(No Model.)

2 Sheets—Sheet 1.

J. L. SAXE.

RIVETING MACHINE.

No. 287,730. Patented Oct. 30, 1883.

fig. 5

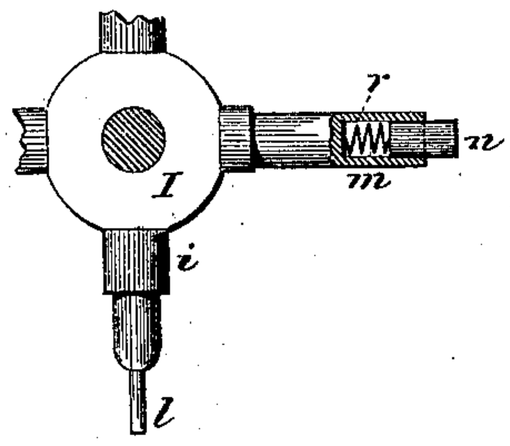


fig. 1

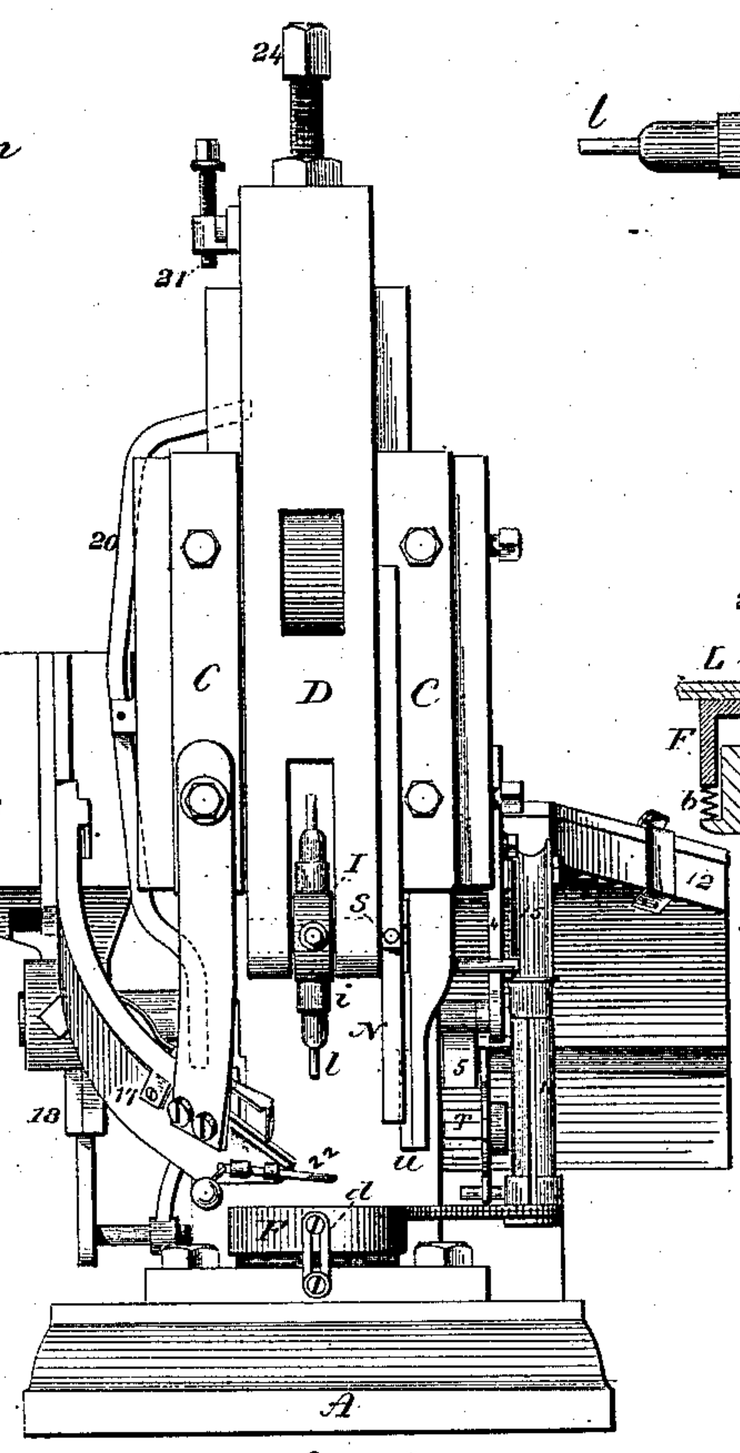


fig. 4

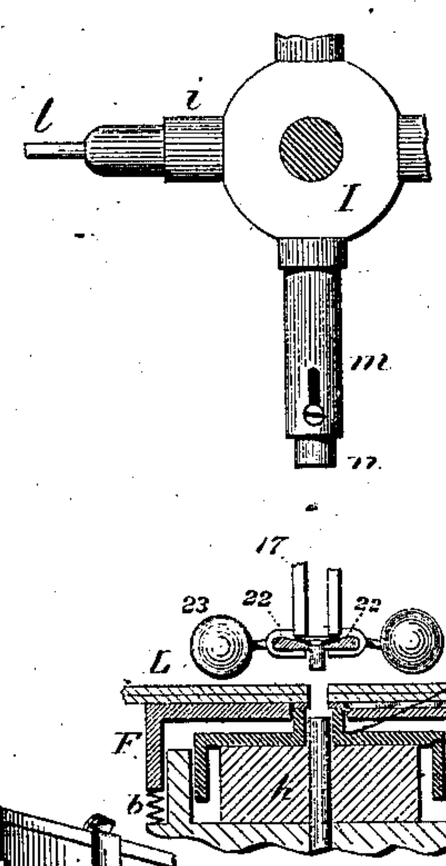


fig. 15

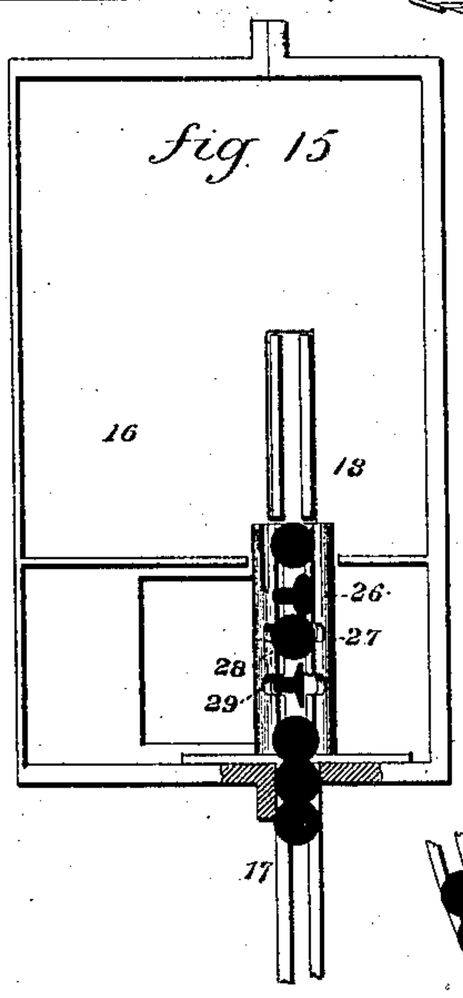


fig. 12

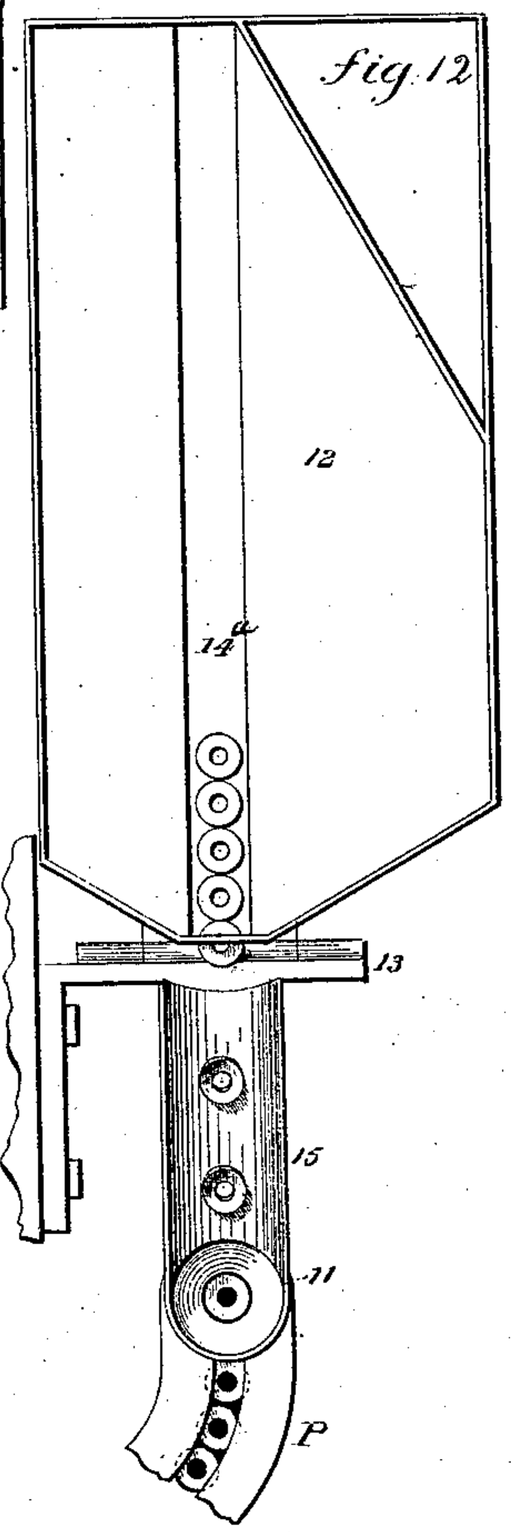


fig. 3

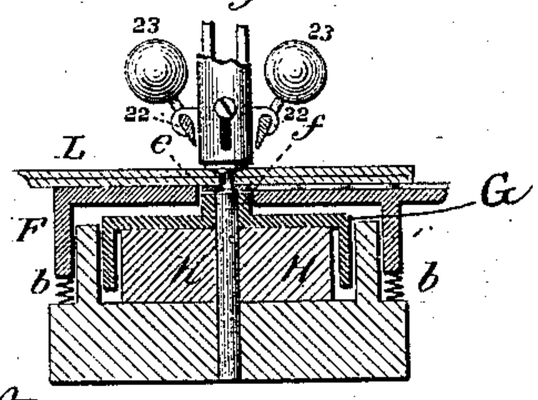


fig. 13.

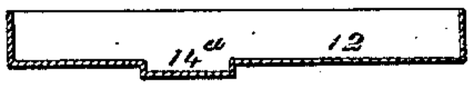
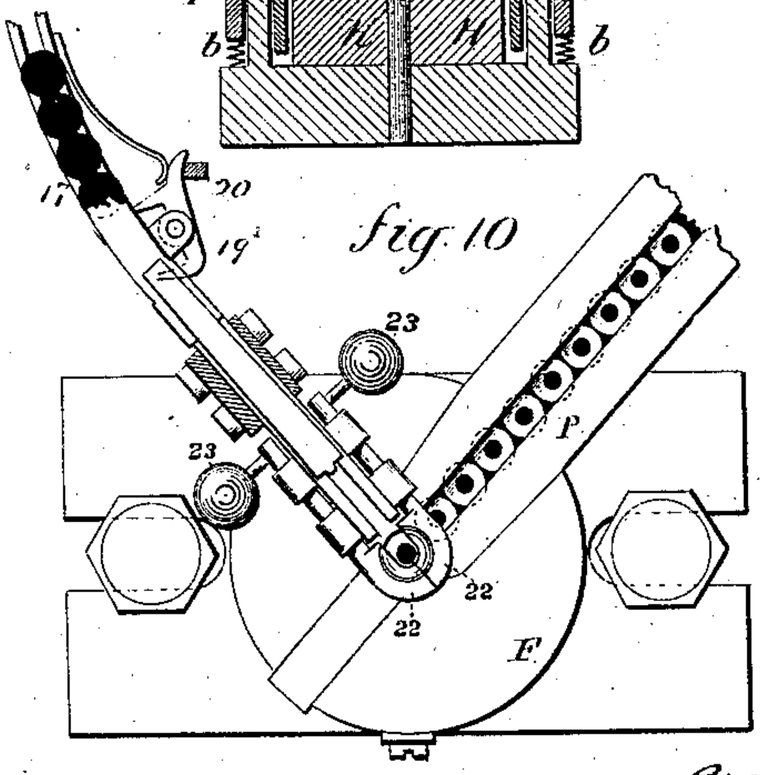


fig. 10



Witnesses.

J. N. Shumway

Jos. C. Dale

John L. Saxe
Inventor

By Atty.

John C. Earle

(No Model.)

2 Sheets—Sheet 2.

J. L. SAXE.

RIVETING MACHINE.

No. 287,730.

Patented Oct. 30, 1883.

Fig. 14

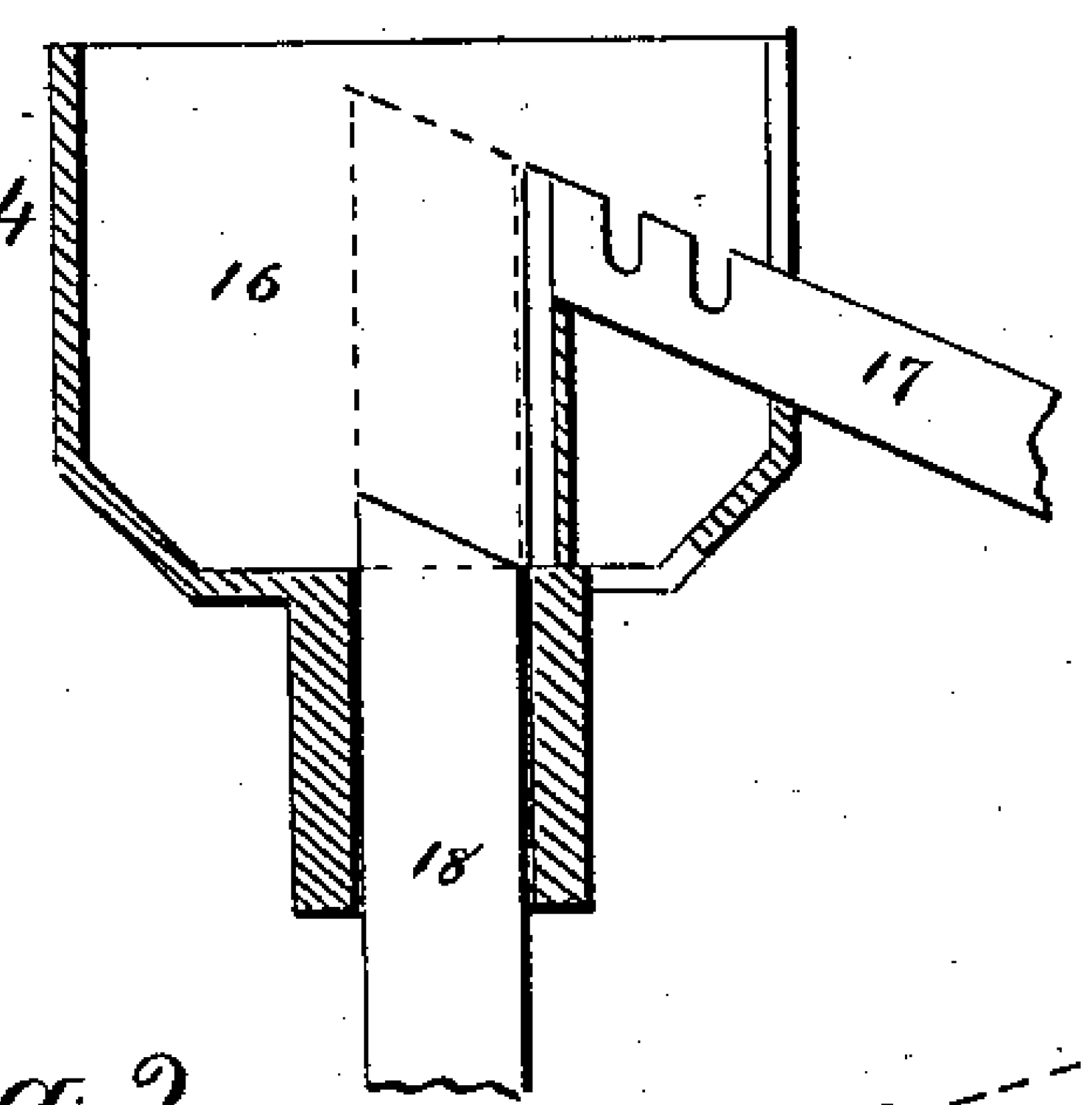


Fig. 16

Fig. 2

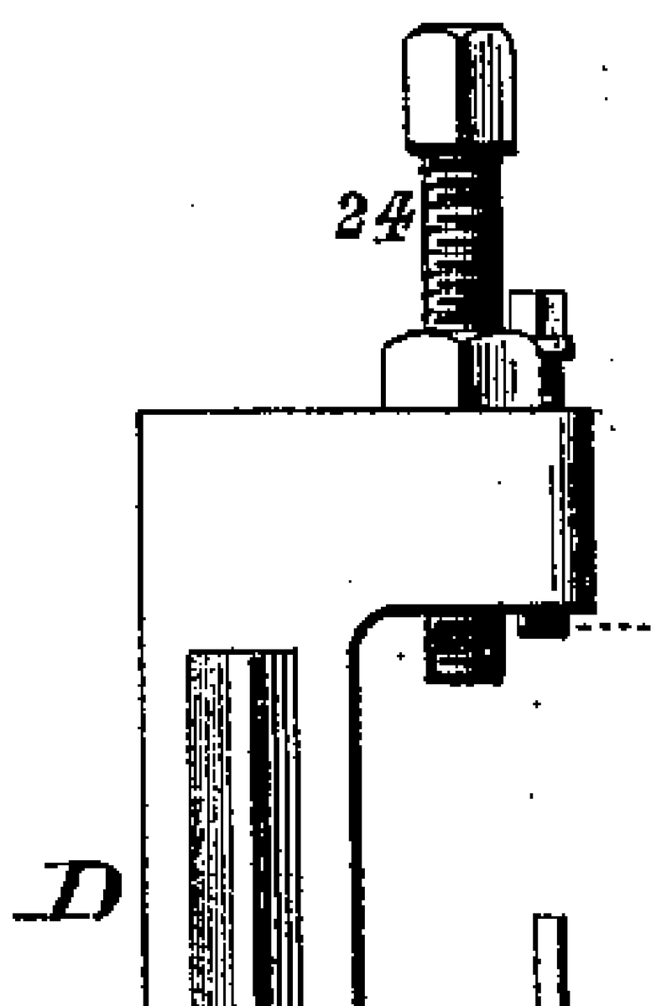
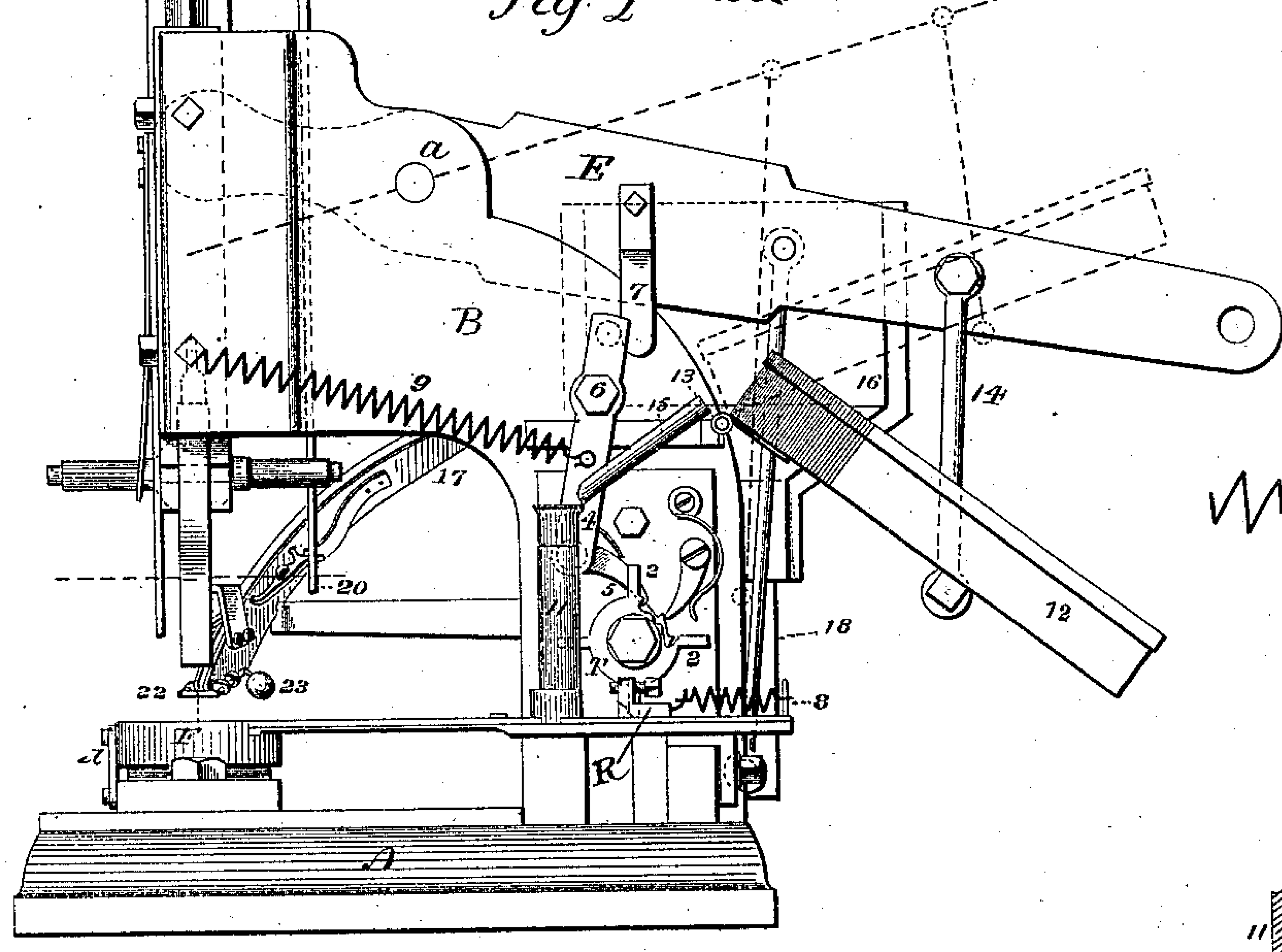



Fig. 11

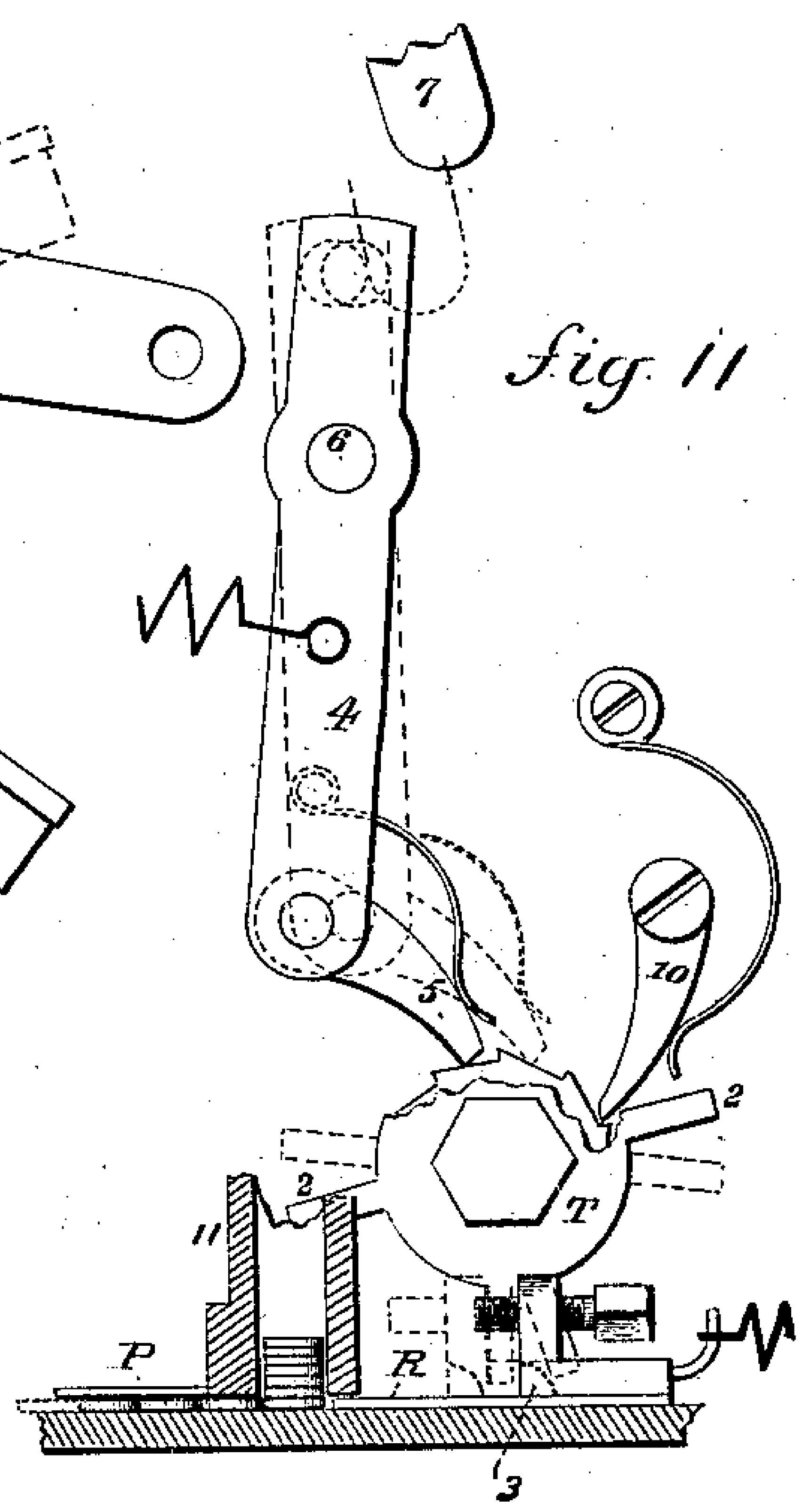


Fig. 6

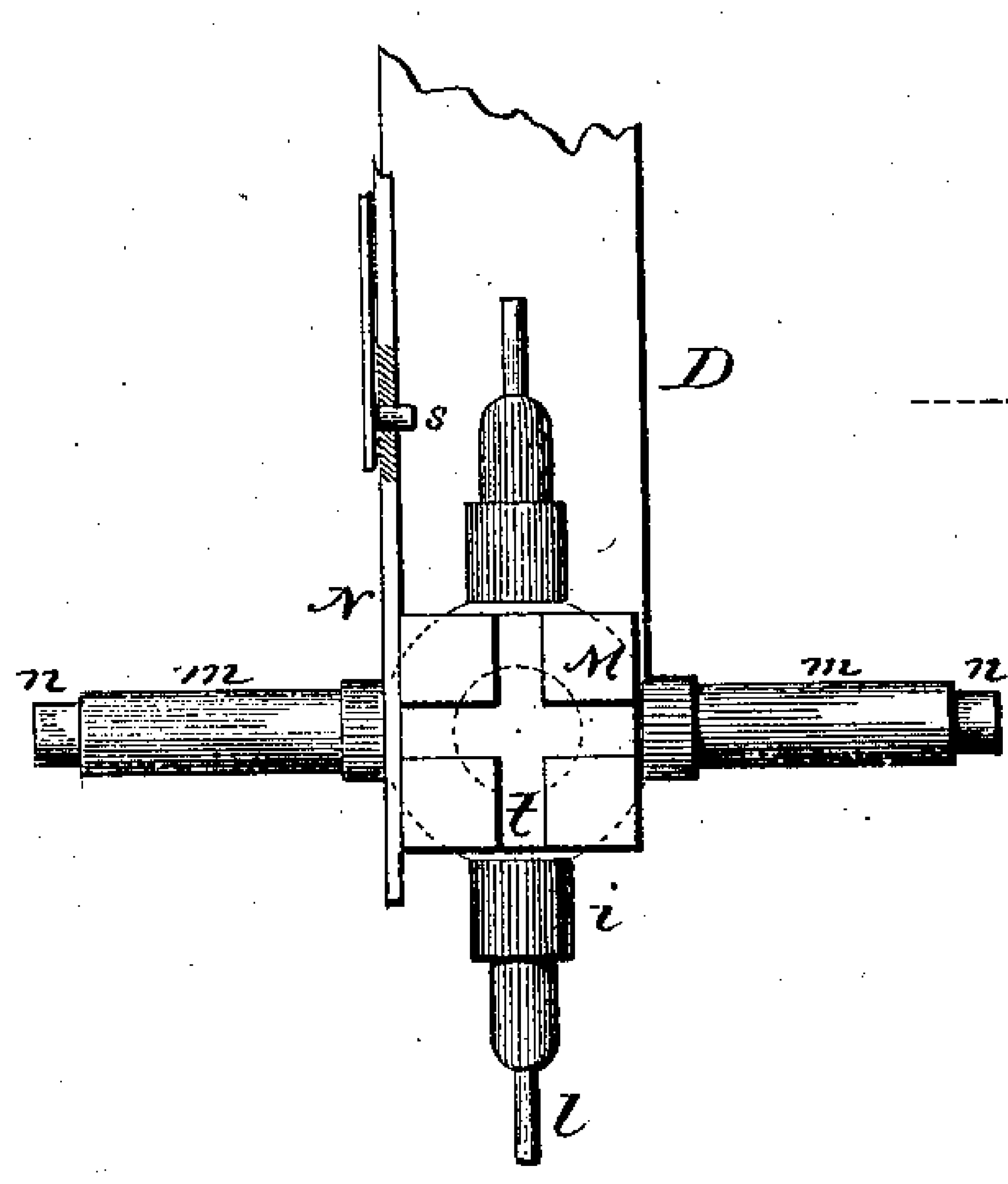


Fig. 7

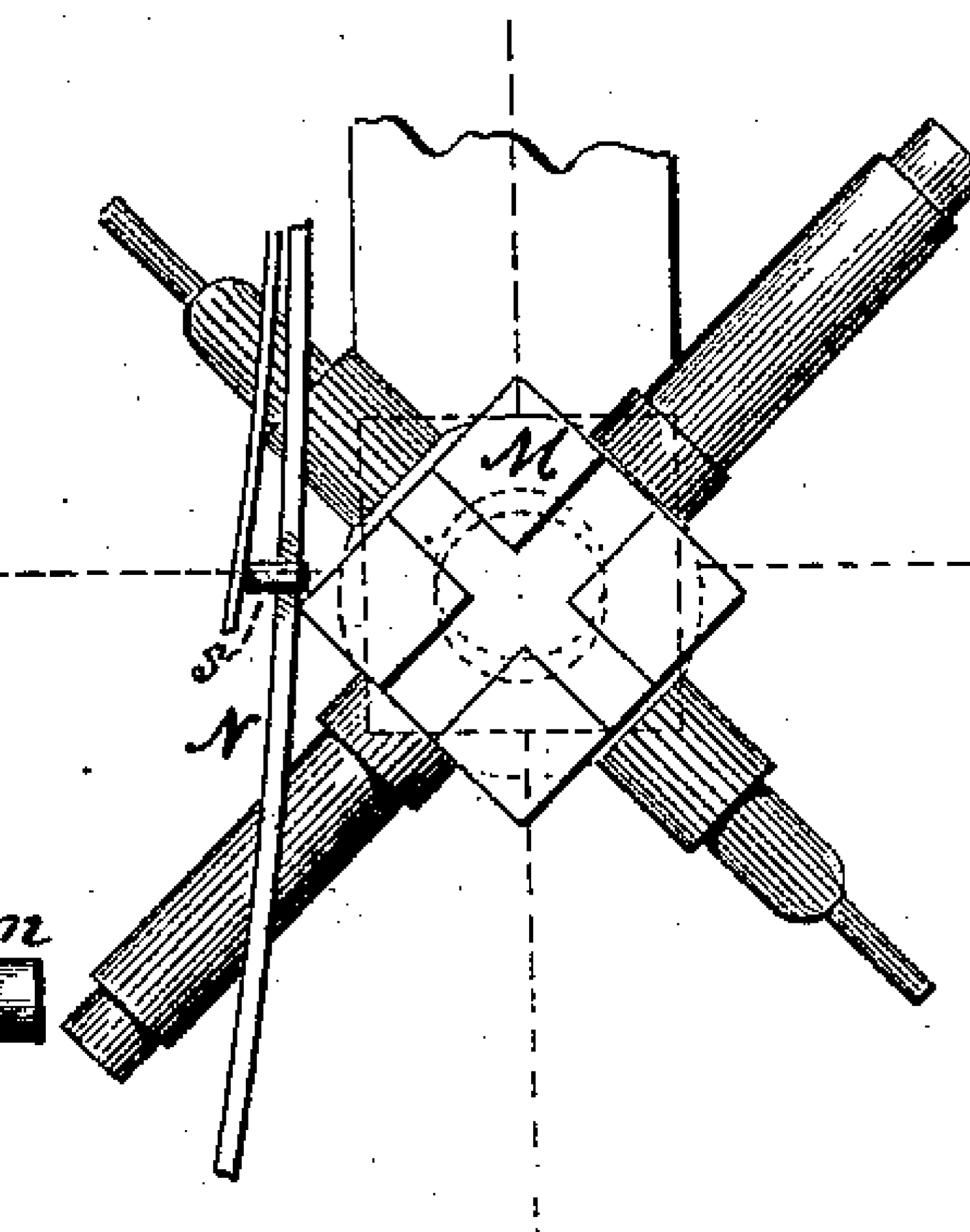


Fig. 8

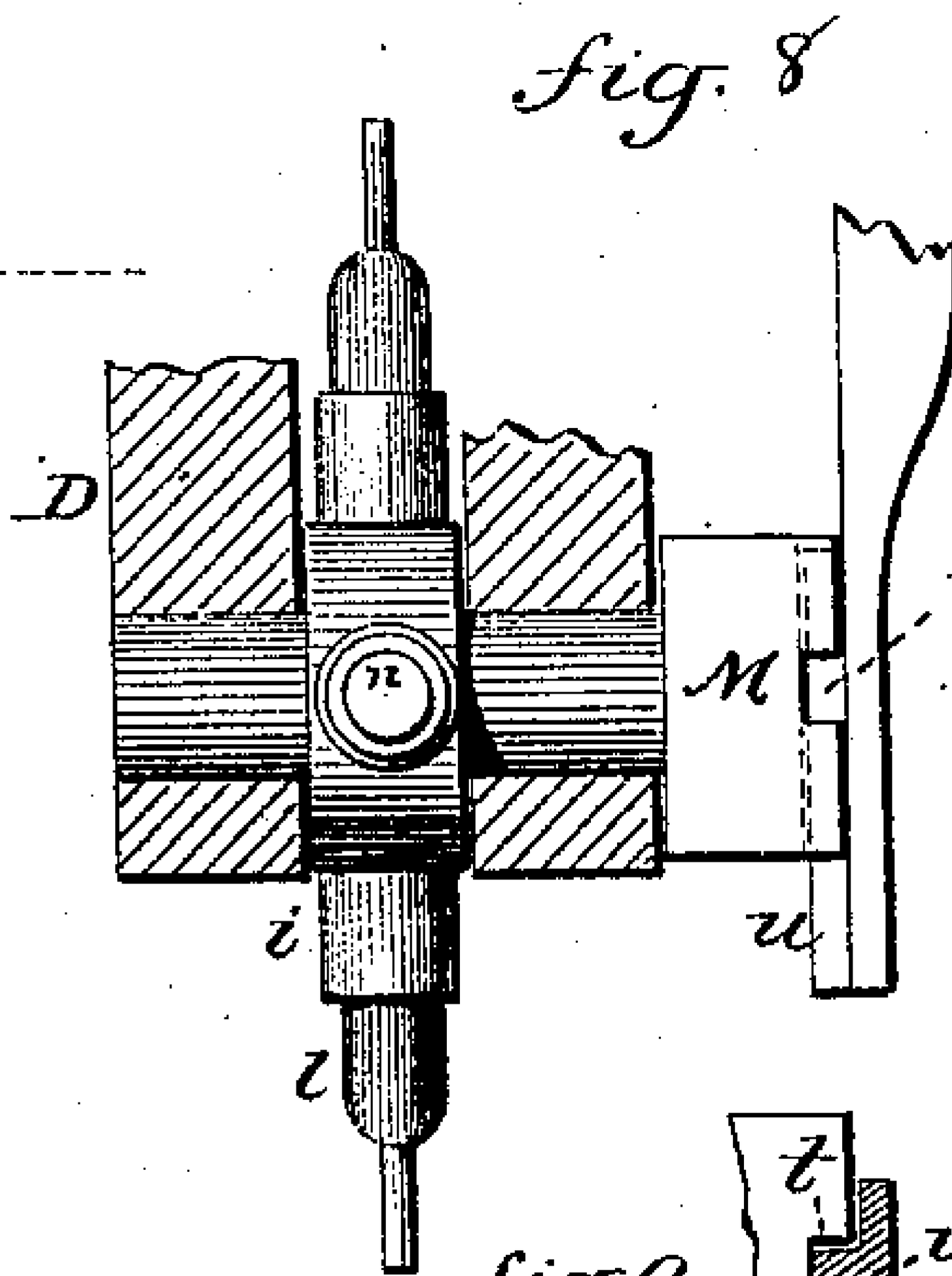
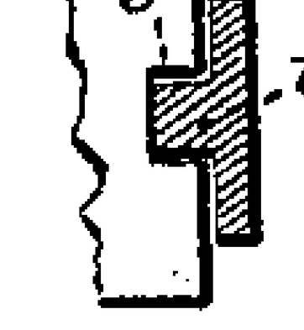


Fig. 9



Witnesses.
J. H. Shumway
Jos. C. Earle

John L. Saxe
Inventor
By atty. Wm. C. Earle

UNITED STATES PATENT OFFICE.

JOHN L. SAXE, OF WATERBURY, CONNECTICUT.

RIVETING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 287,730, dated October 30, 1883.

Application filed January 2, 1883. (No model.)

To all whom it may concern:

Be it known that I, JOHN L. SAXE, of Waterbury, in the county of New Haven and State of Connecticut, have invented a new Improvement in Riveting-Machines; and I do hereby declare the following, when taken in connection with accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a front view; Fig. 2, a side view; Figs. 3, 4, and 5, vertical central sections through the support, showing the punch and driver in different positions; Figs. 6, 7, 8, and 9, detailed views illustrating the construction and operation of the riveting-head in the slide; Fig. 10, a plan over the support for the work above the rivet-receiving fingers; Fig. 11, the feeding device to present the washers; Fig. 12, a plan, and Fig. 13 a transverse section, of the washer-hopper; Fig. 14, a vertical section, and Fig. 15 a top view, of the rivet hopper and channel; Fig. 16, a vertical central section through the rivet-feeding channel.

This invention relates to an improvement in machines for riveting belting and other leather-work, the object of the invention being a machine arranged to punch the hole in the material for the rivet, present the washer upon one side and the headed rivet on the other side, drive the rivet through the material, through the washer, and upset the end of the rivet upon the washer, all the parts operating to perform their work automatically, so that the blanks and rivets may both be delivered to the machine in mass, to be successively presented for operation; and the invention consists in the combination of elements, as hereinafter described, and more particularly recited in the claims.

A represents the bed of the machine, on which the operative mechanism is placed. The upright B extends from the bed and carries vertical guides C C, between which plays the slide D, arranged to be moved freely up and down, here represented as by means of a lever, E, hung in the upright upon a fulcrum, *a*, one arm in connection with the slide D, the other in connection with a treadle or other device by which it may be raised to force the slide D downward, and depressed to draw the slide D upward.

Beneath the slide is the rest or support F, on which the material to be riveted is placed. This support is of inverted-cup shape, as seen in Fig. 3, resting upon springs *b*, its upward motion limited by a slotted connection, *d*, (see Fig. 1,) between it and the base, so that it may yield to any pressure brought to bear upon its upper surface, and return when that pressure is removed.

Centrally through the top of the support F is an opening, *e*, substantially the diameter of the washers, and in that opening is a follower, *f*, which is in the form of a stud on the upper side of an inverted cup, G. This cup G rests upon an india-rubber or other flexible cushion, H, so that it has a certain amount of yielding capacity; and *h* is the bunter or riveting-stud. It is arranged centrally through the follower.

The slide D carries upon a transverse pivot at its lower end a rotating head, I. (Shown detached in Figs. 4 and 5.) This head is provided with several radially-projecting sockets. (Here represented as four.) One of the sockets, *i*, carries a hollow punch, *l*, substantially like what is commonly called a "shoe-punch," and which will cut a hole through the material and take the core within itself, each successive core forcing the preceding cores up and from the hollow punch.

The material is placed upon the rest beneath the slide, as seen in Fig. 3, L representing the material in section. The slide D carries the punch *l* down and forces it through the material, making the hole for the rivet. Then, rising, the washer is placed in position in the center of the stud, beneath the material, and the rivet is passed through the hole and washer, ready for riveting. When the slide ascends, after having punched the hole, the head I is rotated to present the next tool, *m*. This tool is in diameter substantially that of the head of the rivet, but is tubular and carries a follower, *n*, free for longitudinal movement, and provided with a spring, *r*, within the tool end, the tendency of which is to force the follower *n* outward to the extent permitted by a slot in the tool, through which a stud extends from the follower, as seen in Fig. 4. As the

slide descends, the spring-follower *n* strikes upon the rivet and presses it through the material, if it has not already passed through. The follower standing upon the head, the tool *m* continues its descent until it strikes the head of the rivet. Then, the pressure being continued, it forces the other end of the rivet down upon the heading-stud *h* and causes that end to be upset upon the washer, as seen in Fig. 3. Then the slide D rises, the material is moved to a new position, and the head I turned to present the punch *l* to make the next hole through the material.

The head I is rotated by the ascent of the slide, as seen in Figs. 6, 7, and 8. At one side of the slide a four-sided cam, M, is attached to the pivot or arbor which forms the center of motion of the head I, the arbor being fixed in the head I and in the cam, so that turning one turns the other. In the path of the cam M, as it ascends, stands a stud, *s*, and so that one of the angles of the cam strikes that stud, as seen in Fig. 7, and then as the slide continues its upward movement, it causes the cam, with the head I, to turn one-fourth around, and so as to present the next succeeding tool in position. A spring, N, bears against one of the flat surfaces of the cam M, as seen in Fig. 6, but yields, as seen in Fig. 7, so that the cam may turn. Then, when it has nearly approached the turned position, the spring will cause it to turn until its flat side takes a bearing upon the spring end, as seen in Fig. 6, which is substantially the working position for the head. Each succeeding movement of the slide correspondingly turns the head and presents successively the tools.

The stud *s* is attached to a spring upon the outside of the spring N, and so that the stud will be forced outward as the cam comes into position against the spring and out of the way of the cam, the spring of the stud being considerably lighter than the spring N.

The spring N cannot be depended upon to hold the punch so as to prevent its glancing or turning from its proper position. To thus hold and locate the punch as it is presented, I form a diametrical groove, *t*, in the face of the cam M, and in the same radial line as the punches, and at a point below the point where the head begins its rotation I arrange a guide, *u*, as seen in Fig. 1, also seen detached in Figs. 8 and 9, which engages the groove *t* as the slide descends, and serves to rigidly hold the head which carries the tools in proper relation to the work below, and as the slide ascends the cam passes from the guide *u* before it reaches the stud *s*.

To automatically feed the washers to a position on the rest beneath the material, I arrange a horizontal guide, P, (see Fig. 10,) the width and thickness correspondiug to the washers, and in this guide a succession of washers are arranged, the guide opening to a position at the center of the rest, as seen in Fig. 10. In the same path as the guide I arrange a feeding-slide, R, (see Fig. 11,) which has a reciprocating movement imparted to it to an extent equal to the diameter of a single washer, and so that each movement will move the washers in the guide, and present the first to its proper position on the rest.

To impart the reciprocating movement to the feeding-slide R, I arrange a rotating disk, T, having radially-projecting fingers 2, more or less in number, (here represented as four,) so that one of the fingers will strike an arm, 3, attached to the slide R, as seen in broken lines, Fig. 11. An intermittent rotation is imparted to the disk T by means of a lever, 4, carrying a pawl, 5, at its lower end, its upper end extending above its pivot or fulcrum 6 into the path of a finger, 7, on the lever E, in rear of its pivot, and so that as the lever E is depressed it will strike the upper arm ot the lever 4 and turn it to the position seen in broken lines, Fig. 11. The pawl 5, working in a ratchet on the disk T, will impart to that disk a rotation corresponding to the movement of the lever 4, and in such rotation the finger 2 on the disk, which is in engagement with the slide, will move the slide accordingly, and having so moved the slide the finger will escape therefrom. Then the slide will be drawn back by the spring 8, ready for the next feed, and the lever 4 will be returned by its spring 9. At the same time the dog 10 will engage the ratchet and prevent the return of the disk T. Then when the lever is again depressed the disk will be turned as before, and so continuing, at each descent of the rear arm of the lever, the disk will be turned one point; but as the washer must not be presented until after the hole has been punched and in readiness for the riveting operation, the movement of the slide or feed must not occur until the next movement after the punching has been made; hence I make the fingers 2 of the disk distant from each other equal to two movements of the disk, so that each alternate movement only of the disk will impart the feeding movement to the slide, and that movement occurs as the punch which forms the hole ascends, so that the washer will stand in position for the riveting-tool.

To supply the guide P with washers, I arrange a tube, 11, of internal diameter corresponding to the size of the washers, and into this tube I arrange a column of washers, as seen in Fig. 11. The tube stands so that the feeding-slide R will pass beneath it at one side and force the lower washer of the column forward into the guide P, as seen in Fig. 11. Then as the slide retreats the column will fall and present the next washer to like action of the feed, and so continuing as long as there are washers in the column.

The washers may be supplied to the tube by hand; but to make this part of the operation automatic, I provide a hopper, 12, which consists of a flat-bottomed box, one end hinged at a point higher than the top of the tube 11, as

at 13. Then in rear of the hinge 13 I make a connection, 14, with the lever E in rear of its fulcrum, and so that as the lever is raised it will turn the hopper 12 up into a position inclined downward toward its hinge, as seen in broken lines, Fig. 2, and when the lever is depressed it will turn the hopper into opposite relation to its hinge, as seen in Fig. 2. The hopper has in its bottom a groove, 14ª, (see Figs. 12 and 13,) in width and depth about equal to the diameter and thickness of the washers. The groove opens at the hinged end of the hopper toward a conductor, 15, (see Fig. 2,) which leads directly to the upper end or mouth of the tube 11. A mass of washers is placed in the hopper 12, which is covered, and then as the hopper is raised up and down the washers in the hopper slide from end to end, some of them finding their way into the groove 14ª, and thence, when the hopper is raised, into the conductor 15, which leads them to the column 11. Thus the column will be kept constantly supplied. Upon the opposite side of the machine a hopper, 16, is arranged to supply the rivets, and from this hopper a channel, 17, leads down to the center, as seen in Figs. 1 and 10. This channel consists of two sides arranged to leave a space between them a little broader than the diameter of the body of the rivets, substantially such a channel as is used for feeding headed blanks of various kinds. The blanks are delivered to the channel from the hopper by means of a vertical slide, 18, (see Figs. 14 and 15,) which works up through the hopper, its upper end corresponding to the channel which conducts the rivets to the center. It is dropped to the bottom of the hopper through the mass of rivets, so that some of the rivets will fall into the upper end of the slide 18, and then, when the slide is raised into a position in line with the channel, as seen in broken lines, Fig. 14, the rivets will fall down the inclined upper end of the slide 18 onto the conductor in like manner as in similar feeds for headed blanks. Instead of this vertical slide, a common vibrating fork may be used, which will pass down through the blanks, then return, taking some of the blanks with it, and when to a sufficiently-inclined position will slide from the fork down onto the channel. This device is too well known to require particular description.

A check, 19, is arranged in the channel to hold back the column of blanks therein. This check consists of a two-armed lever, one forward and the other in rear of the pivot, and so that when the forward arm is turned inward, as seen in Fig. 10, the column will rest against that arm; but when turned in the opposite direction the other arm will pass behind the lowermost rivet. The forward arm, moved outward from in front of that rivet, will permit that rivet to pass down the inclined way, the space between the two arms or prongs of the lever being a little more than the diameter of the head of the rivet. This check is operated by a lever, 20, the lower arm of which stands against the rear end of the check. The upper arm is turned inward and stands in the path of a stud, 21, on the slide, so that as the slide descends the stud 21 will strike the upper arm of the lever and throw the lower arm against the check, and cause it to turn to release the lower rivet. This movement occurs at the extreme downward movement of the slide. As the slide ascends, taking with it the punch which has made the hole, the rivet comes to a position at the center over the material and upon a pair of fingers, 22. (See Figs. 10 and 4.) These fingers 22 are hinged one at each side of the channel and outside of it, parallel with each other, the fingers turned inward at the center, as seen in Fig. 10, and in front of the channel, so that as the rivet passes down the channel it will come to a position on the fingers directly over the center, as seen in Fig. 4. The fingers are provided with weights 23, or may be springs, to hold them in their closed position, ready to receive the rivet, but so as to yield and be turned away, as seen in Fig. 3, to permit the rivet to pass down between them. The hole having been punched in the material, the washer delivered at its proper position beneath that hole, and the rivet delivered to the fingers above that same hole, as seen in Fig. 4, the next descent of the slide brings the follower *n* upon the head of the rivet, causing it with a yielding pressure to force the rivet down between the fingers through the hole in the material and through the washer. The movement continuing, the tool *m* strikes the rivet and forces the rivet downward until the end meets and is upset by the stud *h*, and as seen in Fig. 3. Then as the tool returns the fingers come into place and the work goes on as before. As in the case of the washers, the delivery of a rivet must only occur immediately after the hole has been punched—that is to say, the punch for the hole descends, passes freely between the fingers, and makes the hole, and in such descent to make the hole the stud 21 strikes the lever 20 and delivers the rivet, which, as the punch rises, will pass onto the fingers and there be held until the tool comes down to force the rivet through the material, as before described; but as this tool ascends, another rivet must not come to the fingers; hence the punch is made shorter than the tool which drives the rivet, and so that in punching the hole the slide comes farther down than when the rivet is driven, and the different movement of the slide is such that as the punch comes down the stud will strike the lever 20; but when the rivet-driver or tool comes down, that will arrest the descent of the slide before the stop 21 will have reached the lever 20; hence in that operation no rivet will be delivered.

I have represented two punches and two riveting-tools or drivers in alternate positions, so that only a one-fourth rotation of the head

I is required at each operation. There may be but the two tools—the punch and the driver—arranged diametrically opposite each other. In that case the half-revolution of the head may be made at each operation; or, if a greater number of pairs of tools be arranged, the rotation of the head I must be according to their relative positions, so as to first bring the punch into play, and then the next successive tool or driver; but in that case the feed of both the washer and rivet must be between the ascent of the punch and the descent of the driver.

The rivets are so short that they are liable to be presented across the channel, as seen at 26, Fig. 15, the flange of the head resting against one side and the body lying on the other side. In that position they will clog the channel, as they cannot fall out of the way, as in case of longer articles, like screws and similar blanks. To overcome this difficulty I make the two sides of the channel 17 as seen in Fig. 16, the opening at the upper edge little more than the diameter of the body of the rivet, but expanding below it about the length of the rivet. Then at points along the edge of the channel I cut notches 27 down into the broader width of the space between the two sides, these notches a little wider than the diameter of the body of the rivet. When the rivets pass down over the guides in proper position, as seen at 28, Fig. 15, the head rides freely over the notches; but if they are presented with the body transversely, as at 26, so soon as the rivet arrives at one of the notches its body will drop through that notch, as seen at 29, Fig. 15, and permit that rivet to fall down between the sides and escape from the channel.

To adjust the amount of upsetting of the rivet to make the work more or less firm, I arrange a set-screw, 24, in the upper end of the slide D, which will come to a bearing below on the upright when the driver is forced downward. The movement of the driver will therefore be governed by the time at which this screw comes upon it to impart to it the movement of the slide. The sooner the screw strikes the driver the greater will be the depression of the driver, and consequently the rivet will be driven farther downward or harder set, and vice versa.

The elasticity of the support F is necessary in order to allow a free passage of the washer beneath the material. The groove of the guide P, which conducts the washers to the center, is in the upper surface of the support F, as seen in Fig. 3, and is of somewhat greater depth than the thickness of the washer, the bottom of the groove being substantially flush with the follower *f*, and so that the washer will pass freely to its position on the follower. Then as the rivet is forced downward the pressure forces the support F down upon its springs until the material comes to a solid bearing upon the upper surface of the washer, and when that pressure is removed the support F rises to take the material up out of the way of the next advancing washer. A certain amount of elasticity is also given to the follower *f*, so that in its normal condition it stands slightly above the upper end of the stud *h*, which is also for the purpose of allowing perfect freedom for the entrance of the washer without interference with the stud *h*.

The parts of the machine are made adjustable in the usual manner of adjusting this class of machines, to adapt it to different lengths of rivet or classes of work.

I have represented the washers as introduced below the material and the rivets above; but this order of introduction may be reversed.

The delivery-channel for the rivets and the hinged fingers for supporting the rivet in its position may be employed in connection with the driver without the employment of a punch to make the holes, the holes having been made in another machine.

I claim—

1. In a riveting-machine, the combination of a support for the material to be riveted, a reciprocating slide carrying a rotating head, provided with a punch for making the hole for the rivet in the material, and a tool or driver, the said punch and driver projecting radially from the said head, and a cam in connection with said head, whereby in the movement of the slide a punch is first presented to make the hole in the material, then the driver to force the rivet through the material, and an upsetting-stud upon the reverse side of the material, substantially as described.

2. In a riveting-machine, the combination of the elastic support F, the follower *f*, arranged in an opening through said support, the riveting-stud *h*, centrally through said follower, and the vertical slide above, carrying the punch and driving-tool, substantially as described.

3. The combination of the slide D, the head I, arranged to be rotated therein and carrying radially-projecting punch and driver, the cam M, in connection with said head, and presenting sides corresponding to the position of the tools which the head carries, the spring N, and the spring-stud *s*, substantially as described.

4. The combination of the slide D, the head I, arranged to be rotated therein, carrying radially-projecting punch and driver, the cam M, in connection with the said head, and presenting sides corresponding to the position of the tools which the head carries, and constructed with a groove, *t*, in the same radial plane as the tools which the head carries, and a guide, *u*, to engage said groove in the descent of the slide after the head has been rotated, substantially as described.

5. A channel for conducting headed rivets or blanks, consisting of the two sides, being divergent at their lower edges, upon which the head will rest with the body suspended between, the sides constructed with notches on

their upper edges, on which the heads ride to permit the rivet to escape when riding transversely across the channel, substantially as described.

6. The combination of a support for the material to be riveted with a reciprocating slide carrying a rotating head provided with the punch and driver, to be alternately presented to first punch the hole, and then drive the rivet, with a channel leading to a central position on the support, to present the washers upon one side of the material, and a channel arranged to conduct the rivets to a corresponding position upon the opposite side of the material, with a hopper carrying the washers, hinged at one end, so as to receive a vibratory motion from the machine, and constructed with a central groove corresponding in width to the diameter of the washers, said groove opening in the end of the hopper to a column which delivers the washers to the feeding device, substantially as described.

JOHN L. SAXE.

Witnesses:
JOHN E. EARLE,
LILLIAN D. KELSEY.