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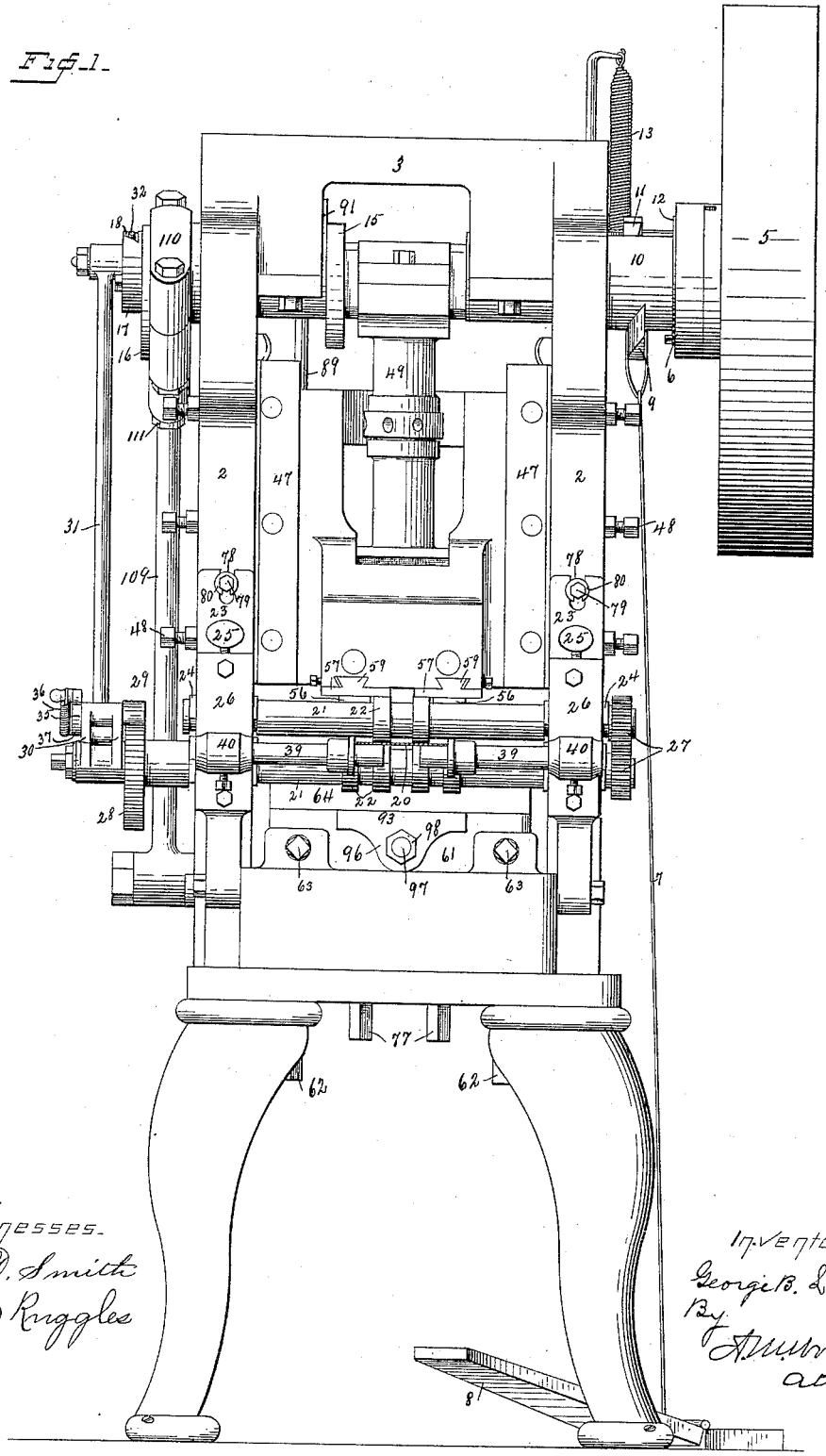
G. B. LAMB.

MACHINE FOR MAKING SHOE SHANKS.

No. 417,925. Patented Dec. 24, 1889.

Fig. 1.



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(No Model.) 7 Sheets—Sheet 2.

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MACHINE FOR MAKING SHOE SHANKS.

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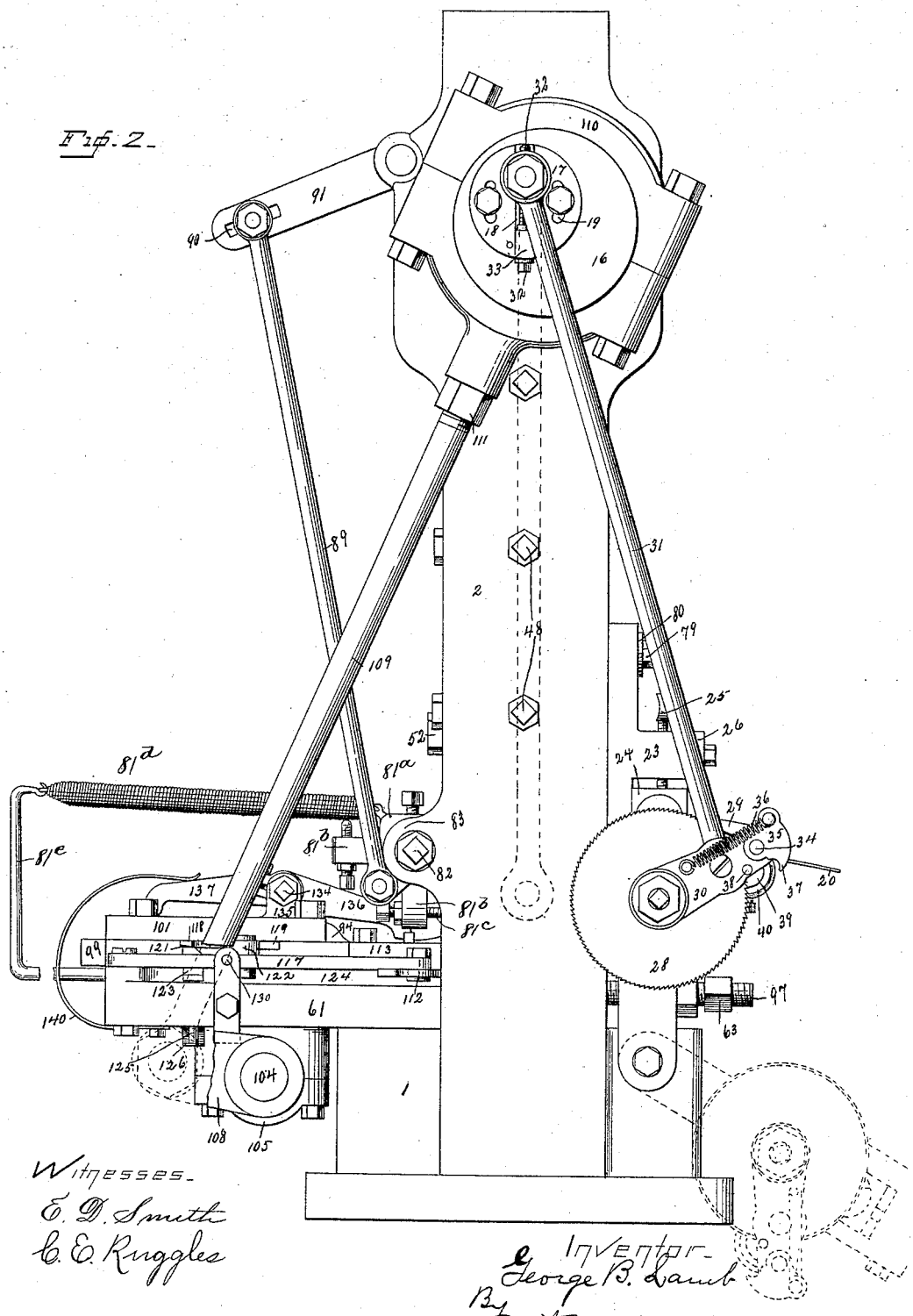
Fig. 2.



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MACHINE FOR MAKING SHOE SHANKS.

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Fig. 3.

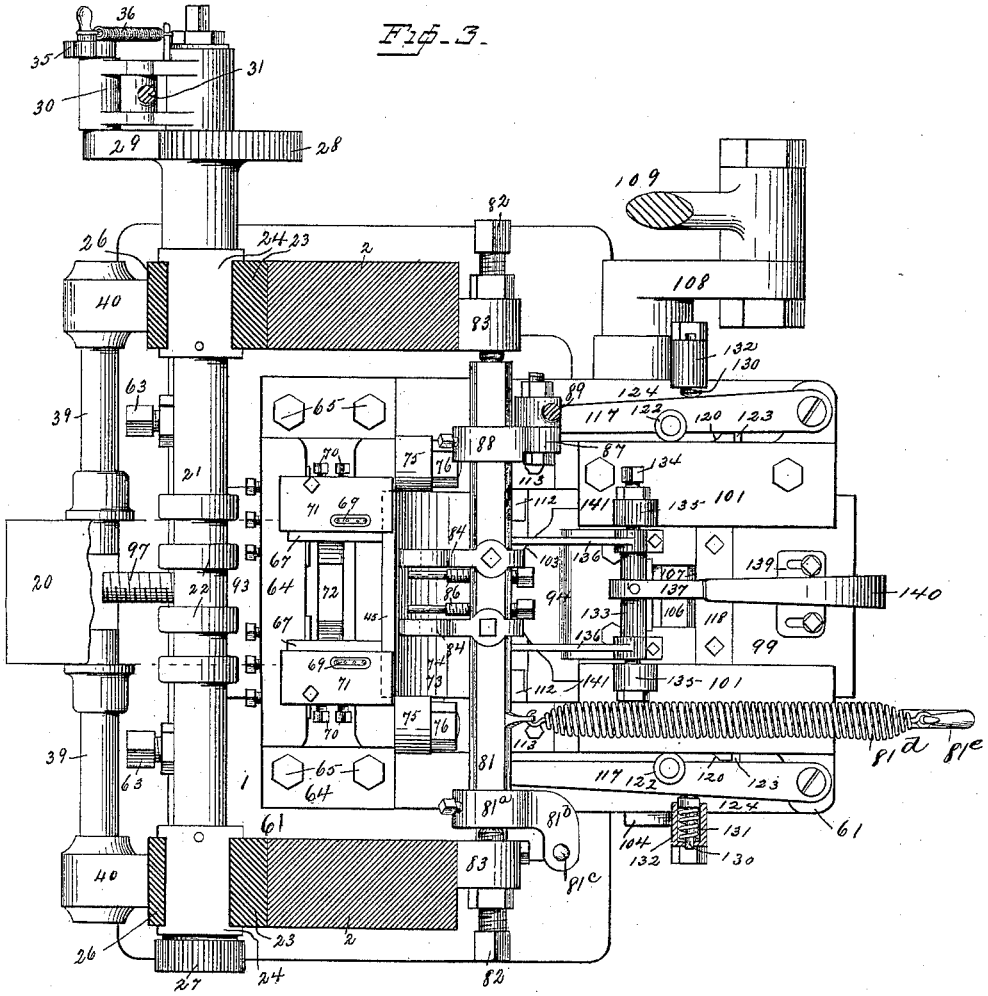

Fig. 11.

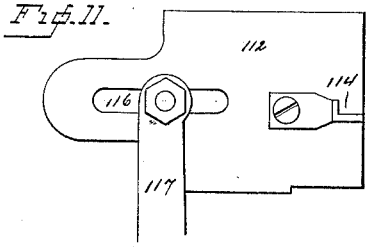

Fig. 12.

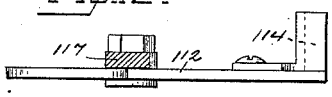

Fig. 13.

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Fig. 14.

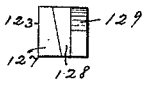
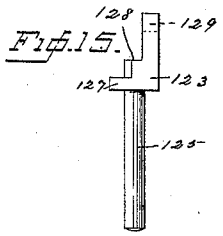


Fig. 15.



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MACHINE FOR MAKING SHOE SHANKS.

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Fig. 4.

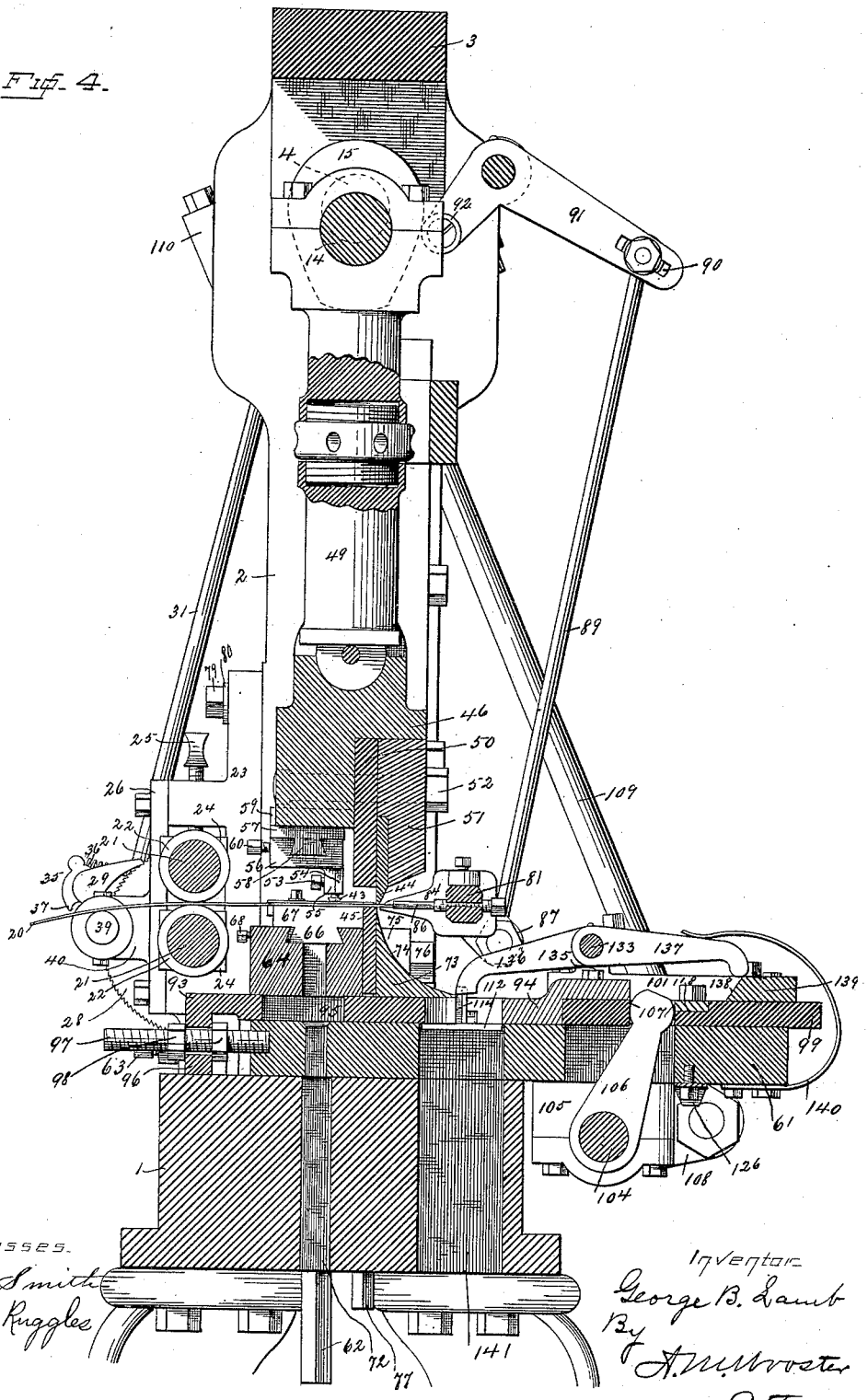

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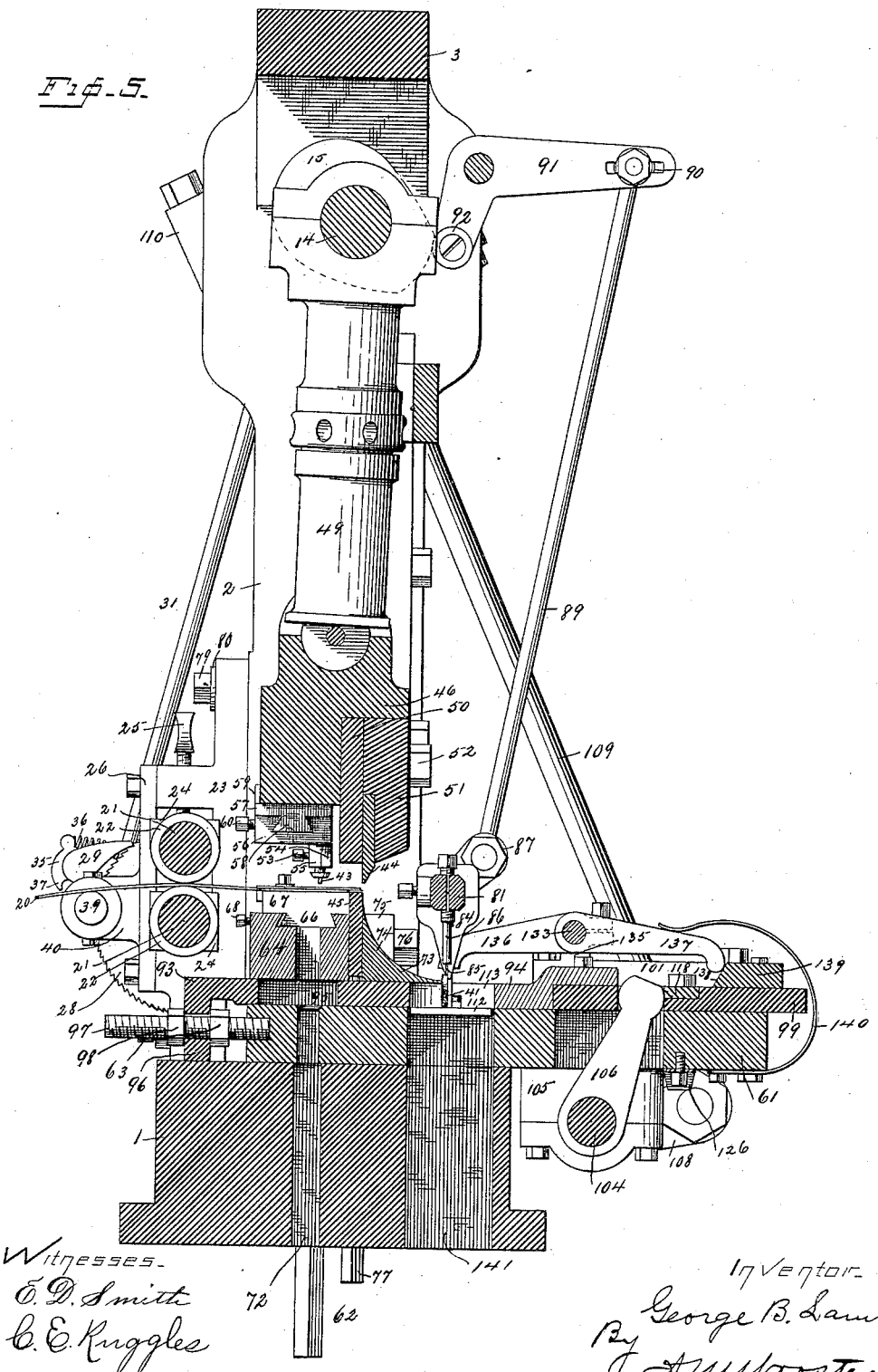
Fig. 5.



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MACHINE FOR MAKING SHOE SHANKS.

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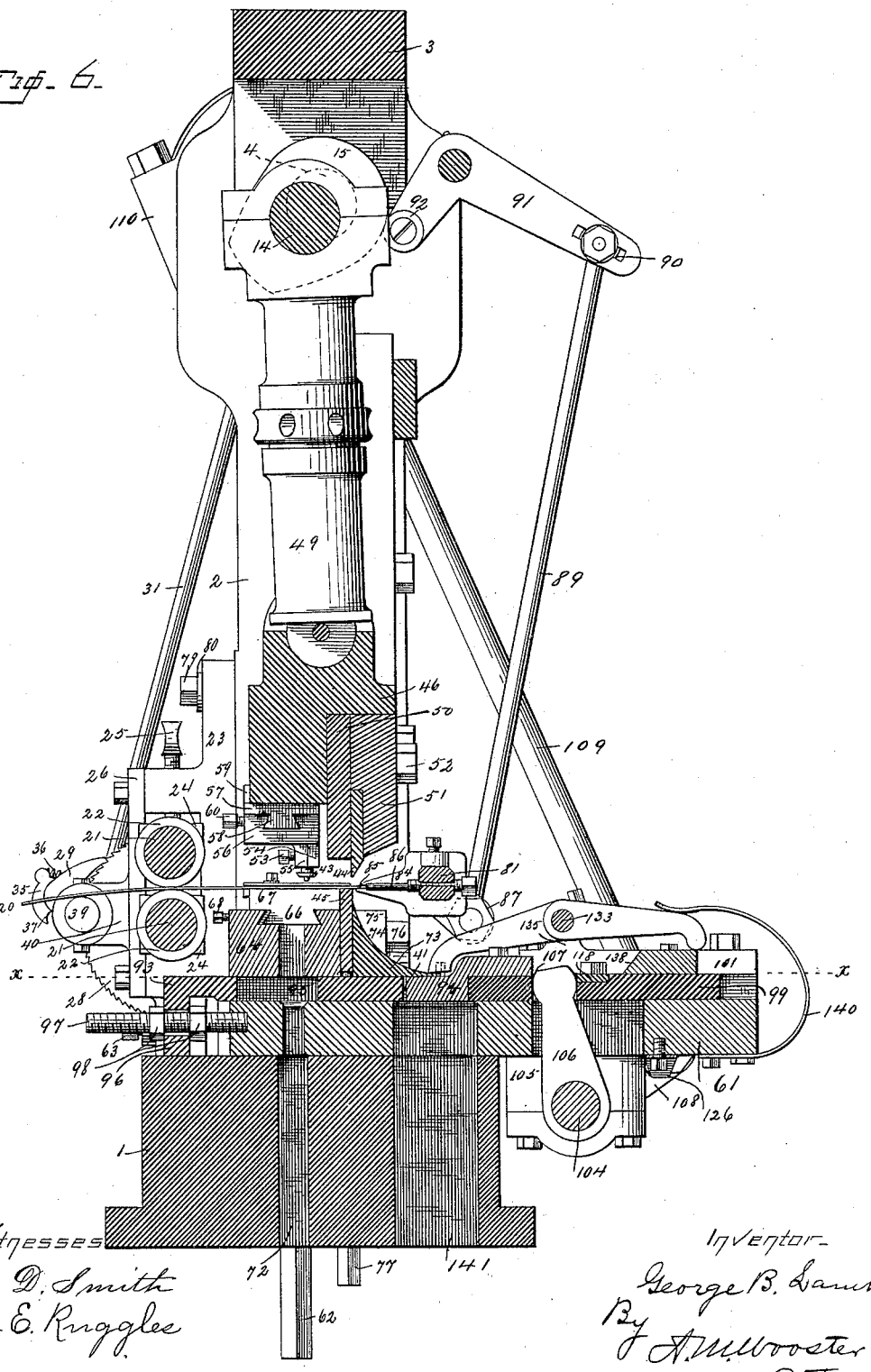
Fig. 6.



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MACHINE FOR MAKING SHOE SHANKS.

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Fig. 7.

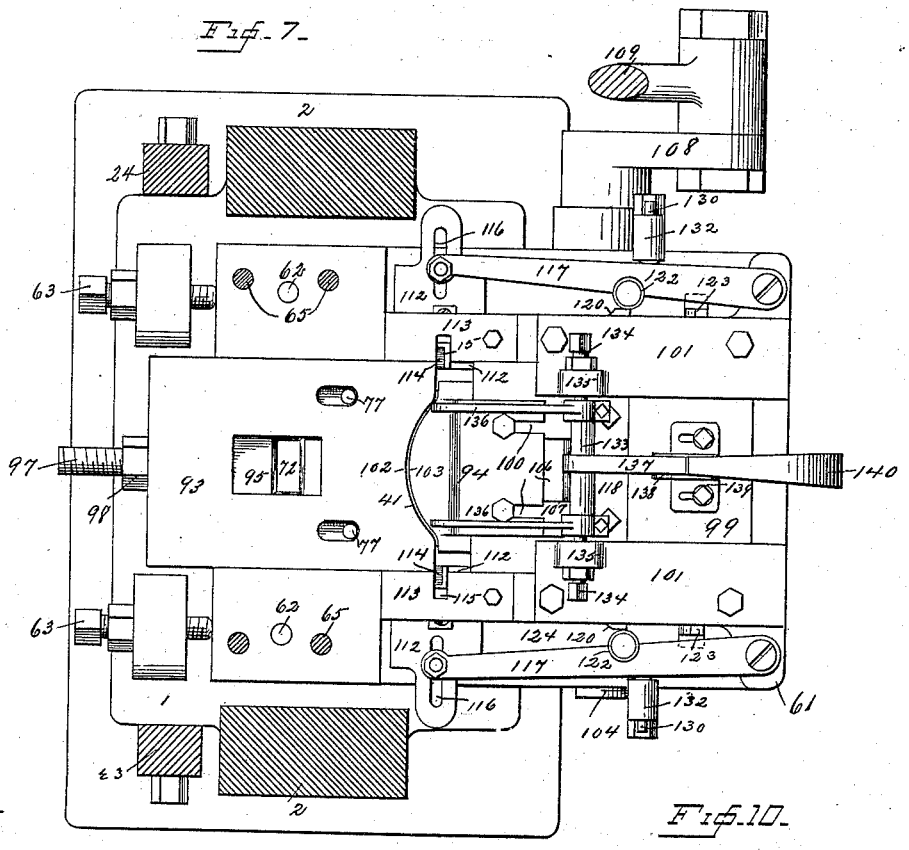


Fig. 9.

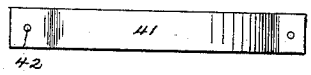


Fig. 10.

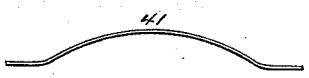
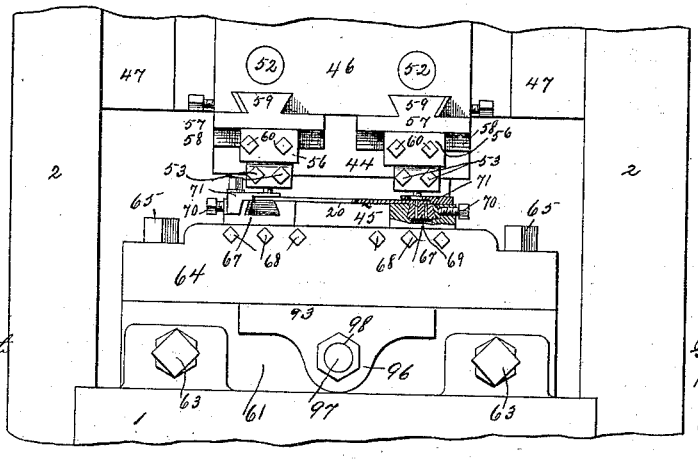


Fig. 8.



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UNITED STATES PATENT OFFICE.

GEORGE B. LAMB, OF WATERBURY, ASSIGNOR TO THE BRIDGEPORT STEEL CUTTING COMPANY, OF BRIDGEPORT, CONNECTICUT.

MACHINE FOR MAKING SHOE-SHANKS.

SPECIFICATION forming part of Letters Patent No. 417,925, dated December 24, 1889.

Application filed February 4, 1887. Serial No. 226,536. (No model.)

To all whom it may concern:

Be it known that I, GEORGE B. LAMB, a citizen of the United States, residing at Waterbury, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Machines for Making Shoe-Shanks; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to the manufacture of steel shanks for boots or shoes, and has for its object to produce mechanism for automatically punching, cutting, and forming the shanks from a strip of sheet metal which is fed into the machine.

With these ends in view I have devised the novel construction of which the following description, in connection with the accompanying drawings, is a specification, similar numbers being used in all the figures to denote the same parts of the machine.

Figure 1 is a front elevation of the machine complete; Fig. 2, a side elevation on an enlarged scale, as seen from the left in Fig. 1; Fig. 3, a plan view of the bed of the machine, the side pieces of the frame-work being in section; Fig. 4, a central section of the entire machine, showing the parts in the first position in the formation of a shank, the punchers and cutters being shown as acting; Fig. 5, a similar section illustrating the parts in the second position in the formation of each shank, the shank after being punched and severed from the strip having been placed in position to be acted upon by the forming-dies; Fig. 6, a similar section illustrating the third position in the formation of each shank, the male die having moved to its operative position; Fig. 7, a section on the line $x\,x$ in Fig. 6, looking down upon the bed of the machine; Fig. 8, a detail view of the front of the machine, the feed-rollers being removed and portions broken away to show the construction and adjustment of the punchers and their corresponding dies; Fig. 9, a plan view of a completed shank; Fig. 10, an edge view of the same; Fig. 11, a detail plan view, on an enlarged scale, of one of the cross-slides carrying a socket; Fig. 12, an edge view of the plate, showing the socket in elevation; Fig. 13, an end view, also on an enlarged scale, of the plate upon the slide, showing the inclines; Fig. 14, an enlarged plan view of the spring-actuated locking-block detached; and Fig. 15 is an elevation of the same.

1 denotes the bed of the machine, and 2 the side pieces of the frame-work, connected together at the top by a cross-piece 3.

4 denotes the main shaft, which is journaled in the upper portion of the frame-work and carries a fly-wheel 5, adapted to receive a belt (not shown) by which power is applied to the machine.

As it is desirable that the operator shall have control of the machine to stop and start it instantly without shifting the belt from the fly-wheel, I preferably make the latter loose upon the shaft and provide suitable clutch mechanism, (denoted in its entirety by 6,) which is connected by a rod 7 with a treadle 8. As this clutch mechanism forms no portion of my present invention, I have not deemed it necessary to illustrate it in detail. It is simply necessary to say that lug 9 is pivoted back of the shaft, as it appears in Fig. 1, and is curved partially about enlargement 10. Lug 11 is made integral with a slide moving in a slot in the enlargement. A flat spring 12 acts to hold the clutch in the engaged position. When the treadle is in the raised position, the engagement of lug 11 with curved lug 9 draws the slide out and disengages it from a locking recess in the hub of the fly-wheel, which stops the machine instantly. When continuous operation of the machine is desired, lug 9 is drawn down by the treadle, so that lug 11 clears it at each revolution. Spring 13 acts to hold curved lug 11 to the position shown in Fig. 1. The top of the fly-wheel moves from back to front, and in the position in which the parts are shown the movement of the machine will be stopped the instant lug 11 upon the slide engages lug 9.

The movements of the machine are all imparted from shaft 4. Midway between the two side pieces the shaft is provided with an eccentric 14, which operates the punch. At the left of the eccentric is a cam 15, by which the carrying-fingers are actuated. Upon the outside of the frame-work the shaft is pro-

vided with an eccentric 16, by which the male forming-die is actuated. The movements of all of these parts will presently be explained in detail.

At the extreme end of the shaft I provide a disk 17, having an undercut groove 18 across its face. This disk is made adjustable at the end of the shaft by means of bolts passing through curved slots 19, to secure accurate timing of the machine.

20 denotes the strip of metal which is being fed to the machine.

21 denotes feed-rollers having enlargements 22, by which the strip of metal is gripped and fed forward. Both of these rollers are journaled in boxes 24, carried by bracket 23, which is pivoted to any suitable portion of the bed or frame-work.

25 denotes thumb-screws which pass through the upper portion of the bracket and bear upon the boxes of the upper roller to adjust the pressure of said roller upon the strip of metal.

26 denotes face-plates by which the boxes are held in position.

Both feed-rollers are provided with pinions 27, whereby motion is imparted from one to the other. The shaft of the lower roller is extended out beyond the side pieces of the machine and is provided with a ratchet 28. 29 is a pawl engaging this ratchet, and 30 the pawl-lever, which is journaled upon the end of the extended shaft of the lower feed-roller.

31 is a rod, the lower end of which is pivoted to lever 30 and the upper end to a block, (not shown,) which lies in an undercut groove 18 across the face of disk 17 at the end of the main shaft. This block (not shown) is carried by a screw 32, passing loosely through a block 33, which is securely held in groove 18. Collars on the screw engage opposite sides of the block, to hold the screw against endwise movement. It will readily be seen that the adjustment of the pivotal point of rod 31 to disk 17 will determine the throw of the pawl-lever, thereby regulating the feed and determining the width of the shanks cut from the strip of metal, stops being provided to limit the forward movement. It will be noticed in Fig. 1 that the shaft 34 of the pawl passes through the pawl-lever and is provided at its outer end with a plate 35. (See, also, Fig. 2.) This plate is rigid with the shaft and pawl. A spring 36, engaging pins on the pawl-lever and the plate, acts to hold the pawl to its operative position. The operation of this portion of the machine is so simple as hardly to require description. It will be seen that the first half of each rotation of shaft 4 carries the pawl-lever downward and moves the pawl backward over the teeth of the ratchet a distance which depends entirely upon the adjustment of the pivotal point of rod 31 to disk 17 upon the shaft. The second half of the rotation draws the pawl-lever upward again, causing the pawl to carry the ratchet forward, imparting movement to the feed-rollers and carrying the strip of metal forward in position for its inner end to be acted upon by the punches and cutters, as will presently be explained.

It will be apparent from a glance at either of the sectional views that the length of the strip of metal between the feed-rollers and the cutting mechanism is sufficient to form a number of shanks, and that this would be wasted unless fed independently of the rollers. I have therefore provided a simple arrangement for disconnecting the feeding mechanism from the other portions of the machine, so that while all other portions of the machine are operated in the usual manner the feeding must be done by hand. To disconnect the feeding mechanism, it is simply necessary to turn plate 35 downward until hook 37 engages pin 38 on the pawl-lever, which lifts the pawl out of contact with the ratchet. This will have swung spring 36 past the pivotal point of the plate, so that it will act to hold the pawl out of engagement with the ratchet in the same manner that it previously acted to hold it in engagement. Having disconnected the feeding mechanism, thumb-screws 25 are turned backward and a tool made to engage the end of the strip of metal, as inserted between the central enlargements 22 on the feed-rollers, and the feeding is continued by hand until the strip is used up.

39 (see Fig. 3) denotes guides carried by brackets 40 upon pivoted bracket 23, between which the strip passes and which insures its passing evenly to the feed-rollers and the cutter.

41 (see Figs. 9 and 10) denotes the completed blank, which is provided near each end with one or more holes 42.

After leaving the feed-rollers the strip of metal is first acted on by punches 43, which make the holes in the shank. At the same instant that the holes are punched a punched shank is severed from the strip of metal by the upper and lower cutters 44 and 45. The punches and the upper cutter are carried by a block 46, adapted to slide in ways 47. These ways are bolted to the side pieces 2, and are made adjustable by means of set-screws 48. Block 46 and the punches and cutter are actuated by eccentric 14 on the main shaft. The eccentric-rod 49 is pivoted to block 46, and is made adjustable in the usual or any preferred manner. The upper cutter is secured to block 46 by being clamped between plates 50 and 51, one or both of said plates being recessed to receive the cutter and the several parts being locked in position by bolts 52, which pass through the plates and through block 46. The punches are held in place by being clamped by set screws 53 between plates 54 and 55, the former being made integral with a block 56, provided with a dovetailed groove engaging a corresponding spline 58 on the under side of a block 57, which is provided on its upper side with splines 59, en-

gaging dovetailed grooves in the under side of block 46. It will be seen in the sectional views and in Fig. 8 that the splines on block 57 are at right angles to each other, the object being to insure perfect adjustment of the punches in both directions. Both blocks are locked in position by set-screws 60.

In Fig. 9 I have shown a shank as provided with one hole at each end, which is the ordinary construction. Sometimes, however, it is desirable to have two holes at one end and one at the other, and sometimes two holes are required at both ends. It will of course be understood that the change may be readily effected by adding another punch or by substituting a double punch. These being simple mechanical details within the province of any skilled mechanic have not been illustrated in the drawings.

61 (see the sectional views and Fig. 7) is a plate secured to the bed by bolts 62. This plate is also steadied by set-screws 63, passing through lugs cast upon the bed. (See Figs. 7 and 8.)

64 denotes a block secured to plate 61 by bolts 65. This block is provided with a dovetailed groove adapted to receive splines 66 on die-blocks 67. These die-blocks are locked in position by bolts 68, passing through block 64.

69 (see Figs. 3 and 8) denotes the dies which slide in dovetailed grooves in blocks 67. These dies are provided with a number of holes corresponding with the punch. It will of course be understood that the wear upon the dies is at the edges of these holes. When they become worn, the dies are shifted to bring a new hole in line with the punch. The dies are held in position by set-screws 70.

71 denotes plates secured to block 64 and recessed upon their under sides to receive the strip of metal 20. These plates serve as guides for the strip of metal and hold it firmly in place as it is being acted on by the punches. The arrangement of the dies, punches, and guide-plates relatively to the strip of metal is clearly illustrated in Fig. 8.

72 denotes an opening down through block 64, plate 61, and the bed of the machine, through which the pieces of metal forced out by the punches pass.

73 denotes a block having a curved incline 74 upon its outer face for a purpose presently to be described, and provided with lugs 75. The lower cutter 45 lies in a recess in the back of block 64, and is held in position by bolts 76, passing through lugs 75 and engaging block 64. These bolts when tightened up act to clamp block 73 and the lower cutter firmly in position. The upper end of incline 74 terminates in almost an edge, which lies a slight distance below the top of the cutter. The lower cutter is capable of vertical adjustment by means of bolts 77, which extend up through the bed of the machine and bear against it.

As already described, bracket 23, which carries the feeding mechanism, is pivoted to the bed or frame-work of the machine. This bracket is, in fact, double, and consists of independent arms upon each side of the machine. The upper ends of these arms are provided with slots 78, wide enough to permit the heads of bolts 79 to pass through them. These bolts engage side pieces 2, and their heads project out above the surface of the arms of the bracket. Slotted washers 80, made considerably wider than the slots, are adapted to pass over the bolts under their heads, thus locking the arms of the bracket in the operative position.

When a punch breaks, or any adjustment of punches, dies, or cutters becomes necessary, ready access may be had to these parts by simply slipping off washers 80, disconnecting rod 31 from pawl-lever 30 and turning the bracket and all the parts carried thereby over out of the way.

The position of the bracket and parts carried thereby in the lowered position is indicated in dotted outline in Fig. 2.

Just back of the cutting mechanism is a rock-shaft 81, which is stepped upon the pointed ends of the screws 82, which pass through lugs 83 upon the side pieces, and are locked in position by check-nuts.

84 denotes fingers, having slots 85 at their ends, which are secured to the rock-shaft by set-screws or in any suitable manner. Between the fingers (two being ordinarily used) are stop-pins 86, which lie in the same plane as the fingers and project forward to or slightly beyond the bottoms of the slots in the ends of the fingers. The shanks of these pins are threaded and pass through the rock-shaft. They may be readily adjusted by applying a wrench to their squared heads, as shown in Fig. 3.

87 denotes a crank-arm projecting from a sleeve 88, which is secured to the rock-shaft by a set-screw.

89 denotes a rod, one end of which is pivoted to crank-arm 87, and the other is adjustably secured in a slot 90 at the end of one arm of bell-crank lever 91, which is pivoted to one of the side pieces. The other arm of bell-crank lever 91 is provided with a roller 92, which bears against the surface of cam 15 upon the main shaft. This cam is so shaped that each rotation of the shaft causes the rock-shaft to oscillate in an arc of about ninety degrees. A spring 81^d, connected to the rock-shaft and to an arm 81^e, extending upward from plate 61, acts to return the rock-shaft and fingers from the position shown in Fig. 5 to the position shown in Fig. 3—that is, the position in which the end of the strip of metal is received. The extent of the oscillation of the rock-shaft may be either increased or diminished by adjustment of the upper end of rod 89 in slot 90.

81^a denotes collars on the rock-shaft, which are secured in place by set-screws, each collar being provided with two arms 81^b, which

project outward at right angles to each other. 81ᶜ denotes screws which pass through these arms, and are locked in any desired position by check-nuts. (See Figs. 2 and 3.) These screws serve to limit and determine the oscillation of rock-shaft 81, the screws in the upper arms being so adjusted that their ends will strike side pieces 2 above lugs 83 at the exact instant that the slots in fingers 84 are in position to receive the edge of the strip of metal as it is carried forward by the feeding mechanism, and the screws through the lower arms being so adjusted as to strike the side pieces below lugs 83 at the instant that fingers 84 are in position to drop the severed shank into the sockets which receive it, as will be more fully explained.

The operation of this portion of my invention is as follows: The stop-pins are so adjusted that each actuation of the feeding mechanism will carry the strip of metal forward against them, the width of the shanks being determined by the distance between the cutters and the ends of the pins. It will of course be understood that the shanks are cut crosswise of the strip of metal. It has already been explained that the holes are punched before the strip reaches the cutters. Each actuation of block 46 punches the holes for one shank and severs another from the strip of metal. As block 46, with the punches and upper cutter rises, the feeding mechanism carries the strip of metal forward, the end of it passing into slots 85 in the fingers and resting against the stop-pins. The upper cutter now descends and severs a shank from the strip of metal. The instant it is severed the oscillation of the rock-shaft commences, and the severed shank held in the slots in the fingers is swung down curved incline 74 on block 73. It will of course be understood that the curve of this incline is an arc of a circle slightly larger but concentric with the circle, an arc of which is described by the ends of the fingers, the center being the center of rotation of the rock-shaft. After being severed from the strip of metal and carried down the incline the shank is ready to be formed or shaped by dies 93 and 94.

The shape of the female forming-die 93 is clearly shown in the sectional views and in plan in Fig. 7.

95 is an opening through the female die which registers with opening 72, and allows the pieces forced out by the punches to pass through. This die is recessed into plate 61, as clearly shown in Figs. 7 and 8, and is provided with a downwardly-extending lip or lug 96, as shown in the sectional views and in Fig. 8.

97 is an adjusting-screw passing loosely through the lip or lug and engaging plate 61. After adjusting the female die it is locked in the desired position by check-nuts 98. The male forming-die 94 is bolted to a slide 99, the bolts passing through slots 100 to give the necessary adjustment. The action of the two dies 93 and 94 is to form the shanks to the shape shown in Fig. 10, the female die being provided with a concave curve 102, and the male die with a convex curve 103, corresponding therewith, as clearly shown in Fig. 7. Slide 99 is recessed into plate 61, and is held in position by plates 101, bolted to plate 61.

104 denotes a rock-shaft, journaled in lugs 105, cast upon the under side of plate 61. An arm 106, rigidly secured to this shaft, projects upward through a slot 107 in slide 99, engaging said slot and imparting reciprocatory motion to the slide. 108 is a crank-arm at one end of this rock-shaft, and 109 is a rod, one end of which is pivoted to the outer end of the crank-arm and the other adjustably connected to the strap 110 of the eccentric 16 on the main shaft. The upper end of this rod is threaded and is screwed to a hub on the strap and locked in position by a check-nut 111. It will thus be seen that each rotation of the shaft imparts an oscillation to the rock-shaft, and through arm 106 a forward and backward movement to the slide carrying the male die.

112 denotes cross-slides on opposite sides of the machine, which are loosely recessed into plate 61, and are held in position by plates 113, bolted to said plate.

114 denotes sockets, (see Figs. 2, 7, 11, and 12,) the bases of which are loosely recessed in the under side of plate 113 and which are screwed to cross-slides 112. These sockets project upward through recesses 115 in plates 113 for a purpose presently to be explained. At the outer ends of the cross slides are slots 116.

117 denotes levers the forward ends of which are adjustably secured to the cross-slides by bolts passing through the slots. The rear ends of these levers are pivoted to plate 61.

118 (see the sectional views and Figs. 3 and 13) denotes a plate bolted to the slide, the ends of which project beyond the slide and move in recesses 119 in plate 61. The ends of plate 118 are provided with inclines 120 upon the forward sides and 121 upon the under sides.

122 denotes rollers pivoted upon levers 117. At each forward movement of the slide inclines 120 engage these rollers and actuate levers 117, thereby throwing the cross-slides to their extreme retracted position.

123 denotes blocks, which lie in recesses 124 in the edges of plate 61. These blocks are provided with shanks 125, which extend down through holes in plate 61, the ends of the shanks being engaged by springs 126, which act to force the blocks upward. The outer sides of the blocks are provided with steps 127 and 128, and the top of the block is provided with an incline 129, extending forward and downward. When the parts are in the position shown in Fig. 7—that is, when the male die is thrown forward and the cross-

slides retracted—the blocks are forced up by springs 126, so that levers 117 are engaged by the lower steps or recesses 127, thus locking the cross-slides in the retracted position, in which position they remain until inclines 129 at the tops of the blocks are engaged by inclines 121 on the under sides of plate 118 as slide 99 moves backward. This engagement of the inclines forces the blocks downward and permits spring-pins 130 to force the levers forward, so that they lie in the upper steps or recesses of block 123, thus throwing the cross-slides and sockets to their extreme forward position.

Pins 130 and the springs therefor lie in sockets 131, carried by brackets 132, bolted to the sides of plate 61.

133 denotes a rock-shaft stepped upon the pointed ends of screws 134, which pass through lugs 135, cast upon plates 101, and are locked in position by check-nuts. 136 denotes fingers carried by collars clamped to this rock-shaft. These fingers project forward and act to press each severed shank into position to be acted upon by the forming-dies, as will be more fully explained. The rock-shaft and fingers are actuated by means of an arm 137, secured to the rock-shaft and projecting backward, the rear end of which engages an incline 138 upon a plate 139, which is adjustably secured to the slide by means of bolts passing through slots in the plate. The free end of a curved spring 140, attached to plate 61, bears against arm 137 and acts to press it downward, thus holding the fingers at their raised position. When the slide moves forward, as in Fig. 4, the end of arm 137 rides up the incline, and while the male die is at its forward position said arm is resting upon the top of plate 139. When the slide moves backward, the spring forces the end of the arm down the incline again and raises the fingers out of operative position.

The operation of this portion of my invention is as follows: Fig. 4 shows the strip of metal as thrown forward by the feeding mechanism, the edge of the strip lying in the slots in fingers 84, the cutters in the act of severing a shank, and the punches in the act of punching the holes for another shank. At this instant slide 99, carrying the male die and fingers 136, is moving backward—that, is, away from the female die. The oscillation of rock-shaft 81 then commences swinging fingers 84 downward, carrying the severed shank with them, the outer edge of the shank resting on incline 74. The backward movement of the slide still continues. Just before the slide reaches its extreme backward position blocks 123 are engaged by inclines 121 upon plate 118 and forced downward, thereby releasing levers 117 and allowing spring-pins 130 to throw cross-slides 112, carrying sockets 114 to their forward position. An instant later the extreme of the downward movement of fingers 84 will be reached and the shank carried by the fingers will be dropped into the sockets, the ends of the shank resting on the cross-slides. The position of the parts at this instant is clearly shown in Fig. 5, fingers 136 being then at their raised position, slide 99 at its extreme retracted position, and arm 137 lying in front of incline 138 on plate 139. The instant the forward movement of the slide commences arm 137 travels up the incline again, forcing fingers 136 downward, as shown in Figs. 4 and 6. The action of these fingers is to insure that the shank shall be pressed into sockets 114. The forward movement of the slide continues, and the shank is engaged by the male die and held firmly between the male and female dies. At this instant levers 117 will be engaged by inclines 120 at the ends of plate 118. This acts to throw the levers outward, retracting the cross-slides and leaving the shanks between the two dies. The forward movement of the male die continues until the parts are in the position shown in Figs. 6 and 7, the male die being at its extreme forward position and the finished shank still clamped between the dies. This is the last operation and completes the formation of the shank. The instant the backward movement of the male die commences the completed shank drops out from between the dies and down through opening 141 in the bed of the machine and plate 61. The several movements just described are continuously repeated, each rotation of the shaft feeding forward the strip of metal and acting to punch, sever, and form a shank.

In order that the operation of the entire machine may be clearly understood, I will briefly review the same. The strip of metal passes between guides, which insure its correct position as it passes to the feed-rollers. Each actuation of the feeding mechanism carries the strip forward a distance equal to the width of one shank. The instant the forward movement of the plate ceases it is acted upon by the punches, which make the holes for one shank, and by the cutters, which sever a shank from the end of the strip. The block carrying the punches and upper cutter is then raised and another movement of the feeding mechanism takes place. The end of the strip of metal as it is fed forward enters slots in the ends of fingers upon a rock-shaft, adjustable stops being provided between the fingers to regulate the width of each shank. The instant the shank is severed the fingers swing downward, describing an arc of ninety degrees, the outer edge of the shank resting against an incline, which is an arc of a circle concentric with, but of greater diameter than, the arc described by the ends of the fingers. The extremes of oscillation of the rock-shaft are determined by set-screws, the ends of which strike the side pieces and stop the fingers in their upward movement at just the right position to receive the end of the strip as it is fed forward, and in their downward movement at just the position to drop the

severed shank into sockets carried by cross-slides. At this instant a pair of fingers 136 swing downward and insure that the shank passes into the sockets. When the shank has passed into the sockets, it is ready to be bent to the desired curvature by the forming-dies. At the instant the male die has advanced sufficiently far forward to engage the shank the cross-slides and sockets are retracted, leaving the shank unsupported and free to receive the full action of the forming-dies. While the shank is being formed between the dies the fingers on the rock-shaft are moving upward to receive another shank. The instant the male die begins to move backward the completed shank drops out and an instant later the cross-slides, carrying the sockets, are thrown forward to receive the next shank, fingers 136 are raised, and the fingers on rock-shaft 81 swing downward and drop another shank into the sockets. Fingers 136 then swing downward again to insure its being properly placed to receive the action of the dies and the male die moves forward to shape the shank as before, these operations being repeated and a completed shank being produced by each rotation of the shaft of the machine.

As the machine contains many parts, I have taken great pains to describe its construction and operation minutely. It should be understood, however, that I do not desire to limit myself to the exact details of construction shown and described, as they may obviously be greatly varied without departing from the spirit of my invention.

I claim—

1. The combination, with the feeding mechanism, the punches, and the dies, of the cutters and oscillating slotted fingers which receive each shank from the cutters and place it in position for the next operation.

2. The combination, with the cutters, of oscillating slotted fingers which receive the end of the strip of metal and when the shank is severed place it in position for the next operation.

3. The combination, with the cutters and the oscillating slotted fingers, of forming-dies by which the shank is shaped.

4. The combination, with the cutters and the oscillating slotted fingers, of a curved incline against which the edge of the shank rests during the movement of the fingers.

5. The combination, with the cutters and the oscillating slotted fingers, of adjustable stop-pins between said fingers, whereby the width of each shank is determined.

6. The combination, with the cutters and the oscillating slotted fingers, of cross-slides carrying sockets which receive each shank.

7. The combination, with the cutters, the oscillating slotted fingers, and the sockets, of male and female forming-dies.

8. The cutters, the oscillating slotted fingers, and curved incline 74, in combination with the cross-slides having sockets 114, and the male and female forming-dies.

9. The combination, with the cutters and the oscillating slotted fingers, of cross-slides having sockets 114, swinging fingers 136, which act to press each shank into the sockets, and the male and female forming-dies.

10. The cutters and the oscillating slotted fingers, in combination with the cross-slides having sockets 114, the female die, and slide 99, carrying a male die corresponding therewith.

11. Rock-shaft 81, having slotted fingers 84 and adjustable stop-pins 86, in combination with cutters whereby each shank is severed, incline 74, upon which the shank rests during the movement of the fingers, cross-slides carrying sockets 114, and forming-dies whereby each shank is shaped.

12. The cutters, and the cross-slides having sockets to receive the shanks, in combination with rock-shaft 81, having slotted fingers 84, stop-pins 86, and arms with screws 81^c, whereby the oscillation of the rock-shaft is adjusted, as and for the purpose set forth.

13. The rock-shaft having slotted fingers and stop-pins, and the cross-slide having sockets 114, in combination with feeding mechanism, the punches, and cutters.

14. The combination, with the punches, cutters, and oscillating slotted fingers, of feeding mechanism consisting of rollers 21, a pawl, pawl-lever, and a ratchet actuated from the main shaft.

15. The combination, with the feeding mechanism, substantially as described, of the punches, adjustable blocks 56 and 57, by which the punches are carried, adjustable dies 69 and adjustable die-blocks 67, by which they are carried.

16. The combination, with the feeding mechanism, punches, and dies 69, of plates 71, recessed upon their under side, whereby the strip of metal is guided and held while being acted upon by the punches.

17. The feeding mechanism, punches, and dies 69, in combination with plates 71 and the cutters.

18. The feeding mechanism, sliding blocks 46, carrying adjustable punches, and the upper cutter, in combination with blocks 64, carrying adjustable dies 69, and an adjustable lower cutter clamped to said block.

19. The combination, with the cutters and blocks 73, having curved incline 74, of rock-shaft 81, having slotted fingers 84, which receive the severed shanks.

20. The combination, with the cutters, rock-shaft carrying fingers 84, and the female die, of slide 99, carrying the male die.

21. The combination, with the oscillating slotted fingers and the female die, of cross-slides having sockets 114, slide 99, carrying the male die, and levers 117, which are pivoted to the cross-slides, and plate 118, hav-

inclines 120, engaging said levers, whereby the cross-slides are actuated.

22. The side pieces having lugs 83 and screws 82, in combination with rock-shaft 81, stepped on the points of said screws, collars upon said rock-shaft, having arms 81^b, and screws 81^c, passing through said arms and adapted to bear against the side pieces above and below the lugs, whereby the oscillation of the rock-shaft is limited.

23. The rock-shaft 81, having slotted fingers 84, stop-pins 86, and arms 81^b, having screws 81^c, in combination with the male and female forming-dies.

24. The combination, with the rock-shaft having slotted fingers 84 and crank-arm 87, of cam 15 on the main shaft, bell-crank lever 91, rod 89, connecting said lever to the crank-arm, and spring 81^d, connected to the rock-shaft and to an arm projecting from the bed, as and for the purpose set forth.

25. The combination, with the female die and slide 99, carrying the male die, of rock-shaft 133, having fingers 136 and arm 137, incline 138 on the slide, and spring 140, bearing on said arm, whereby the movements of the fingers are controlled.

26. The forming-dies and the cross-slides having sockets 114, in combination with oscillating arms 136, acting to press the shanks into the sockets.

27. Slide 99, having incline 138, in combination with the cross-slides, fingers 136, and arm 137, engaging the incline, whereby the fingers are operated.

28. Slide 99, having plate 118, with inclines 120, in combination with the cross-slides, levers pivoted to said cross-slides and to a solid portion of the machine, and rollers on said levers adapted to engage the inclines, whereby the cross-slides are retracted.

29. Slide 99, having plate 118, with inclines 120, in combination with levers 117, having rollers engaging inclines 120 to retract the cross-slides, and spring-actuated blocks 123, which engage said levers to hold the slides at their retracted position.

30. Slide 99, having inclines 120, the cross-slides, and levers 117, having rollers to engage the inclines, in combination with spring-actuated blocks 123, having steps 127, which engage the levers and hold the cross-slides at their retracted position.

31. Slide 99, having inclines 121, the cross-slides, and levers 117, in combination with spring-actuated blocks 123, engaging the levers, whereby the cross-slides are locked in their retracted position.

32. Slide 99, having plate 118, with inclines 120 and 121, the cross-slides, and levers 117, having rollers 122, in combination with spring-actuated blocks 123, having steps, and inclines 129, engaged by inclines 121, whereby the blocks are forced down to release the levers when the backward movement of the slide takes place.

33. Slide 99, having inclines 120 and 121, the cross-slides, and levers 117, in combination with spring-actuated blocks 123 and spring-pins 130, whereby the cross-slides are thrown to their operative position.

34. The cross-slides, slide 99, having inclines 120 and 121, and levers 117, having rollers 122, in combination with spring-actuated blocks having steps 127 and 128, and inclines 129, whereby the cross-slides are retracted as slide 99 moves forward and locked in their retracted position until the return movement of the slide forces down the blocks and releases the levers.

35. The cross-slides, slide 99, having inclines 120 and 121, and levers 117, having rollers 122, in combination with spring-actuated blocks having steps 127 and 128 and inclines 129, and spring-actuated pins 130, whereby the cross-slides are thrown forward when the levers are released by the backward movement of the slide.

36. Slide 99, having inclines 120, 121, and 138, in combination with the cross-slides, levers 117, having rollers, spring-actuated blocks 123, and rock-shaft 133, having arm 137.

37. The combination, with the cutters, the female die, and slide 99, carrying the male die, of rock-shaft 104, having arm 106, engaging the slide and crank-arm 108, and a rod connected to said crank-arm and the eccentric upon the main shaft.

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

GEORGE B. LAMB.

Witnesses:
A. M. WOOSTER,
CHAS. M. BURTON.