

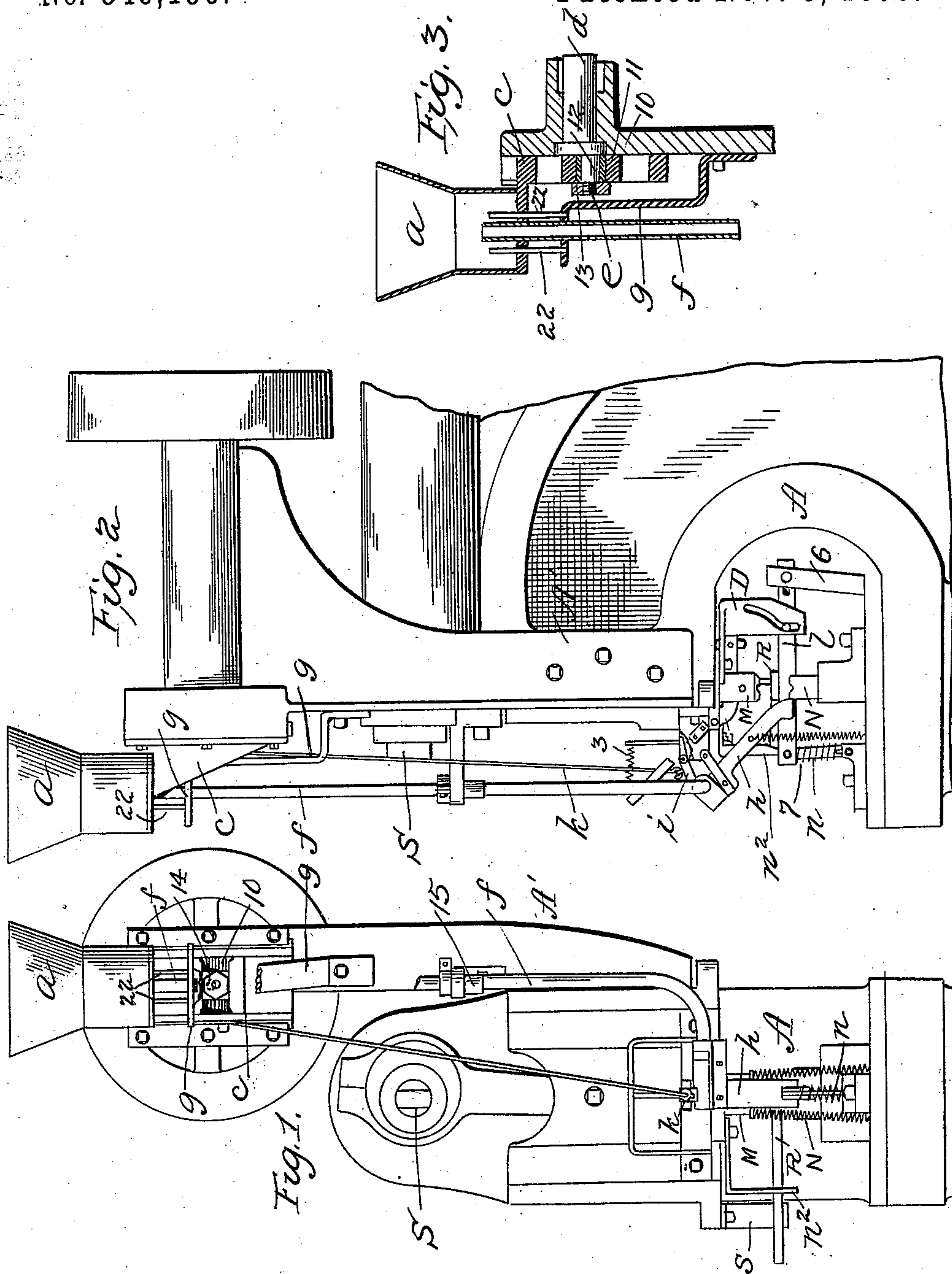
(No Model.)

3 Sheets—Sheet 1.

W. R. FOX.  
RIVET MAKING MACHINE.

No. 549,190.

Patented Nov. 5, 1895.



Attest  
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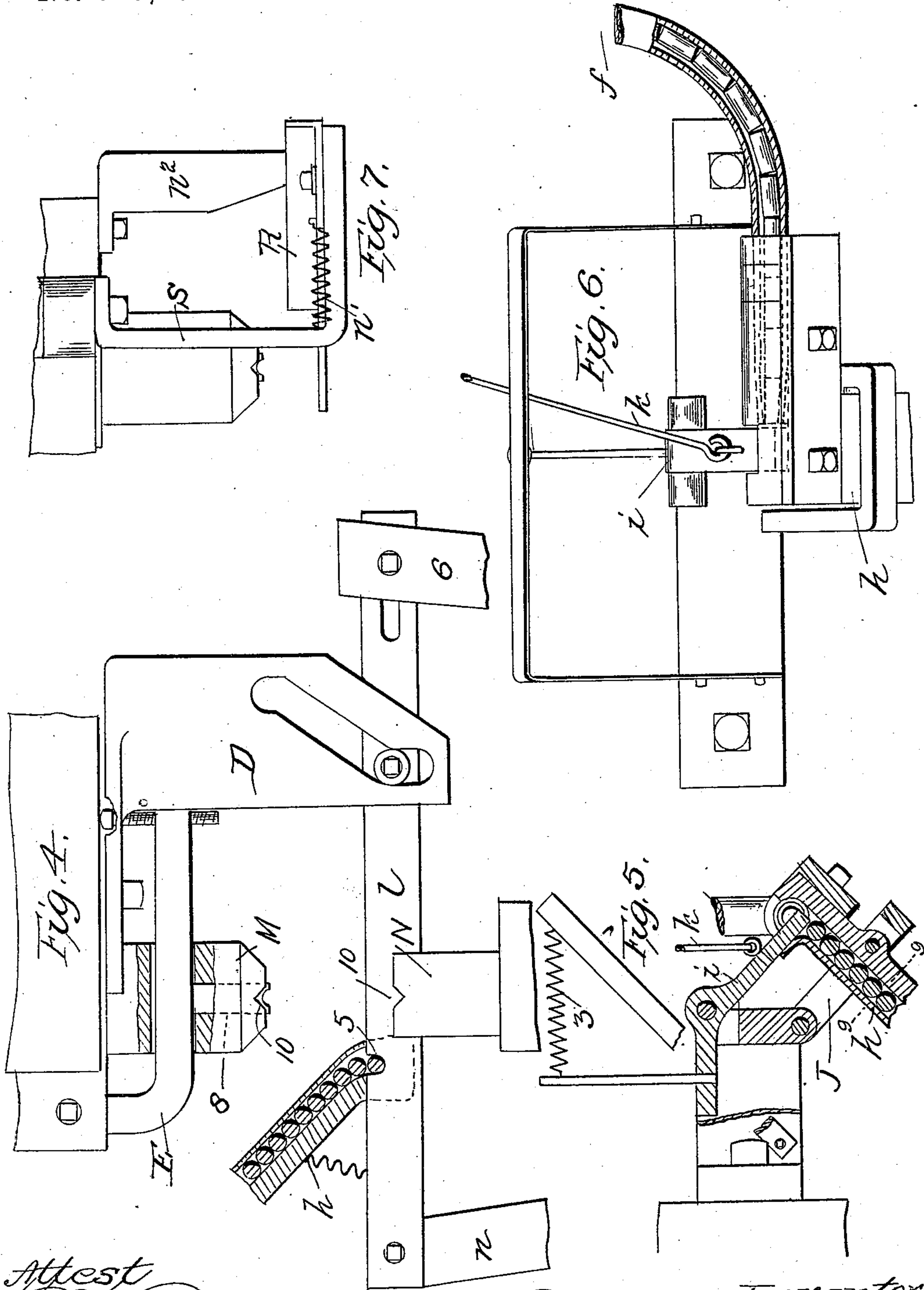
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W. R. FOX.  
RIVET MAKING MACHINE.

No. 549,190.

Patented Nov. 5, 1895.



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(No Model.)

3 Sheets—Sheet. 3.

W. R. FOX.  
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Fig. 8.

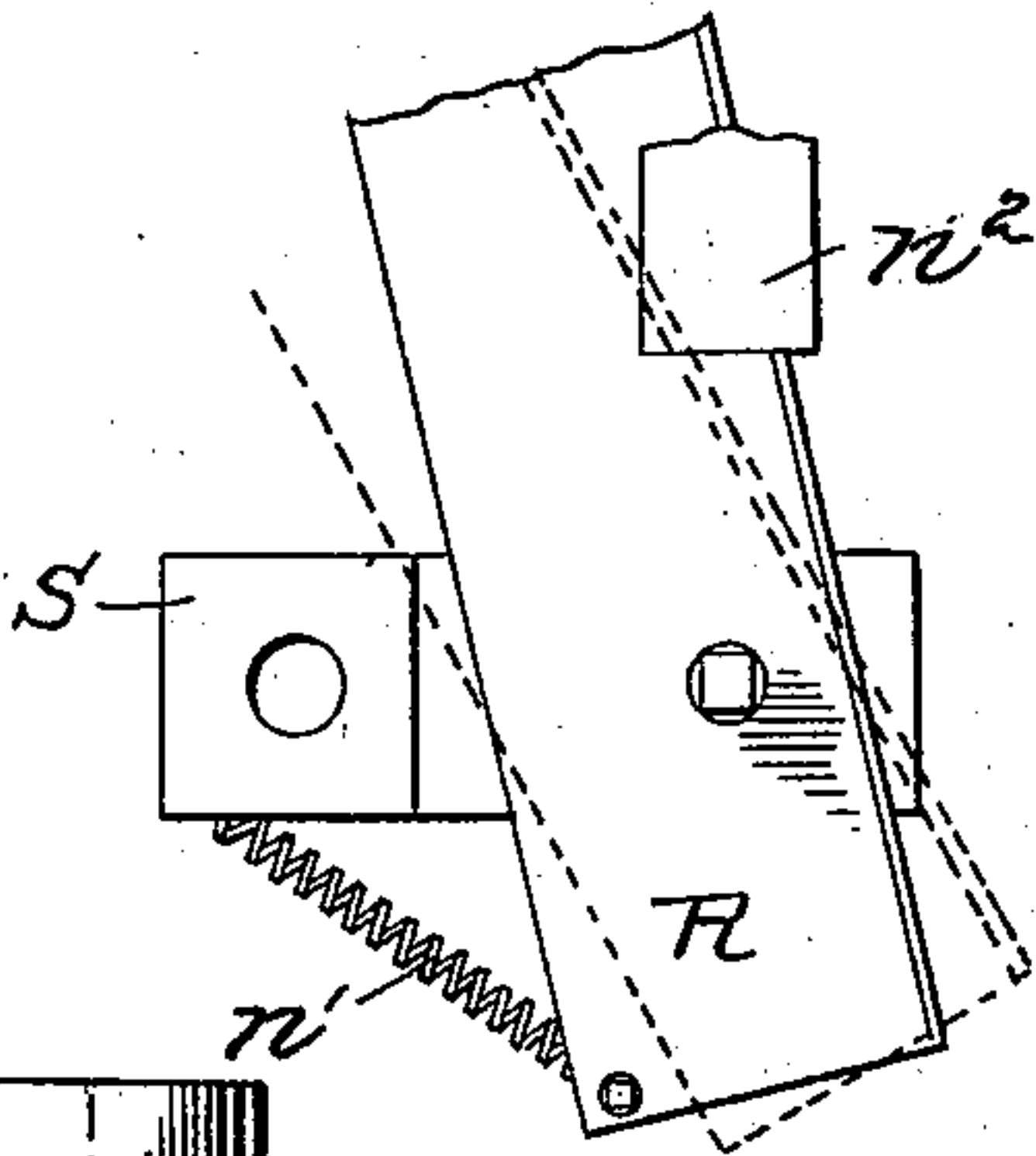
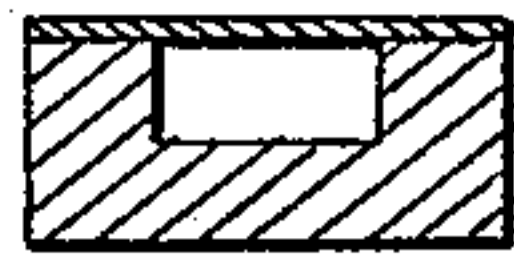


Fig. 9.



Sec. 9-9-fig. 5

Fig. 13.

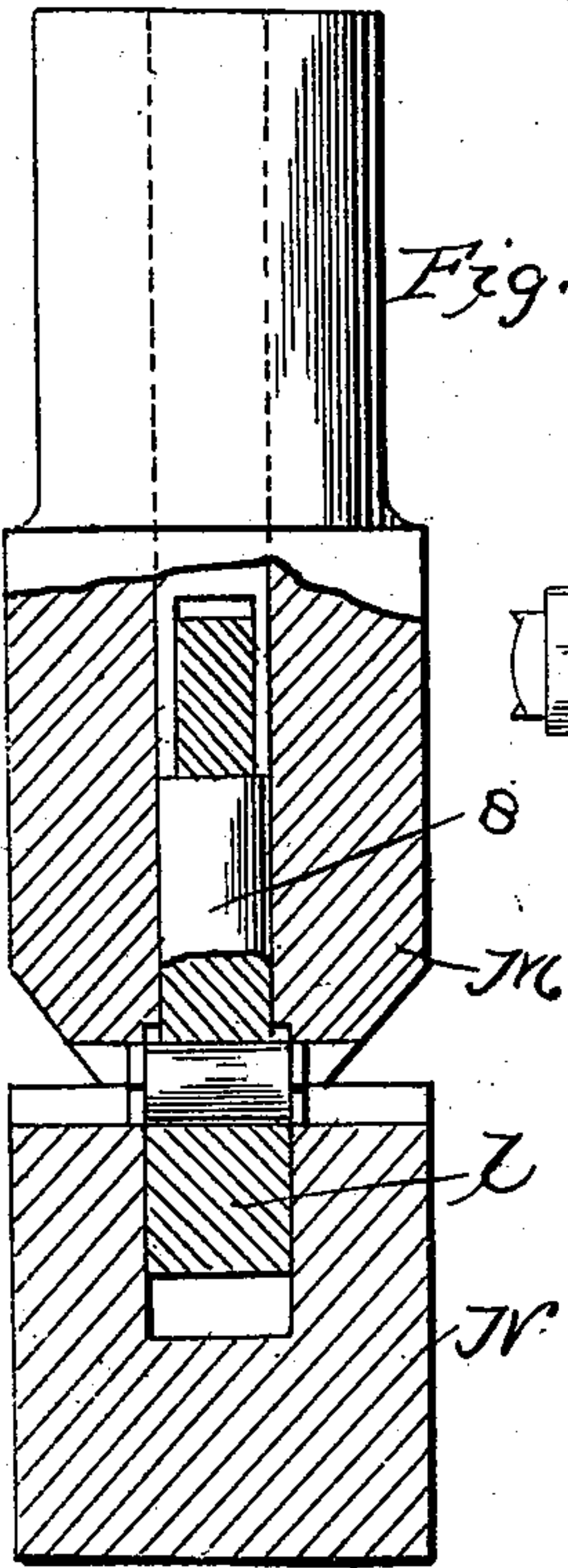


Fig. 10.



Fig. 11.

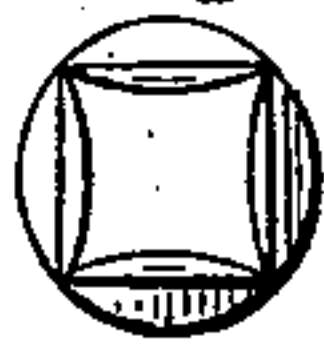


Fig. 12.

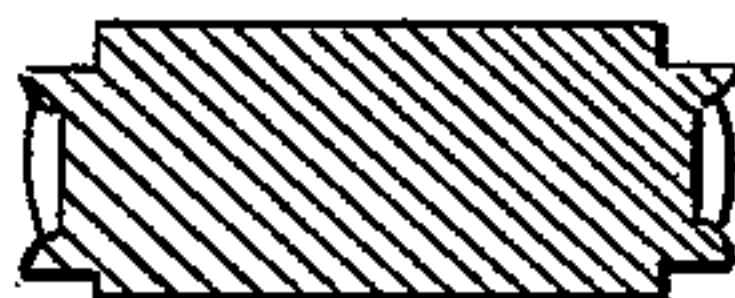
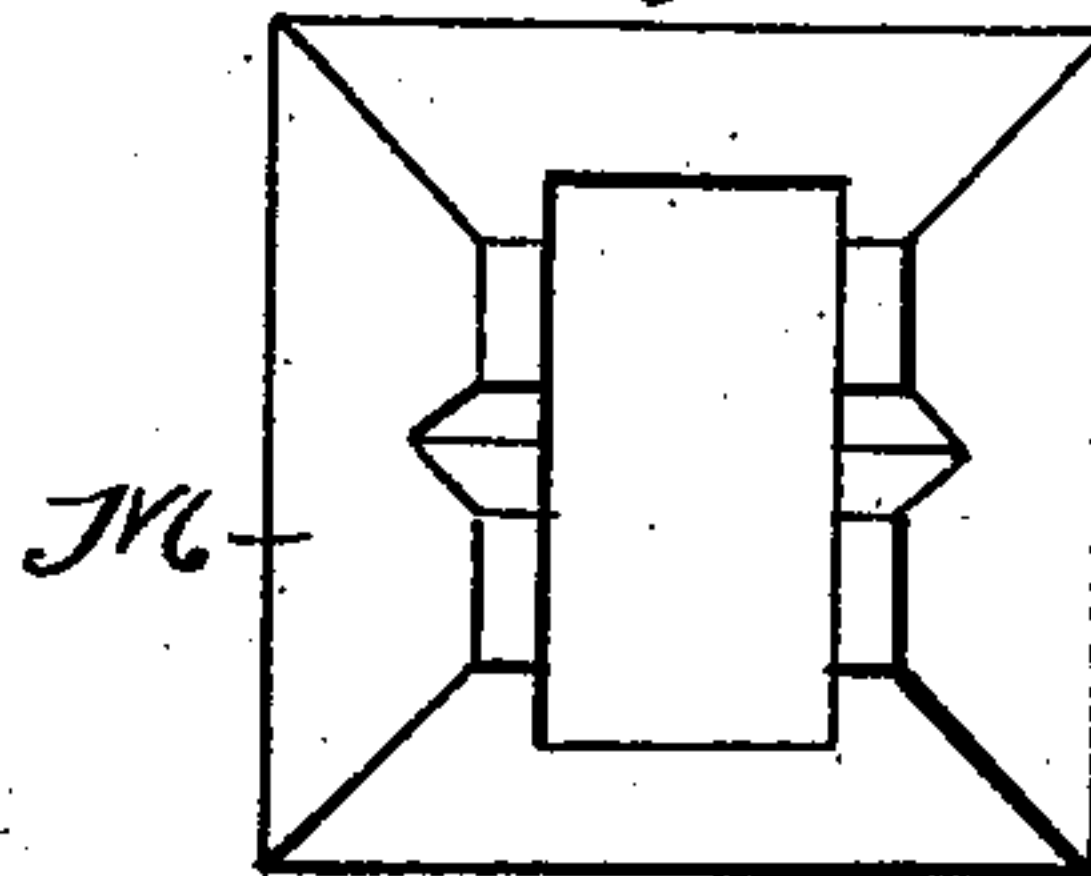


Fig. 14.



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# UNITED STATES PATENT OFFICE.

WILLIAM R. FOX, OF GRAND RAPIDS, MICHIGAN, ASSIGNOR TO THE FOX MACHINE COMPANY, OF SAME PLACE.

## RIVET-MAKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 549,190, dated November 5, 1895.

Application filed May 28, 1895. Serial No. 550,927. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM R. FOX, a citizen of the United States, residing at Grand Rapids, in the county of Kent and State of Michigan, have invented certain new and useful Improvements in Rivet-Making Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention is an improved automatic rivet-former, and is designed to form the ends of rivets upon blanks prepared and fed by the machine to the forming-dies.

My said invention is illustrated in the accompanying drawings, in which—

Figure 1 represents the machine in front elevation. Fig. 2 is a similar view in side elevation. Fig. 3 shows a section of the upper part of the machine. Fig. 4 is a side elevation, partly in section, on an enlarged scale, showing the dies and mechanism for feeding the blanks thereto and removing them therefrom. Figs. 5, 6, 7, 8, and 9 show details of construction of parts of the machine, all on a scale larger than Figs. 1, 2, and 3. Figs. 10, 11, and 12 illustrate the form of the finished rivet. Fig. 13 is a sectional view through the shuttle and dies. Fig. 14 is a plan view of one of the dies.

In the drawings the main supporting piece or standard (shown at A) is made as usual in this class of machines, being cast in one piece. A supplemental standard A' is bolted to it and carries the hopper and its operating mechanism. The hopper *a* is supported upon a vertical slide *c*, which moves in guides on the upper standard. It is caused to reciprocate vertically by means of a shaft *d*, carrying an eccentric *e*, engaging with the slide. For this purpose the slide has a laterally-extending slot 10, in which a block 11 may slide, and this block is held on the eccentric-pin 12 by the nut 13, the center of the shaft being indicated in Fig. 1 at 14. A discharge-pipe *f* enters the bottom of the hopper and projects with its open end within the hopper and above the bottom, and the hopper moves up and down on this pipe. Pins 22 also project through the bottom, being fixed on a bracket *g* on the standard, and these pins as the hopper falls lift and disturb the blanks and

cause them to enter the mouth of the pipe. These blanks fall down in the tube, which, as it turns at the bottom, as shown in Figs. 1 and 6, for example, brings them into a horizontal position, where they are moved forward by the weight of those behind in the vertical part of the tube. Figs. 5 and 6 illustrate how these blanks, moving endwise, pass into the upper open end of the inclined chute *h*, when they are permitted by the spring-gate *i*, the end of which is shut down automatically by means of a spring 3 and when down closes the open lower end of the pipe. This gate is opened by means of a rod *k*, connecting the gate with the reciprocating hopper. The gate, when raised, permits one blank to move forward, so as to fall into the chute *h*. From this the blank passes into a notch 5 of a reciprocating shuttle or carrier *l*, this notch forming a bed for the blanks and being in line with the end of the chute when at its rear limit. From this position the shuttle moves to carry the blank into line with the dies M and N, of which the upper or movable die M is then raised. The forming-cavities of these dies correspond in shape to the finished rivets shown in Figs. 10, 11, and 12. The shuttle remains in place until the die M has descended on the fixed die N and pressed the blank into the shape shown in the figures last named. The shuttle is supported on one end by a pivoted standard *n*. It moves in the lower die and has sliding connection with a standard 6 at the other end. It is reciprocated by means of cam-plate D, engaging with a pin on the shuttle. The pivoted standard has a slotted lower connection and is held up normally by a spring 7, and the shuttle in reciprocating moves and carries the blank on a level a little above that of the lower-die face; but the upper die forces this down on the blank until the blank is forced onto the forming ends. As the die rises the shuttle is lifted by the spring and disengages the rivet from the lower die. Following this is the action of a small plunger 8, centrally arranged and freely moving in the upper die to advance and push off the rivet from the upper die. This is effected at or near the limit of upward movement of the die by means of an arm E, which is carried on the



upper-die slide and projects laterally through an opening in the die sufficiently large to allow vertical spring of the arm, which is caused in the last one-eighth of an inch upward movement of the die by means of a set-screw in the free end of the arm coming into contact with a fixed part of the standard. The little plunger is attached to this arm and moves with it. As the upper die recedes from the lower a rivet-receiver R, pivotally supported on bracket S, is swung by means of the spring  $n'$  so that the inner end of the receiver (shown in Fig. 1) will be swung beneath the upper die. As the die advances again a plate  $n^2$ , having an inclined edge and fixed to the die-slide, pushes the inner arm or part of the receiver aside and discharges the rivet. As the rivet is dropped from the die on the last part of the upward movement of the die and the receiver is returned beneath the die by a spring it follows the movement of the die and is removed again before the die again acts on another blank. The plate  $n^2$  is attached to and moves with the upper-die holder. The upper die is attached to a slide worked by an eccentric on a shaft S. The shaft which operates the hopper-slide moves a little faster than that which operates the shuttle, and thus the clutch is kept always full, so that in case a rivet stick in the tube and a few revolutions occur without feeding the hopper will soon compensate for the loss and fill the tube. The blank-tube is contracted at the end, so that only one blank can pass at a time to the shuttle. If the gate should be lifted when the chute  $h$  is full, no damage would be done, as the gate is pulled over the opening by a spring and forces the rivet down only when the blank has passed out of the way.

The notch forming the rivet-bed in the shuttle is round and that part of the rivet-blank lying therein retains its shape. The ends of said blank projecting over and upon the angular notches 10 in the dies (shown in Fig. 4) are squared and the rivet formed in the shape illustrated in the drawings.

As the rivet-chute  $h$  is set with its lower end close to the shuttle, provision is made for its upward movement when the shuttle rises to disengage the rivet from the lower die. For this purpose the chute is hung in a link J, and the feed-tube  $f$  has a telescoping joint at 15, Fig. 1, to allow the lower part of the tube to move in relation to the upper part.

The operation is as follows: The cylindrical blanks are fed into the tube  $f$  by the vertical reciprocation of the hopper, aided by the stationary pins 22, and from this tube the blanks are forced one by one, due to the weight of the blanks in the tube, into the inclined chute  $h$ , the passage of the blanks being regulated by the spring-gate  $i$ , operating in unison with the hopper. From the chute  $h$  the blanks fall into the pocket or opening in the shuttle, and this then moves longitudinally and carries the blank between the dies, the upper one of which then comes down and presses

the ends of the blank projecting on each side of the shuttle into the lower die, the shuttle yielding for this purpose. The ends of the rivet are thus formed and the upper die recedes. At the same time the shuttle, rising, frees the blank from the lower die, which thus remains fixed to the upper die until in the final upward movement the plunger 8 discharges the rivet from the upper die. Just prior to this, however, the receiver R has been swung beneath the die by its spring  $n'$ , the plate  $n^2$  receding with the upper die and allowing said spring  $n'$  to act, and the rivet falls into this receiver, and as the die comes down for another action the plate  $n^2$ , moving therewith, engages the receiver and moves the same aside to discharge the rivet.

I claim—

1. In combination in a rivet forming machine, a pair of dies to form the ends of the rivet, a shuttle to engage the body of the blank leaving its ends free, and means to move the shuttle between the dies to hold the blank while the dies act thereon and to retract the same after the dies have operated, substantially as described.

2. In combination in a rivet forming machine, a pair of dies to form the ends of the blank by engaging with the sides of said ends, and a shuttle to move the blanks between the dies, said shuttle engaging the body of the blank and leaving its ends projecting, substantially as described.

3. In combination in a rivet forming machine, a pair of dies to form the ends of the rivet, a shuttle, means for moving said shuttle longitudinally and vertically between the dies and means for feeding blanks to the shuttle, substantially as described.

4. In combination a pair of dies one of which is movable, a shuttle reciprocating across one of the dies, having a recess for the blank, said shuttle having spring support, said dies having forming surfaces outside of the shuttle and means for feeding the blanks to the shuttle, substantially as described.

5. In combination with the hopper, the pipe turned to horizontal position, the chute and the spring gate pivotally supported and means for raising the gate, substantially as described.

6. In combination, the horizontally turned feed tube, the chute, the shuttle having a recess for the blank, arranged to register with the said chute, and a spring gate arranged over the chute at the mouth of the tube and means for raising the gate, substantially as described.

7. In combination, the shuttle, having a recess for the blank, the rivet chute, arranged to deliver the blanks to the shuttle, the horizontally turned tube arranged to deliver blanks to the rivet chute, means for reciprocating the shuttle whereby it will feed the blanks one by one to the dies and will cut off the blanks in the chute, all substantially as described.



8. In combination the dies, the shuttle moving across and in one of the dies, and pressed normally upward, a rivet holder arranged so that it may be forced upward, and deliver 5 the blanks to the shuttle, and movable tube arranged to deliver the blanks to the holder, all substantially as described.

9. In combination, the hopper, operated by a shaft, and having a tube for conveying the 10 blanks, the gate at the lower end thereof, a chute arranged to receive the blanks from the tube, dies, and means for conveying the blanks to the dies and a shaft arranged to operate the die, said die shaft operating more 15 slowly than the chute shaft, substantially as described.

10. In combination with the dies and the shuttle, the spring receiver for removing the rivets held normally below the die by the 20 spring and means for removing the receiver from beneath the die as the die descends, substantially as described.

11. In combination, the hopper, the agitating fingers reciprocating vertically through 25 the bottom of the hopper and the feeding tube extending up through the bottom of the hopper and projecting vertically therein alongside of the agitating fingers, substantially as described.

30 12. In combination, the two dies each hav-

ing forming surfaces to form the opposite ends of the blank at one operation by engaging the sides of said ends and means for holding the blank and feeding the same to the dies, substantially as described.

13. In combination, the two dies, the shuttle with means for moving it laterally between the dies and for moving it vertically to free the rivet from the lower die, and means for freeing the rivet from the upper die, substantially as described. 35 40

14. In combination, the upper and lower dies, means for freeing the rivet from the upper die as the same recedes, and a receiver with means for operating the same to and 45 from position beneath the upper dies, substantially as described.

15. In combination, the hopper, the feed tube with its lower end turned horizontally, a chute to receive the blanks therefrom, the 50 dies and a gate operating vertically across the lateral opening of the lower end of the chute, substantially as described.

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

WILLIAM R. FOX.

Witnesses:

JNO. DUFFY,  
EARL STOKOE.