No. 644,560.

Patented Feb. 27, 1900.

F. HOWE.

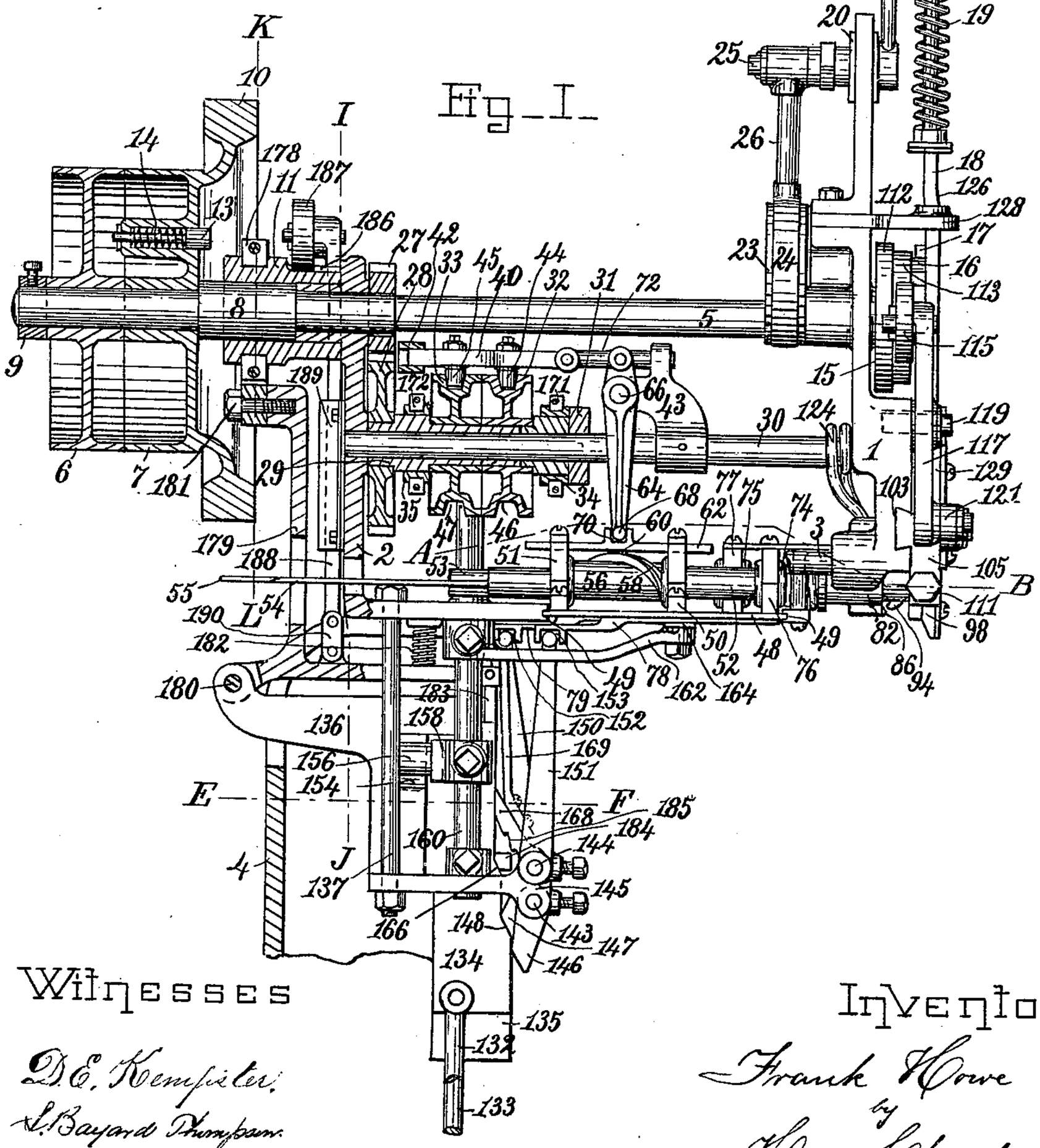
NAILING MACHINE.

(Application filed Feb. 21, 1899.)

(No Model.)

6 Sheets—Sheet 1.

Fig. 1.



Witnesses

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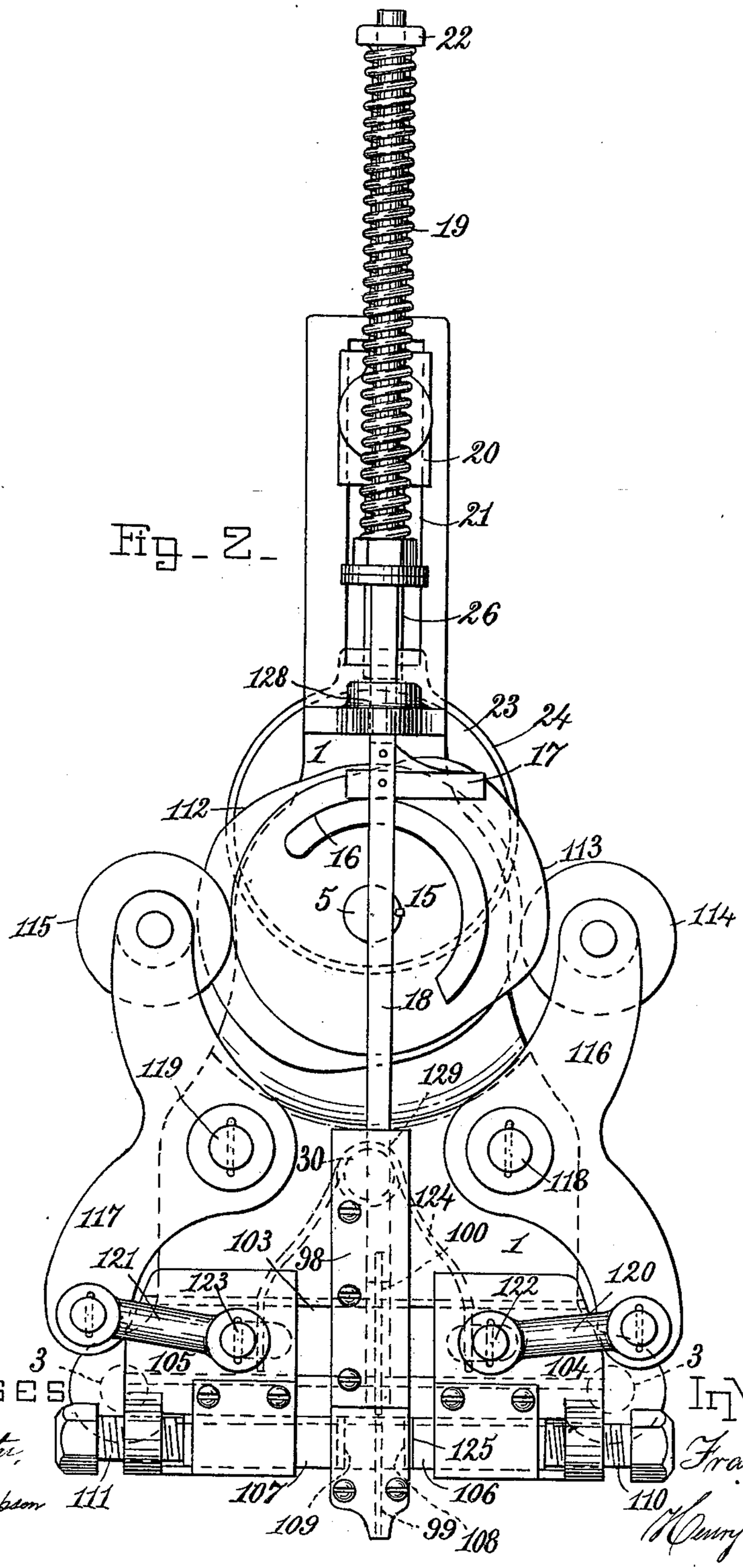
(No Model.) 6 Sheets—Sheet 2.

Fig. 2.



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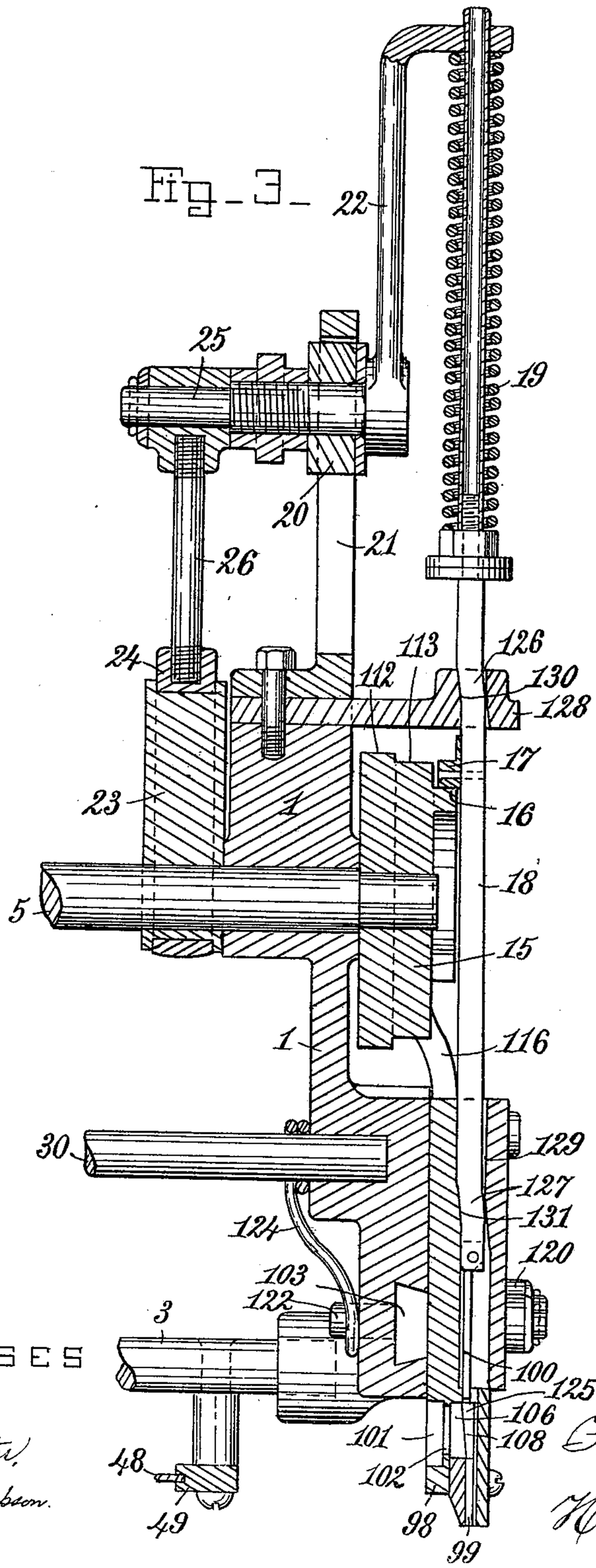
6 Sheets—Sheet 3.

Fig. 3.



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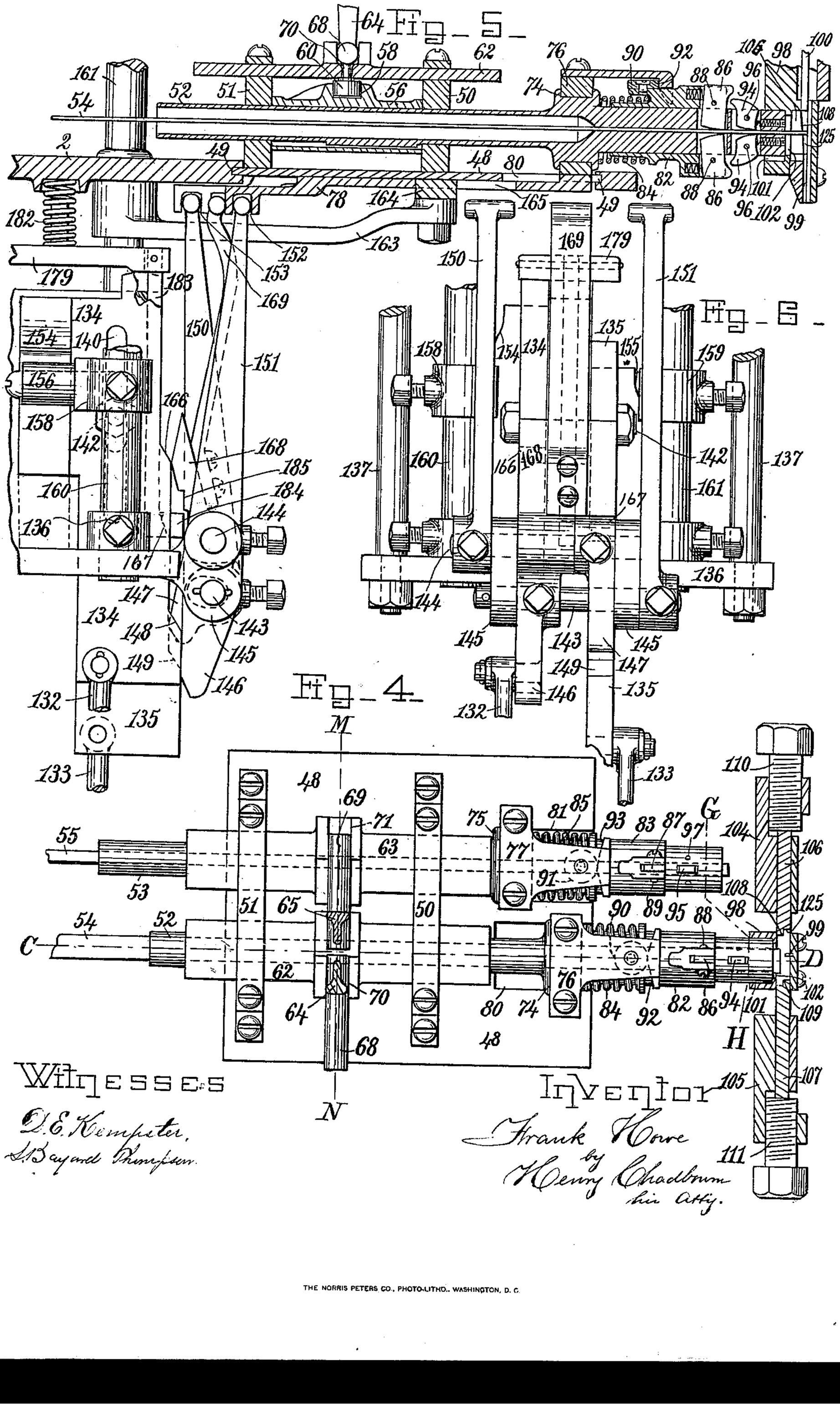
(No Model.) 6 Sheets—Sheet 4.



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(No Model.) 6 Sheets—Sheet 5.

Fig. 9.

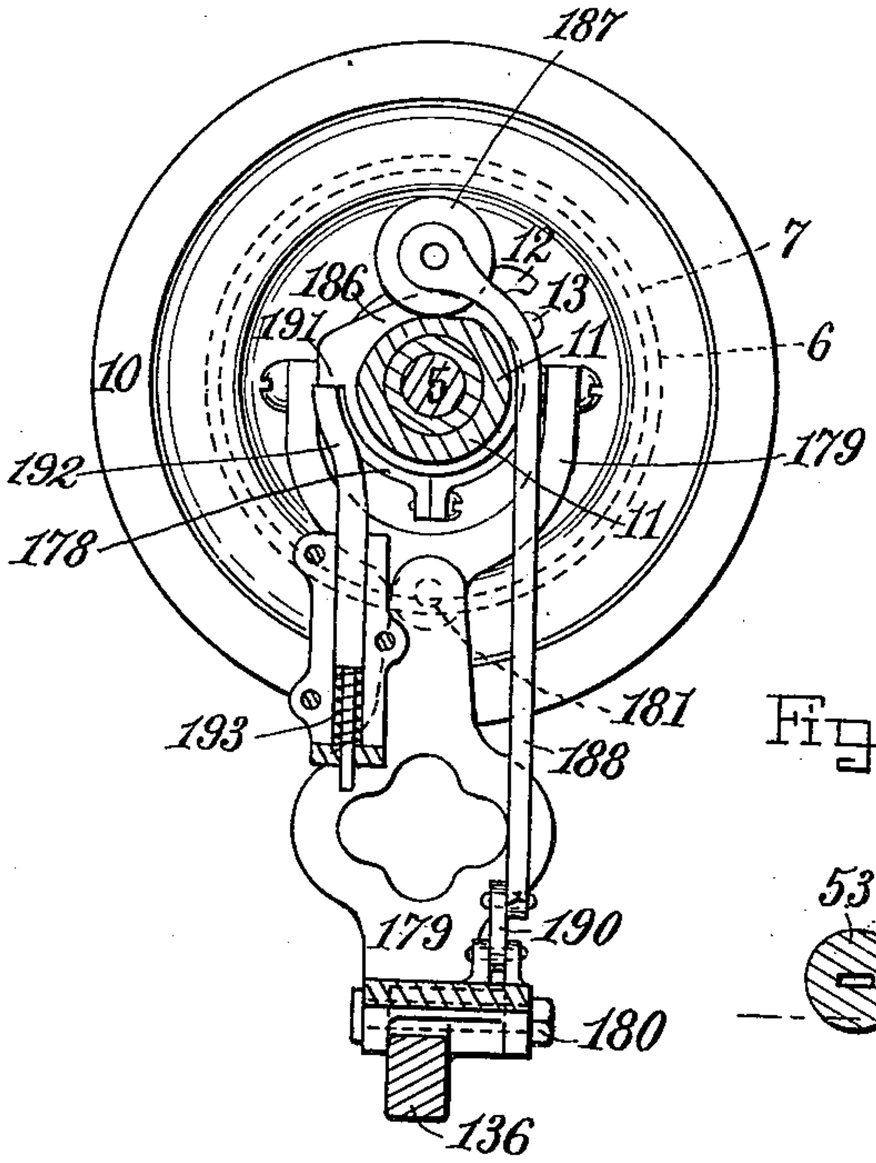


Fig. 10.

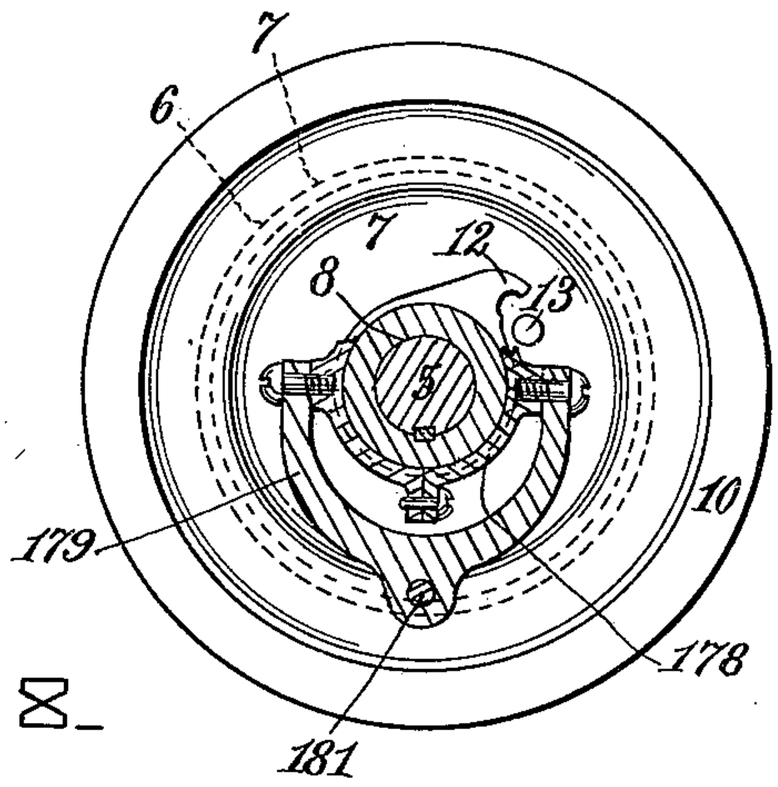


Fig. 8.

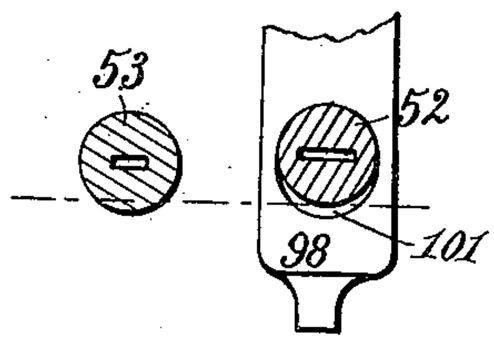
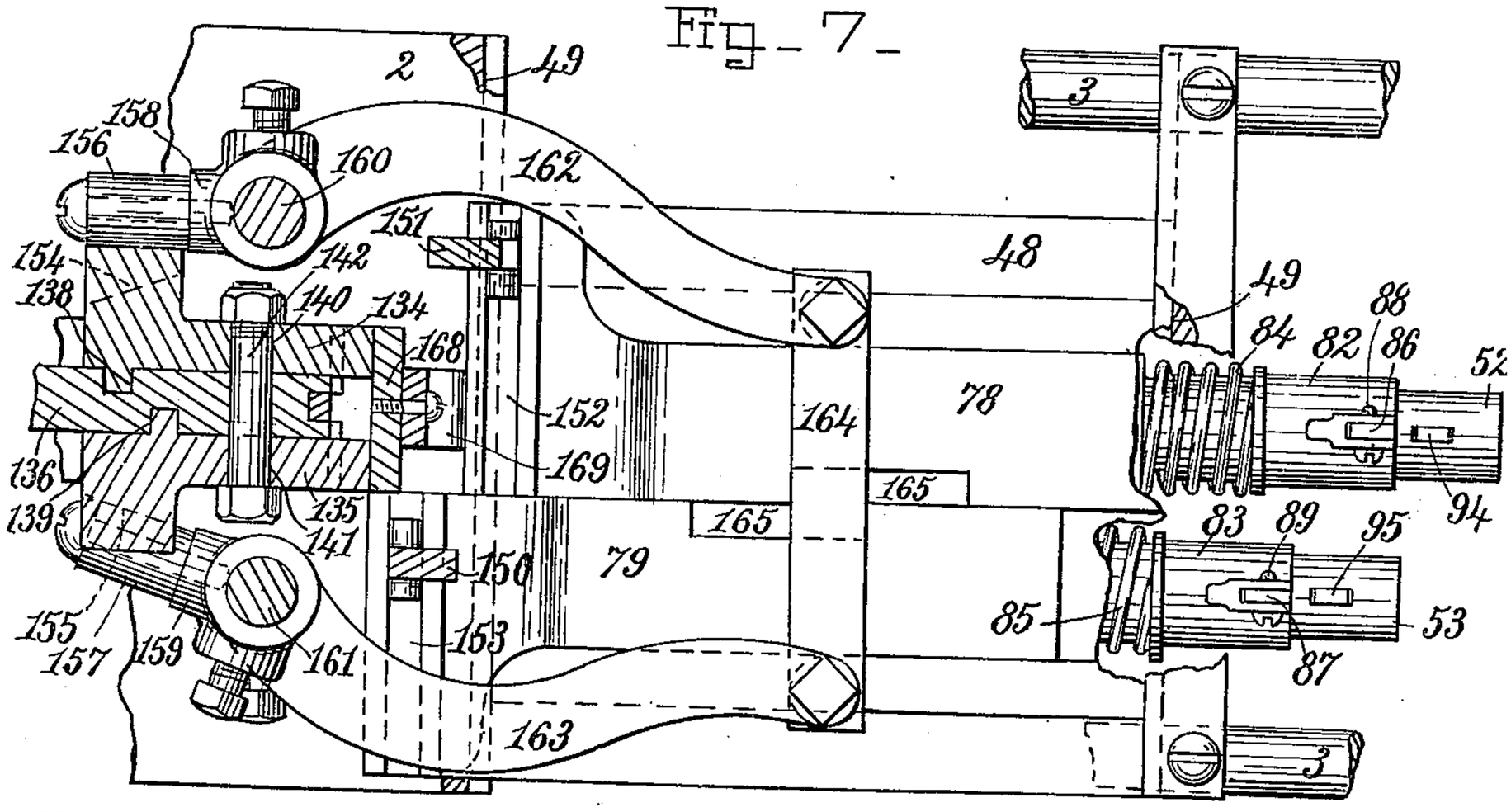


Fig. 7.



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(No Model.) 6 Sheets—Sheet 6.

Fig. 13.

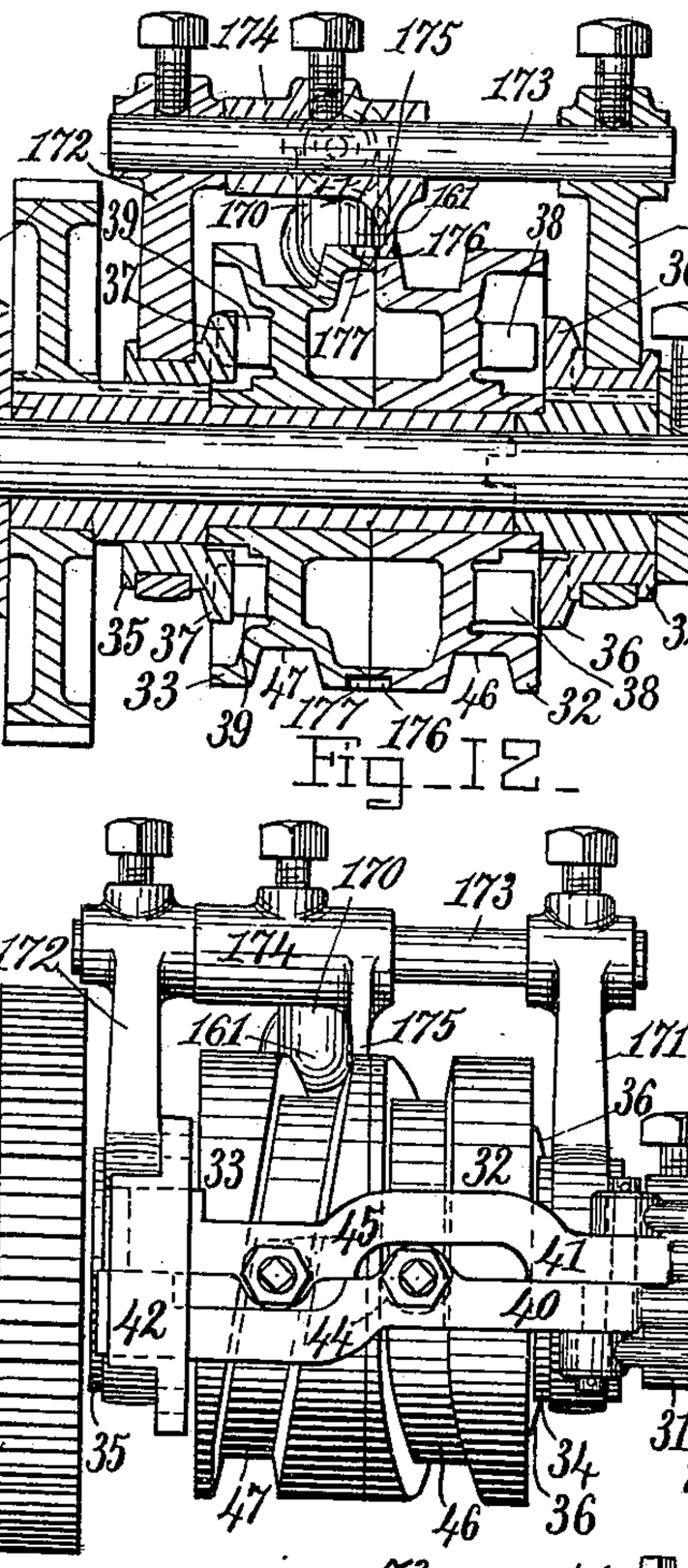


Fig. 12.

Fig. 14.

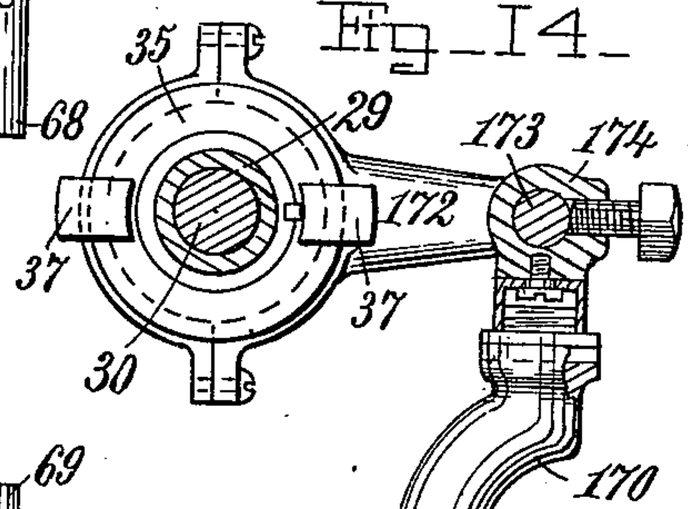
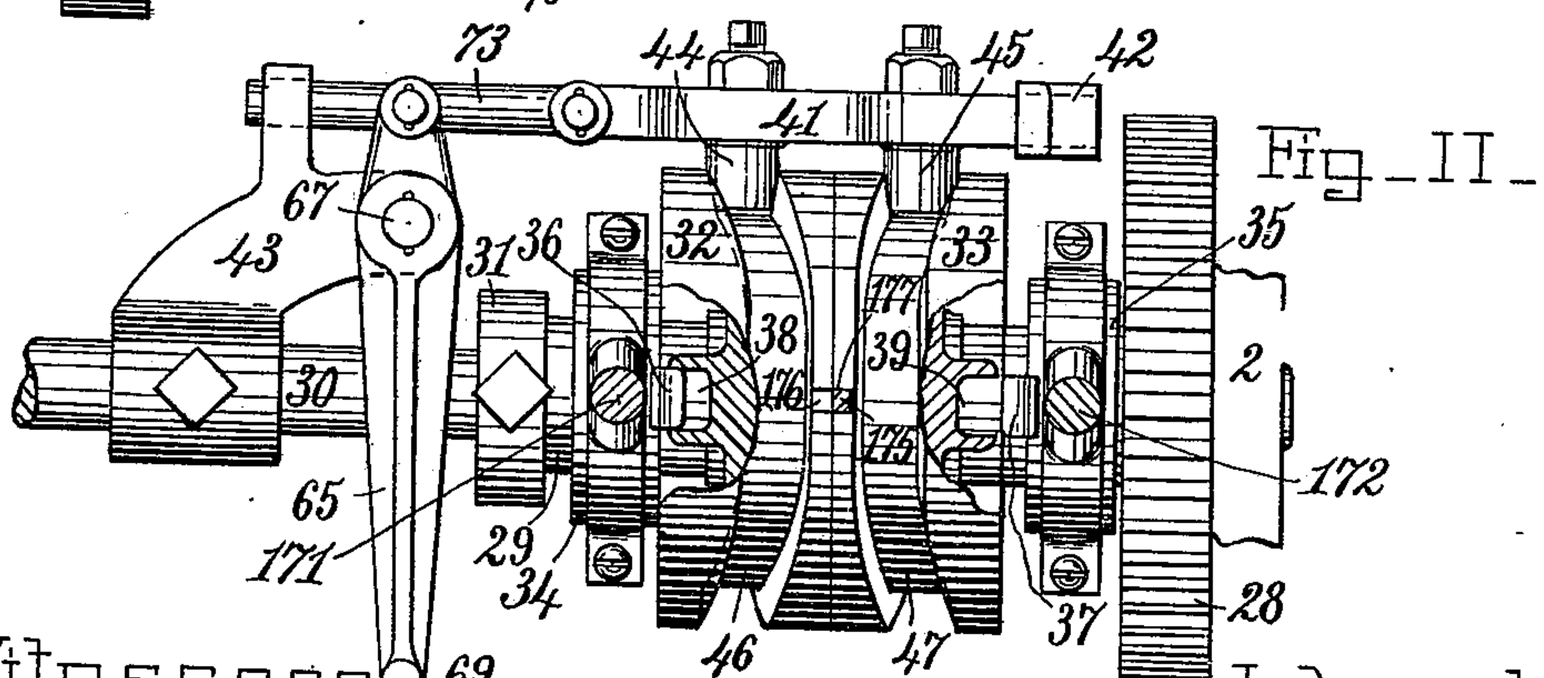


Fig. 11.



Witnesses

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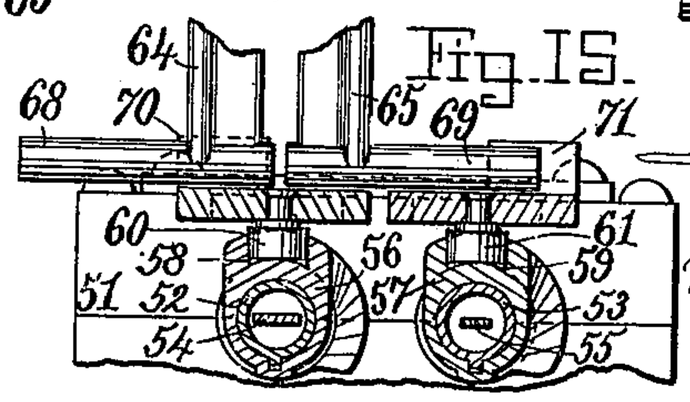
L. Bayard Thompson.

Fig. 15.



Inventor

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by Henry Chadbourn

his atty.

UNITED STATES PATENT OFFICE.

FRANK HOWE, OF BOSTON, MASSACHUSETTS.

NAILING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 644,560, dated February 27, 1900.

Application filed February 21, 1899. Serial No. 706,389. (No model.)

To all whom it may concern:

Be it known that I, FRANK HOWE, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Nailing-Machines, of which the following is a specification.

This invention relates to improvements in nailing-machines for boots and shoes, and particularly in that class of nailing-machines known in the trade as "tacking-machines," and especially in that class of machines in which a metal strip or metal strips are used and rotated, so as to remove tack after tack from the strip without wasting any portion of the strip or strips.

The invention consists of the novel constructions, arrangements, operations, and combinations of parts, as clearly described hereinafter and particularly set forth in the claims, and it is carried out substantially as illustrated on the accompanying drawings, which form an essential part of this specification, and whereon—

Figure 1 represents a side elevation, partly in section, of the head and a portion of the standard of my improved machine. Fig. 2 represents a front elevation of the head of the machine. Fig. 3 represents a central longitudinal vertical section of the front portion of the machine. Fig. 4 represents a horizontal section on the line A B in Fig. 1 looking downward and showing the feeding-tubes for two strips of different widths to be used for the formation of tacks of two different lengths or sizes. Fig. 5 represents a vertical section on the line C D in Fig. 4 and also showing a side elevation of a portion of the mechanism used to place the desired feeding-tube and its contained strip in line, so as to feed the strip to the driver. Fig. 6 represents a front elevation of a portion of the mechanism used to place the desired feeding-tube and its contained strip in line, so as to feed the strip to the driver. Fig. 7 represents a horizontal section on the line E F in Fig. 1 looking upward and showing the mechanism to shift the feeding-tubes for the strips, as described, to drive different sizes or lengths of tacks. Fig. 8 represents a cross-section on the line G H in Fig. 4, showing the relative heights of the delivery ends of the feeding-tubes. Fig. 9 represents a vertical cross-section on the line I J in Fig. 1 and looking toward the rear of the machine. Fig. 10 represents a vertical cross-section on the line K L in Fig. 1 looking in the same direction as in Fig. 9. Fig. 11 represents a detail side elevation as seen from the right side of the machine, showing a portion of the mechanism whereby the feeding-tubes for the strips are rotated. Fig. 12 represents a detail plan view of the mechanism shown in Fig. 11. Fig. 13 represents a detail horizontal longitudinal section of the mechanism shown in Fig. 11. Fig. 14 represents a detail of a portion of the shifting mechanism which governs or controls the feeding-tube which is to be rotated by the mechanism shown in Figs. 11, 12, and 13. Fig. 15 represents a vertical cross-section on the line M N in Fig. 4 looking toward the rear of the machine.

Like characters of reference refer to like parts wherever they occur on the different parts of the drawings.

The frame for the support of the various devices forming my improved machine is composed of the front portion 1, the back portion 2, and the stay-rods 3 3 3 between said portions.

The head of the machine is attached to a suitable standard or support 4, the upper end of which has been shown in section in Fig. 1.

The driving-shaft is mounted within bearings in the frame of the machine, and upon the rear of this shaft are loosely mounted the loose pulleys 6 and 7, which pulleys are prevented from longitudinal movement on said shaft by means of an elongated enlarged portion 8 of the shaft and a collar 9, firmly attached to the shaft. The pulley 7 is provided with a balance-wheel 10, which is made in one piece with the pulley or is firmly attached thereto.

A sleeve 11 is longitudinally movable upon the enlarged portion 8 of the driving-shaft and is splined thereto, so that said sleeve and shaft will rotate together. This sleeve is provided with the radiating arm or lug 12. (See Figs. 9 and 10.) A pin 13, projecting from the pulley 7, engages the lug 12 when said pulley is rotated and the sleeve is moved backward on the driving-shaft, thereby imparting a rotary motion from the pulley to the shaft to cause the operation of the machine. If so

desired, there may be a number of the pins 13 used on the pulley 7, so as to prevent any unnecessary loss of motion when starting the machine. In order to be able to move the sleeve 11 backward to the full extent of its movement, irrespective of the relative positions of the lug 12 and pin 13, I make the pin 13 longitudinally movable in bearings in the pulley 7 and normally hold said pin forward by means of the spring 14. By this construction the pin 13 will yield if the lug 12 is in line with said pin when the sleeve 11 is moved backward to start the machine, but the pin will immediately be forced forward to its normal position when the pulley 7 has rotated sufficiently to carry the pin out of line with the lug on the sleeve.

Upon the forward end of the driving-shaft is mounted the cam 15, and upon the face of this cam is a semicircular projecting ledge 16, which, in connection with a projection 17 on the driver-bar 18, acts to raise the driver-bar slowly against the influence of the spring 19 during a part of the revolution of the driving-shaft and then allows the spring to immediately force the driver-bar downward to drive the nail or tack.

A block 20 is movable vertically within a slot 21 or other suitable guide in the front of the frame of the machine and is provided with an arm 22, which embraces the upper end of the driver-bar 18 within a perforation in said arm and is movable up and down upon said driver-bar. This arm rests against the top of the spring 19, which surrounds the upper part of the driver-bar. An eccentric 23 is firmly mounted upon the driving-shaft and rotates therewith, it having an eccentric ring or strap 24, which is pivotally connected to a stud 25 on the block 20 by means of the eccentric-rod 26. The action of the eccentric is such that it causes the reciprocation of the arm 22 upon the upper end of the driver-bar, and thereby alternately compresses the spring 19 and allows it to be released from compression. The action of the eccentric upon the spring 19 is so timed in relation to the action of the cam-ledge 16 upon the projection 17 on the driver-bar that the spring will be under its greatest compression just at the time when the cam-ledge moves from under the projection on the driver-bar to allow the spring to force the driver-bar immediately downward with its greatest strength. The action of the eccentric upon the spring 19 is so timed in relation to the mechanism which stops the rotations of the driving-shaft and which is to be described hereinafter that the compression of the spring will be entirely removed when the machine is stopped and at rest. Thus there is no liability of the spring 19 becoming set by the machine remaining unused for a long time, and as the compression of the spring 19 is partly released before the ledge 16 acts upon the projection 17 to raise the driver-bar and continues to be released until the driver-bar is raised said driver-bar will be raised with the expenditure of very little power.

A spur-gear 27 is keyed or otherwise firmly mounted upon the driving-shaft so as to rotate therewith, and it meshes into a spur-gear 28, which is keyed or otherwise firmly mounted upon a sleeve 29, so as to cause the rotation of said sleeve upon a stationary shaft 30, having a bearing in the front and in the back portion of the frame of the machine. This sleeve is prevented from longitudinal movement upon the shaft 30 by means of the back portion of the frame and a collar 31, secured upon said shaft. Two cams 32 and 33 are loosely mounted upon the sleeve 29 between two shoulders thereon, said sleeve being preferably made in two parts, as shown, in order to admit of said cams being placed on the sleeve. Grooved collars 34 and 35 are splined and longitudinally movable upon the sleeve 29, one at each end thereof, and rotate with said sleeve. These collars are provided with the respective lugs or projections 36 36 and 37 37, which engage the respective recesses 38 38 and 39 39 on the respective cams 32 and 33. Thus the lugs 36 and 37, in combination with the recesses 38 and 39, form clutches between the cams 32 and 33 and the sleeve 29, whereby said cams are caused to be rotated by said sleeve, or said sleeve is free to rotate without imparting a rotary motion to the cams, according to whether the grooved collars are moved so as to cause the lugs to enter the recesses on the cams or to be drawn from said recesses.

Bars 40 and 41, arranged parallel to the shaft 30, have bearings at one end in a block 42, secured to or made in one piece with the back portion of the frame, and have bearings at the opposite end in a bracket 43, firmly secured to the shaft 30. Cam-rolls 44 and 45 are secured to the respective bars 40 and 41 and enter the respective cam-grooves 46 and 47 in the respective cams 32 and 33. It will be seen that the bars 40 and 41 are caused to reciprocate in their bearings by the rotation of the cams 32 and 33.

A plate 48 is mounted within grooved guides 49 49 in the frame of the machine or in bars secured to said frame, and said plate is movable horizontally and crosswise of the machine within said guides for a purpose to be understood by a further description of the invention.

Within bearings in the blocks 50 and 51 upon the plate 48 are rotatably mounted the feeding-tubes 52 and 53, which tubes are also longitudinally movable within said bearings. Metal strips or tapes 54 and 55 of different widths or thicknesses and from which nails or tacks of different lengths or sizes are to be cut, as hereinafter described, are inserted within the tubes 52 and 53, the forward end of each tube being provided with a perforation substantially corresponding in size and

shape to the cross-section of the strip to be carried by said tube. Sleeves 56 and 57 are splined upon the respective tubes 52 and 53 and are placed upon said tubes between the bearing-blocks 50 and 51, so that said bearings will prevent said sleeves from longitudinal movement, but at the same time will allow of the free longitudinal movement of the tubes within said sleeves and bearing-blocks when so desired. The outer surfaces of the sleeves 56 and 57 are provided with the respective spiral cam-grooves 58 and 59, which are engaged by the respective cam-rolls 60 and 61 on the respective reciprocating slides 62 and 63, which are mounted in bearings in the blocks 50 and 51 and reciprocate in lines parallel to the centers of rotation of the tubes 52 and 53. Levers 64 and 65 are pivotally mounted at 66 and 67 to the bracket 43, one of said levers on either side of said bracket, and said levers are provided at their lower ends with the respective horizontal cylindrical extensions 68 and 69, which extend crosswise of the machine and in lines parallel to the movements of the plate 48 in its guides, which extensions enter the respective recesses 70 and 71 on the slides 62 and 63, which recesses extend crosswise of said slides substantially as shown. The upper ends of the levers 64 and 65 are connected to the respective bars 40 and 41 by means of the respective connecting-links 72 and 73.

From the above description it will be seen that the rotation of the cam 32 will cause the reciprocation of the slide 62 through the medium of the cam-roll 44, bar 40, link 72, lever 64, and recess 70 on said slide 62, and that the reciprocation of the slide 62 will cause the oscillation of the feeding-tube 52 upon its axis through the medium of the cam-roll 60, spiral cam-groove 58, and the sleeve 56, which latter is splined upon said feeding-tube. This oscillation of the feeding-tube will cause the alternate turning of the strip 54, which is carried by said tube for a purpose to be described hereinafter. It will also be seen that the rotation of the cam 33 will cause the turning of the strip 55 through the medium of the roll 45, bar 41, link 73, lever 65, recess 71, slide 63, roll 61, spiral cam-groove 59, sleeve 57, and feeding-tube 53, which tube carries the strip 55 in a manner similar to the turning of the strip 54 from the rotations of the cam 32 and for a similar purpose.

The feeding-tubes 52 and 53 are provided with the respective grooved collars 74 and 75, the grooves on which receive the respective bearing-blocks 76 and 77, which blocks are mounted upon the respective slides 78 and 79, guided within the respective perforations 80 and 81 in the plate 48 in such a manner that said slides may be reciprocated in said plate and thereby reciprocate the feeding-tubes 52 and 53 longitudinally in their bearings in the blocks 50 and 51 for a purpose to be clearly understood by a further description of my invention. Sleeves 82 and 83 are mounted and longitudinally movable upon the forward ends of the respective feeding-tubes 52 and 53. Springs 84 and 85 surround the ends of the respective feeding-tubes 52 and 53 between the respective grooved collars 74 and 75 and the longitudinally-movable sleeves 82 and 83 mounted thereon, which springs tend to move these sleeves toward the ends of the tubes. The sleeves 82 and 83 are provided with the respective spring-actuated pawls 86 and 87, having fulcra, respectively, at 88 and 89 on said sleeves, which pawls enter slotted perforations in the feeding-tubes and engage the respective strips 54 and 55. These pawls are so shaped and actuated by their respective springs that they will move upon the surface of the strips when the sleeves are moved back upon the feeding-tubes against the influence of the springs on said tubes, but will impinge said strips when the sleeves are moved forward by the influence of the springs, and thereby will feed the strips forward through the feeding-tubes. These pawls also act to prevent the sleeves from rotating on the feeding-tubes and consequently perform the office of a spline. The sleeves 82 and 83 are provided with the respective cam-rolls 90 and 91, which engage the respective cam-surfaces 92 and 93, attached to or made in one piece with the respective bearing-blocks 76 and 77, when the feeding-tubes and sleeve are rotated in their bearings by the action of the cams 32 and 33. The action of these cams and cam-rolls is such that it moves the sleeves 82 and 83 longitudinally upon the feeding-tubes against the influence of the springs 84 and 85 or allows said springs to return said sleeves to their normal position, thus causing the reciprocation of the sleeves upon the feeding-tubes, and thereby causes the pawls 86 and 87 to feed the respective strips 54 and 55 through the feeding-tubes. The forward ends of the feeding-tubes are provided with the respective spring-actuated pawls 94 and 95, which are inserted within slots in said tubes and are fulcrumed, respectively, at 96 and 97 to said tubes. The inner ends of these pawls impinge the metal strips on opposite sides thereof and prevent the strips from being drawn backward after they have been fed forward by the pawls 86 and 87.

To the lower part of the front portion 1 of the frame of the machine is firmly secured the block 98, within the lower part of which is formed the nail-tube 99, through which the nail or tack is driven by the driver 100, attached to the lower end of the driver-bar 18, after said nail or tack has been cut from the metal strip, as described hereinafter. The back part of the block 98 is provided with a recess 101, into which the forward end of the feeding-tube which is being used enters when said tube is moved forward in its bearings in the blocks 50 and 51. The block 98 is also provided with the perforation 102, which connects the recess 101 with the nail or tack tube

99 and through which the metal strip is fed from the feeding-tube which is then in use.

Within a guide 103 in the front portion 1 of the frame are mounted the cutter-blocks 104 and 105, (see Figs. 1, 2, and 8,) which blocks are arranged to reciprocate crosswise of the frame within said guide. To these blocks are clamped the respective cutters 106 and 107, which have their respective inner cutting edges 108 and 109 made inclined, as shown in Fig. 3, so as to cut a tapered nail or tack from the end of the metal strip when the cutting edges of said cutters are forced together, as hereinafter described. The cutters 106 and 107 are adjusted and supported in their respective blocks by means of the respective set-screws 110 and 111. The cam 15 is provided with the cam-surfaces 112 and 113, which act upon the respective cam-rolls 114 and 115 on the upper ends of the respective levers 116 and 117, fulcrumed, respectively, at 118 and 119 to the front portion 1 of the frame. The lower ends of the levers 116 and 117 are connected to the respective sliding cutter-blocks 104 and 105 by means of the respective connecting-links 120 and 121. Studs 122 and 123 project backward from the respective cutter-blocks 104 and 105 through perforations in the frame, and a spring 124, acting upon said studs, tends to slide said blocks in their guide 103 and to hold them at the greatest distance from each other. It will thus be seen that the combined actions of the cam-surfaces 112 and 113 upon the levers 116 and 117 and that of the spring 124 upon the studs 122 and 123 will cause the reciprocations of the cutter-blocks in their guide 103 and cause the cutting edges of their attached cutters to pass each other and cut a nail or tack from the metal strip which has been fed into their path by the strip-feeding mechanism above described.

On the drawings the feeding-tubes have been shown in their normal position. The metal strips carried by and fed through said tubes are arranged with their width extending crosswise of the machine or in a flat position; but when the cutters are operated to cut a nail or tack from said strips the strips will have been rotated one-quarter of a revolution or so that they stand on end. The movements of the cutters when cutting a nail or tack from the strip are so adjusted that the cutter 106 will move so that its cutting edge will come into contact with one side of the strip, while the cutter 107 will move so that its cutting edge will pass the cutting edge of the other cutter, cutting the nail or tack from the strip, and so that the extreme end of the cutter 107 will move the severed nail or tack sidewise and in combination with the surface 125 on the cutter 106 will form a continuation of the nail-tube 99 and guide the nail or tack when driven by the driver.

The cutting edges of the cutters are made inclined, as above set forth, and this construction, in combination with the semirotation of the strip between each nail or tack cut therefrom, will cause a nail or tack which is tapered on both sides to be cut from the strip at each operation of the machine. As the inclined surface of the cutter 106 forms one of the walls of the extension of the nail or tack tube and as the nail or tack moves downward on this inclined surface when being driven by the driver, it will be seen that said nail or tack must of necessity move toward the front of the machine bodily while being driven. This forward movement of the nail or tack tends either to move the nail or tack sidewise from under the driver or to spring the driver forward, which would be liable to cause the driver to break or to be bent. In order to obviate the liability of moving the nail or tack from under the driver or of the springing of the driver, I provide the driver-bar with the inclined portions 126 and 127, corresponding in incline to that of the incline of the cutting edges of the cutters, and provide the guides 128 and 129, in which the driver-bar is guided, with the inclined surfaces 130 and 131, against which the inclined portions of the driver-bar move when it is forced downward by the spring 19. These inclined surfaces on the driver-bar and those in the guides for the driver-bar cause the driver-bar to move forward in a manner corresponding to the forward movement of the nail or tack while being driven, and therefore prevent the springing of the driver or the movement of the nail or tack from under the driver.

The machine is provided with two treadles of any of the common and well-known constructions, but which have not been illustrated on the drawings, as it is deemed unnecessary to show them. Rods 132 and 133 are connected at their lower ends to the treadles, one rod being attached to each treadle. The upper ends of these rods are connected to the respective slides 134 and 135, which slide vertically upon the frame 136, suspended from the under side of the rear portion 2 of the main frame by means of one or more rods 137. The slides 134 and 135 are guided, respectively, in their vertical movements within guiding-grooves 138 and 139 on frame 136 and are limited in their movements by means of their respective slotted perforations 140 and 141 and a bolt 142, which passes through said slotted perforations and a perforation in the frame 136, said bolt also acting to retain the slides and frame in contact with each other during the movements of the slides. Shafts 143 and 144 are rotatably mounted in two ears 145, attached to or made in one piece with the suspended frame 136, which shafts are arranged horizontally and crosswise of the machine. Crank-arms 146 and 147 are firmly mounted upon the respective shaft 143 and 144, which crank-arms extend downward and are engaged by the cam-surfaces 148 and 149 on the respective slides 134 and 135 to rock said shafts in their bear-

ings when said slides are moved in their guides by the operation of the treadle to which they are attached. Crank-arms 150 and 151 are also firmly mounted upon the respective shafts 143 and 144, which crank-arms extend upward and have their upper ends made T-shaped, which ends extend crosswise of the machine and enter the respective cross-grooves 153 and 152 on the under side of the respective slides 79 and 78.

From the above description of the connection between the slides 134 and 135, connected to the treadles and the respective slides 63 and 62, which carry the respective feeding-tubes 53 and 52, it will be seen that when the slide 134 is moved upward by the operation of its connected treadle the cam-surface 148 on the slide will engage the crank-arm 146 on the shaft 143 and force its lower end forward, which will rock said shaft in its bearings and will cause the upper end of the crank-arm 150, attached to said shaft, to move backward and carry the slide 63 and the feeding-tube 53, carried thereby, with it, thus withdrawing the forward end of the feeding-tube from the recess 101 in the nail-tube block 98. It will also be seen that the upward movement of the slide 135 will cause the feeding-tube 52 to be moved backward through the action of the cam-surface 149 upon the crank-arm 147 and consequent working of the shaft 144, with its attached crank-arm 151, in the bearings for said shaft. On the drawings I have illustrated the slide 134 as being moved upward in its guides and the feeding-tube 53 moved backward thereby.

The slides 134 and 135 are provided with the respective cam-surfaces 154 and 155, which engage the respective cam-rolls 156 and 157 when said slides are moved upward by the operation of their connected treadles. The cam-rolls 156 and 157 are mounted upon the free ends of the respective crank-arms 158 and 159, which crank-arms are firmly mounted upon the respective vertical shafts 160 and 161, having bearings in the suspended frame 136 and the back portion 2 of the main frame of the machine. Upon the shafts 160 and 161 are mounted the respective crank-arms 162 and 163, which are pinned or otherwise firmly attached to said shafts. The forward ends of the crank-arms 162 and 163 are connected by means of the link 164, which is so shaped that it enters a recess 165, formed by cut-away portions in the adjacent edges of the slides 78 and 79. The cut-away portions of the slides 78 and 79 are of such a shape and size that they will allow of the free reciprocations of the slides, as above set forth, but will prevent any movement of the link 164 therein crosswise of the machine, and as the slides are mounted upon the plate 48, which is free to slide crosswise of the machine, it will be seen that any movement of the link crosswise of the machine will cause the plate 48 to move in a corresponding direction in its guides, carrying with it the feeding-tubes which are mounted thereon. Thus it will be seen that the action of the cam-surfaces 154 and 155 upon the cam-rolls 156 and 157 when the slides 134 and 135 are moved upward in their guides is such that it causes the reciprocation of the plate 48 crosswise of the machine in either direction, according to which of said slides is moved upward. This reciprocation of the plate 48, as above set forth, brings one of the other of the slides 78 or 79, with the feeding-tubes carried thereby, in line with the recess 101 in the nail-tube block 98, and so that said feeding-tube may be moved into the recess 101 by the mechanism to be described hereinafter, so as to be able to feed the strip carried by said feeding-tube into the nail or tack tube.

The slides 134 and 135 are provided with the respective cam-surfaces 166 and 167, (the latter being shown in dotted lines in Figs. 5 and 6 and the former in full lines in Fig. 5 and dotted lines in Fig. 6,) each of which surfaces engage a plate 168, loosely mounted upon the shaft 144, and turns said plate upon said shaft when either of said slides is moved upward by the operation of its connected treadle. An arm 169 is attached to the plate 168, which arm extends upward, so that its upper end will come into contact with the back part of the particular slide 78 or 79 which has been moved into line with the recess 101 by the reciprocations of the plate 48, as above set forth, and by contacting with said slide will move the feeding-tube carried thereby into the recess 101 and in position to feed the strip carried by said tube into the nail or tack tube, so as to cut nails or tacks therefrom.

It is desirable that the mechanism to turn the particular feeding-tube carried into line with the nail or tack tube by the reciprocations of the plate 48 should be brought into operative condition by the operation of the same mechanism which reciprocates said plate, and I accomplish this result by the following construction:

The crank-arms 162 and 163 being coupled together by the link 164 and being firmly mounted on the respective shafts 160 and 161, it will be seen that when either of the cam-surfaces 154 or 155 acts upon its respective cam-roll 156 or 157 to turn its respective shaft 160 or 161 it will cause both of said shafts to be turned, but they will be turned in opposite directions by said cam-surfaces, and consequently the plate 48 will be moved in opposite directions, according to which of the cam-surfaces are acting to turn it. The shaft 161 extends upward through the back portion 2 of the frame and is offset at its upper end, so as to form the crank 170. Crank-arms 171 and 172 are loosely mounted within the grooves in the respective grooved collars 34 and 35 and are connected at their outer ends to a short shaft 173 by means of set-screws in said crank-arms. It will thus be seen that the grooved collars 34 and 35 are coupled or yoked together by means of the crank-arms 171 and 172

and the short shaft 173 in such a manner that they will be reciprocated in unison upon the sleeve 29. Upon the short shaft 173 is firmly mounted the collar 174, which is connected to the crank 170 in such a manner that when said crank is turned by the rotation of the shaft 161 it will cause the reciprocation of the grooved collars 34 and 35 upon the sleeve 29, and thereby connect the desired cam 32 or 33 to said sleeve, according to the direction in which the shaft 161 is turned and the desired feeding-tube to be turned. It will thus be seen that when the slide 134 is moved upward it will cause the feeding-tube 52 to be moved into line with the nail or tack tube and will also cause the grooved collars 34 and 35 to slide longitudinally on the sleeve 29, so as to connect the sleeve 29 with the cam 32 and so that the rotations of said cam will cause said feeding-tube 52 to be rotated when the machine is in operation. If the slide 135 is moved upward, it will cause the feeding-tube 53 to be moved into line with the nail or tack tube and will cause the grooved collars 34 and 35 to slide longitudinally on the sleeve 29, so as to connect the sleeve 29 with the cam 33 and so that the rotations of said cam will cause the feeding-tube 53 to be rotated when the machine is in operation.

In order to prevent either the cam 32 or 33 from rotating with the sleeve 29 when the other cam is connected so as to rotate with said sleeve, I provide the collar 174 with the projection 175, which projection consequently moves with the short shaft 173 and enters one or the other of the recesses 176 or 177 in the respective cams 32 or 33, and thereby locks whichever of these cams is released from the sleeve by this movement of the short shaft. As the sleeve 29 only makes one-half of a complete revolution for each complete revolution of the driving-shaft and consequent complete operation of the machine, it is necessary that the cams 32 and 33 should be made duplex and should have the respective recesses 176 and 177 on diametrically-opposite sides, as shown in Fig. 13.

As hereinbefore set forth, the machine is set into operation by a longitudinal movement of the sleeve 11 upon the driving-shaft, which movement carries the lug 12 on said sleeve into the path of the pin 13 on the loose pulley 7. In order to accomplish this longitudinal movement of the sleeve 11, I mount the split collar 178 within a groove in the sleeve 11 and pivotally attach to said collar the upper forked end of the bell-crank lever 179, which lever is fulcrumed at 180 to the suspended frame 136 and has its free end extending toward the front of the machine, directly over and in the path of the slides 134 and 135, when they are operated by the treadles, as hereinafter set forth. On the drawings the bell-crank lever 179 has been shown as being made in two parts firmly connected by means of the screw 181, but it might to equal advantage be made in one piece, if so desired. A spring 182 is interposed between the bell-crank lever 179 and the portion 2 of the frame of the machine, which spring tends to hold the sleeve 11 in such a position on the driving-shaft that its lug 12 will be withdrawn from the path of the pin 13 and the machine will be at rest.

A rod 183 is guided within a vertical guide in the suspended frame 136 and is pivotally attached at its upper end to the forward end of the bell-crank lever 179 in such a manner that it will be moved vertically within its guide when said bell-crank lever is turned upon its fulcrum to start the machine by the upward movement of either of the slides 134 or 135, causing said slides to come into contact with the under side of the forward end of said bell-crank lever and to turn said lever on its fulcrum. The rod 183 is provided with a projection 184, which is moved upward with said rod and moves upon the surface 185 on the plate 168, which is brought into the path of the outer end of said projection by the action of the slides 134 and 135 on said plate. It will thus be seen that the projection 184, in combination with the surface 185, will lock the arm 169 in its forward position and hold the feeding-tube 52 or 53 forced forward thereby in its position in the recess 101 during the time that the machine remains in operation; but said projection will be moved downward out of contact with the surface 185 by the action of the spring 182 upon the bell-crank lever when the machine is stopped.

In order to insure the complete operation of the machine after it has been started by the depression of one or the other of the treadles and consequent upward movement of the slide 134 or 135 even though the treadle is released and the connected slide moves downward, I provide the sleeve 11 with the cam-surface 186, upon which the cam-roll 187 travels while the sleeve is being moved longitudinally or is rotated. This cam-roll is mounted upon the sliding bar 188, which slides vertically within the guide 189 on the rear portion 2 of the frame. The lower end of the bar 188 is connected to the bell-crank lever 179 by means of the link 190. The cam-surface 186 is so shaped that its lowest part will be under the cam-roll at the time when the machine has completed its operation, and the highest part of this cam-surface will be carried under the cam-roll almost immediately after the machine has been started. The high part of the cam-surface extends sufficiently far around the sleeve 11 to retain the cam-roll elevated until the machine has nearly completed its operation or until the momentum of the driving-shaft will insure the complete rotation of the driving-shaft. It will thus be seen that the cam-surface on the sleeve 11, in combination with cam-roll on the bar 188 and the connection of said bar to the bell-crank lever 179, will keep said bell-crank lever in position to cause motion to be imparted to the driving-shaft from the

pulley 7 after said lever has been put in such position by the depression of the treadle and until the complete operation of the machine has been insured and that the same mechanism will keep the projection 184 in contact with the surface 185 on the plate 168 and prevent the feeding-tube from moving out of operative position until the operation of the machine has been completed.

To prevent a strain upon the machine by the sudden stopping of the same, I provide the sleeve 11 with the lug 191 and provide the portion 2 of the frame with a bar 192, which is guided in a bearing in said frame, which bar is supported and pressed upward by means of the spring 193. The lug 191 is so located on the sleeve 11 that it will be brought so as to engage the bar 192 when said sleeve is moved longitudinally on the driving-shaft to stop the machine, and the yielding of said bar caused by the spring 193 will cushion the stopping of the machine.

The cam-surfaces on the slides 134 and 135 are so placed thereon that the operations of the various devices operated thereby will be in the following order:

If the feeding-tube which carries the metal strip other than that desired to be used is in line with the nail or tack tube and is forced into the recess 101, it will be first withdrawn by the action of the cam-surface 148 or 149. The plate 48 will then be moved crosswise of the machine by the action of the cam-surface 154 or 155, so as to bring the desired feeding-tube in line with the nail or tack tube. This feeding-tube will then be forced into the recess 101 by the action of the cam-surface 166 or 167, and finally the machine will be started and the feeding-tube locked in position by the operation of the bell-crank lever 179. After the desired treadle has been partially depressed, so as to move the slide connected thereto, and thereby located the desired feeding-tube in operative position within the recess 101, locked the cam 32 or 33, which is not required to rotate that feeding-tube, and connected the other cam to the sleeve 29, the further operation of the machine is as follows: A completion of the depression of the treadle is then made, which will cause it to operate the bell-crank lever 179 and start the machine and at the same time will lock the feeding-tube in its operative position. The rotation of the driving-shaft will cause the rotation of the cam 32 or 33, which is connected to the sleeve 29, and by the connecting mechanism operated thereby will cause the intermittent oscillation of the feeding-tube within its bearings and in the recess 101, thus turning the metal strip carried by said tube one-half a rotation alternately in opposite directions to present it to the cutters, so that said cutters will cut nails or tacks therefrom one after another, with their head portions cut alternately from opposite sides of the strip, thus using the entire strip to form nails or tacks. The oscillation of the feeding-tube will cause the intermittent feeding of the metal strip forward during each oscillation of said tube. The rotation of the driving-shaft will also cause the rotation of the cam 15 and operate the cutters to cut the nail or tack from the strip, said cam also causing the driver to be raised to its highest position. The eccentric on the driving-shaft, which is also rotated thereby, will cause the spring 19 to be compressed, so as to drive the nail or tack when the driver is released from the action of the cam 15 and will also prevent the spring from being in a compressed condition when the machine is stopped or at rest.

It will be understood that I have illustrated on the drawings and described in the specification suitable connecting operating mechanisms to assemble the various devices which constitute my invention in a single organized nailing-machine, but that the said mechanisms may be changed by the use of other and well-known equivalent mechanisms without departing from my invention, also that the various devices which constitute my invention may be used independent of each other and in connection with other suitable devices than those illustrated and described, if so desired.

Having thus fully described the nature, construction, and operation of my invention, I wish to secure by Letters Patent and claim—

1. In a nailing-machine, a reciprocating driver-bar with inclined portions, and a guide for said driver-bar with inclined surfaces whereby the driver-bar is given a slight forward movement bodily in unison with its reciprocating movement, for the purpose set forth.

2. In a nailing-machine, a reciprocating driver-bar with inclined portions, and a guide for said driver-bar with inclined surfaces, combined with a metal-strip-feeding device and cutters with inclined cutting edges to cut a tapered nail or tack from said strip whereby the driver-bar will have a forward movement bodily in unison with its reciprocating movement, its driving end will follow the incline of the cutting edge of the cutters, and the tapered nail will not move laterally upon the end of the driver while the nail is being driven, for the purpose set forth.

3. In a nailing-machine, a reciprocating driver-bar, a spring to move the driver-bar in one direction to drive the nail or tack, mechanism to move the driver-bar in opposition to the influence of said spring, an eccentric, and intermediate mechanism between the eccentric and said spring to alternately compress and release said spring from compression, whereby said spring is under the greatest compression due to said eccentric at the time the driver-bar is released from the mechanism which moves the driver-bar in opposition to said spring in order to drive the nail or tack, and is released from compression due to said eccentric, at the time the machine is at rest, for the purpose set forth.

4. In a nailing-machine, in which nails or tacks are cut from a metal strip or tape with their head portions cut alternately from opposite edges of the strip or tape, a feeding-tube through which said strip or tape is fed and by which it is carried, bearings in which said tube is rotatably mounted, mechanism to oscillate said tube and the strip carried thereby in said bearings, a sleeve longitudinally movable on said tube, pawls carried by said sleeve and engaging said metal strip, a spring to normally hold said sleeve forward, a cam and cam-roll to move said sleeve backward when the feeding-tube is oscillated, whereby said strip is intermittingly fed forward a predetermined amount during each oscillation of the feeding-tube, for the purpose set forth.

5. In a nailing-machine in which nails or tacks are cut from a metal strip or tape with their head portions cut alternately from opposite edges of the strip or tape, a feeding-tube through which said strip or tape is fed and by which it is carried, bearings in which said feeding-tube is rotatably mounted, mechanism to oscillate said feeding-tube and strip or tape carried thereby in said bearings, a sleeve longitudinally movable on said feeding-tube, pawls carried by said sleeve and engaging said metal strip, mechanism to intermittingly reciprocate said sleeve upon said feeding-tube to intermittingly feed said strip or tape forward, and detent-pawls carried by said feeding-tube to prevent the drawing backward of the strip or tape by the backward movement of the said sleeve and pawls carried thereby, for the purpose set forth.

6. In a nailing-machine in which nails or tacks of two different dimensions are to be cut from metal strips or tapes with their head portions cut alternately from opposite edges of said strips or tapes, two feeding-tubes through which said strips or tapes are fed, bearings in which said tubes are rotatably mounted, a rotary shaft, two cams loosely mounted on said shaft, intermediate mechanism between each of said cams and a feeding-tube whereby each tube is oscillated by the action of its respective cam when said cam is rotated to turn the strip or tape carried thereby, and two clutches one for each of said cams between said shaft and cams coupled together and operated in unison, whereby one of said cams is clutched to the shaft and the other cam is released by the operation of the clutches, for the purpose set forth.

7. In a nailing-machine in which nails or tacks of two different dimensions are to be cut from metal strips or tapes with their head portions cut alternately from opposite edges of said strips or tapes, two feeding-tubes through which said strips or tapes are fed, bearings in which said tubes are rotatably mounted, a rotary shaft, two cams loosely mounted on said shaft, intermediate mechanism between each of said cams and a feeding-tube, whereby each tube is oscillated by the action of its respective cam when said cam is rotated, to turn the strip or tape carried thereby, and two clutches one for each of said cams between said shaft and cams coupled together and operated in unison, whereby one of said cams is clutched to the shaft and the other cam is released by the operation of the clutches, and a locking device for said cams operated in unison with the clutches and locking each cam in a stationary position when released from the rotary shaft by its clutches, for the purpose set forth.

8. In a nailing-machine in which nails or tacks of two different dimensions are to be cut from metal strips or tapes, with their head portions cut alternately from opposite edges of said strip or tape, a nail or tack tube, a driver and operating mechanism to cause it to drive a nail or tack through said tube, two feeding-tubes through which the metal strips or tapes are fed into said nail or tack tube movable laterally and longitudinally to bring them in turn in line with the nail or tack tube and to move them into operative position with said tube, two treadles, two slides each connected with and operated by one of said treadles, cam-surfaces on said slides, arms operated by said cam-surfaces and acting on said feeding-tubes to move them laterally and longitudinally, for the purpose set forth.

9. In a nailing-machine in which nails or tacks of two different dimensions are to be cut from metal strips or tapes with their head portions cut alternately from opposite edges of said strip or tape, a nail or tack tube, a driver and operating mechanism to cause it to drive a nail or tack through said tube, two feeding-tubes through which the metal strips or tapes are fed into said nail or tack tube, movable laterally and longitudinally to bring them in turn in line with the nail or tack tube and to allow them to be moved into operative position with said tube, a turning mechanism to rotate said feeding-tubes, a starting and stopping mechanism, two treadles, two slides each connected with and operated by one of said treadles, cam-surfaces on said slides, arms actuated by said cam-surfaces to move said feeding-tubes laterally and longitudinally in order to bring the desired feeding-tube into operative position to cause the operation of said turning mechanism and to turn the feeding-tube thus located, said slides engaging the starting mechanism to start the machine, for the purpose set forth.

10. In a nailing-machine in which nails or tacks of two different dimensions are to be cut from metal strips or tapes, a nail or tack tube, a driver and operating mechanism to cause it to drive a nail or tack through said tube, two feeding-tubes through which the metal strips or tapes are fed into said nail or tack tube, movable laterally and longitudinally to bring them in turn in line with the

nail or tack tube and allow them to be moved into operative position with said tube, a starting and stopping mechanism, two treadles, two slides each connected with and operated by one of said treadles, cam-surfaces to move said feeding-tubes into operative position, a lever connected to said starting mechanism and engaged by said slides to start the machine, and a bar connected to said lever and operated thereby to lock the feeding-tubes in operative position, for the purpose set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

FRANK HOWE.

Witnesses:
HENRY CHADBRUM,
D. E. KEMPSTER.