used.

On the main shaft 54, suitably arranged below the table 53 is journaled the main ratchet-cam C provided with the cam-groove 55 and the peripheral ratchet 56. This ratchet is formed as here shown with a certain number of teeth, or notches, uniformly spaced except that at one, or more, points the space is greater. As here shown, there are seven equal spaces and one enlarged space. On the main-shaft 54 is fixed a slotted-lever 58 having the slots 59, and carrying a pawl 60 on its outer end, adapted to engage with the peripheral notches of the ratchet. The connecting-rod 48 carries on its lower end the roller-stud engaging with the cam-groove 55 and a block 63 fitting the straight slots 59 in the lever 58. In the construction here shown the connecting-rod extends through an edge opening 64 in said lever 58 to equalize the strain. On a pin *a* is arranged a friction-band *b* engaging a flange *c* secured on the cam C, to steady the movement of that cam. Dog *f* on pin *g* prevents back-turn of the cam.

The cam-groove 55, throughout its greater extent, is uniform and concentric, but at one point is depressed toward the center. The result of this is that while the roller-stud 62 engages with the concentric portion of the cam-groove, the slotted lever 58 and the pawl 60 will make equal strokes at each revolution of the driving-shaft 20, to correspond to such equal movements the teeth or notches, are uniformly spaced throughout the greater extent of the ratchet periphery and the spaces are of such a length that the pawl will move from tooth to tooth at each stroke. But when the roller 62 is forced down into the depressed portion of the groove, the stroke of the lever is increased and one of the spaces is correspondingly increased for the purpose now to be described. This ratchet-cam is an important feature of my invention. By the arm 66 connected by the link 67 to the slide 3, the reciprocating movement of the slotted lever 58 is communicated to the feed-jaws A whereby they are reciprocated. It will be understood that the depressed portion of the cam-groove 55 and the cam 23 are so timed that these jaws are opened as they start up and remain open until they reach the upper end of their stroke and then immediately close to take a fresh grip on the sheet. From the foregoing description it will be understood that all but one of these feed strokes are of uniform length and the number of the strokes is predetermined so that the entire sheet is cut up into uniform blanks, for instance, the can covers shown; but when all the covers have been cut, there remains a portion of the sheet which it is necessary to eject from the machine uncut. Otherwise half blanks would be cut therefrom which would be of no value; these would also be difficult to discharge from the dies and would tend to indent and destroy the forming body of the die. For this purpose is provided the depressed portion of the cam-groove, feeding the lever through a greater arc, whereby a long stroke is given to the slide of the feed-jaws, permitting them to carry the uncut waste portions of the sheet past the punches, and thus avoiding the cutting of half blanks at the beginning and at the end of the sheet.

The retaining jaws B are the same in construction as the feed-jaws A, except that they do not slide, but are fixed on the plates 5. (Fig. 6) They are opened and closed by the same mechanism to grip the sheets, and their function is firmly to maintain the sheet in position when the feed-jaws are open and moving back for a fresh grip. The retaining-jaws remain closed during the entire return stroke of the feed-jaws and remain open during the time that the feed-jaws are feeding the sheet. An important feature is that these retaining-jaws must not open before the feed-jaws are closed, nor must the feed-jaws open and return before the retaining-jaws are closed. Thus we have two periods one at the beginning and one at the end of each stroke of the feed-jaws, when all the jaws are closed on the sheet, whereby the sheet is constantly held firmly in position and cannot become shifted by jarring or other cause. This simultaneous closing of all the jaws at the beginning and the end of the feed-jaw stroke is effected by the arrangement of the toggle-links. Evidently all the jaws are closed when the toggle-links reach the center position, but these links are arranged to oper-

ate reversely, that is, the links for one set of jaws move above the center line, and the links for the other set of jaws move below. The links are so arranged that in their movement they cross the center very slightly, but not enough to loosen their grip on the sheet. The purpose of this slight crossing, by one or the other, is that, so to speak, short spaces or zones are created in which both sets of jaws are closed, one space at the beginning and one space at the end of each stroke, as aforesaid. The springs 13, and the spring grip of the jaws, produce dwells and zones of sufficient length. As the jaws on both sides must open and close at the same time, reverse movement must be given to the two rock-shafts 31 and this is effected by a bent-link 42 connecting an upper crank 43 on the front rock-shaft to the lower crank 44 on the rear rock-shaft. On the table 53 are arranged the side gages 75 preferably slightly adjustable.

76 is a push gage having a straight edge and tongues 78 fitted to guide slots 79 in the table. On this push gage is arranged one, or more, clamps D; one is generally sufficient. This may be of any simple construction. As shown, the clamp is pivoted at 80 and is provided with a rearwardly extending handle 81 and with an integral socket 82, in which operates an adjustable plunger 83 to adjust the tension-spring 84, whereby the nose of the clamp is held down to grip the sheet. All that is necessary for the workman to do is to insert the sheet under the nose, either with or without operating the clamp by the handle, whereupon it is delivered automatically down to the feed-jaws at the proper time by the following mechanism.

Secured on the shaft 54, or connected to the arm 66, is a second arm 87 connected by a link 88 to the arm 89, loose on the clamp-shaft 90, and provided with pawls 92 92′ engaging respectively with the ratchet wheels 93 93′ fixed on the shaft 90. On the end of this shaft 90 or at some suitable point, is fixed the cam E with which engages the roller 94 on the end of the arm 96, fixed on the push-bar shaft 97. This push-bar shaft is provided with arms 98 98 connected to the push gage by links 99 99. Retaining dogs *d d′* are shown on the frame to engage with the ratchet wheels 93 93′ to prevent them from running backward. A friction-band *e* is arranged to engage with a flange on cam E to steady the cam. By these connections the ratchet 93 and its cam E are arranged to rotate step-by-step with the main ratchet cam C, and cam E is so timed that, at the time the slotted lever 58 moves through the long arc, the crank 96 will slip off the enlarged portion of the cam E onto the cut-away portion, and thus will move forward the push-gage and the clamp at the proper time to deliver the sheet to the rear feed-jaws, which grip it with a strong grip and withdraw it from the clamp.

This machine is particularly adapted to cutting out can covers of standard sizes. I have shown here two push-bar ratchets 93 93′ with pawls 92 92′ of which one ratchet only is in operation at once, the pawl of the other being thrown out of action. Where it is desired to cut tops of the other size, the other ratchet and pawl are put into operation, and a different ratchet-cam C, having more or less teeth, is arranged on the shaft 54. My machine may be used for cutting can-covers of many sizes, for cutting other articles, and may be modified in the form and arrangements of its parts. The press is not shown but is indicated by the dies X and the punches Y. In Fig. 2 the cutting of the first sheet is finished. The next stroke will be the long stroke to bring down the second sheet and to eject the waste of the first. Power may be communicated to the driving-shaft by any suitable means.

Having fully described my invention, what I claim, is:—

1. In a mechanism for feeding sheets to power presses, the combination with a main frame, of parallel slides oppositely arranged on the main frame, feed-jaws inwardly extending from the slides, to grip the opposite side edges of the sheet, retaining-jaws fixed on the frame, said retaining-jaws being arranged in alinement with the feed-jaws, means to retract and advance the slides a predetermined number of equal strokes to present the sheets to be cut and a longer stroke to eject the sheets from the press and to feed a new sheet, means to open the feed-jaws when about to be retracted and to close them when about to be advanced, and means to close the retaining-jaws when the feed-jaws are being retracted and to open the retaining jaws when the feed-jaws are being advanced.

2. In a feeding mechanism for power presses, a suitable frame, parallel slides arranged in slide-ways on the frame, lower feed-jaws on the slides, lower retaining-jaws fixed on the frame, said retaining-jaws being arranged parallel and in alinement with the feed-jaws, upper jaw supports pivoted to the lower-jaws, pins arranged in bearings on said supports, upper jaws on the pins, springs in the bearings, said springs engaging with the upper-jaws and forcing the upper jaws against the lower jaws, toggle-links pivoted to the lower jaws, links connecting the toggle-links to the upper jaw supports, means to rock the toggle-links to open and close the jaws, the toggle-links of the feed-jaws and of the retaining-jaws being reversely arranged and adapted slightly to cross the center line, permitting all the jaws to be closed during short inter-

vals at the beginning and end of each stroke, and means to reciprocate the slides.

3. In a feeding mechanism for power presses, the combination with a suitable frame, of parallel slides arranged thereon, inwardly extending lower feed-jaws secured on the slides in oppositely arranged pairs, similar lower retaining-jaws fixed on the frame, between the feed-jaws on both sides of the machine, all the jaws on each side being parallel and in alinement, upper jaws pivotally supported on all the lower jaws, toggle-links pivotally supported on the lower jaws and having forked outer ends, connections between the toggle-link inner ends and the upper jaws, rock-shafts outside of the slides and parallel thereto, inwardly extending levers on the rock-shafts, cross-pins on the inner ends of said levers, blocks fitted to slide on the cross-pins and fitted to grooves in the inner faces of the toggle-link forked ends, a connection between the rock-shafts to rock them reversely, a crank-arm on one of the rock-shafts, a driving shaft arranged in bearings in the upper portion of the frame, a connecting-rod connected at its lower end to the crank-arm and a crank connection between the upper end of the connecting-rod and the driving shaft.

4. In a feeding mechanism for power presses, a suitable frame and a bed-plate, of dies for the press on the bed-plate, parallel slides arranged in slide-ways on the bed-plate on each side of the dies, feed-jaws arranged on the slides and inwardly extending toward the dies, means to open the jaws when about to retract and to close the jaws to grip the sheet when being advanced, and means to retract and advance the jaws, having in combination a main-shaft, a main-cam journaled on the main-shaft, said cam having peripheral ratchet-teeth and a cam-groove on one face, said cam-groove being depressed at one point toward the center but being otherwise concentric, said ratchet-teeth being uniformly spaced except that there is a larger space opposite the depressed portion of the cam-groove, a longitudinally slotted lever fixed on the main-shaft adjacent the grooved face of the cam, a rotating driving-shaft journaled in the upper portion of the frame, a connecting-rod, a crank connection between the upper end of the rod and the driving-shaft, a block on the lower end of the connecting-rod fitting said slot, a stud on the rod fitting the cam-groove, a pawl on the slotted lever to engage with the ratchet-teeth, arms on the main-shaft and links connecting the arms respectively to the respective slides.

5. In a mechanism for transforming rotating movement into reciprocating movement, the combination with a rotating shaft, of a rocking-shaft, a ratchet-wheel journaled on the rocking-shaft and having a series of ratchet teeth on its periphery, an arm fixed on the rocking-shaft, a rod connected to said arm, a crank connection between the rod and the rotating shaft, a pawl on the arm to engage with the teeth, a part to be reciprocated, a second arm on the rocking-shaft and a connection between said second arm and the part to be reciprocated.

6. In a mechanism for transforming rotating movement into variable reciprocating movement, the combination with a rotating drive-shaft, of a rock-shaft, a cam-wheel journaled on said rocking-shaft, said cam wheel having ratchet teeth on its periphery and a cam-groove on one face, said cam-groove having concentric portions and eccentric portions, the teeth around the concentric portions being uniformly spaced and the teeth opposite the eccentric portions being variably spaced, an arm fixed on the rocking-shaft and having a longitudinal slot, a connecting-rod, a crank connection between the rod and the drive-shaft, a part on the rod engaging said slot, a pin on the rod engaging said cam-groove, a pawl on the arm to engage with the teeth, a second arm on the rocking-shaft, and a part to be reciprocated connected to said second arm.

7. In a machine for feeding metal sheets to be punched to a power press, the combination with a frame, of a bed-plate for the sheets on the frame, feed-jaws, retaining jaws, said jaws being arranged on either side of the machine to grip the opposite edges of the sheets, means to open and close the feed-jaws, means to retract the feed-jaws when open and to advance them when closed, and means to close the retaining jaws when the feed-jaws are opening and moving back and to open the retaining jaws when the feed-jaws are closing and advancing.

8. In a feeding mechanism for power presses the combination with the punch press having a suitable frame, of parallel slides arranged on the frame, feed-jaws inwardly extending from the slides to grip the edges of the sheet, retaining-jaws fixed on the frame, said retaining jaws being arranged in alinement with the feed jaws, a drive-shaft, a rock-shaft, connections between the rock-shaft and the slides whereby the slides will be reciprocated on the rocking of said shaft, a fixed arm on the rock-shaft, a fulcrum block slidably arranged on said arm, connections between the drive-shaft and the arm to rock the rock-shaft, said connections being pivoted to the fulcrum block, and means to move the fulcrum-block to change its relation to the rock-shaft at predetermined points whereby a variable reciprocating movement is imparted to the feed jaws, means to open the feed jaws when about to be retracted and to close said feed-jaws when about to be advanced, and means to close the retaining jaws when the feed-jaws are being

retracted and to open the retaining-jaws when the feed jaws are being advanced.

9. In a metal sheet feeding mechanism the combination with a punch-press, of feed-jaw slides, feed-jaws arranged thereon to grip the sheet to be fed, means to operate the jaws to grip the sheet, when about to be advanced, a drive shaft, a rock-shaft, connections between the rock-shaft and the slides whereby the slides will be reciprocated on the rocking of said shaft, a fixed arm on the rock-shaft, a fulcrum-block carried on said arm and adapted to move thereon with relation to the rock-shaft, connections between the drive-shaft and the arm to rock the shaft, said connections being pivotally secured to the fulcrum block, a cam wheel journaled on the rock-shaft having a cam-groove, a pin on the fulcrum-block engaging the cam-groove, whereby the block is caused to move with relation to the rock-shaft to vary the reciprocal movement of the feed-slides, and engaging means on the arm to engage and rotate the cam-wheel on each successive stroke thereof.

10. In a metal sheet feeding mechanism, the combination with a punch-press, of feed-jaws oppositely arranged to engage the side edges of the sheet and means to operate the jaws to advance the sheets with successive, equal feed strokes through the press, means to impart a single increased stroke to the advancing means when the sheet has been completely punched, to eject the waste from the press, and means operating simultaneously with said increased-stroke-imparting means, automatically to deliver a new sheet to the press.

11. In a metal sheet feeding mechanism the combination with a punch-press, of feed-jaw slides, feed jaws carried on the slides, retaining jaws, means to open and close the jaws, a drive shaft, a rock shaft, connections between the rock-shaft and the slides to reciprocate the slides, an arm fixed on the rock-shaft, a connecting link between the drive-shaft and the arm and means to move the fulcrum point of the connecting link toward the rock-shaft when the sheet has been completely punched to impart an increased movement to the slides to eject the waste from the press.

12. In a metal sheet feeding mechanism, the combination with a punch press, of two pair of retaining jaws and two pair of feed-jaws, said jaws being arranged one pair of each on each side and said two sets of jaws being arranged substantially beyond the side edges of the sheet, and adapted to grip the sheet by their extreme edges and with merely the tips of the jaws, means to open and close the feed jaws, means to retract the feed jaws when open and to advance them when closed, means to close the retaining jaws when the feed jaws are opening and moving back, and to open the retaining jaws when the feed jaws are closing and advancing, and means to impart a single increased stroke to the feed jaws when the sheet has been completely punched to eject the waste from the press.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LOUIS C. KRUMMEL.

Witnesses:
AGNES KRUMMEL,
LILY RICHTER.