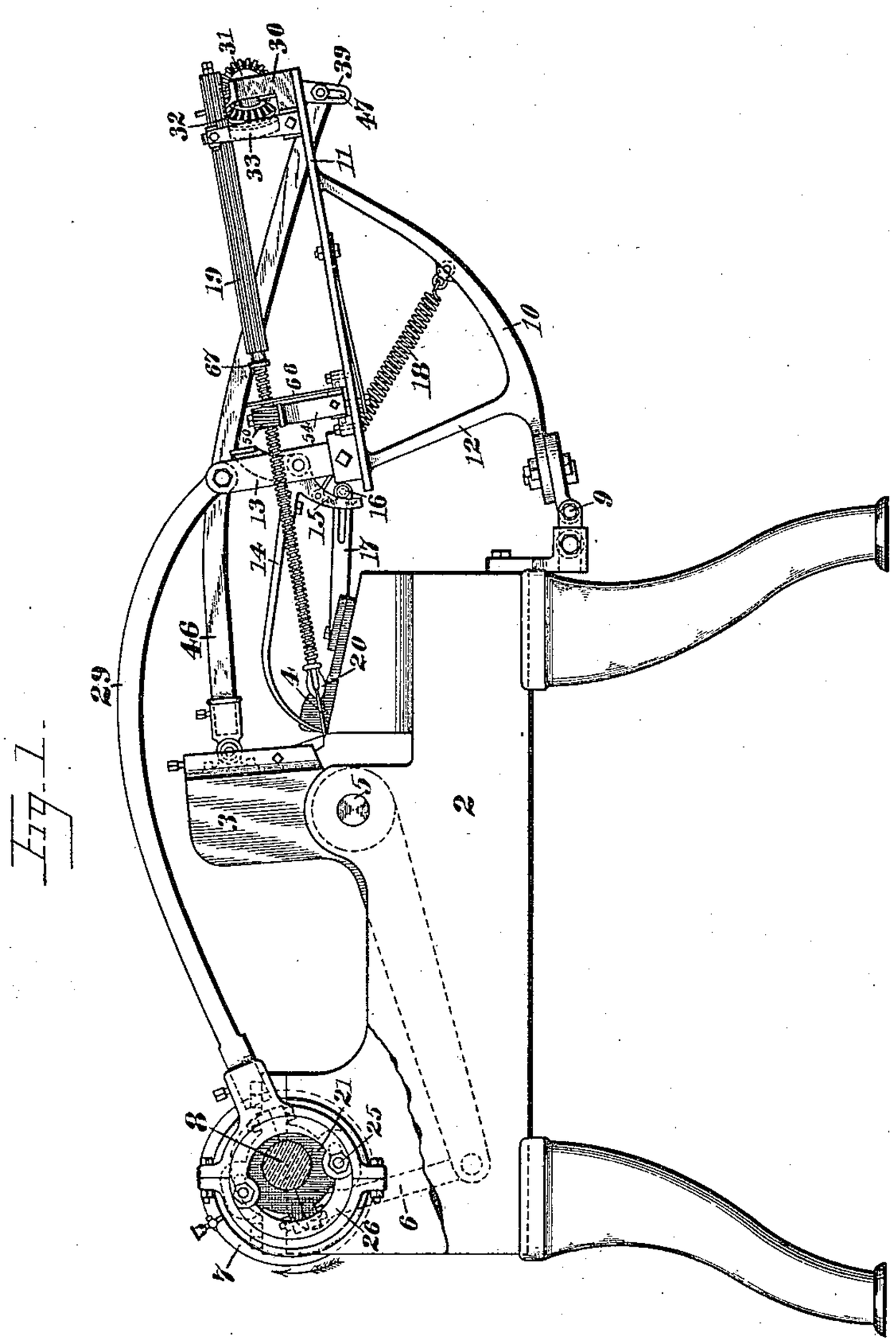
(No Model.) 6 Sheets—Sheet 1.

J. H. DUNBAR.

NAIL PLATE FEEDER.

No. 355,813. Patented Jan. 11, 1887.



Witnesses.
J. A. Burns.
J. K. Smith

Inventor.
Junius H. Dunbar
by Bakewell & Kerr
his Attorneys

(No Model.) 6 Sheets—Sheet 2.

J. H. DUNBAR.

NAIL PLATE FEEDER.

No. 355,813. Patented Jan. 11, 1887.

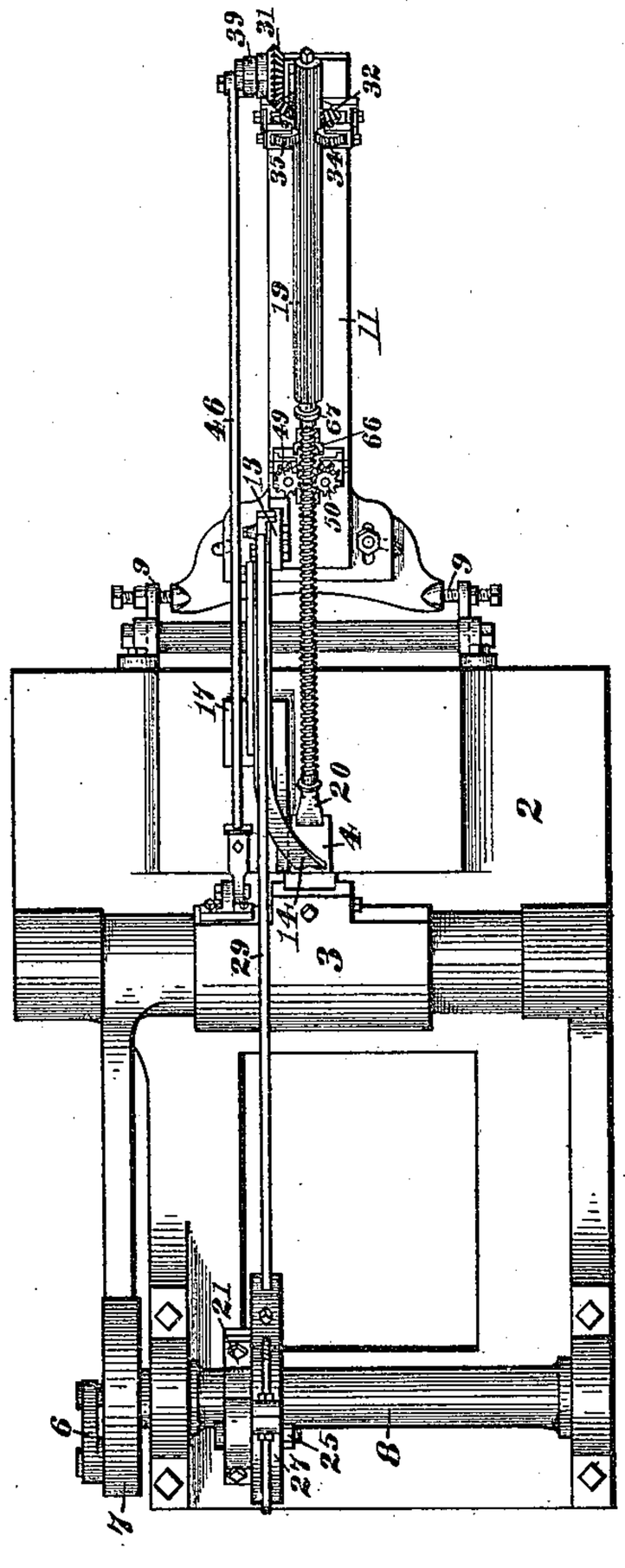


Fig. 2.

Witnesses.
J. A. Burns;
J. K. Smith

Inventor.
Junius H. Dunbar
by Bakewell & Kerr
his Attorneys

(No Model.) 6 Sheets—Sheet 3.

J. H. DUNBAR.

NAIL PLATE FEEDER.

No. 355,813. Patented Jan. 11, 1887.

Fig. 1.

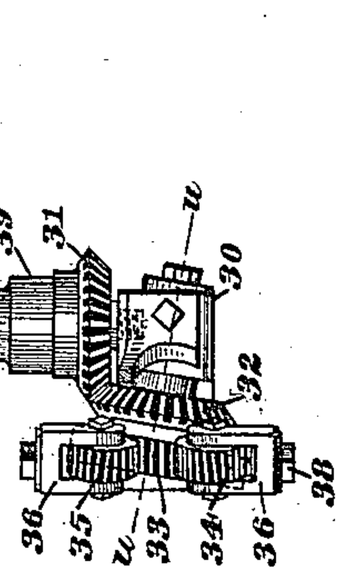


Fig. 2.

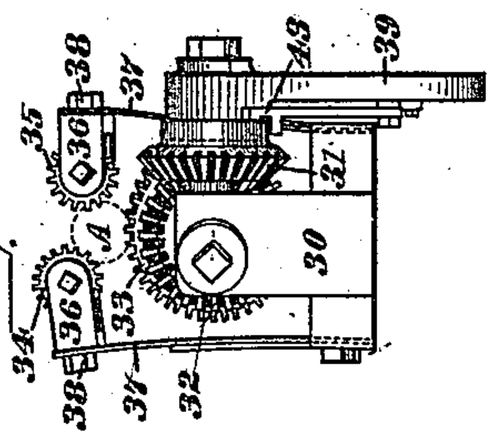


Fig. 3.

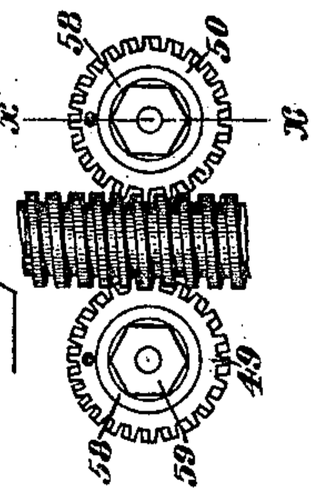


Fig. 4.

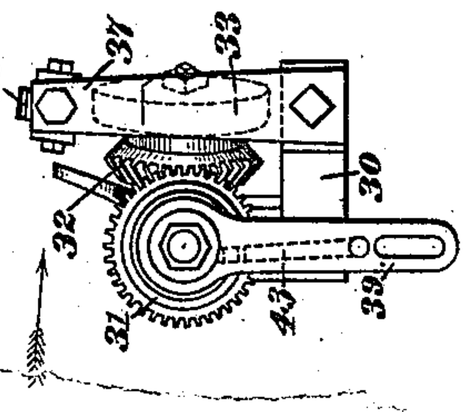


Fig. 5.

Fig. 6.

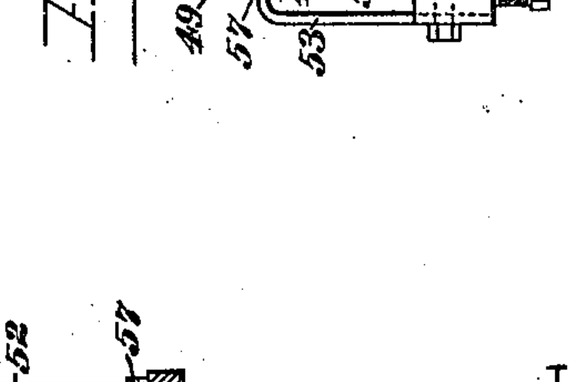


Fig. 7.

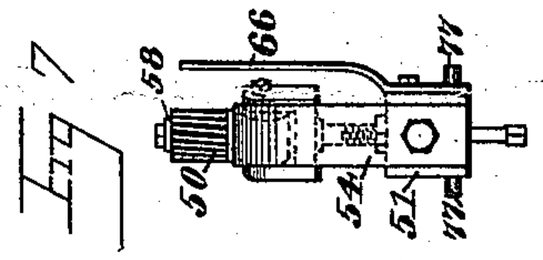


Fig. 8.

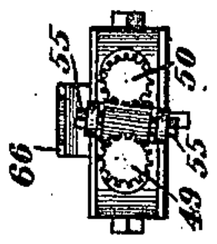


Fig. 9.

Fig. 10.

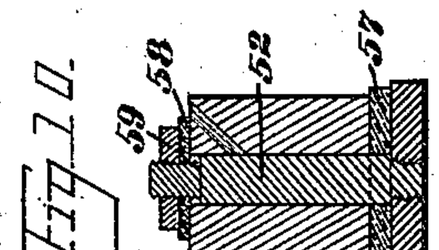


Fig. 11.

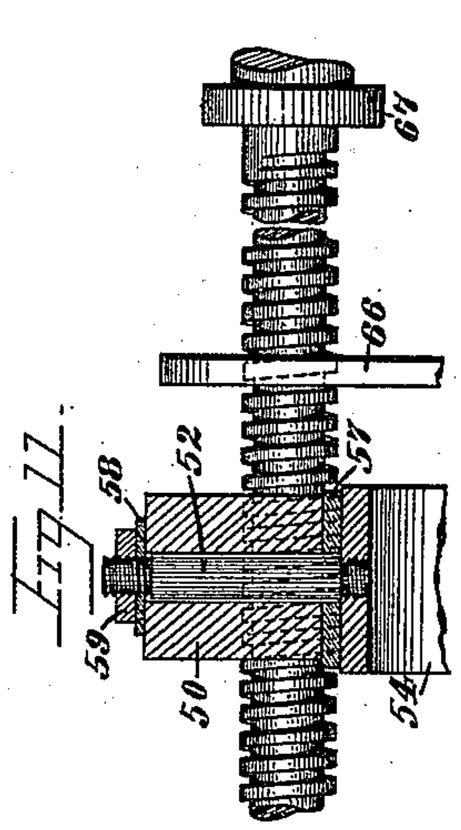


Fig. 12.

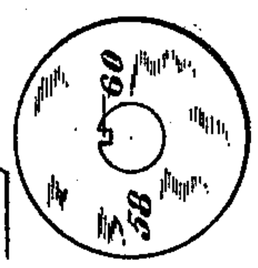


Fig. 13.

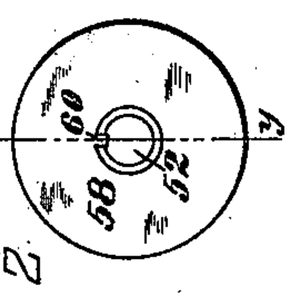
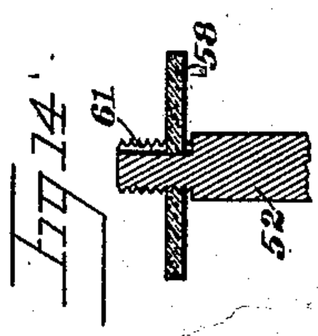


Fig. 14.



Witnesses.
J. A. Burns,
J. K. Smith

Inventor
Junius H. Dunbar
by Bakewell & Kerr
his Attorneys

(No Model.)

6 Sheets—Sheet 4.

J. H. DUNBAR.

NAIL PLATE FEEDER.

No. 355,813. Patented Jan. 11, 1887.

Fig. 17.

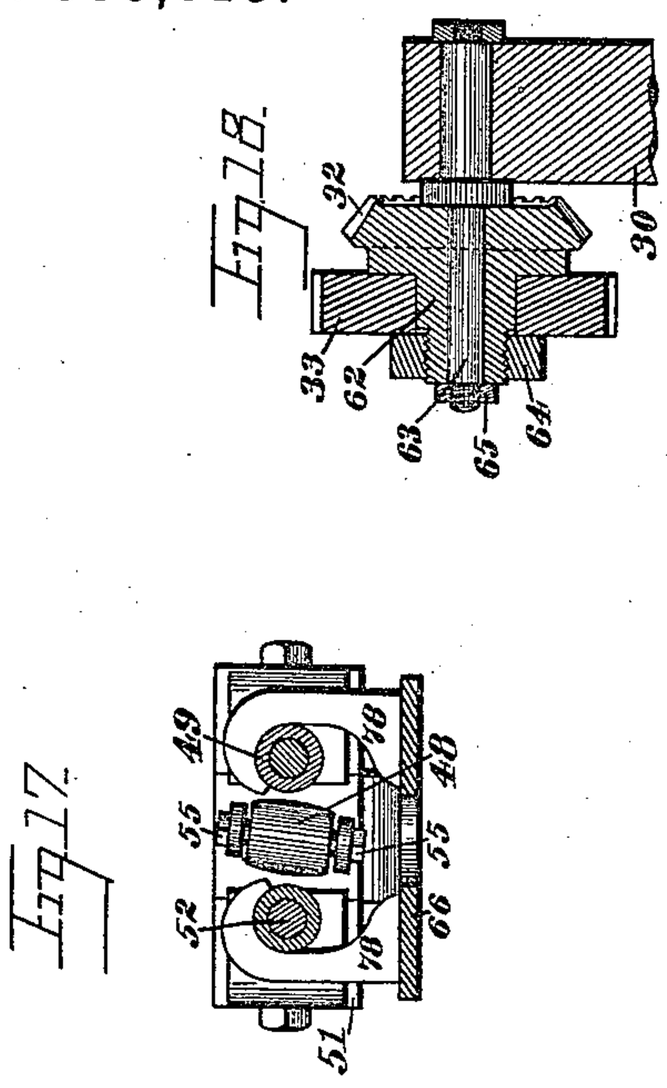


Fig. 17.

Fig. 21.

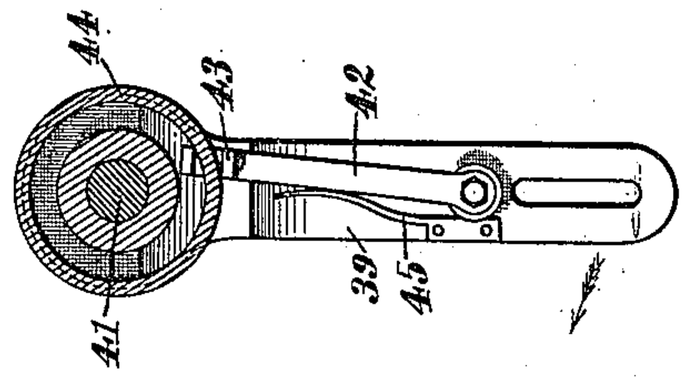


Fig. 16.

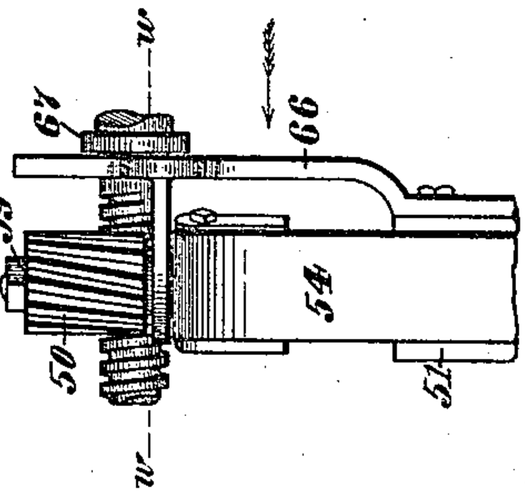


Fig. 20.

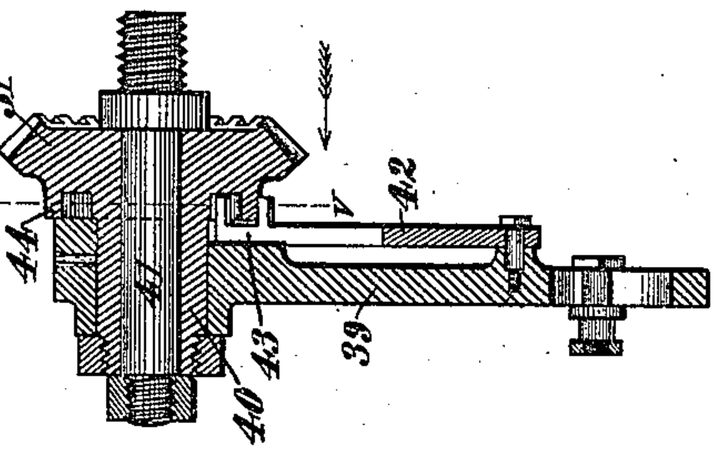


Fig. 15.

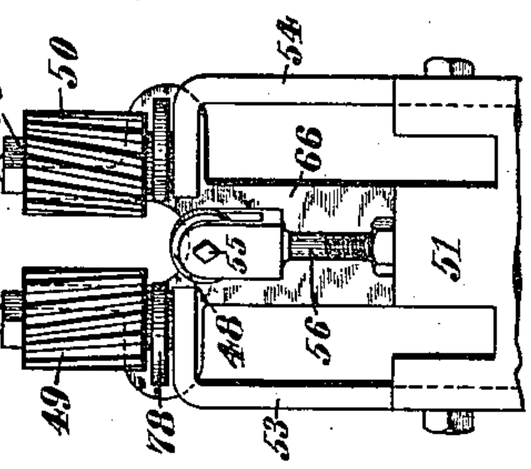
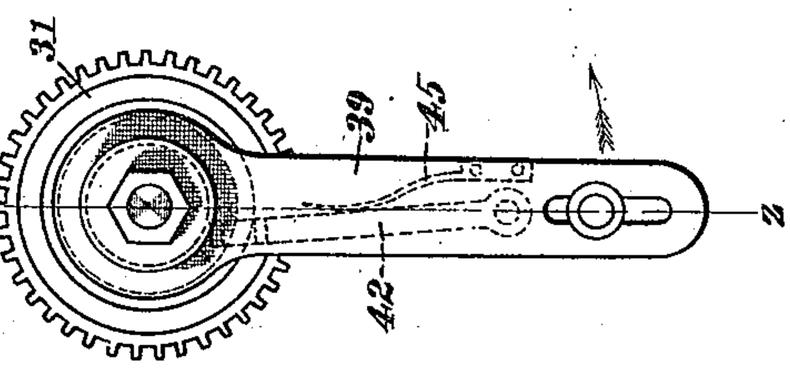


Fig. 19.



Witnesses
J. A. Burns.
J. K. Smith

Inventor
Junius H. Dunbar
by Bakewell & Kerr
his Attorneys

(No Model.)

6 Sheets—Sheet 5.

J. H. DUNBAR.

NAIL PLATE FEEDER.

No. 355,813. Patented Jan. 11, 1887.

Fig. 26.

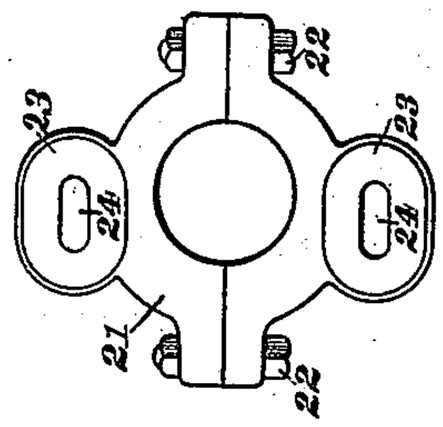


Fig. 25.

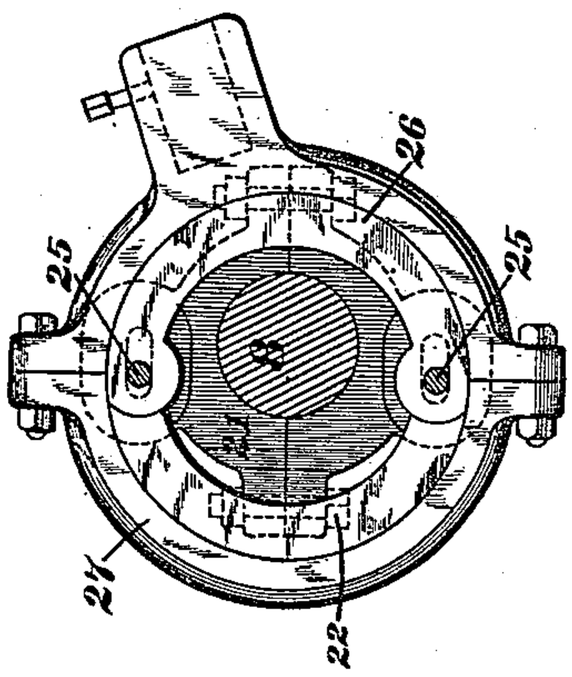


Fig. 27.

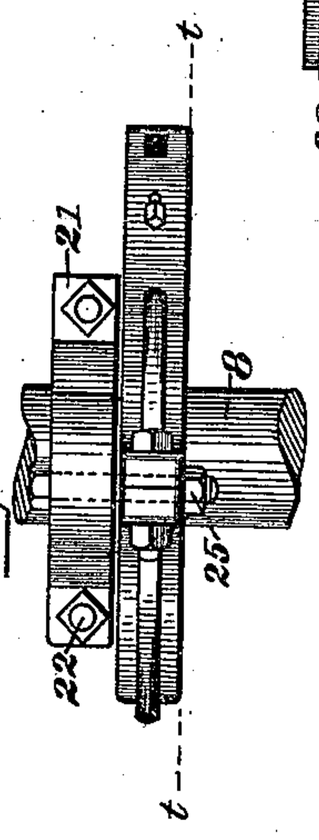


Fig. 29.

Fig. 28.

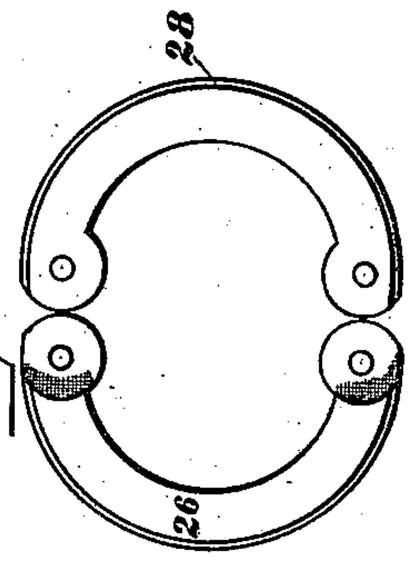


Fig. 22.

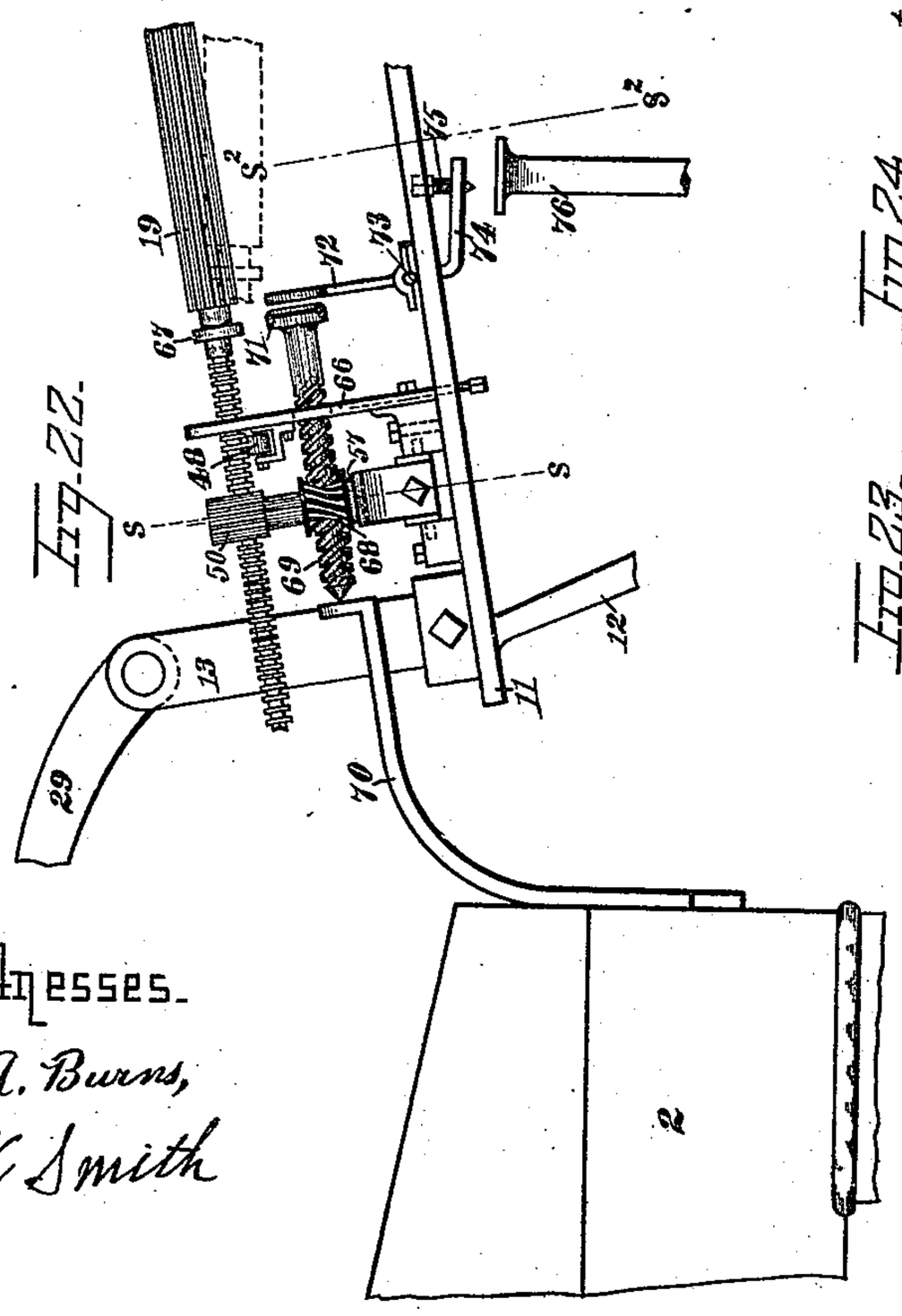


Fig. 24.

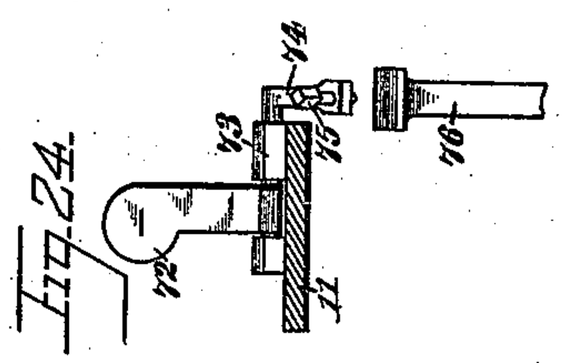
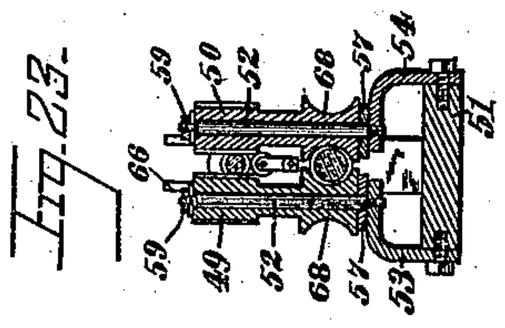


Fig. 23.



Witnesses.

J. A. Burns,

J. K. Smith

Inventor.

Junius H. Dunbar

by Bakewell & Kerr

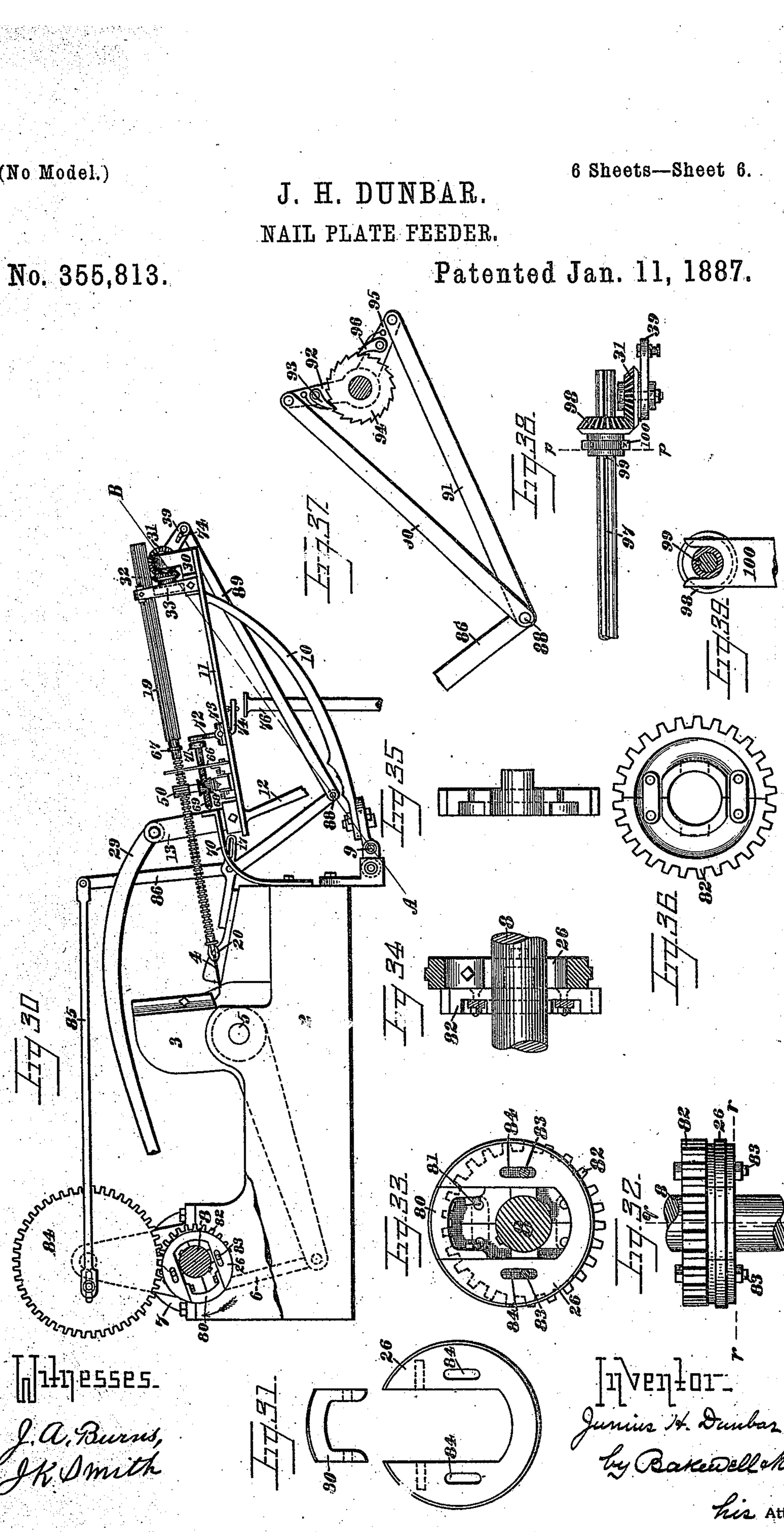
his Attorneys

(No Model.) 6 Sheets—Sheet 6.

J. H. DUNBAR.

NAIL PLATE FEEDER.

No. 355,813. Patented Jan. 11, 1887.



Witnesses.

J. A. Burns,

J. K. Smith

Inventor.

Junius H. Dunbar

by Bakewell & Kerr

his Att'ys.

UNITED STATES PATENT OFFICE.

JUNIUS H. DUNBAR, OF YOUNGSTOWN, OHIO.

NAIL-PLATE FEEDER.

SPECIFICATION forming part of Letters Patent No. 355,813, dated January 11, 1887.

Application filed March 4, 1886. Serial No. 193,934. (No model.)

To all whom it may concern:

Be it known that I, JUNIUS H. DUNBAR, of Youngstown, in the county of Mahoning and State of Ohio, have invented a new and useful Improvement in Nail-Plate Feeders; and I do hereby declare the following to be a full, clear, and exact description thereof.

My present invention relates to an improvement in a machine for which Letters Patent of the United States, No. 328,882, were granted to me on the 20th day of October, 1885.

I will now describe the improved machine, so that others skilled in the art to which it appertains may manufacture and use it, reference being had to the accompanying six sheets of drawings, in which—

Figure 1, Sheet 1, is a side elevation of the machine. Fig. 2, Sheet 2, is a plan view thereof. Fig. 3, Sheet 3, is a rear end view of the mechanism employed for rotating the feed-rod. Fig. 4 is a side view, and Fig. 5 is a plan view thereof. Figs. 6, 7, and 8 are, respectively, a rear view, a side view, and a plan view of the auxiliary feed-rolls. Fig. 9 is a plan view of the auxiliary feed-rolls when the feed-rod is interposed, and is on a larger scale than are the preceding three figures. Fig. 10 is a vertical axial section of one of the auxiliary feed-rolls on the line *x x* of Fig. 9. Fig. 11 is a view of a part of the feed-rod shown adjacent to one of the auxiliary feed-rolls, which is in vertical section. Fig. 12 is a top plan view of Fig. 14. Fig. 13 is a plan view of the washer marked 58 in Fig. 10. Fig. 14 is a vertical section of the spindle of the auxiliary feed-roll and of the washer 58 on the line *y y* of Fig. 12. Fig. 15, Sheet 4, is a rear view of the auxiliary feed-rolls, illustrating a modification thereof. Fig. 16 is a side view thereof. Fig. 17 is a horizontal cross-section on the line *w w* of Fig. 16. Fig. 18 is a vertical section on the line *u u* of Fig. 5. Fig. 19 is a side view of a peculiar form of mechanism which I use to drive the rotating mechanism of the feed-rod. It is seen in the direction of the visual arrow *a* in Fig. 3. Fig. 20 is a vertical cross-section on the line *z z* of Fig. 19. Fig. 21 is a vertical section on the line *v v* of Fig. 20, viewed in the direction of the arrow *b*. Fig. 22, Sheet 5, is a side view of a part of the rocking frame, showing a modification of the auxiliary feeding mechanism. Fig. 23 is a vertical cross-section on the line *s s* of Fig. 22. Fig. 24 is a rear view of parts shown in Fig. 22, and is a section on the line s^2 s^2 in that figure. Fig. 25 is a side view of the eccentric mechanism shown in Fig. 1, which causes the oscillation of the rocking frame and is a vertical section on the line *t t* of Fig. 27. Fig. 26 is a side view of an eccentric frame or carrier which forms part of the mechanism shown in Fig. 25. Fig. 27 is a top view of Fig. 25. Fig. 28 is a side view of the annular cam marked 26 in Fig. 25, the parts being shown disjointed for purposes of illustration. Fig. 29 is an edge view of the same. Fig. 30, Sheet 6, is a side view of a modified form of the machine. Fig. 31 is a detail view. Fig. 32 is an edge view of a part. Fig. 33 is a vertical cross-section on the line *r r* of Fig. 32. Fig. 34 is a vertical section on the line *q q* of Fig. 32. Fig. 35 is an axial section of a part marked 82. Fig. 36 is a detail plan view of a part. Fig. 37 is a side view of a modified form of a part. Fig. 38 is a plan view of a modified form of feed-rod. Fig. 39 is a vertical section on the line *p p* of Fig. 38.

In the several figures like symbols of reference indicate like parts.

In the drawings, (see Figs. 1 and 2,) 2 represents the bed-frame of the machine, and 3 the oscillating cutter-head, which severs the nails from a nail-plate, 4, which is fed by mechanism hereinafter to be described. The cutter-lever is pivoted at 5 near its cutting-edge, and at its rear end is pivotally attached to a crank arm or lever, 6. The latter is pivoted eccentrically to and is operated by a disk, 7, on the rotary main shaft of the machine, and by its movements causes the oscillation of the cutter-head.

Pivoted to the forward end of the bed-frame 2, at 9, is the rocking frame 10, which is preferably made as shown in Figs. 1 and 2, curving upward from its pivot to a point near the level of the nail-cutters. A bar or frame, 11, is fastened to the upper part of the frame 10, and serves as a support for the feed-rollers. The bar 11 is braced and connected with the lower part of the rocking frame by means of a brace, 12, and for greater strength and ease of manufacture the parts 10, 11, and 12 may well be cast in a single piece of metal. They all together constitute the rocking frame,

which I will designate by the reference figure 10.

14 is a finger-lever pivoted to a standard, 13, which rises from the bar 11. The free end of the lever bears upon and controls the motion of the nail-plate, and at the fulcrum end of the lever an arm, 15, projects downward therefrom and bears upon a friction-roller, 16, which is supported by a bar, 17, from the bed-frame of the machine, and is in contact with the rear side of the arm 15. A tension-spring, 18, connects the arm 15 with the lower part of the rocking frame.

19 is the feed-rod, which is mounted on the rocking frame. It has nippers or clamps 20 at its forward end for holding the nail-plate, and is rotated by mechanism situated at the rear of the rocking frame. The machine is so constructed that as the rocking frame rises in its oscillations upon the pivot 9 it will bring the nail-plate into place between the cutters, where it is held by the finger 14. The cutter 3 then severs a nail from the plate, and thereupon the rocking frame 10 falls, and in falling raises the finger 14 and lifts the nail-plate from its place between the cutters. At the same time suitable rotating mechanism gives the feed-rod a semi-revolution, thereby, turning over the nail-plate, while a forward feed equal to the width of a nail is given to the rod, so that when the rocking frame again rises and readjusts the plate between the cutters it may be in proper position to have another nail cut therefrom, the object of the machine being to supply means for substituting a mechanical feeding device for the mode of hand-feeding now commonly practiced. Of course the purpose of rocking the frame 10 is to raise the nail-plate from the cutters and to allow it to be turned and fed.

Thus far the present machine is similar to the patented machine before referred to. The differences consist in a novel arrangement and construction of the devices for feeding and rotating the feed-rod and in the mechanism for oscillating the rocking frame, wherein the present machine is better than the former.

I will first describe the construction and operation of the mechanism for oscillating the rocking frame.

Referring to Figs. 1, 2, 25, 26, 27, 28, and 29, the rotary main shaft 8 is encircled by a cam frame or carrier, 21, Fig. 26, of peculiar construction, which is keyed to the shaft and revolves with it. This cam-frame is made in two sections, to enable it to be set on the shaft, and these sections are joined by bolts 22 passing through flanges. There are two projecting plates, 23, made by extension of the frame, on opposite sides of it, and parallel slots 24 are made in these plates tangentially to the periphery of the frame. A ring or annular plate, 26, Figs. 25 and 29, is set around the shaft 8 against the side of the carrier 21, and is secured thereto by bolts 25, passing through diametrically opposite holes in the ring and through the slots 24. This ring is preferably made in two semicircular sections, the ends of which are laid adjacently and provided with registering bolt-holes, through which the bolts pass to secure the ring to the frame 21. This is illustrated in Fig. 28, in which the parts of the ring are shown disconnected. If, now, the ring 26 be bolted to the frame 21, by passing the bolts 25 through the centers of the opposite slots 24, so that the ring and the shaft 8 shall be concentric, the revolution of the ring as it is carried by the frame 21 will be regular; but if the bolts be shifted to one side or the other of the centers of the slots, so that the ring shall be eccentric to the shaft, an eccentric or cam motion will be imparted thereto in its revolution, the throw being equal to twice the distance of the situation of the bolts 25 from the centers of their respective slots 24. The ring 26 is surrounded by an annular cam-yoke, 27, loosely mounted on the ring and secured thereto by a circumferential tongue, 28, on the ring fitting within a groove on the inner periphery of the yoke, Fig. 29. The cam-yoke 27 is connected with the rocking frame by a connecting-bar, 29, which is fixed to the yoke at one end and at the other end is pivoted to the standard 13. Thus arranged it is obvious that if the annular cam 26 be set concentrically with the shaft 8 its rotation can have no effect on the rocking frame; but if the cam be shifted on the frame 21 until it becomes eccentric to the shaft the rotation of the latter, acting on the yoke 27 through the cam, will cause the frame to rock or oscillate on its pivot 9. The limits of this oscillation are determined by the degree of eccentricity of the cam, and, as has been noted, this may be fixed with great accuracy and stability by the bolts 25. The cam 26 and the eccentric 7, being on the same shaft, are timed relatively to each other, so that the cutter-head 3 shall rise during the fall of the rocking frame, and that the head shall descend and sever the nail when the frame has risen and adjusted the nail-plate in position for the cutting. The advantages of this form of cam in regulating the motion of the rocking frame over the devices shown in my said Patent No. 328,882 are that it is more accurately adjustable, and when adjusted acts more certainly and with less lost motion.

I have shown a modified form of the cam in Figs. 31, 32, 33, 34, 35, and 36 on the sixth sheet of the drawings. Here the cam 26 is made in the form shown in Fig. 31, having a removable outer segment, 80, secured to the cam by bolts 81, to permit easy adjustment of the cam upon the shaft 8. The cam is secured to the side of an adjacent spurred pinion, 82, by bolts 83, which extend from the pinion through parallel slots 84 in the side of the cam. By moving the cam to the proper place on the pinion 82, and there securing it by the bolts 83, its eccentricity is regulable in substantially the same way as explained with reference to the form shown on Sheet 5 of the drawings. The cam 26 is encircled by a yoke and connected to the rocking frame by a rod, 29, just

as described with reference to those figures. The pinion 82 is keyed to the shaft 8, and performs the same function as does the cam-carrier 21 of Fig. 26, with an added function which I will describe hereinafter.

I will now describe the mechanism for rotating and feeding the feed-rod, which is shown in Figs. 1, 2, 3, 4, 5, 18, 19, 20, and 21.

On the rear end of the bar 11 (see Fig. 1) is a housing-frame, 30, on which a beveled gear-wheel, 31, is journaled, with its sides longitudinal with the rocking frame. A second beveled gear-wheel, 32, is journaled in the housing-frame 30, meshing with the wheel 31, and having its axis longitudinal with, but slightly inclined to, the line of the rocking frame. 33 is a toothed wheel, which is mounted on the axis of the gear-wheel 32, and acts in rotating and feeding the feed-rod. In addition to the wheel 33 there are two other toothed wheels, 34 and 35, Fig. 3, which aid in impelling the feed-rod. They are mounted in bearings 36, which are secured by bolts and nuts 38 to vertical spring-standards 37. These hold the wheels above the level of the wheel 33, and at either side of it, the three being arranged at the angles of a vertical triangle, so that there may be an intermediate space, A, through which the feed-rod passes and in which it is situate, as shown by a dotted circle in Fig. 3. The purpose of the spring-standards 37 is to keep the cog-wheels 34 and 35 in contact and in gear with the interposed feed-rod by pressing them inward against it. This arrangement differs from that shown in my patent above mentioned only in that the wheel 34 is elevated somewhat above the level of its companion, 35, and that its bearing 36 is slightly inclined upward. I have found that when the three wheels are arranged at the angles of an equilateral triangle, the feed-rod is apt to become displaced from between them and to rise above the lowest wheel, 33; but by elevating the wheel 34, as herein shown, this difficulty is avoided and the rod held securely in position to be acted upon by the driven wheel 33.

The latter wheel is actuated by the following mechanism: A ratchet-lever, 39, is loosely mounted on a collar, 40, which surrounds the axis or spindle 41 of the gear-wheel 31, and which is made integral with or affixed to the latter wheel. (See Figs. 19, 20, and 21.) The lever 39 depends from the gear-wheel 31, as shown in these figures, and is provided on its inner face with a pawl, 42, the lower end of which is pivoted to the lever 39, and the upper end has a lateral fork, 43, which incloses on each side a circular bead or projection, 44, on the rear side of the wheel 31. A spring, 45, attached to the lever 39 bears upon the pawl 42, and normally keeps the fork in contact with and slightly biting upon the ring 44. As shown in Fig. 1, a connecting-rod, 46, is pivoted at one end to the cutter-head 3 and extends to the lever 39, in a slot, 47, of which it is pivoted. As the head 3 oscillates in cutting the nails through the reciprocations of the connecting-rod 46 it will oscillate the lever 39 upon its journal. As this lever oscillates in its strokes toward the cutter-head the forks of the pawl 42 will bite upon the bead 44 and will turn the gear-wheel through a distance equal to the degree of motion of the lever 39. On the back strokes of the lever 39 the gear-wheel 31 will not be moved, and the forks of the pawl will slip back over the bead. This device imparts intermittent rotation to the gear-wheel in the same manner as when an ordinary pawl and ratchet-wheel is used. In fact, I have substituted it for the pawl and ratchet-wheel shown in my said patent, and find it of advantage, because the rotations of the gear-wheel are made accurately uniform, not depending on accurate cutting and spacing of the ratchet-teeth. The purpose of pivoting the pawl 42 to the lever 39 is that by transposing the spring 45 to the other side of the pawl, and by throwing the pawl over on its pivot to engage with the annular bead on the other vertical section of the gear-wheel, the driven mechanism may be caused to operate in a reverse direction, as will be readily understood.

The degree of each motion of the gear-wheel is determined by adjusting the end of the connecting-rod 46 in the slot 47, being less as the rod is removed from the axis of the lever. As the gear-wheel 31 is rotated by the action of the cutter-head it will also rotate the gear-wheel 32 and the cog-wheel 33, as will be readily understood. The feed-rod 19 is interposed in the space A between the wheels 33, 34, and 35, and extends thence to a point near the nail-cutters, and has at its ends the tongs or nippers 20, which grasp the nail-plate. At an intermediate point the feed-rod is supported by guide-rolls, hereinafter to be explained.

The surface of the feed-rod for a considerable space from and up to its outer end is provided with longitudinal gear-teeth, which mesh with the teeth of the rolls 33, 34, and 35 when it is set within the space A. The axis of the gear wheel or roll 33 is inclined to the line of the feed-rod, and its teeth are inclined to its own axis, so as to be parallel with the teeth of the feed-rod. As the roll 33 is rotated by the lever 39 it will impart a rotary motion to the feed-rod, and by reason of its inclination to the axis of the latter it also gives it a longitudinal motion or feed, as explained in my said patent.

The function of the rolls 34 and 35 is to assist in imparting the longitudinal feed to the feed-rod, and to this end their bearings 36 are so adjusted that their toothed peripheries shall be inclined at acute angles to the feed-rod, but in opposite directions. Their teeth are accordingly made at acute angles to their peripheries, corresponding to the inclination of the wheels themselves to the feed-rod, so that as the former rotate their teeth may be parallel with and capable of meshing with the teeth on the rod. The consequence is that the rotation of the feed-roll 33 will also rotate the rolls 34

and 35, and all together they will act as a worm or screw to force the feed-rod forward in a right line toward the cutters. The exact extent of this feed is determinable by the guide-rolls hereinafter to be explained. The operation of these feed-rolls in turning and feeding the feed-rod is substantially identical with that described in the Patent No. 328,882, and similarly the lever 39 is so adjusted that its each forward stroke shall give a half-turn to the feed-rod and shall turn the nail-plate over on the bed-cutter.

I will now describe the novel construction of the guide-rolls 48, 49, and 50, which are shown in detail in Figs. 6 to 14, inclusive. They are mounted triangularly on a frame, 51, the upper rolls, 49 and 50, being mounted on upright spindles 52, which are set on the upper ends of vertical spring-standards 53 and 54. The upper rolls are separated laterally sufficiently for the interposition of the feed-rod, and at their bases the bottom or supporting roll, 48, is journaled horizontally in bearings 55, which are adjustable vertically by means of a screw-support, 56, entering the frame 51. The frame 51 is pivoted in bearings on the rocking frame by pintles 77, which allow the frame to be movable laterally, to secure perfect alignment of the space B, between the guide-rolls, with the corresponding space, A, between the feed-rolls.

The axes of the upper guide-rolls, 49 and 50, are vertical, and their peripheries are toothed by cogs, which are inclined at an acute angle thereto, as shown in Fig. 6. The axis of the supporting-roll 48 is, preferably, set at an angle to the line of the feed-rod, and its periphery need not be toothed. The mode of setting the rolls 49 and 50 upon their spindles 52 is shown in the sectional figures, 10, 11, 12, and 14. The spindle is fixed to its standard 53, and the bottom of the roll rests upon a leather washer, 57, which encircles the spindle. A metallic washer, 58, is placed around the spindle on the top of the roll, and this is surmounted by a nut, 59, which, being screwed on the upper end of the spindle over the washer, holds the roll in place. The latter washer, as shown in the plan view, Fig. 13, has in its eye an inwardly-projecting tongue or key, 60, which, when the washer is placed on the spindle, fits within a lateral vertical keyway, 61, therein, and is prevented from rotation with the roll. The purpose of thus fixing the washer is to prevent the nut 59 from being screwed or unscrewed with rotation of the roll, as it would had it a rotary instead of a fixed seat.

Referring now to Figs. 1, 2, 6, and 9, the feed-rod is interposed in the space B, resting upon the supporting-roll 48, and so much of the rod as moves within this space is threaded helically, as shown in these figures. The teeth on the rolls 49 and 50 are inclined conformably to the pitch of the screw on the feed-rod 19, so that they may mesh therewith, as shown in Fig. 9. Suppose, now, that the nuts 59 are screwed down on their spindles so as to press upon the rolls 49 and 50 sufficiently to prevent their being turned with ease and that the feed-rod 19 be rotated. The rolls then remaining stationary will act as a fixed nut, and their teeth meshing with the teeth on the feed-rod will screw the latter forward in a right line. If, however, the feed-rod should meet with an obstacle, as if the nail-plate should be fed too far and should engage its stop or gage back of the cutters, the strain will overcome the friction of the bolts 59 and the washers 57 upon the rolls, and will cause the latter to turn upon their bearings, and consequently to impart no forward feed to the rod. If it were attempted to substitute a fixed nut in place of the rolls 49 and 50, the feed-rod, if it should be fed too far and should strike the nail-plate against the gage, would either break itself or the plate or the nut; but with the use of the rolls adjusted as I have described them no harm can occur to the machine, and the situation of the gage may be changed to vary the thickness of the nails without danger.

The operation of the feed-rod is then as follows: Each forward stroke of the connecting-rod 29 lowers the rocking frame 10, and raising the finger 14 from the nail-plate allows the latter to be lifted from the bed-cutter by the descent of the frame. At about the same time the rise of the cutter-head 3 retracts the connecting-rod 46 and moves the lever 39 and its driven toothed roll 33, so as to give a semi-revolution to the feed-rod and to reverse the nail-plate. This rotation of the roll 33, as before explained, gives somewhat of a forward impulse to the feed-rod; but its chief feed is given by the guide-rolls 49 and 50 in the manner which I have already indicated. The feed will in any case be enough to carry the nail-plate to the stop-gage, and if it be too much for that purpose the consequent slipping of the rolls 49 and 50 prevents harm. The re-ascent of the rocking frame then brings the reversed nail-plate down upon the bed-knife, the finger 14 falls on the plate and clamps it, and the head 3 descends and severs a nail. In order to prevent possibility of the positive feed of the toothed roll 33 turning the feed-rolls too far, I prefer to construct it as shown in Fig. 18. Here the roll, instead of being fixed to the gear-wheel 32, is journaled loosely on a neck, 62, which projects therefrom and encircles its spindle 63.

A nut, 64, screwed on the neck of the gear-wheel 32 holds the roll in place, and is itself held by a nut, 65, on the projecting end of the spindle. The nut 64 is screwed against the roll 33 tightly enough to prevent its being easily turned on its bearings, but not so tightly that it may not slip thereon on encountering considerable resistance. Then, if the feed-rod be free to move, the roll 33 will turn with the gear-wheel 32, and will drive the feed-rod; but if the parts be so misgeared as to give the feed-rod and the nail-plate more than their proper half-turn the resistance of the engage-

ment of the nail-plate with the bed-knife of the cutters will cause the driving-roll 33 to slip on its bearings and to cease to turn the rod. In this way any inaccuracy in the adjustment of the machine is compensated.

From the foregoing description it is evident that the inclination of the teeth of the feed-rolls 33 34 35, while it acts in impelling the feed-rod, is not essential, because the principal feed is derived from the forward rolls, 48, 49, and 50. The rear rolls may therefore be made as ordinary spur-wheels, with teeth parallel to those of the feed-rod. They will then only rotate the feed-rod, leaving the forward feed to be given by the rolls 48, 49, and 50 alone. I do not, therefore, desire to limit the scope of my invention as respects the latter rolls by the construction of the former, which may be substituted by any mechanical device which will rotate the feed-rod. I have shown such substituted device on Sheet 6 of the drawings, which I will explain hereinafter.

In Figs. 7 and 11, I have shown a device for automatically stopping the advance of the feed-rod when the whole nail-plate is cut. Without some automatic stop the carelessness of a workman might allow the nail-plate to be cut and the feed-rod itself to be drawn into the cutters. Just back of the guide-roll frame 51, and preferably fixed to it, is an upright fork, 66, whose prongs are separated far enough to allow free passage of the feed-rod; but on the latter, at the end of the screw-thread, there is a projecting collar or stop, 67, which is of greater width than the space of the fork. When the feed-rod advances so far that the collar 67 engages the fork 66 the latter will automatically check the feed-rod, and by starting the rotation of the rolls 49 and 50 the parts will be relieved from strain, as before explained. The collar 67 should be so distanced from the end of the feed-rod that the former shall engage the fork before the latter shall have reached the cutters.

Figs. 22 and 23 illustrate a modified form of the guide-rolls and automatically-acting devices for properly checking the motion of the feed-rod. The feed-rod in this case, instead of being a helical screw, is provided with a series of parallel circular threads or beads, and the rolls 49 and 50, between which the feed-rod rests, have vertical and parallel teeth capable of meshing with the teeth on the feed-rod. On the same spindle with the rolls 49 and 50, and fixed to or made integral with the latter, is a pair of adjacent gear-wheels, 68, having inclined or helical lateral threads, and preferably having their peripheries concave, as shown in Fig. 23.

A screw-rod, 69, is interposed between the toothed wheels 68, the pitch of the screw being such as to mesh with their teeth. The bases of the wheels 68 rest upon the leather washers 57 and nuts 59 on the projecting ends of the spindles 52, and bearing on the tops of the compound wheels 49 68 and 50 68 enable them to be tightened to their seats, so that they may be turned with difficulty, but will turn if sufficient force be applied.

The screw 69 is supported in place between the wheels 68 by passing through a hole in the body of the upright fork 66. The front end of the screw is pointed, and opposite to the point is the end of a rigid arm or projection, 70, which extends from the frame of the machine, while the rear end of the screw is blunted or provided with an enlarged head, 71, and opposite to it is the flattened side of an upright lever-stop, 72, which is pivoted to the rocking frame in bearings 73, and has a horizontally-projecting arm, 74. The end of the latter is provided with a set-screw, 75, projecting from its under side and directed toward a stationary post or stop, (not on the rocking frame,) which serves to limit the motion of the lever 72. (See Fig. 24.) Suppose, now, that the rocking frame be rising, as shown in Fig. 22, and in the act of placing the already turned and advanced nail-plate on the cutters. This motion of the frame will bring the pointed end of the screw 69 against the rigid stop 70, and will press it against the same. The point of the screw creates little friction, and the pressure of motion of the rocking frame will cause the wheels 68 to act as a nut, within which the screw will turn and will be retracted away from the stop, the wheels themselves remaining stationary. When the rocking frame begins to fall, however, the set-screw 75, engaging in its descent the fixed stop 76, will throw the lever 72 forward until it engages the blunt end of the screw 69, which until then has been moving with the rocking frame back from the stop 70. This will stop the further backward movement of the screw and will exert a forward force thereon; but, because of the relatively great friction between the stop-lever 72 and the head 71 of the screw, the latter will not turn through the worm-gear wheels 68, but the resistance of the friction being exerted upon the latter will overcome their friction and cause them to revolve, while the screw itself simply advances without rotation and acts as a helical rack upon the wheels 68 as pinions. The revolution of the latter wheels will of course rotate the toothed rolls 49 and 50, which, meshing with the toothed feed-rod, will act as pinions thereon, and will move it forward in a right line during the remainder of the descent of the rocking frame. This in no wise prevents the rotation of the feed-rod by the rear rolls, 33, 34, and 35, which act quite independently of the mechanism just described.

As the rocking frame rises the point of the screw 69 again engages the stop 70, and will screw itself back between the worm-wheels without moving the latter or the feed-rod. It will be observed that during the first period of the descent of the rocking frame (*i. e.*, before the end of the screw 69 engages the lever 72, and before the set-screw 75 engages the stop 76) the screw 69 and the feed-rod are unaffected, and that the entire feed is performed

during the latter part of the descent of the frame, while the set-screw 75 is in contact with the stop 76. The exact extent of the feed and the thickness of the cut nails can therefore be accurately adjusted by a simple projection and retraction of the set-screw; and on account of its remarkable precision this form of device I think to be the most suitable of the modifications herein shown. I do not claim it specifically herein, but intend to claim it in a separate application for Letters Patent.

In Figs. 15, 16, and 17 I have illustrated another modification of the guide-rolls, which possesses features of advantage in its simplicity and strength. The rolls 49 and 50 are made in the same way as their counterparts in Fig. 6, their teeth being inclined suitably to mesh with the screw-threads on the feed-rod. They are, however, set loosely on their spindles, and hooks or brake-arms 78, projecting from the stop 66, inclose the lower parts of the rolls, which are preferably contracted in diameter. The stop 66 is made to have a spring action away from the frame 51, and by reason thereof it exerts a tension on the rolls and opposes friction to their rotation. The tension of the spring, like the resistance of the nuts and washers in Fig. 6, prevents rotation of the rolls within the limits of the strain exerted by the free turning and passage of the feed-rod between their peripheries. If, however, the feed-rod should meet an obstacle the consequent strain would overcome the resistance of the brakes 78 and cause the rolls to turn, thus checking the feed of the feed-rod, and when the collar 67 on the feed-rod reaches the forked spring-stop 66 and pushes it forward it will also move the hooked brakes 78 away from the rolls, thus relieving them from friction, allowing them to turn and to relieve the feed-rod from strain.

When constructed as before described the machine is strong and durable, it works with little jar and great certainty, and, by enabling nail-manufacturers to safely dispense with a large amount of labor, it greatly reduces the cost of cutting nails.

The modification shown on Sheet 6 is yet to be described. Here the pinion 82, which is keyed to the shaft 8 and revolves therewith, meshes with a gear-wheel, 84, of twice the number of teeth. A pitman, 85, is pivoted eccentrically to the wheel 84, and at its other end is pivoted to a bell-crank lever, 86, the fulcrum of which is at the rigid supporting arm or bracket 17. The second arm of the lever 86 is pivotally attached at a point, 88, to the forward end of a connecting-rod, 89, the rear end of which is pivoted to the lever 39, which actuates the pinion 31 of the feed-rod-rotating mechanism. The latter lever, instead of working as a ratchet on the pinion 31, is affixed thereto so that the rod 89 will turn the pinion both in its forward and backward motions, though in opposite directions. The pinion 31 meshes with the driven gear-wheel 32, and this in turn drives the pinion 33, which meshes with the teeth of the feed-rod 19. The forward part of the feed-rod and rocking frame are provided with devices just as described with reference to Fig. 22.

The operation is as follows: Each rotation of the shaft 8 produces a semi-rotation of the gear and crank wheel 84, and at each semi-rotation of the latter the consequent movements of the pitman 85, lever 86, and arm 89 will move the lever 39 either forward or backward, and will give the feed-rod a half-turn, either to the right or left, as the case may be. The next half-revolution of the wheel 84 will turn the feed-rod in the reverse direction. In this way, as the shaft 8 revolves, the nail-plate will be turned over on the cutters, first in one direction and then in the other, in just the same manner as in the ordinary process of manual nail-plate feeding. Meanwhile the necessary feed is given to the rod by the oscillations of the rocking frame, as has already been described with reference to Fig. 22. The motion of the pitman 85 is timed relatively to the eccentric 7 so that the nail-plate shall be reversed and in position on the bed-knife just before the descent of the cutter-head 3.

If desired, the pitman 85 may be connected with the cutter-head instead of with the wheel 84.

It will be noticed that the pivotal point 88 is situate on an imaginary line, A B, connecting the point 9 with the axis of the pinion 31, and that it is quite near the point 9. The purpose of this is that the oscillations of the rocking frame may not move the lever 39, as otherwise they would.

In Fig. 37 I show the end of lever 86 pivotally attached to two connecting-rods, 90 and 91, which replace the rod 89. The rear end of the rod 90 is pivoted to a lever, 92, which is journaled on the axis of the pinion 31, and a pawl, 93, on this lever takes into the teeth of a ratchet, 94, which is fixed to the pinion. In like manner the rod 91 is pivoted to a lever, 95, a pawl, 96, on which engages the teeth on the opposite side of the ratchet, as shown. It is thus clear that as the arms 90 and 91 move back in their reciprocations the pawl 93 will turn the ratchet and the pinion 31, while in their forward strokes the pawl 96 will do so.

The modification shown in Figs. 38 and 39 consists in a device for dispensing with the cogging of the feed-rod of Fig. 30. The periphery of the latter is plain, but has a longitudinal groove or keyway, 97. 98 is a gear-wheel mounted on the feed-rod, and having a spline, 99, fitting within the keyway 97, so that while the wheel cannot rotate independently of the feed-rod, it may move longitudinally thereon. The pinion 31 meshes with and drives the gear-wheel 98, and the lever 39 actuates the pinion. 100 is a fixed forked stop engaging the front of the gear-wheel 98 and preventing longitudinal motion thereof. The operation is as follows: As the lever 39 vibrates it will, through the gear-wheels 31 and 98, turn the feed-rod to reverse the nail-plate,

while the arrangement of the gear-wheel 98 with feather and spline permits the feed-rod to be drawn forward freely by oscillations of the rocking frame.

I have in the foregoing description clearly set forth the principle and the preferable mode of applying my invention. I do not therefore desire to limit myself strictly to the construction of the parts as shown and described. For example, in Figs. 6 and 22 one of the toothed rolls, 49 or 50, may be omitted and substituted by a plain roll, which would keep the feed-rod in contact with the remaining toothed roll. So in Fig. 23 only one of the rolls 68 need be employed in conjunction with some similar device for keeping the screw-shaft 69 in contact therewith.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a nail-plate feeder, the combination, with a longitudinally-traveling and axially-rotating feed-rod, of a set of feed-rolls, 33, 34, and 35, the roll 34 being situate above the level of its companion roll, 35, substantially as and for the purposes described.

2. In a nail-plate feeder, the combination, with a longitudinally-traveling and axially-rotating feed-rod, of a set of feed-rolls, 33, 34, and 35, the roll 34 being situate above the level of its companion roll, 35, and having its bearings upwardly inclined, substantially as and for the purposes described.

3. In a nail-plate feeder, the combination of a rotary feed-rod, a wheel or roll connected with the feed-rod for rotating it, an oscillating lever, 39, journaled so as to be movable independently of the wheel or roll, a pawl mounted on the lever, and a fork on the pawl engaging with an annular bead on said wheel or roll, substantially as and for the purposes described.

4. The combination of a driving wheel or shaft, a lever, 39, journaled so as to be oscillatory independently thereof, and a fork on the lever engaging an annular bead on said driving wheel or shaft, substantially as and for the purposes described.

5. The combination of a driving wheel or shaft, a lever, 39, journaled so as to be oscillatory independently thereof, and a pawl pivoted to the lever and provided with a fork which engages an annular bead on said driving wheel or shaft, substantially as and for the purposes described.

6. The combination of a driving wheel or shaft, a lever, 39, journaled so as to be oscillatory independently thereof, a pawl pivoted to the lever and provided with a fork which engages an annular bead on said driving wheel or shaft, and a spring bearing against the pawl, substantially as and for the purposes described.

7. In a nail-plate feeder, the combination of a rotary feed-rod provided with gear-teeth, a toothed driving-roll meshing with the teeth of the feed-rod, a rotary shaft or spindle on which said roll is mounted, and a nut bearing on the roll, whereby it is secured to its shaft or spindle by friction of adjustable degree, substantially as and for the purposes described.

8. In a nail-plate feeder, the combination of a rotary feed-rod provided with gear-teeth, a toothed driving-roll meshing with the feed-rod, a rotary gear-wheel, 32, having a collar, 62, on which the driving-roll is journaled, and a nut, 64, mounted on said collar and bearing against the driving-roll, substantially as and for the purposes described.

9. The combination, in a nail-plate feeder, of a longitudinally-traveling and axially-rotating feed-rod, mechanism for rotating it, and a guide-roll having inclined or helical gear-teeth which mesh with a screw-thread on the adjacent feed-rod, substantially as and for the purposes described.

10. The combination, in a nail-plate feeder, of a longitudinally-traveling and axially-rotating feed-rod, mechanism for rotating it, a guide-roll which bears against the feed-rod and which, when stationary, causes the advance of the rotating feed-rod, but when rotating does not so advance the feed-rod, and friction devices for retarding the rotation of the guide-roll, substantially as and for the purposes described.

11. The combination, in a nail-plate feeder, of a longitudinally-traveling and axially-rotating feed-rod, mechanism for rotating it, and guide-rolls having inclined or helical gear-teeth which mesh with a screw-thread on the adjacent feed-rod, substantially as and for the purposes described.

12. The combination, in a nail-plate feeder, of a longitudinally-traveling and axially-rotating feed-rod, mechanism for rotating it, a guide-roll having inclined or helical gear-teeth which mesh with a screw-thread on the adjacent feed-rod, friction devices for retarding the rotation of said guide-roll, whereby it will normally remain stationary to cause the advance of the feed-rod, but will rotate upon the application of excessive rotary force, a collar or stop on the feed-rod, and a second stop situate in the path of the feed-rod collar or stop for stopping the advance of the feed-rod, substantially as and for the purposes described.

13. The combination, in a nail-plate feeder, of a longitudinally-traveling and axially-rotating feed-rod, mechanism for rotating it, a guide-roll having inclined or helical gear-teeth which mesh with a screw-thread on the adjacent feed rod, a brake bearing against said roll for opposing resistance to its rotation, a spring for exerting a tension on the brake, and a collar or stop on the feed-rod arranged to engage the spring during the advance of the feed-rod, whereby the tension of the spring is released and the roll permitted to rotate, substantially as and for the purposes described.

14. In a nail-plate feeder, the combination of a rocking frame, a rotary shaft, 8, an eccentric carrier fixed to and rotary with the shaft, a circular cam mounted on the side of said carrier and adjustable thereon so as to be con-

centric with or eccentric to the shaft, a cam-yoke encircling the cam, and a connecting mechanism connecting the yoke with the rocking frame, substantially as and for the purposes described.

15. In a nail-plate feeder, the combination of a rocking frame, a rotary shaft, 8, an eccentric carrier fixed to and rotary with the shaft, a circular cam mounted on the side of the carrier and adjustably secured thereto by bolts holding the cam and traversing slots in the cam or carrier frame, a cam-yoke encircling the cam, and connecting mechanism connecting the yoke with the rocking frame, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 30th day of January, A. D. 1886.

JUNIUS H. DUNBAR.

Witnesses:
H. W. SQUIRE,
A. E. KNIGHT.