No. 686,792. Patented Nov. 19, 1901.

F. WESTWOOD.

MACHINE FOR SEPARATING SHEET METAL PLATES.

(Application filed Mar. 29, 1901.)

(No Model.) 3 Sheets—Sheet 1.

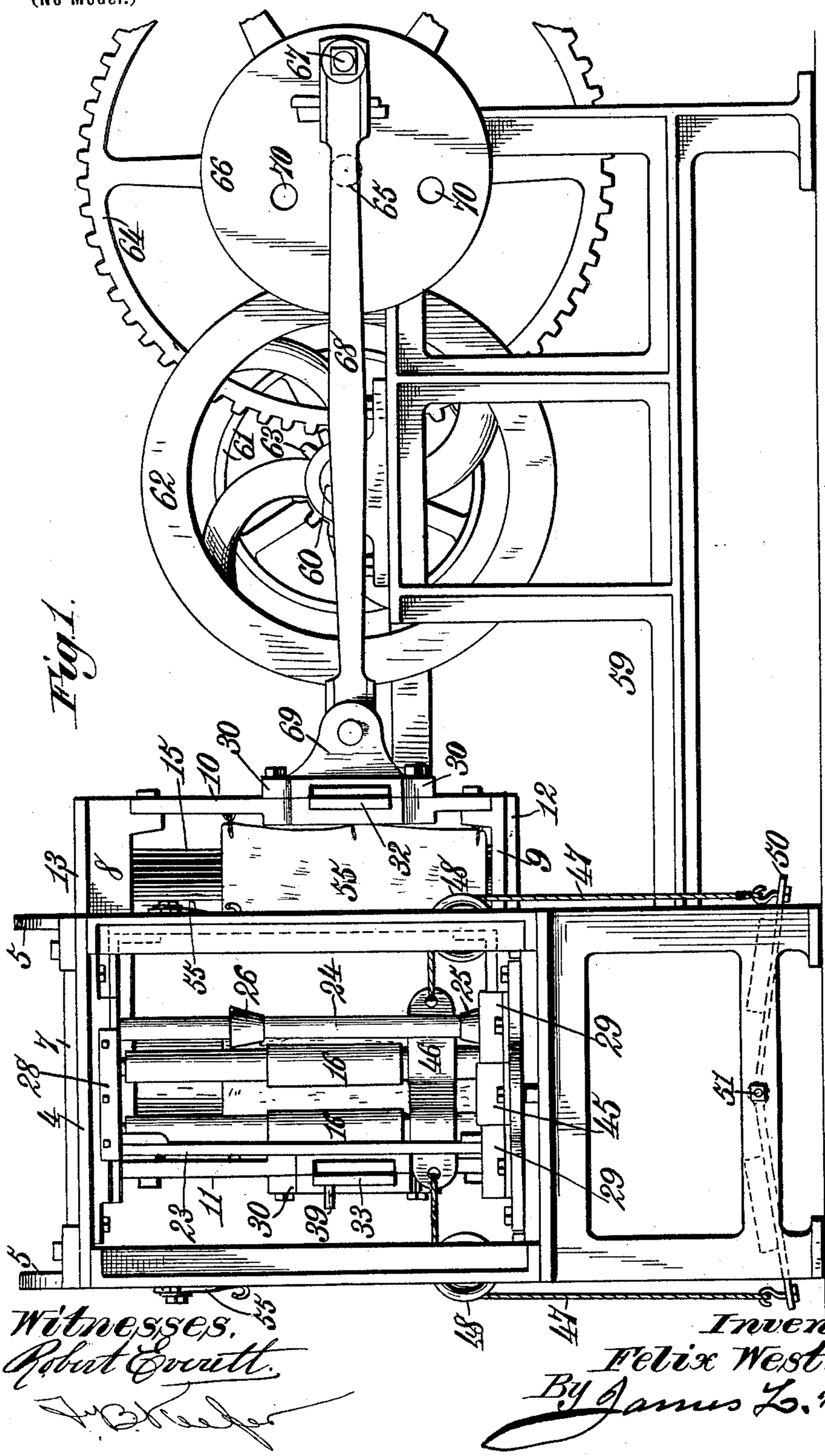


Fig. 1.

No. 686,792. Patented Nov. 19, 1901.

F. WESTWOOD.

MACHINE FOR SEPARATING SHEET METAL PLATES.

(Application filed Mar. 29, 1901.)

(No Model.) 3 Sheets—Sheet 2.

Fig. 2.

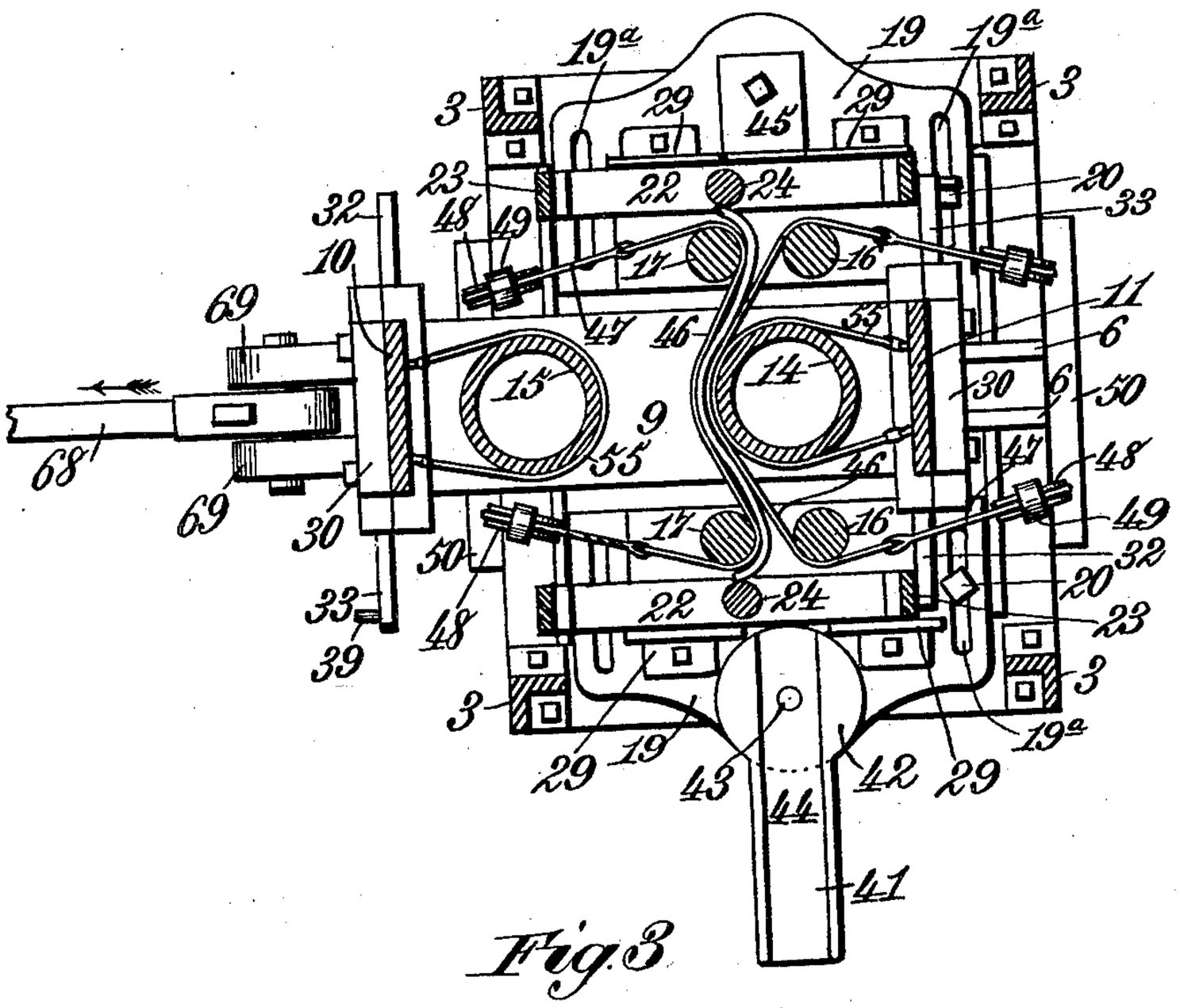
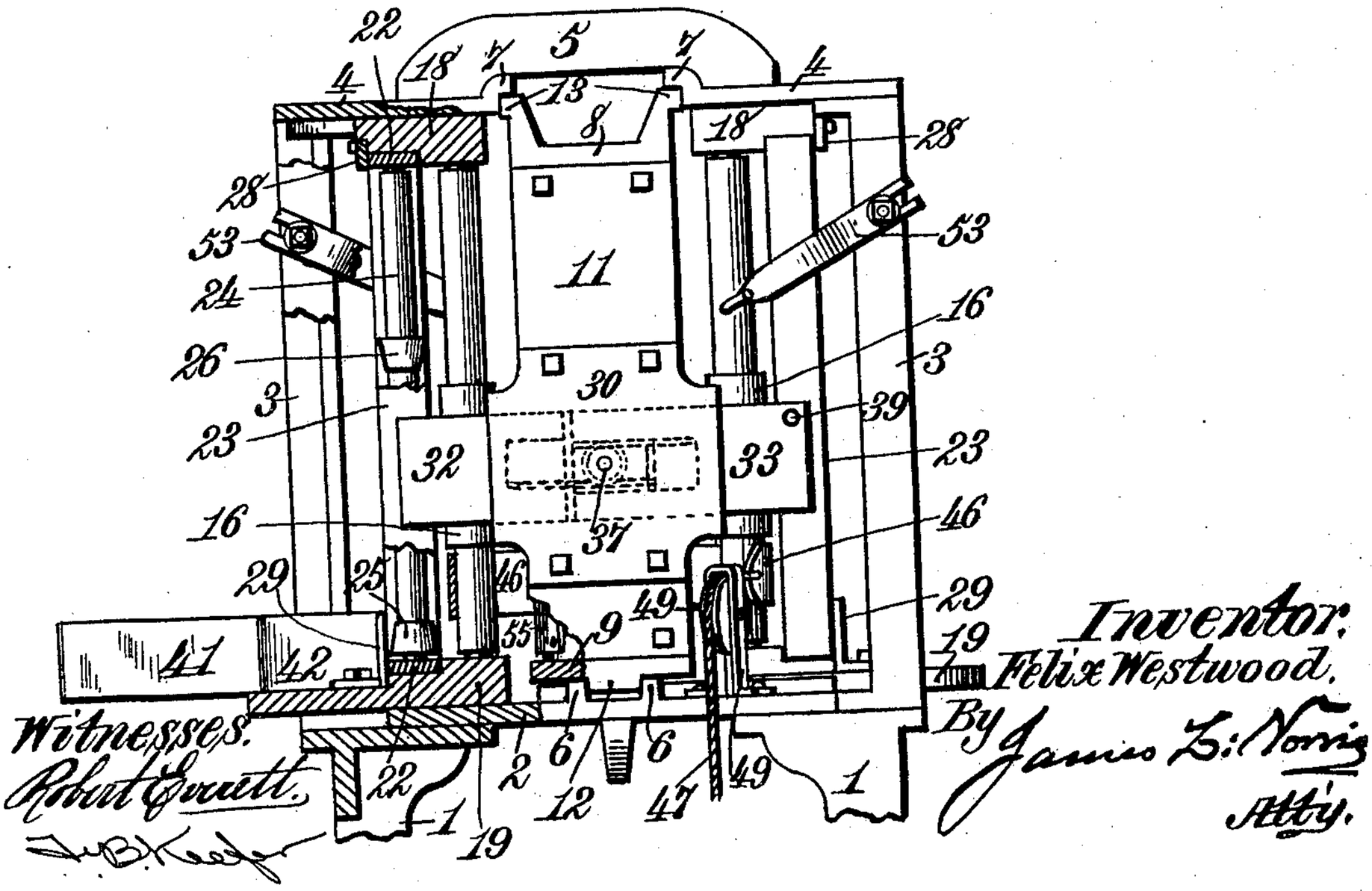


Fig. 3



Witnesses:
Robt Ewett.
J. B. Keefer

Inventor:
Felix Westwood.
By James L. Norris
Atty.

No. 686,792. Patented Nov. 19, 1901.

F. WESTWOOD.

MACHINE FOR SEPARATING SHEET METAL PLATES.

(Application filed Mar. 29, 1901.)

(No Model.) 3 Sheets—Sheet 3

Fig. 4.

Fig. 5.

Fig. 6.

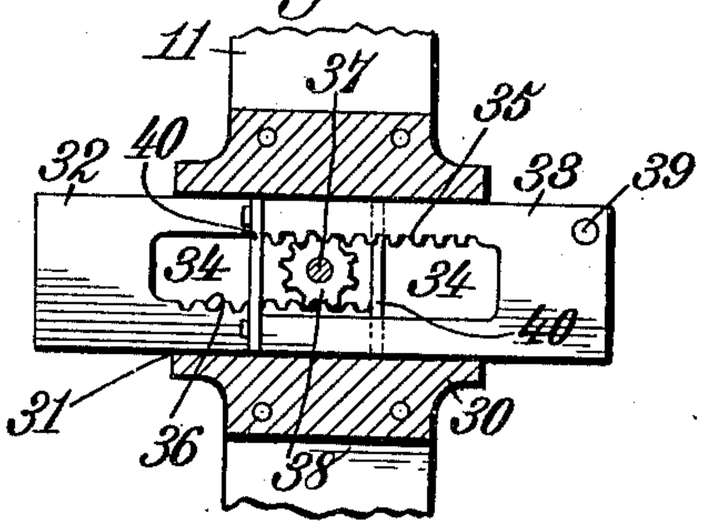


Fig. 7.

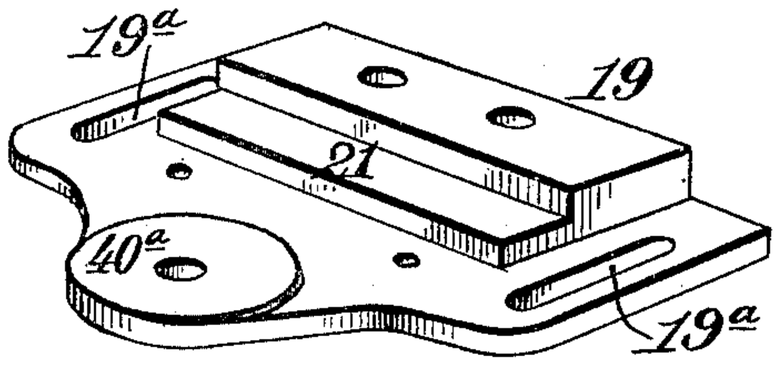
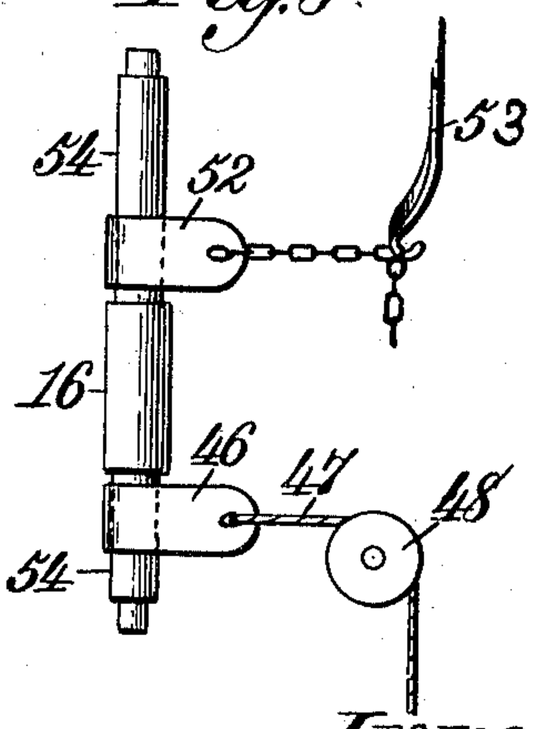


Fig. 8.



Witnesses.
Robert Everett.
J. B. Keelan

Inventor.
Felix Westwood.
By James L. Norris.
Atty.

UNITED STATES PATENT OFFICE.

FELIX WESTWOOD, OF WEST LIBERTY, WEST VIRGINIA.

MACHINE FOR SEPARATING SHEET-METAL PLATES.

SPECIFICATION forming part of Letters Patent No. 686,792, dated November 19, 1901.

Application filed March 29, 1901. Serial No. 53,473. (No model.)

To all whom it may concern:

Be it known that I, FELIX WESTWOOD, a citizen of the United States, residing at West Liberty, in the county of Ohio and State of West Virginia, have invented new and useful Improvements in Machines for Separating Sheet-Metal Plates, of which the following is a specification.

This invention relates to machines for separating packs of sheet-metal plates, and is in the nature of an improvement on the machine for which I secured Letters Patent of the United States No. 609,645, dated August 23, 1898.

The present invention has for its objects the more rapid and complete separation of the plates, to provide means for simultaneously bending the centers and ends of the plates in reverse directions, to provide means for bending the corners of the plates to a greater extent than the vertical edge portions between the corners, to provide means for adjusting the machine to separate sheets of different sizes, and finally it has for its object to improve the construction and render more efficient and rapid the operation of the machine generally.

To these ends my invention consists in the features and in the construction, combination, and arrangement of parts hereinafter described, and particularly pointed out in the claims following the description, reference being had to the accompanying drawings, forming a part of this specification, wherein—

Figure 1 is a view in side elevation of my improved machine. Fig. 2 is a horizontal sectional view of the same. Fig. 3 is a view in front elevation, partly in section. Fig. 4 is a detail perspective view of one of the movable frames carrying the end and corner bending rollers. Fig. 5 is a detail view illustrating the means for throwing the means for actuating said frames into and out of operation. Fig. 6 is a similar view taken at a right angle to Fig. 5. Fig. 7 is a detail perspective view of one of the bottom rests or guides in which said frames move, and Fig. 8 is a detail view showing the means for holding the guide-straps taut.

In my Letters Patent above referred to I show, describe, and claim a machine for separating rapidly and effectually the several sheets comprising packages of sheet-metal plates, such as laminated or superimposed sheet-metal plates designed for the manufacture of tin-plate. In practice the plates are formed by first rolling a plate of metal out to the desired thickness. This plate is then folded or doubled upon itself and passed between two rolls, forming two superimposed plates. The two plates are again folded and passed between rolls, forming four plates, and the latter are finally doubled or folded once more, forming a pack of eight plates or sheets, which are passed between the rolls and are then trimmed on the edges. A pack of eight superimposed plates are thus formed. In order to properly fold and roll the plates, it is necessary to heat the metal, and hence when the pack of eight sheets has been formed the sheets, though not welded together, adhere to one another with great tenacity, and prior to the invention of the machine disclosed in my said Letters Patent it was the ordinary practice to effect the separation of the sheets by hand—a slow, expensive, laborious, and difficult operation. By means of my said patented machine this was automatically accomplished in a successful manner. The present invention is designed to separate the plates more rapidly, effectually, and in a more satisfactory manner than was accomplished by the prior machine referred to.

Referring to the drawings, the numeral 1 indicates a chair or support on which is fastened a bed-plate 2. Bolted to the four corners of the chair are vertical angle-irons 3, to the tops of which are bolted stringers 4 and transverse arches 5. The above-named parts form the frame of the machine and support the various operative parts thereof.

Formed centrally on the upper side of the bed-plate 2 are two longitudinal parallel ribs 6, forming a guideway in which the bottom of a carriage is adapted to travel, and the adjacent edges of the stringers 4 are formed with rabbeted overhanging lips or flanges 7, forming guideways for the top of said carriage to travel in. The carriage consists of two longitudinal metallic bars 8 and 9, arranged horizontally one above the other, and to the ends of said bars are bolted two uprights 10 and 11, said bars and uprights forming a vertical rectangular frame. On the

bottom of the lower bar 9 is formed a rib 12, which travels in the guideway formed by the ribs 6, and the upper bar 8 is formed with laterally-projecting flanges 13, which travel in the guideways formed by the rabbeted lips 7. The carriage is thus caused to travel in a true right line and is firmly supported in its movements. Mounted in the bars 8 and 9 of the carriage are two vertical pillars 14 and 15 of relatively large diameter, said pillars being arranged a suitable distance apart for the purpose hereinafter explained.

Arranged on opposite sides of the carriage are two pairs of roller-abutments, the rollers of each pair being respectively designated by the numerals 16 and 17. The said rollers are journaled in top and bottom bearing-plates 18 and 19, which are respectively adjustably bolted to the stringers 4 and the bed-plate 2 by bolts 20, said bolts passing through elongated slots 19ª, formed in the bearing-plates, whereby when the bolts are loosened the bearing-plates may be moved toward and from each other for the purpose hereinafter set forth. As shown most clearly in Figs. 3 and 7, the bearing-plates are rabbeted, as at 21, and in said rabbets are adapted to reciprocate two rectangular frames, each consisting of two parallel bars 22, having bolted to their flanged ends uprights or side pieces 23. (See Fig. 4.) Journaled centrally in the bars 22 of each of said frames is a vertical roller 24, and on said roller are mounted two frusto-conical collars 25 and 26, the upper collar 26 being adjustably secured on the roller by a set-screw 27. As shown, the collars are so arranged on the rollers that their smaller ends are disposed toward one another. As stated, the frames carrying the rollers are free to reciprocate in the rabbets 21, formed in the bearing-plates 18 and 19, and are held in place therein by strips 28, fastened to the outer edges of the upper bearing-plates 18 and by angle-brackets 29, bolted to the under bearing-plates 19.

Bolted to the outer faces of the uprights 10 and 11 of the carriage carrying the pillars 14 and 15 are face-plates 30, and in the adjacent faces of said uprights and face-plates are formed horizontal recesses which unite to form a horizontal rectangular slot 31, in which are movably arranged two slide-bars 32 and 33, disposed one in front of the other. Said slide-bars are longitudinally slotted from their inner to near their outer ends, as at 34, and on the upper wall of the slot in one of said slide-bars is formed a rack 35, while a similar rack 36 is formed on the lower wall of the slot in the other slide-bar. A short shaft 37 is fixed in the upright and face-plate and passes through the slots in the slide-bars, and on said shaft is mounted a pinion 38, which gears with both the racks 35 and 36. A knob or handle 39 is fixed to the outer end of one of the slide-bars, as 33, and it will be apparent that if said slide-bar be moved in or out the other slide-bar 33 will, through the medium of the pinion 38 and racks 35 and 36, be also moved in or out, the two slide-bars simultaneously moving in opposite directions. Strips 40 are fastened on the inner ends of the slide-bars and bridge the slotted ends thereof, said strips operating to prevent the entire withdrawal of the slide-bars. It will of course be understood that a pair of slide-bars will be arranged on each of the uprights 10 11 of the carriage. If the slide-bars be drawn out, they will engage the ends of the frames carrying the rollers 24 as the carriage moves back and forth and will communicate a reciprocating motion to said frames and rollers; but if the slide-bars be pushed in then as the carriage reciprocates they will fail to engage the ends of the frames, and the latter and their rollers will remain stationary. It will be noted that the distance between the two sets of slide-bars is greater than the distance between the ends 23 of the sliding frames. Hence there will be lost motion between the carriage and said frames, or, in other words, when the carriage commences its movement in either direction it will have to move a certain distance before the slide-bars will engage and move the frames for the purpose hereinafter made apparent.

In order that certain details of construction hereinafter referred to may be the more clearly understood, I will here briefly explain the operation of that portion of the machine above described. It will be understood that the carriage carrying the pillars 14 and 15 is constantly reciprocated back and forth in its ways while the machine is in operation and that the frames carrying the rollers 24 are thrown into and out of operation periodically by hand at such times as the circumstances require by sliding in or out the slide-bars 32 and 33. Before the insertion of packs of sheets in the machine the slide-bars will be pushed in, so they will not engage the frames carrying the rollers 24, and the latter will remain stationary. Packs of sheets to be separated are then inserted vertically edgewise from one side of the machine between the roller-abutments 16 and 17 and between the pillars 14 and 15, the ends of the sheets resting in front of the rollers 24. The slide-bars 32 and 33 are then drawn outward in position to engage the sliding frames carrying the rollers 24. As the carriage carrying the pillars 14 and 15 advances one of the pillars—as 14, for example—engages the center of the pack of sheets, and at about the same time the sliding frames are engaged by the slide-bars and the rollers 24 engage the ends of the sheets. As the carriage continues to advance the pillar 14 bends the sheets at the center, as most clearly shown in Fig. 2, and at the same time the rollers 24 in their forward movement bend the ends of the sheets about the roller-abutments 17. Owing to the thickness of the pack of sheets, said sheets will be bent on the arcs of circles of slightly-different diameters, and hence each sheet will have a slight sliding or "creeping" movement on the

two adjacent sheets, thus slipping the sheets laterally apart and separating them. This action takes place at both the center and ends of the sheets, the bends therein being formed in reverse directions, as shown, and hence the sliding or creeping movement of the sheets occurs in opposite directions, thus aiding in the more effectual separation of the sheets. As the rollers 24 move forward to engage the ends of the sheets the conical collars first engage the corners thereof and bend them over before the vertical edges of the sheets are engaged by the rollers and operate to separate the sheets at the corners, after which the rollers engage the edges of the sheets and bend them about the pillars 17, as before described. When the rollers 24 have moved sufficiently far forward to release or disengage the end edges of the sheets, the latter spring violently backward and strike the roller-abutments 16, whereby a sharp and abrupt jar or shock is given to the sheets, which operates to shake the sheets loose from one another. On the return movement of the carriage this operation is repeated by the pillar 15, roller-abutments 17, and rollers 24 upon the reverse sides of the sheets, and the operation may be repeated as often as it is found necessary to effect the thorough separation of all the sheets. When this has been accomplished, the separated sheets are withdrawn from the machine, the slide-bars 32 and 33 having been first drawn inward to throw the rollers 24 out of operation.

I have described the abutments 16 and 17 as being "rollers," and this is the preferable way of mounting them; but it will be manifest that they might be stationary pillars without affecting the principle of their operation, and hence wherever the term "roller-abutments" is used I wish to be understood as including stationary or non-rotatable pillars.

I will now describe various other details of construction, which will be the more readily understood from the above brief description of the operation of the machine.

As before stated, the packs of sheets are inserted vertically edgewise in the machine from one side of the latter, and for thus feeding the sheets I provide the following means: One of the lower bearing-plates 19 at one side of the machine is formed with a circular raised bearing or boss 40^a, and adapted to oscillate on said bearing or boss is a feed device consisting of a trough 41, which is provided at its inner end with a circular head or hub 42, that is rotatably secured on the boss 40^a by a bolt or pivot-pin 43. As most clearly shown in Fig. 2, the two angle-brackets 29 are separated from one another, and the circular head or hub 42 is disposed in the space or opening between said brackets and closes the latter. The longitudinal slot or passage 44 in the feed-trough extends from end to end of the latter, passing through the circular head or hub. On the opposite side of the machine an angle-bracket 45 is bolted to the bearing-plate 19 and serves as a stop to limit the insertion of the packs of sheets. In practice the feed-trough will be turned to the position shown in Fig. 2, and the lower edge of the pack of sheets will be rested in the passage-way of said trough. The packs are then pushed into the machine until their edges engage the angle-bracket 45, after which the feed-trough is turned about its pivot 43 to one side, thus causing the circular head or hub 42 to close the opening between the angle-brackets 29. The machine is then in readiness to operate upon the sheets to separate them. The circular head or hub and the angle-bracket 45 serve to confine the sheets between the pillars and roller-abutments and prevent the sheets from being displaced laterally to either side. To withdraw the finished sheets, the feed-trough is turned back to its original position or until its passage-way 44 is in alinement with the opening between the angle-brackets 29.

In order to properly guide the sheets between the roller-abutments in the operation of feeding, I provide the following means: Passing around the lower ends of each pair of roller-abutments 16 16 and the intermediate pillar 14 and in the same manner about the roller-abutments 17 17 and pillar 15 is an apron or belt 46, of rubber, cloth, leather, sheet metal, or other suitable material, and secured to the ends of each of said aprons or belts are ropes or cables 47, which pass over pulleys 48, journaled in suitable supports 49, secured to the bed-plate 2. The lower ends of said ropes or cables are attached to the free ends of weighted leaves 50, which are hinged at their opposite ends to a rod 51, fixed to the frame of the machine. The weighted leaves and ropes or cables operate to hold the aprons or belts taut about the roller-abutments and pillars and also permit the movement of said aprons or belts as the pillars advance and recede. In similar manner aprons or belts 52 are passed around the upper ends of the roller-abutments and pillars (see Fig. 8) and at their ends are fastened to the hooked ends of leaf-springs 53, that are adjustably fastened to the angle-iron 3 of the machine-frame. The upper aprons or belts need only be used when sheets of relatively large size are to be separated and at other times may be detached from the leaf-springs and removed. The said leaf-springs, moreover, serve as buffers to receive the impact of the sliding frames that carry the rollers 24 and operate to limit the movement of said frames and prevent them from being thrown too far forward in either direction. When the sheets are fed into the machine, they pass between the aprons or belts and are guided by the latter between the roller-abutments. In order that said aprons or belts may not increase the diameter of the roller-abutments, the latter are reduced at their upper and lower ends, as at 54, (see Fig. 8,) so that when the belts are in place the

roller-abutments will be of uniform diameter throughout their operative length. Moreover, by reducing the roller-abutments in the manner shown space is provided for the collars 25 and 26 to rotate in without pinching or scoring the corners of the sheets, thus permitting the rollers 24 to be placed in close proximity to the roller-abutments.

When sheets of a large size are to be operated on, the bolts 20 are loosened, and the bearing-plates 19 are set back or away from each other to permit of the reception of the sheets between the circular head or hub of the feed-trough and the angle-bracket 45, and the collars 26 are also adjusted vertically on the rollers 24 to properly engage the upper corners of the sheets. It also becomes necessary at such times to increase the diameter of the pillars 14 and 15 in order that the bend or curvature may be imparted to every part of the sheets, and this I accomplish by providing blankets 55, which may be of the same material as the aprons or belts 46 and 52, said blankets being passed around the pillars 14 and 15 and secured at their ends to the ends of the carriage carrying the pillars, or the ends of the blankets may be laced together at the rear or outer sides of the pillars. When the blankets are applied to the pillars to increase their diameters, said pillars would engage the center of the pack of sheets before the rollers 24 would engage the ends thereof, and in order to remedy this I extend the ends of the frames carrying the rollers 24 in the following manner: Referring to Fig. 4 of the drawings, the numeral 56 indicates screws or headed pins inserted in the ends or uprights 23 of the frames, and 57 indicates blocks in the opposite end portions of which are formed keyhole-slots 58. By placing the slotted ends of the blocks over the headed pins, so that said pins pass through the larger ends of the keyhole-slots, the blocks will drop by gravity, and the smaller ends of the slots will be engaged by the headed pins, and the latter will hold said blocks in place on the sliding frames. The blocks in practice will be of a sufficient thickness to compensate for the increased diameter given to the pillars by the blankets, and hence as the carriage reciprocates back and forth the slide-bars 32 and 33 will engage the blocks 57 and will cause the rollers 24 to engage the ends of the sheets at approximately the same time the pillars engage their centers. By means of the arrangement shown the blocks may be instantly applied to the sliding frames and as quickly removed.

The means for actuating the movable parts of the machine now only remain to be described.

Referring to Figs. 1 and 2 of the drawings, the numeral 59 indicates a frame of any approved or suitable construction adapted to support the power or actuating mechanism. Journaled in suitable bearings on said frame is a shaft 60, on which is fixed a band-pulley 61 and a fly-wheel 62. Also fixed on said shaft is a pinion 63, that gears with a relatively large gear-wheel 64, fixed on a shaft 65, also journaled in bearings on the frame 59. Fixed on the shaft 65 is a wheel 66, carrying a wrist-pin 67, and on said wrist-pin is loosely mounted one end of a pitman 68, the other end of which is pivoted between two ears or lugs 69, formed on one of the face-plates 30, carried by the reciprocating carriage. Motion is communicated to the band-pulley from any suitable source of power and is communicated through the medium of the pinion 63 and gear-wheel 64 to the wheel 66, and the latter actuates the pitman 68, thus giving a reciprocating movement to the carriage carrying the pillars. The wheel 66 is provided with a plurality of perforations 70, which are severally arranged at different distances from the axis of said wheel, so that by shifting the wrist-pin 67 from one of said perforations to another the length of the stroke of the pitman 68, and hence the distance the carriage and its pillars and the sliding frames carrying the rollers travel, is regulated, it being obvious that the larger the sheets operated upon the greater the reciprocation of the carriage should be.

In practice several of the apparatuses or machines herein shown and above described may be arranged "tandem" or connected together, so that all the pillars, roller-abutments, and rollers of the several apparatuses or machines will be reciprocated in unison.

In view of the foregoing description a very brief explanation of the operation of the machine will be sufficient.

The pack of sheets is fed into the machine in the manner before set forth and the feed-trough turned to close the opening between the two angle-brackets 29. Then the slide-bars 32 and 33 are drawn out to engage the sliding frames. As the carriage advances one of the pillars, as 14, engages the center of the pack of sheets, as most clearly shown in Fig. 2, and at the same time the slide-bars engage the sliding frames and advance the latter, causing the rollers 24 to engage the ends of the sheets and bend or curve them around the roller-abutments 17. The sheets are thus slipped one upon another and caused to creep over each other, thus effecting a separation of the sheets in the direction of their length. As the rollers 24 continue to advance they disengage or release the ends of the sheets, which then violently spring back against the roller-abutments 16 and are given a sharp abrupt jar or shock, which operates to shake them loose from one another. Before the rollers 24, however, engage the ends of the sheets the conical collars 25 and 26 engage the corners of said sheets and bend them over, thus operating to separate the sheets at their corners. On the return movement of the carriage the pillar 15 and rollers 24 engage the other side of the pack of sheets and give a reverse bend or curvature to the sheets, and this operation may be repeated until all the sheets of the pack have been thoroughly separated.

The feed-trough 41 is then turned straight and the separated sheets withdrawn, the slide-bars 32 and 33 having been first withdrawn to throw the sliding frames carrying the rollers 24 out of operation, when the machine is in readiness to receive and separate another pack of sheets.

Having described my invention, what I claim is—

1. A machine for separating sheet-metal plates, comprising oppositely-arranged pairs of abutments for the plates, reciprocating pillars acting on the plates between said abutments, rollers arranged to engage the ends of said plates, and means for reciprocating said pillars and rollers, substantially as described and for the purpose specified.

2. In a machine for separating sheet-metal plates, the combination of oppositely-arranged pairs of abutments for the plates, reciprocating pillars acting on the plates between said abutments, rollers arranged to engage the ends of said plates, means for reciprocating said pillars and rollers, and means for adjusting said rollers toward and from the abutments, substantially as described and for the purpose specified.

3. In a machine for separating sheet-metal plates, the combination of oppositely-arranged pairs of abutments for the plates, reciprocatory pillars acting on the plates between said abutments, rollers arranged to engage the ends of said plates, means for reciprocating said pillars and rollers, means for adjusting said rollers toward and from the abutments, and means for increasing and diminishing the diameters of the pillars, substantially as described.

4. In a machine for separating sheet-metal plates, the combination of oppositely-arranged pairs of abutments for the plates, reciprocatory pillars acting on the plates between said abutments, rollers arranged to engage the ends of said plates and bend the latter about the abutments, means for reciprocating said pillars and rollers, and means carried by the latter for engaging the corners of the plates and bending them forward, substantially as described.

5. In a machine for separating sheet-metal plates, the combination of oppositely-arranged pairs of abutments for the plates, reciprocatory pillars acting on the plates between said abutments, rollers arranged to engage the ends of said plates and bend the latter about the abutments, means for reciprocating said pillars and rollers, and guides arranged between the roller-abutments and operating to guide a pack of sheets in proper position to be acted on by the machine, substantially as described.

6. In a machine for separating sheet-metal plates, the combination of oppositely-arranged pairs of abutments for the plates, reciprocatory pillars acting on the plates between said abutments, rollers arranged to engage the ends of said plates and bend the latter about the abutments, means for reciprocating said pillars and rollers, means for feeding the plates into the machine between the pillars and roller-abutments, and means for preventing endwise movement of the plates while being acted upon, substantially as described.

7. In a machine for separating sheet-metal plates, the combination of oppositely-arranged pairs of abutments for the plates, reciprocatory pillars acting on the plates between said abutments, rollers arranged to engage the ends of said plates, means for adjusting said rollers toward and from the abutments, means for increasing and diminishing the diameters of the pillars, means for reciprocating the pillars and rollers, and means for varying the distance said pillars and rollers are reciprocated, substantially as described.

8. In a machine for separating sheet-metal plates, the combination of oppositely-arranged pairs of abutments for the plates, a carriage arranged to reciprocate between said pairs of abutments, pillars carried by said carriage for acting on the plates between the abutments, sliding frames arranged outside the abutments, rollers carried by said frames for engaging the ends of the plates, and means carried by the carriage for engaging the said sliding frames and reciprocating the latter, substantially as described.

9. In a machine for separating sheet-metal plates, the combination of oppositely-arranged pairs of abutments for the plates, a carriage arranged to reciprocate between said pairs of abutments, pillars carried by said carriage for acting on the plates between the abutments, sliding frames arranged outside the abutments, rollers carried by said frames for engaging the ends of the plates, means carried by the carriage for engaging the said sliding frames and reciprocating the latter, and mechanism for throwing said engaging means out of operation to permit the sliding frames to remain stationary, substantially as described.

10. In a machine for separating sheet-metal plates, the combination of oppositely-arranged pairs of abutments for the plates, a carriage arranged to reciprocate between said pairs of abutments, pillars carried by said carriage for acting on the plates between the abutments, sliding frames arranged outside the abutments, rollers carried by said frames for engaging the ends of the plates, slide-bars projecting from the opposite sides of the opposite ends of the carriage for engaging and moving the sliding frames back and forth, and means for moving said slide-bars in and out to engage and disengage the said sliding frames, substantially as described.

11. In a machine for separating sheet-metal plates, the combination of oppositely-arranged pairs of abutments for the plates, a carriage arranged to reciprocate between said pairs of abutments, pillars carried by said carriage for acting on the plates between the

abutments, sliding frames arranged outside the abutments, rollers carried by said frames for engaging the ends of the plates, slide-bars projecting from the opposite sides of the opposite ends of the carriage for engaging and moving the sliding frames back and forth, and means for simultaneously moving said slide-bars in and out to engage and disengage the said sliding frames, substantially as described.

12. In a machine for separating sheet-metal plates, the combination of oppositely-arranged pairs of abutments for the plates, a carriage arranged to reciprocate between said pairs of abutments, pillars carried by said carriage for acting on the plates between the abutments, sliding frames arranged outside the abutments, rollers carried by said frames for engaging the ends of the plates, slide-bars projecting from the opposite sides of the opposite ends of the carriage for engaging and moving the sliding frames back and forth, oppositely-arranged racks on said slide-bars, and pinions arranged to engage both racks on each set of slide-bars, whereby when one of said slide-bars is moved in or out its companion slide-bar will be moved simultaneously in the same manner, substantially as described.

13. In a machine for separating sheet-metal plates, the combination of oppositely-arranged pairs of abutments for the plates, a carriage arranged to reciprocate between said pairs of abutments, pillars carried by said carriage for acting on the plates between the abutments, sliding frames arranged outside the abutments, rollers carried by said frames for engaging the ends of the plates, means for reciprocating said carriage and frames, and conical collars mounted on said rollers and arranged to engage the corners of the plates, substantially as described.

14. In a machine for separating sheet-metal plates, the combination of oppositely-arranged pairs of abutments for the plates, a carriage arranged to reciprocate between said pairs of abutments, pillars carried by said carriage for acting on the plates between the abutments, sliding frames arranged outside the abutments, rollers carried by said frames for engaging the ends of the plates, means for reciprocating said carriage and frames, and upper and lower conical collars mounted on said rollers, the upper collars being vertically adjustable on said rollers, substantially as described.

15. In a machine for separating sheet-metal plates, the combination of oppositely-arranged pairs of abutments for the plates, a carriage arranged to reciprocate between said pairs of abutments, pillars carried by said carriage for acting on the plates between the abutments, sliding frames arranged outside the abutments, rollers carried by said frames for engaging the ends of the plates, means for reciprocating said carriage and frames, belts passed about the corresponding abutments on the opposite sides of the machine, and means for yieldingly connecting the ends of the belts to the frame of the machine, substantially as described.

16. In a machine for separating sheet-metal plates, the combination of oppositely-arranged pairs of abutments for the plates, a carriage arranged to reciprocate between said pairs of abutments, pillars carried by said carriage for acting on the plates between the abutments, sliding frames arranged outside the abutments, rollers carried by said frames for engaging the ends of the plates, means for reciprocating said carriage and frames, belts passed about the lower ends of corresponding abutments on the opposite sides of the machine, cables attached to the ends of said belts, and means for weighting the ends of said cables, substantially as described.

17. In a machine for separating sheet-metal plates, the combination of oppositely-arranged pairs of abutments for the plates, a carriage arranged to reciprocate between said pairs of abutments, pillars carried by said carriage for acting on the plates between the abutments, sliding frames arranged outside the abutments, rollers carried by said frames for engaging the ends of the plates, means for reciprocating said carriage and frames, belts passed about the lower ends of corresponding abutments on the opposite sides of the machine, weighted hinged leaves, and cables attached to the ends of said belts and to said weighted leaves to hold the belts taut, substantially as described.

18. In a machine for separating sheet-metal plates, the combination of oppositely-arranged pairs of abutments for the plates, a carriage arranged to reciprocate between said pairs of abutments, pillars carried by said carriage for acting on the plates between the abutments, sliding frames arranged outside the abutments, rollers carried by said frames for engaging the ends of the plates, said rollers having reduced end portions, belts passed about the reduced ends of corresponding abutments on opposite sides of the machine, and means for yieldingly connecting the ends of the belts to the frame of the machine, substantially as described.

19. In a machine for separating sheet-metal plates, the combination of oppositely-arranged pairs of abutments for the plates, a carriage arranged to reciprocate between said pairs of abutments, pillars carried by said carriage for acting on the plates between the abutments, sliding frames arranged outside the abutments, rollers carried by said frames for engaging the ends of the plates, said rollers having reduced upper end portions, belts passed about the reduced ends of corresponding abutments on opposite sides of the machine, and leaf-springs secured to the frame of the machine and detachably connected at their ends to said belts, substantially as described.

20. In a machine for separating sheet-metal

plates, the combination of oppositely-arranged pairs of abutments for the plates, a carriage arranged to reciprocate between said pairs of abutments, pillars carried by said carriage for acting on the plates between the abutments, sliding frames arranged outside the abutments, rollers carried by said frames for engaging the ends of the plates, means for reciprocating the carriage and sliding frames, and blankets removably passed about the pillars, substantially as described and for the purpose specified.

21. In a machine for separating sheet-metal plates, the combination of oppositely-arranged pairs of abutments for the plates, a carriage arranged to reciprocate between said pairs of abutments, pillars carried by the carriage for acting on the plates between the abutments, sliding frames arranged outside the abutments, rollers carried by the sliding frames for engaging the ends of the plates, means for reciprocating the carriage and sliding frames, a stop on the outside of one of said sliding frames for limiting the insertion of the plates in the machine, and a feed-trough on the outside of the other sliding frame for feeding the sheets into the machine between the abutments and pillars, substantially as described.

22. In a machine for separating sheet-metal plates, the combination of oppositely-arranged pairs of abutments for the plates, a carriage arranged to reciprocate between said pairs of abutments, pillars carried by the carriage for acting on the plates between the abutments, sliding frames arranged outside the abutments, rollers carried by the sliding frames for engaging the ends of the plates, means for reciprocating the carriage and sliding frames, a stop on the outside of one of the sliding frames for limiting the insertion of the plates in the machine, and a feed-trough provided with a circular head or hub pivoted outside the other sliding frame, substantially as shown and described and for the purpose specified.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

FELIX WESTWOOD.

Witnesses:
VINTON COOMBS,
GEO. W. REA.