Oct. 30, 1928. 1,689,756

E. V. SWANGREN

MECHANISM FOR FEEDING SHEET METAL BLANKS AND THE LIKE

Filed Nov. 10, 1923 6 Sheets-Sheet 1

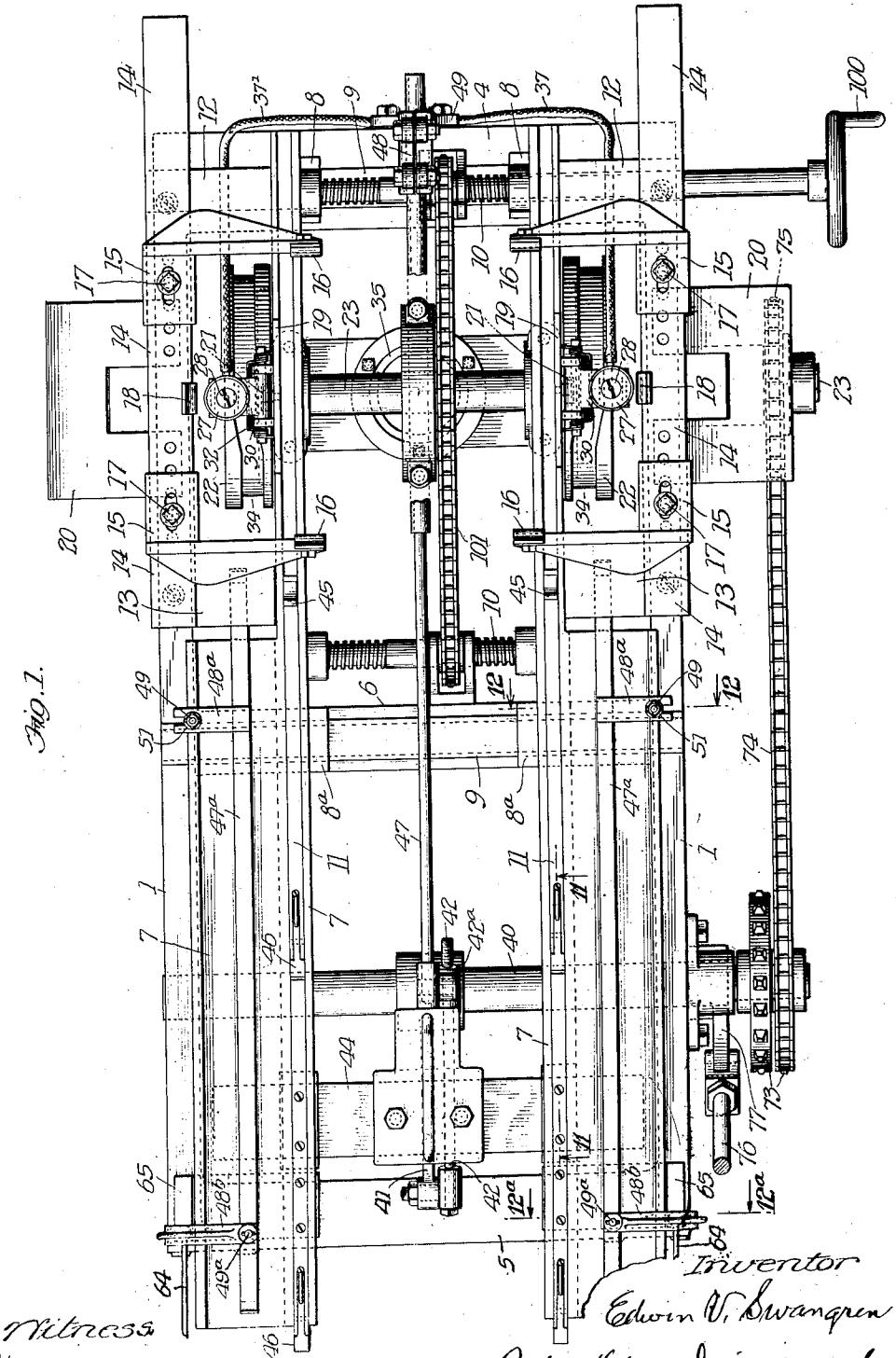


FIG. 1.

Witness
Martin H. Olsen

Inventor
Edwin V. Swangren
By Rector, Hibben, Davis & Macauley
His Attys

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E. V. SWANGREN

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Filed Nov. 10, 1923 6 Sheets-Sheet 2

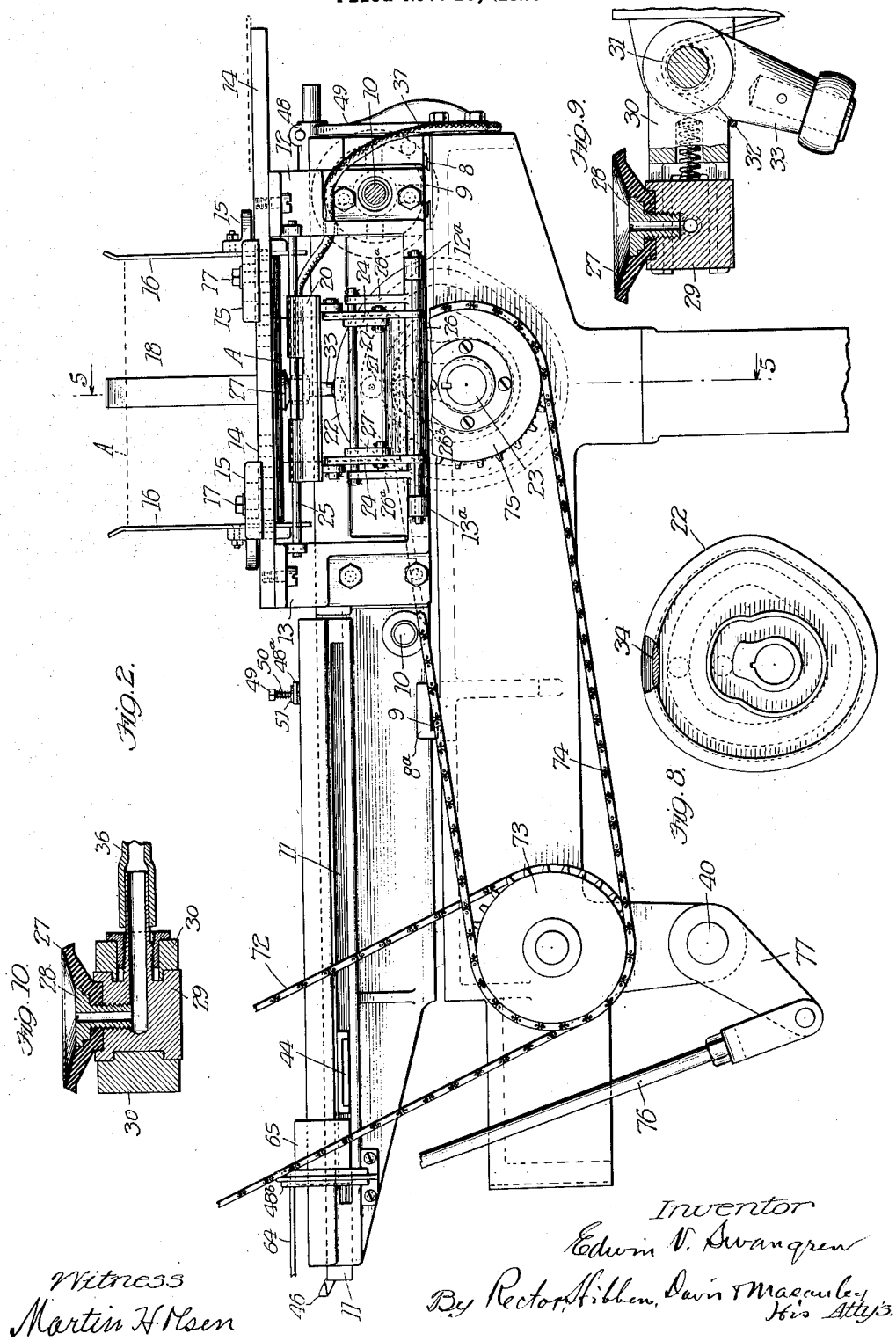


Fig. 2.

Fig. 9.

Fig. 8.

Fig. 10.

Witness
Martin H. Moen

Inventor
Edwin V. Swangren
By Rector, Hibben, Davis & Macauley
His Atty's.

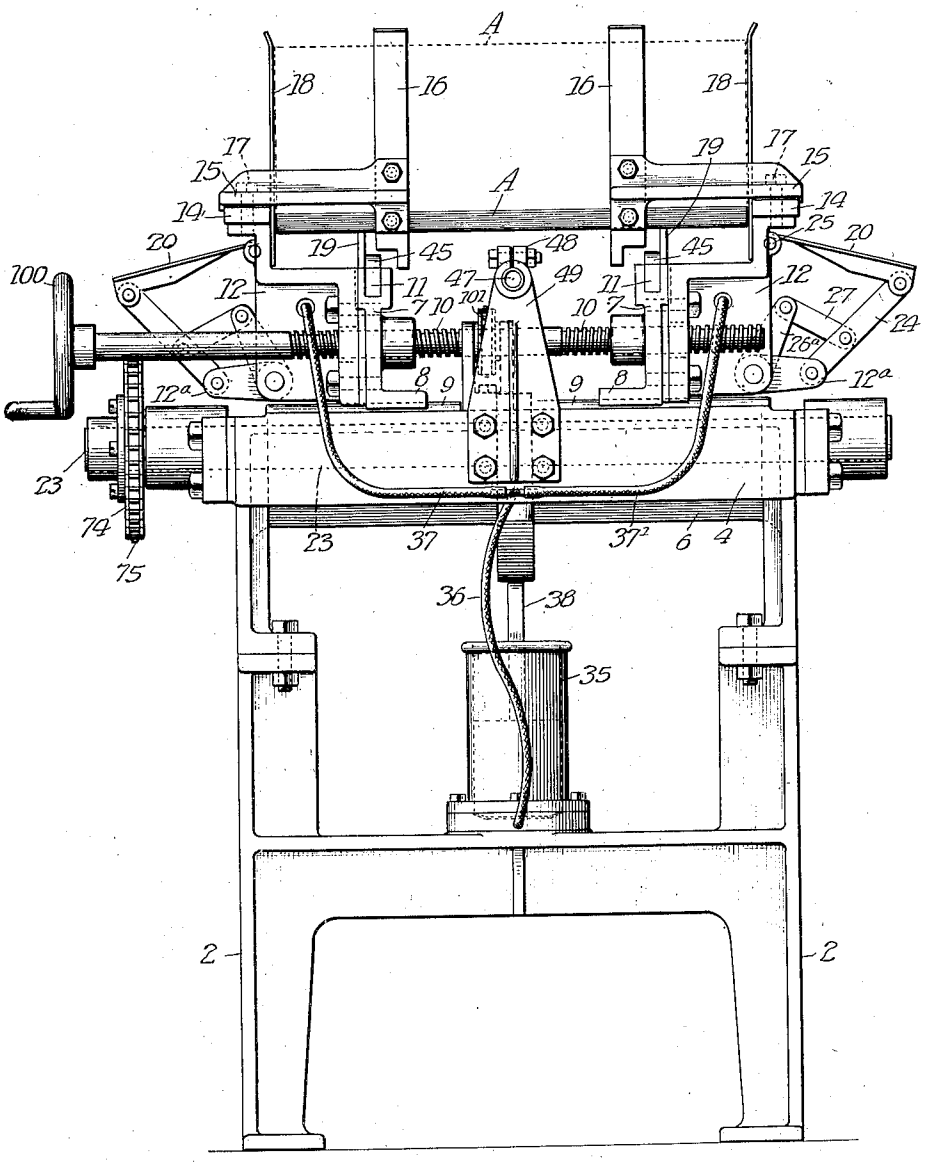
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MECHANISM FOR FEEDING SHEET METAL BLANKS AND THE LIKE

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Fig. 3.



Witness
Martin H. Olsen.

Inventor
Edwin V. Swangren
By Rector, Hibben, Davis & Macaulay
His Attys.

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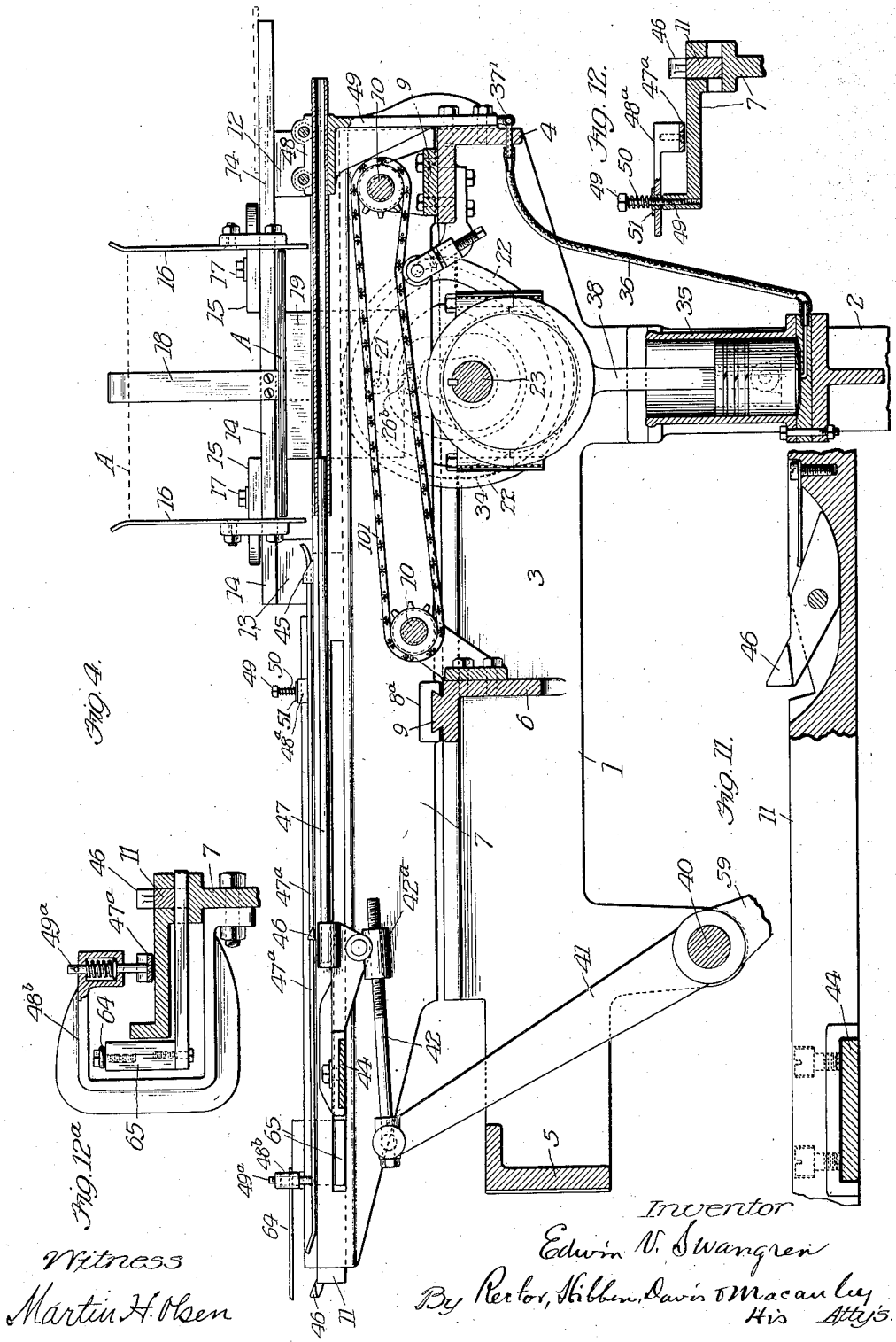


Fig. 4.

Fig. 12.

Fig. 11.

Fig. 12a

Witness
Martin H. Olsen

Inventor
Edwin V. Swangren
By Rector, Hibben, Davis & Macaulay
His Attys.

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MECHANISM FOR FEEDING SHEET METAL BLANKS AND THE LIKE

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Fig. 5.

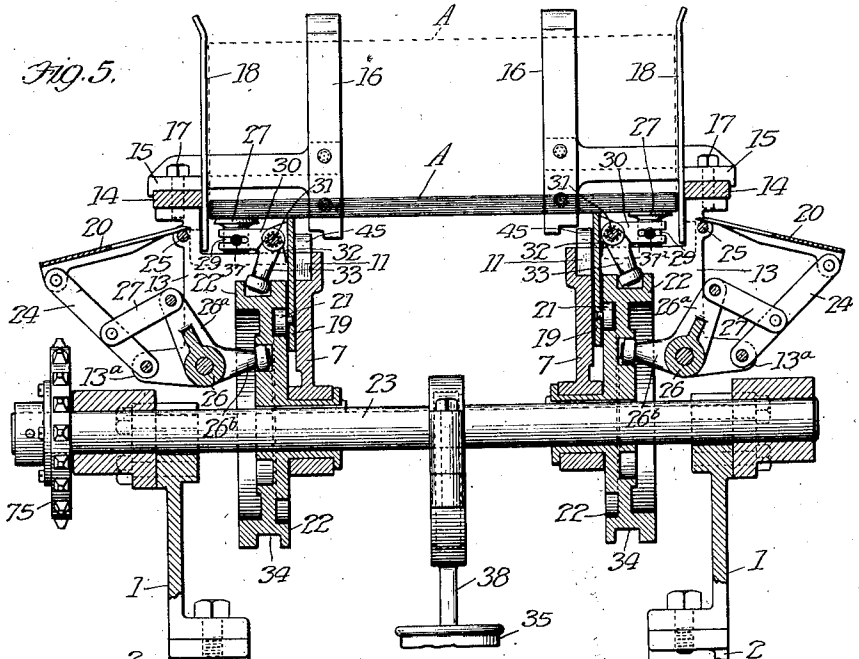


Fig. 6.

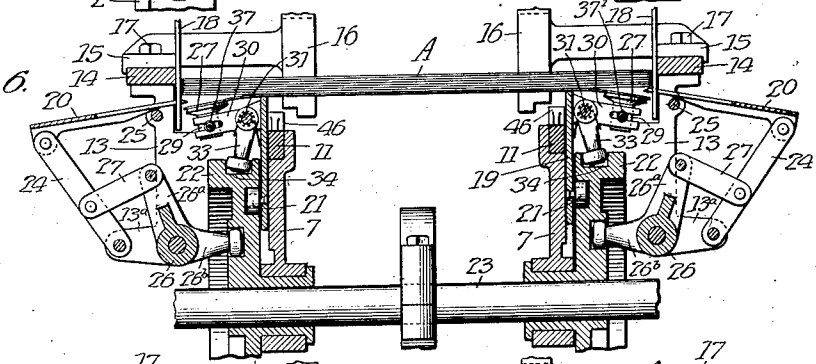
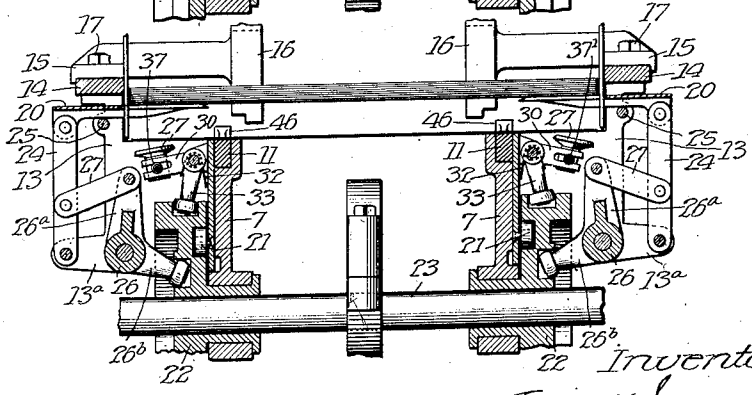


Fig. 7.



Witness
Martin H. Olsen

Inventor
Edwin V. Swangren
By Rector Hibben, Davis & Macauley
His Atty's.

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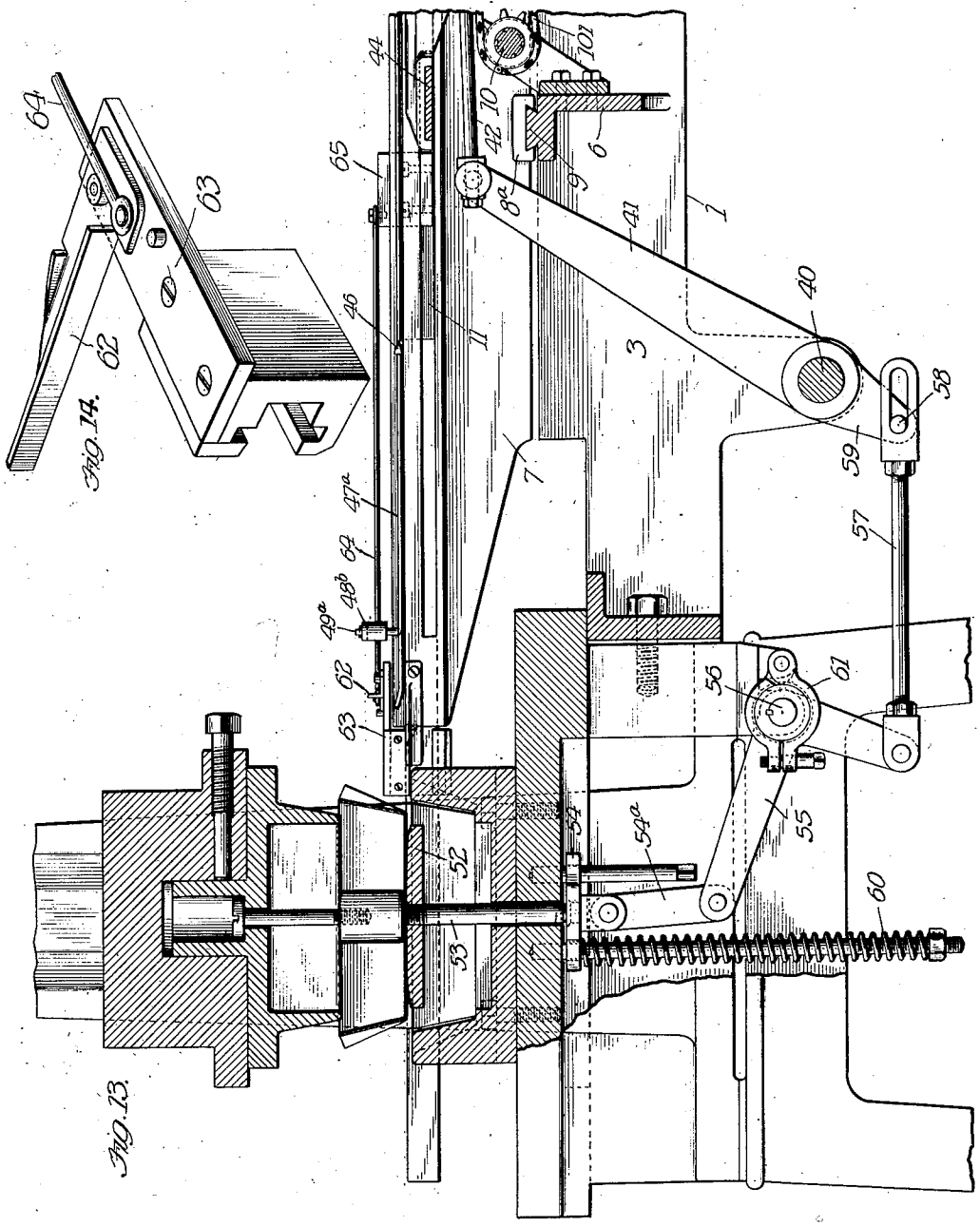


Fig. 13.

Fig. 14.

Witness
Martin H. Olsen

Inventor
Edwin V. Swangren
By Rector Hibben, Davis & Macaulay
His Attys.

Patented Oct. 30, 1928. 1,689,756

UNITED STATES PATENT OFFICE.

EDWIN V. SWANGREN, OF MAYWOOD, ILLINOIS, ASSIGNOR OF ONE-HALF TO WILLIAM M. STEVENSON, OF EVANSTON, ILLINOIS.

MECHANISM FOR FEEDING SHEET-METAL BLANKS AND THE LIKE.

Application filed November 10, 1923. Serial No. 674,099.

My invention relates to a machine which is designed to feed flat sheet metal blanks one by one from a stack of sheet metal blanks to mechanisms for performing further operations on the blank. In the present instance the feeding and delivering mechanisms which form the principal features of my invention are associated with a stamping mechanism arranged to stamp and form blanks passing through the machine, and which cooperates synchronously with the feeding and delivery mechanism, in the manufacture of articles from the blanks operated upon. One important feature of my invention is the provision of a novel feeding mechanism by means of which the lowermost blanks of the stack are successively withdrawn and delivered through transfer mechanism to the stamping mechanism; another relates to the provision of novel mechanism for transferring and delivering the formed blanks; another to the provisions made for adjustment of groups of mechanisms unitarily; and still others relate to various provisions made in the construction and arrangement of parts, and to various combinations and sub-combinations of associated and cooperating elements which I have devised for the purpose of adapting and perfecting the machine to efficiently perform the functions for which it was designed. In the appended claims I have more particularly pointed out the essential features of my invention, it being understood however, that various modifications of construction within the scope of the claims are possible, without departing from the true spirit and substance of my invention.

In the drawings I have illustrated a machine which embodies my invention in a desirable and preferred form, for the purposes of exposition and explanation, though variations in the form and arrangement of structural members and detail of construction will readily occur to those skilled in the art.

Figure 1 of the drawings is a plan view of the machine; Fig. 2 is a left side elevation of the same, the end of the machine at the right in said figure being regarded as the front end; Fig. 3 is an elevation of the front end of the machine; Fig. 4 is a central vertical section, viewed from the left side; Figs. 5, 6 and 7 are similar vertical cross-sections on the line 5—5 of Fig. 2, some of the parts being shown in elevation and illustrating different positions assumed by parts of the feeding mechanism; Fig. 8 is a face view of a cam for imparting movement to parts of the feeding mechanism; Figs. 9 and 10 are detail sections at right angles to each other and passing centrally through the left hand one of a pair of suction cups employed in the feeding mechanism, Fig. 9 illustrating the position of the parts as viewed from the front end of the machine and Fig. 10 as viewed from the left side; Fig. 11 is an enlarged vertical longitudinal section of a portion of one of the pair of reciprocating feed bars, on the line 11—11 of Fig. 1; Figs. 12 and 12ª are fragmentary transverse sections through the front and rear pressure bar supports on the dotted lines 12—12 and 12ª—12ª, respectively, of Fig. 1; Fig. 13 is a central longitudinal vertical section of the rear portion of the machine, portions of the mechanism being shown in elevation; and Fig. 14 is a detail showing in perspective one of the sliding blocks and its associated oscillating finger for delivering the formed article after the stamping mechanism has operated upon the blank.

The same reference characters indicate the same parts on all the figures of the drawing.

The stationary supporting frame of the machine may be constructed in any desired manner so that it will afford suitable support to the other parts. In the machine illustrated the main frame consists of a casting 1 supported on legs 2, and formed with side members 3, a front cross member 4, a rear cross member 5 and an intermediate strengthening member 6. To provide for adjustment of the machine to operate upon blanks of different sizes, the moving parts and associated elements of the feeding mechanism, which consists of pairs of oppositely arranged symmetrical members are mounted upon opposite symmetrical side beams 7—7 which are slidably mounted in the machine frame so that they may be adjusted simultaneously towards and away from the median line of the machine. To this end the beams are formed with front base blocks 8 and rear base blocks 8ª having dove-tailed recesses arranged to slidingly engage transverse guide rails 9 formed on the stationary frame of the machine. The side beams are also formed with front and rear internally threaded bosses arranged to respectively engage the opposite portions of a front right-and-left threaded adjusting screw 10, and a similar rear screw 10. The two screws have a swivel connec-

tion with the main frame and are arranged to be rotated in union through a hand crank 100 on the end of the front screw by means of a sprocket chain 101 engaging similarly formed sprocket wheels secured to the two screws.

The upper faces of the beams are machined to form plate-receiving surfaces over which the blanks may slide in passing through the machine from the feeding to the forming and delivery mechanism, and in the top faces are formed guideways to receive reciprocating feed bars 11—11 by means of which the blanks are intermittently carried rearward, as hereinafter explained.

The supporting structure of the sheet-holding and feeding mechanism includes, in the present instance, a front corner block 12 and a rear corner block 13 rigidly secured to the outer face of each side beam adjacent its front end, and a frame bar 14 extending longitudinally of the machine and secured to the top of the two corner blocks. Upon each bar 14 is mounted a pair of similar oppositely arranged brackets 15 to which are secured vertical spacing posts 16. The brackets are secured to the bars by means of bolts 17, which engage any one of a series of threaded seats in the bars, the orifices in the base flanges of the brackets being elongated sufficiently to permit adjustment of the brackets at any point between the seats. The posts 16 may thus be adjusted to receive a stack of blanks of any desired width from front to rear of the machine.

Midway between the brackets 15 a side spacing post is secured to the inner face of each frame bar 14, the two posts 18 serving to confine the stack of blanks to a central portion in the machine.

The stack of blanks confined by the posts 16 and 18 are maintained at a fixed height a short distance above the top faces of the beam 7 by one or the other of two alternately acting reciprocating devices, one consisting of a pair of vertically sliding supporting plates 19, and the other a pair of separating plates 20, mounted to have a lateral oscillating movement, the lowermost blank being withdrawn from the stack and fed rearward during each cycle of movements of the parts, as will now be explained in detail.

The supporting plates 19 are flat and rectangular in shape, and are mounted to reciprocate vertically in shallow slideways cut in the outer faces of the two side beams 7. On the outer side of each plate is mounted a cam roller 21 arranged to engage a cam groove formed in the inner side face of a rotating cam 22 which is journaled in bearings carried by the associated side beam 7, and which has splined connection with a cam shaft 23 through which it is driven and which is rotatably mounted in the side members of the stationary frame of the machine.

Each of the two separating plates 20 at opposite sides of the machine is pivoted at its outer corners to links 24 which are pivoted to lugs 12^a and 13^a extending outwardly from the corner blocks 12 and 13 respectively. Inwardly of the pivotal connection with the links, the plate 20 rides upon a pair of rollers 25 carried by the two corner blocks. The plate is oscillated between the two positions shown respectively in Figs. 5 and 6 by means of a rocking frame 26 pivotally mounted in bearings formed in the corner blocks 12 and 13 and having upwardly extending side arms 26^a connected by links 27 with the links 24, and having an intermediate inwardly extending arm 26^b equipped with a cam roller arranged to cooperate with a cam groove formed in the outer face of the cam 22 before mentioned.

In the successive cycles of movement of the feeding mechanism the opposite side edges of the lowermost blank in the stack are drawn downwardly from the remaining sheets by means of a pair of suction cups 27, one at each side of the machine,—see Figs. 5, 6, 7, 9 and 10. The cups, which are formed of rubber or other suitable elastic material are each mounted by means of a hollow screw 28 in a spring-press sliding block 29 mounted in a laterally extending arm 30 secured to a rock shaft 31 journaled in bearings on the outer face of the associated supporting plate 19. This rock shaft is yieldingly stressed upwardly by a spring 32 and has secured to it a downwardly extending arm 33 which engages a peripheral groove 34 in the rotating cam 22. Since the suction cup and rock shaft move in unison with the supporting plate the peripheral face of the cam follows the contour of the cam groove engaged by the cam roller 21, and the groove 34 follows this contour and has also an axial or lateral pitch which operates to produce a rising and falling movement of the suction cup with respect to the supporting slide as the parts rise and fall.

The block 29 is bored and provided with a tube connection to provide a passage between the interior of the cup and an exhausting device. This device in the present instance includes a cylinder 35 in communication with the flexible tube 36 leading through branch pipes 37, 37^1 to a piston in said cylinder which is reciprocated through an eccentric on the shaft 23 connected to a strap on this pitman 38 pivoted to the piston.

The manner in which the parts thus far described operate to remove blanks one by one from the bottom of the stack may now be explained, it being understood that the shape of the cams and setting of the cams and eccentric are such as bring about the movements in the order described. Immediately after the end of a rearward feeding movement of the blanks through the machine (produced by means which will later be described), the parts assume the position shown in Fig. 5,

the stack of blanks, marked A, being supported by the plates 19; the separating plates 20 in outermost position, and the suction cups raised and just subjected to exhaustion to cause them to take hold of the opposite edges of the lowermost blank. The axial deviation of the path of the cam groove 34 now rocks the cup downward (the supporting plates 19 meanwhile remaining stationary) thus drawing down the edge of the lowermost blank, and closely following this movement the edges of the separating plates 20 move inwardly under the lowermost blank to and past the position shown in Fig. 6, also moving slightly upwardly and coming to a dwell in the position shown in Fig. 7. The supporting plates 19 immediately fall to lowermost position and the vacuum having at this point been relieved the edges of the blank spring up and it rests upon the flush upper surfaces of the plates 19, the feed bars 11 and face of the side beams 7. As soon as the blank is fed rearwardly through a rearward stroke of the feed bars and clears the rearward line of the stack of blanks the supporting plates move upwardly to uppermost position, and the separating plates are immediately swung to outer position and the suction cups then swing upwardly to the position shown in Fig. 5, to repeat the movements described in the next cycle.

Inasmuch as the suction cups are intercommunicating, if one cup should fail to adhere to the blank, because of an irregularity in the surfaces of the blank or a hole through it, the relief of the vacuum through such cup would extend to the other cup, so that neither edge of the blank would be drawn down, and the separating mechanism would operate idly, and not incorrectly, with consequent liability of damage to the machine, as would be the case were one side of the blank only acted upon.

The mechanism through which the blanks are intermittently moved rearwardly through the machine may next be described. In opposite depending brackets forming part of the stationary frame of the mechanism is journaled a rock shaft 40 to which is secured a rock arm 41 pivotally connected to one end of a connecting rod 42 which at its other end is threaded to provide an adjustable connection with a pivot block 42^a which is pivoted to a cross-bar 44 passing through opposite slots in the side-beams 7 and engaging notches formed on the under sides of the feed bars 11. The crosshead structure is guided by a guide rod 47 which slidingly engages a bushing arranged to be rigidly secured in a split socket 48 at the top of a supporting bracket 49 secured to the crossbar 4 at the front end of the stationary frame of the machine.

Near the front end of the two feeding bars, the bars are equipped on their top side with opposite feed lugs or teeth 45, and rearwardly thereof, spaced the length of a feeding stroke apart, the top of the bars carries spring-pressed feeding pawls 46 (see Fig. 11) which on the forward stroke of the bar yield to pass under a blank on the supporting upper face of the beams 7 and spring upwardly to engage the rear edge of the blank at the end of the stroke, and on the rearward stroke slide the blank rearwardly.

The blanks are held down upon the feed bars and upper faces of the side beams by means of pressure bars 47^a, which extend parallel with the feed bars a short distance outside of them on opposite sides of the machine. In the present instance (see Fig. 12) these pressure bars are provided near their front ends with inwardly-extending fingers 48^a orificed to each loosely engage the stem of a screw 49 engaging a seat in an upturned marginal flange of the rear portion of the adjacent side beam. Interposed between the head of the screw is a spring 50 bearing on a washer 51 arranged on top of the finger, the tension of the bars being regulated by adjustment of the screw. The rear ends of the pressure bars are also yieldingly mounted (see Fig. 12^a) by means of vertically spring-pressed pins 49^a secured to the bars and mounted in brackets 48^b bolted to the side beams 7 and of a curved form to provide clearance for parts to be hereinafter described.

Inasmuch as in stamping or forming machines as ordinarily constructed for forming various kinds of pans and other articles having a flat bottom and upstanding sides, the bottom of the article to be formed from a blank rests upon a depressible spring-pressed plate which after the article is stamped automatically follows the forming die upwards, lifting the formed article so that its bottom comes to the plane originally occupied by the blank, and inasmuch as such movement of the annual spring-pressed plate would interfere with movements of the feed bars 11 of my machine, I have devised means for delaying the return upward movement of the bottom plate so that it may operate in synchronism with the feed bars of the mechanism above described. To this end the plate (marked 52) is equipped with a pair of depending vertical posts 53 which rest upon the top of a vertically-reciprocating cross-head 54 pivotally connected by a link 54^a with the horizontal arm of a bell-crank lever 55 fast upon a cross shaft 56 journaled in the frame of the mechanism. The vertical arm of the bell-crank is pivotally connected with the rear end of a connecting rod 57 which is formed with a slotted front end arranged to engage a stud 58 upon a rock arm 59 secured to the rock shaft 40 before mentioned, the arrangement of the parts being such that during the closing portion of the rearward stroke of the

rock arm and stud the stud will contact the rear end of the slot and quickly return the plate 52 to upper position.

The weight of the plate and connected parts is counterbalanced in suitable manner, as by the compression spring 60 surrounding one of the guide posts upon which the cross-head 54 is mounted to slide and a brake 61 having one member also connected to the cross-shaft 56 is provided to yieldingly maintain the plate in the opposite portions to which it is shifted by application of the positive force of the press in the stamping operation and this action of the rock arm 59.

For the purpose of removing the formed articles from the machine at the conclusion of each stamping operation I employ a pair of rocking fingers 62 mounted respectively on two sliding blocks 63 arranged one at each side of the machine and arranged to engage stationary guide bars on the machine frame. Each finger has an eccentric pivotal connection with the rear end of a rod 64 which at its front end is pivoted to a bracket 65 secured to the feed bar 11 on the particular side of the machine, and the inertia of the block 63 and frictional resistance of the guide way in which such block is mounted are such that the reciprocations of the feed bars will cause the fingers to oscillate from positions parallel with the bars to the transverse position shown in Fig. 14 at the beginning of each rearward movement of the feed bars, and return to their parallel positions at the beginning of each forward stroke, stops being provided for the fingers to bring up against at the limit of each oscillation.

It will be understood that any suitable driving connections may be employed for giving the described movements to the various parts. In the present instance a shaft which makes one complete rotation at each complete to-and-fro movement of the stamping mechanism is equipped with a sprocket wheel (not shown) which through a sprocket chain 72 drives a double sprocket wheel 73 rotatably mounted on a stub shaft on the stationary frame of the machine. A second sprocket chain 74 engaging the wheel 73 engages a sprocket wheel 75 secured to the cam shaft 23 before mentioned.

The operating shaft through which the parts just mentioned are actuated also has a crank connection with the upper end of a connecting rod 76 which is pivotally connected at its lower end to a rock arm 77 fixed to the rock shaft 40.

The arrangement of the parts is such that during each complete stamping operation the blank-separating and blank-transferring mechanisms and the blank-removing mechanism, each make one complete cycle of movements. The blank, separated from the stack in the manner already described, is deposited on the top faces of the side beams 7 and feed bars 11 as the latter reach the forward end of their stroke. They are fed rearward in a given number of successive strokes (three in the present instance), and at the end of the last stroke come to rest, centered in proper position, over the bottom plate 52 of the stamping mechanism, which has just before been lifted to upper position, the formed article which was left on the plate being simultaneously removed by the action of the slidingly mounted rocking fingers actuated by the feed bars. The feed bars and associated parts now recede to forward position, and this movement is followed by the descent of the stamping die, the feeding fingers being oscillated to clear the die as the latter descends. These feeding fingers, it may be noted, are of relatively fragile construction, so that in case of failure to shift to outer position for any reason, they will readily crush and not cause damage to the stamping mechanism.

Inasmuch as the center of the magazine for the blanks and the center of the stamping members are arranged a fixed number of strokes of the feeding bars apart, it is only necessary to the proper operation of the machine that the feed bars 11 be so adjusted in their ways that the front feed lugs 45 shall immediately engage the blanks separated from the stack in the magazine at the beginning of their rearward stroke. This may be accomplished by adjustment of the connecting rod 42 in the pivot block 42^a of the cross-head structure to which the bars are connected.

While for the purpose of exposition I have described my invention as embodied in a machine for stamping blanks formed of sheet metal, it will be understood that by slight modification of parts to adapt it to the particular use, my invention may be adapted to machines operating on blanks of other material than sheet metal. I therefore do not desire to limit my invention to its employment for feeding sheet metal blanks only.

It will further be understood that my invention is not necessarily limited to the particular construction of the mechanical elements and groups of elements for performing the functions hereinbefore mentioned as these may vary widely in form and arrangement from the construction herein described. I therefore desire the claims to be construed to cover all equivalent parts or members or mechanisms which may be substituted for those particularly described, or may be used to accomplish the same ends.

I claim:

1. In a machine for feeding sheet metal blanks and the like and having intermittently acting means for supporting the central portion of a stack of blanks and reciprocating means for intermittently drawing down marginal portions of the bottom blank, separating means including a movable plate having an

inward and upward reciprocating movement transversely of the machine, said movable plate being pivotally mounted on rocking links and arranged to slide upon a stationary portion of the machine.

2. In a machine for feeding sheet-metal blanks and the like and having intermittently acting means for supporting the central portion of a stack of blanks and a reciprocating vacuum cup for intermittently drawing down a marginal portion of the bottom blank, separating means including a plate having a reciprocating lateral movement, said plate being cut away to straddle the vacuum cup.

3. In a machine for feeding metal blanks and the like from a stack of blanks and having alternately acting supporting means for supporting the central portion of the stack and separating means for supporting the marginal portion of the stack above a marginal-separated bottom sheet, a reciprocating vacuum cup arranged to successively operate on marginal portions of the bottom sheets of the stack, said vacuum cup being slidingly mounted on a rocking arm.

4. A machine according to claim 3 in which said vacuum cup is carried by a spring-pressed block.

5. In a machine for feeding sheet-metal blanks and the like from a stack of blanks and having a vertically-reciprocating supporting member for intermittently supporting the central portion of the stack and having alternately acting separating means for supporting the marginal portion of the stack above a marginally separated bottom sheet, a vacuum cup carried by said supporting member and mounted thereon to have relative vertical movement with respect thereto.

6. A machine according to claim 5 in which said vacuum cup is mounted on a rocking arm pivoted on said supporting member.

7. A machine according to claim 5 and having a rotating cam provided with a lateral radially-varying cam groove arranged to control the movement of said supporting member and with a peripheral cam groove varying both radially and axially arranged to control the movement of said vacuum cup.

8. A machine according to claim 5 in which said supporting member is slidingly mounted and equipped with a cam member and said vacuum cup is mounted on one arm of a bell crank pivoted on such supporting member and the other arm is equipped with a cam member, and having a rotating cam provided with a rotating cam formed with a lateral cam groove cooperating with said first mentioned cam member and a peripheral groove cooperating with said second mentioned cam member.

9. In a machine for feeding sheet-metal blanks and the like from a stack and having a vertically-reciprocating supporting slide arranged to intermittently support the central portion of the stack, and having an alternately-acting separating plate for supporting the marginal portion of the stack above a marginally-separated bottom sheet, and having a vacuum cup pivotally supported upon said supporting member and arranged to successively separate marginal portions of the bottom sheets of the stack; a rotating cam provided with a lateral radially-varying cam groove arranged to control the movement of said supporting member and also with a cam groove varying both radially and axially arranged to control the movement of said vacuum cup and also with a lateral radially-varying cam groove arranged to control the movement of said separating plate.

10. A machine according to claim 9 in which said supporting slide is equipped with a cam member and said separating plate is actuated by a rocking frame equipped with a second cam member and said vacuum cup is mounted on one arm of a bell crank of which the other arm is equipped with a third cam member, and having a rotating cam formed with a lateral cam groove cooperating with said first mentioned cam member and a second lateral groove cooperating with said second cam member and a peripheral cam groove cooperating with said third cam member.

11. In a machine of the character described, a stationary frame, a pair of bed members transversely movable in said stationary frame, means for simultaneously shifting said members equally to and from the median line of the machine, and pairs of opposite and similar parts carried by said members and together constituting means for supporting a stack of plates and sheet-separating mechanism and reciprocating slide-bar means for transferring said plates longitudinally of the machine.

12. In a machine of the character described, a stationary frame, a cam shaft journaled in said frame, a pair of laterally-adjustable bed members mounted on said stationary frame, and pairs of opposite similar cooperating parts mounted on said bed members, said pairs including means for supporting a stack of plates and sheet-separating mechanism and rotating cams having splined connection with said cam shaft and respectively arranged to operate the parts of said supporting means and said sheet-separating mechanism.

13. In a machine of the character described, a stationary frame, a cam shaft journaled in said frame, a pair of laterally-adjustable bed members mounted on said stationary frame, and pairs of opposite similar cooperating parts mounted on said bed members, said pairs including a pair of vertically-reciprocating supporting slides and a pair of laterally oscillating separating plates and a pair of vacuum cups arranged to cooperate successively with marginal portions of the sheets being fed, and a pair of rotating cams having splined con-

nection with said cam shaft and respectively cooperatively connected with said supporting slides and separating plates and vacuum cups.

14. In a machine of the character described and having forming mechanism and frame members formed with a blank-supporting surface, reciprocating feed bars slidingly mounted in said frame and having a plurality of feed pawls arranged the distance of one stroke apart, means for delivering blanks on said blank supporting surface in the path of said feed pawls, the distance between the center of the blanks at such point of delivery and the center of the blanks at the forming mechanism being a given whole number of strokes apart, an actuating member having an invariable stroke, and means for variably connecting said actuating member and said feed bars to adjust the position of said feed pawls with respect to the blank centers.

15. In a machine of the character described and having forming mechanism including a vertically reciprocating die and a horizontal plate for supporting the formed articles, a reciprocating blank-feeding mechanism in horizontal alignment with such plate including means for removing formed articles from said plate having a pair of slidingly-mounted pivoted fingers arranged to rock into position to engage the article during a feeding movement of such blank-feeding mechanism and rock out of the path of the die of the forming mechanism during the return movement of such blank-feeding mechanism.

16. A machine of the character described according to claim 15 in which said blank-feeding mechanism includes reciprocating feed bars arranged to deliver blanks laterally onto said plate, a pair of blocks slidably mounted adjacent opposite sides of said plate, a pair of rocking fingers respectively pivoted on said blocks, and links connected to said feed bars and also eccentrically connected to said fingers.

EDWIN V. SWANGREN.