

No. 636,655.

Patented Nov. 7, 1899.

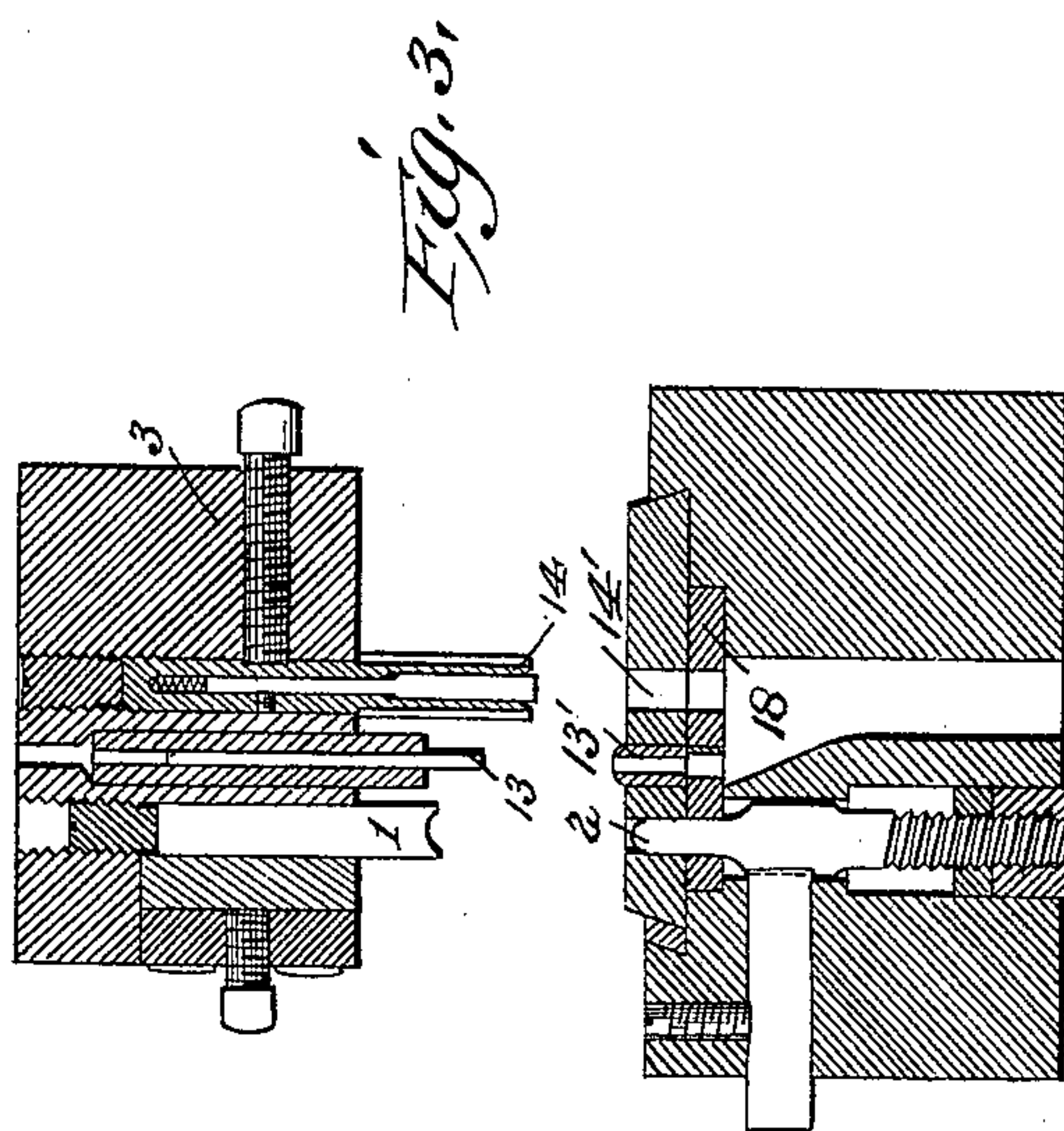
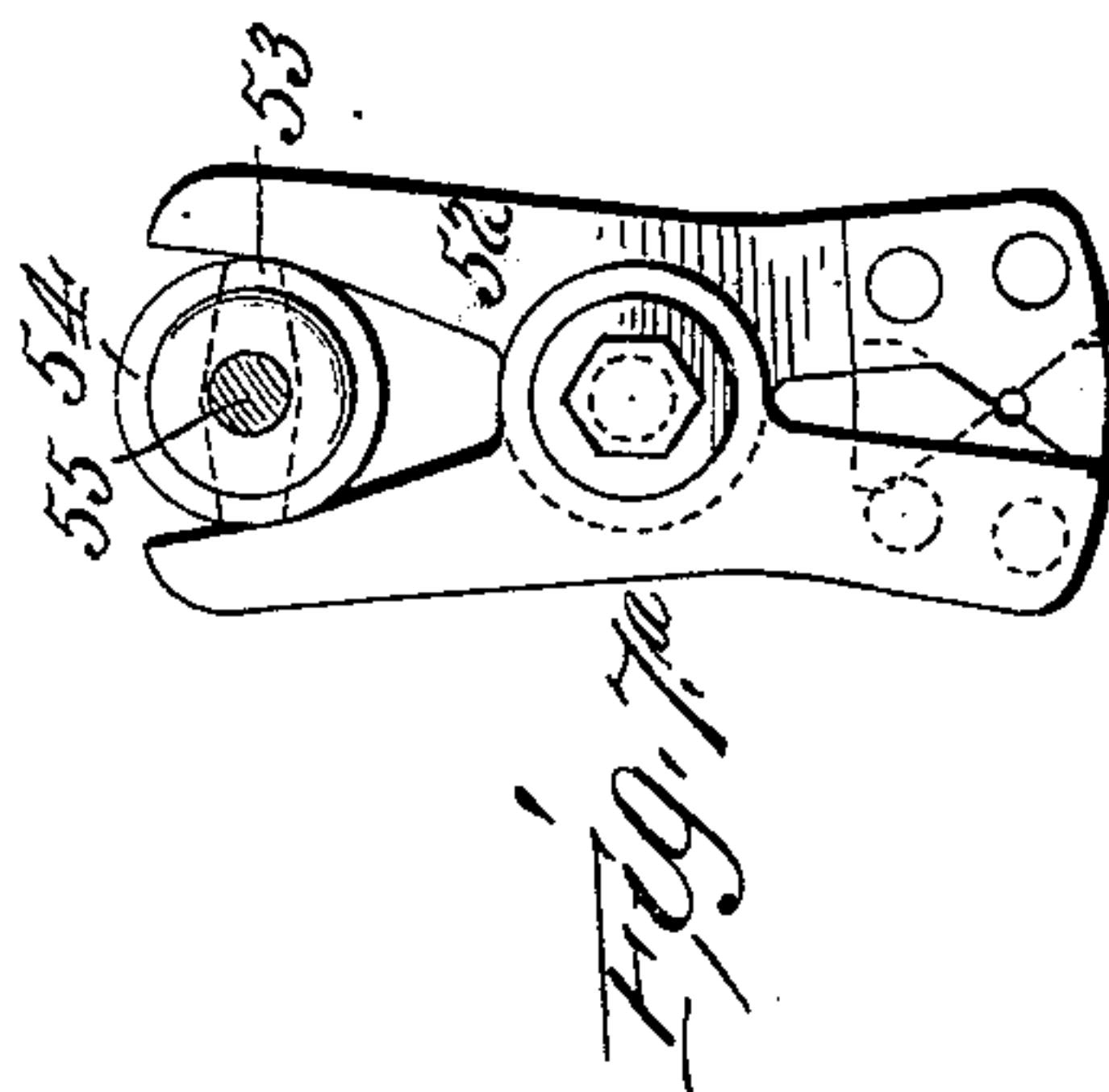
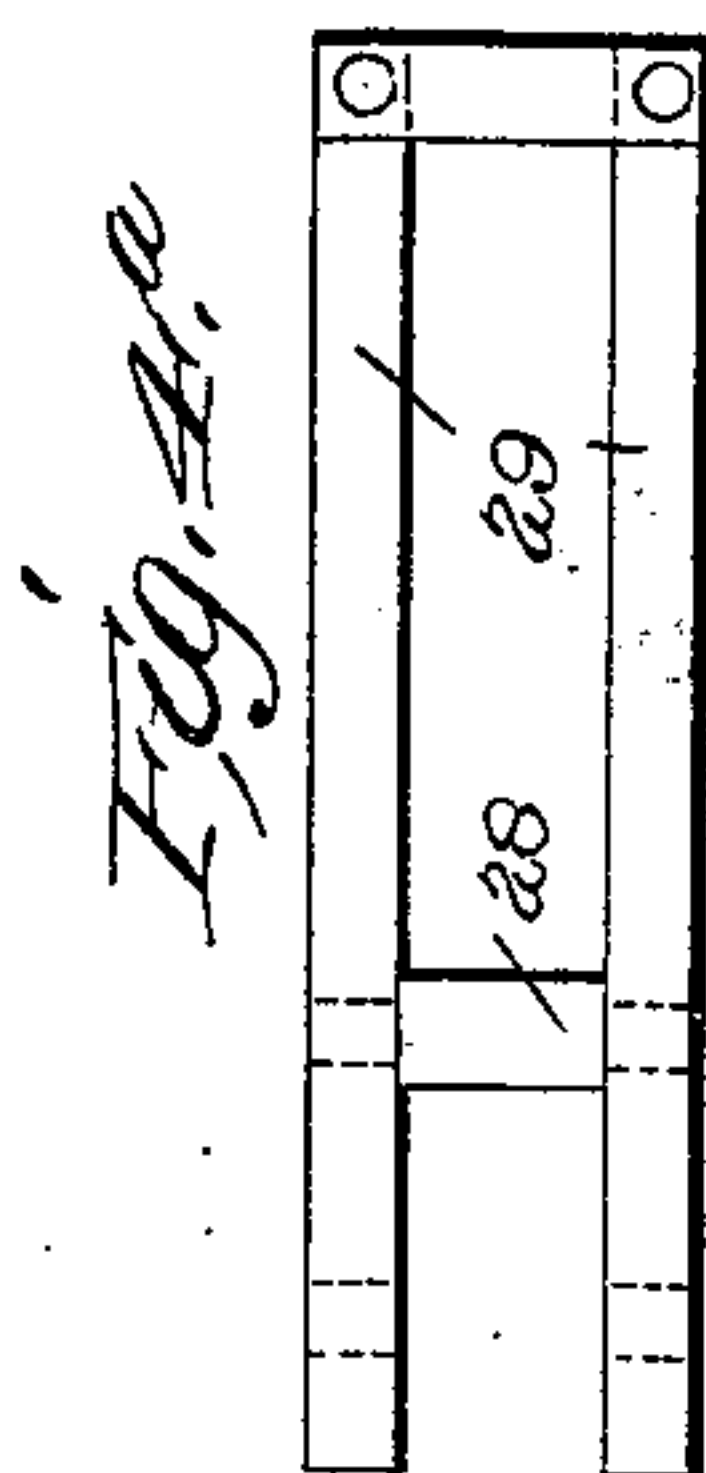
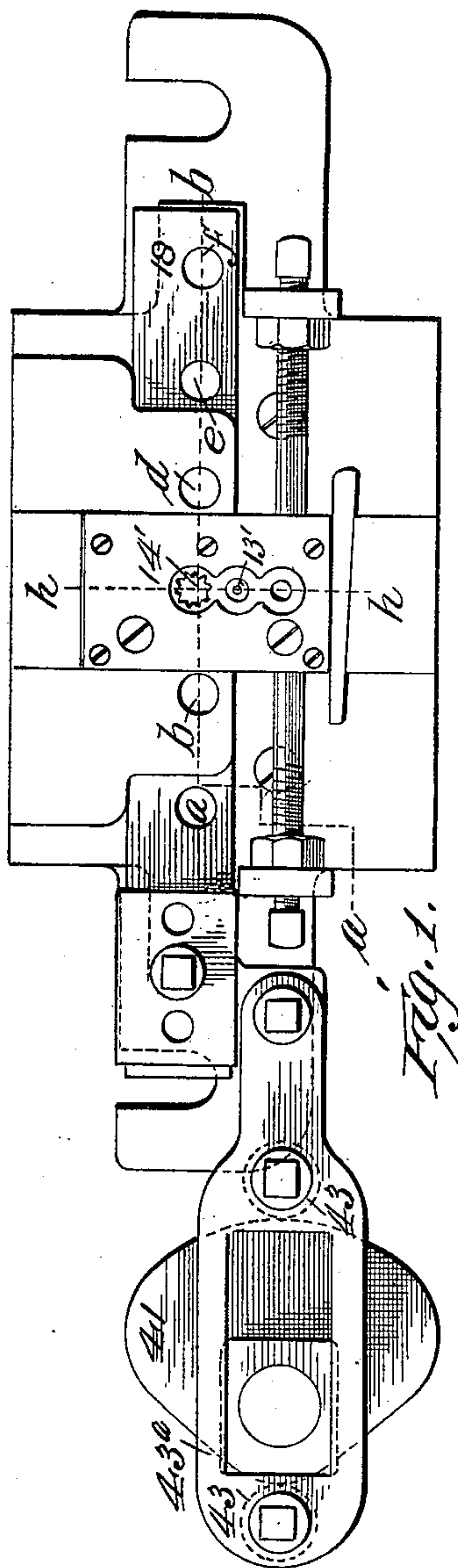
W. R. FOX.

MACHINE FOR FORMING NIPPLE WASHERS.

(Application filed Dec. 16, 1898.)

(No Model.)

4 Sheets—Sheet 1.



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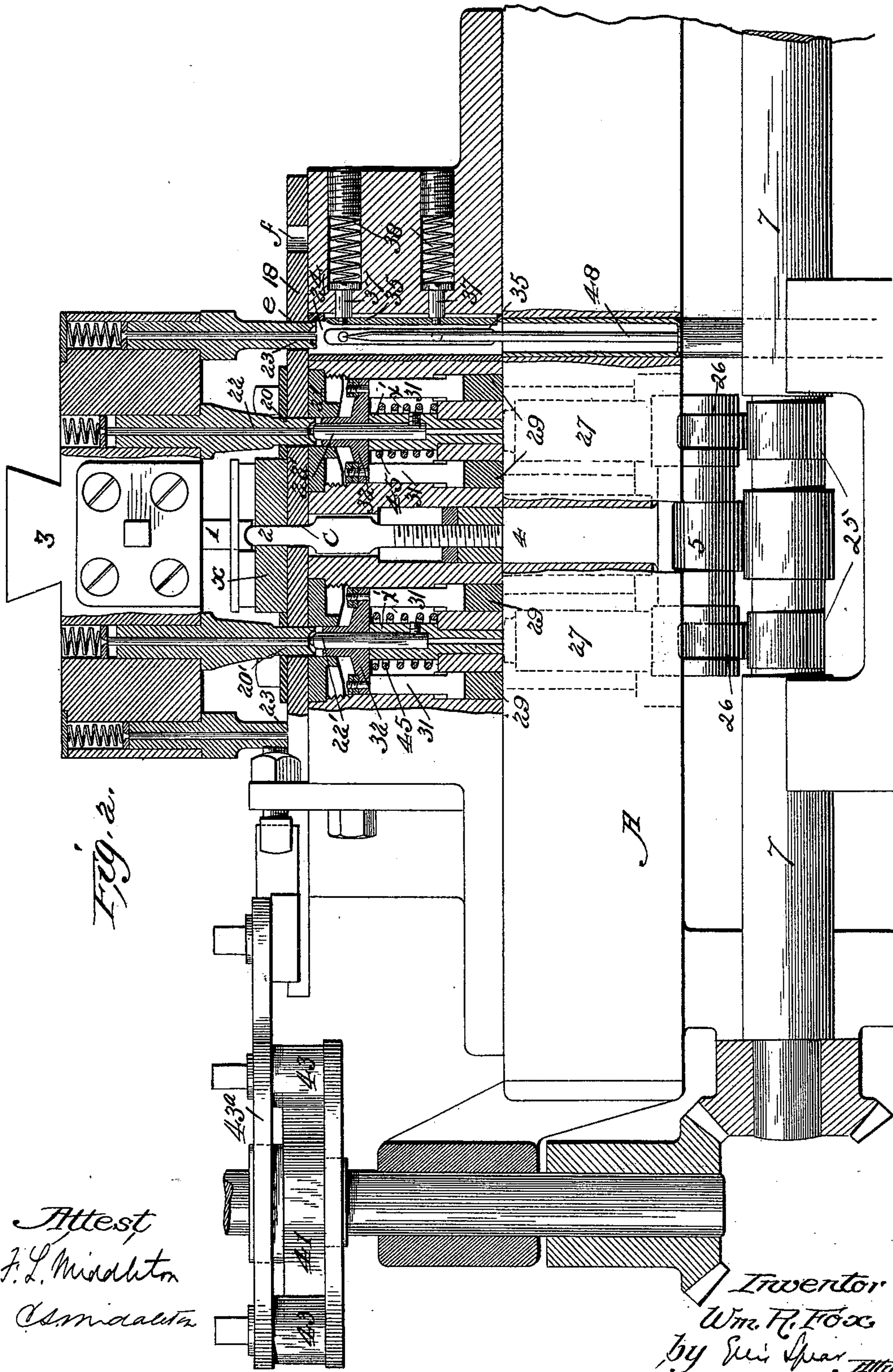
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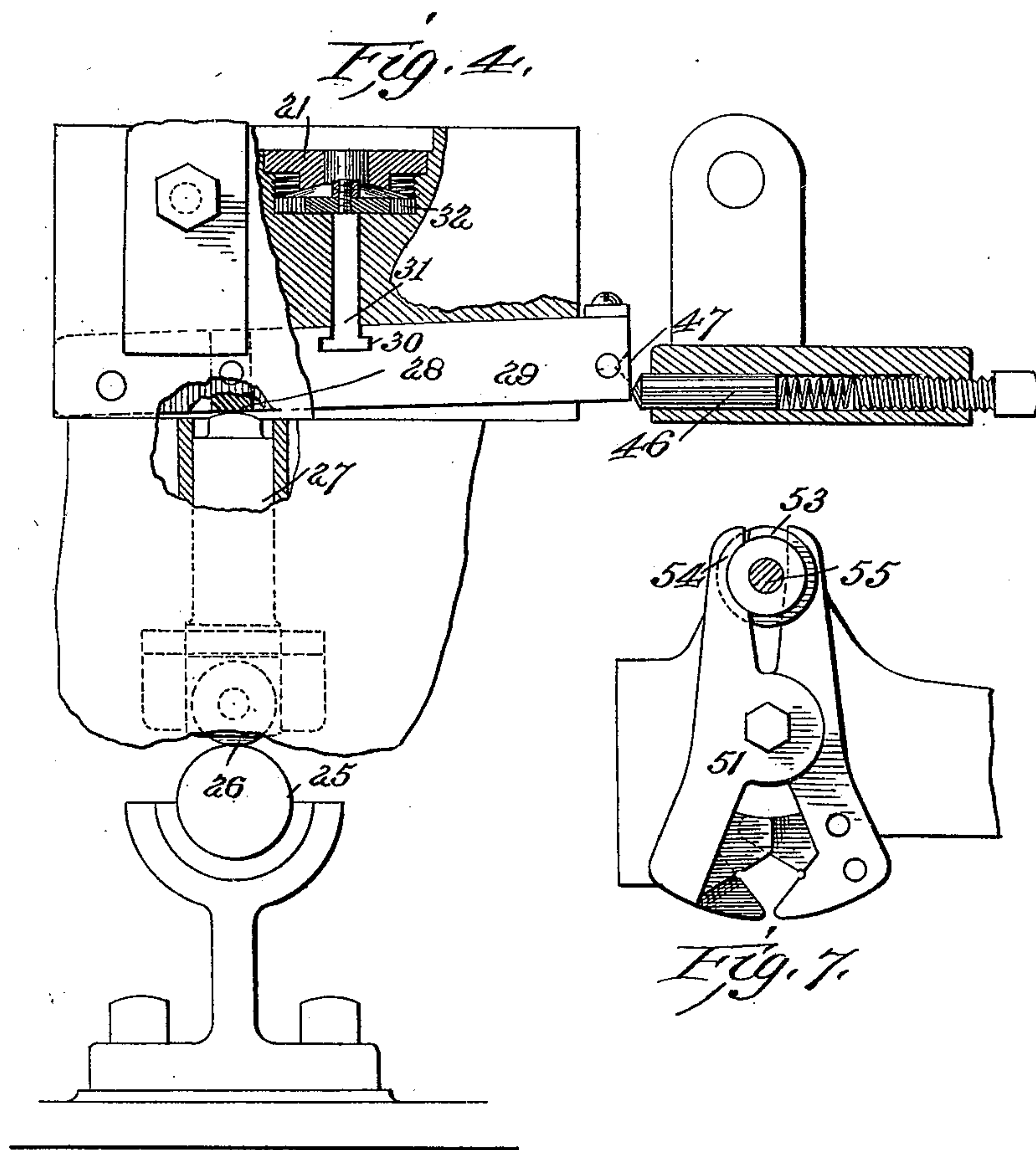
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MACHINE FOR FORMING NIPPLE WASHERS.

(Application filed Dec. 16, 1898.)

(No Model.)

4 Sheets—Sheet 3.



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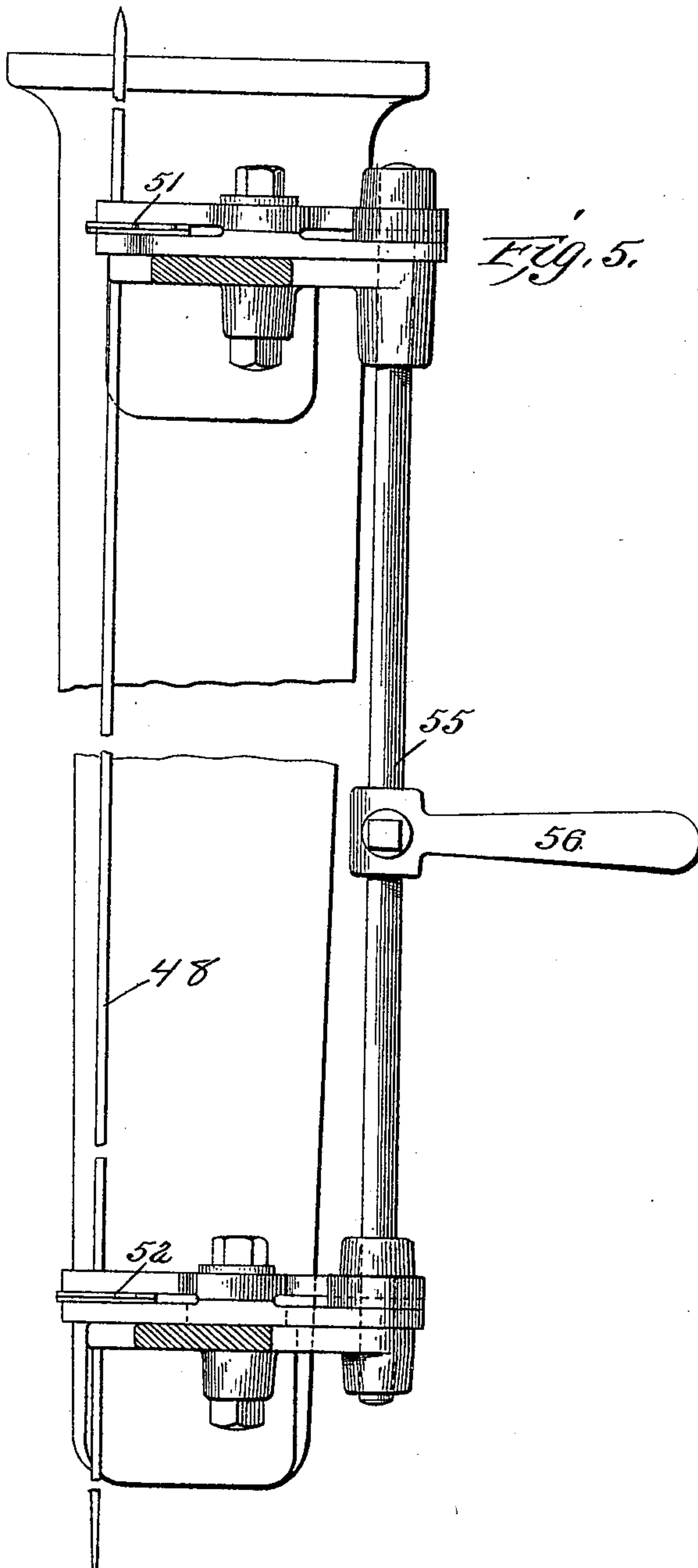
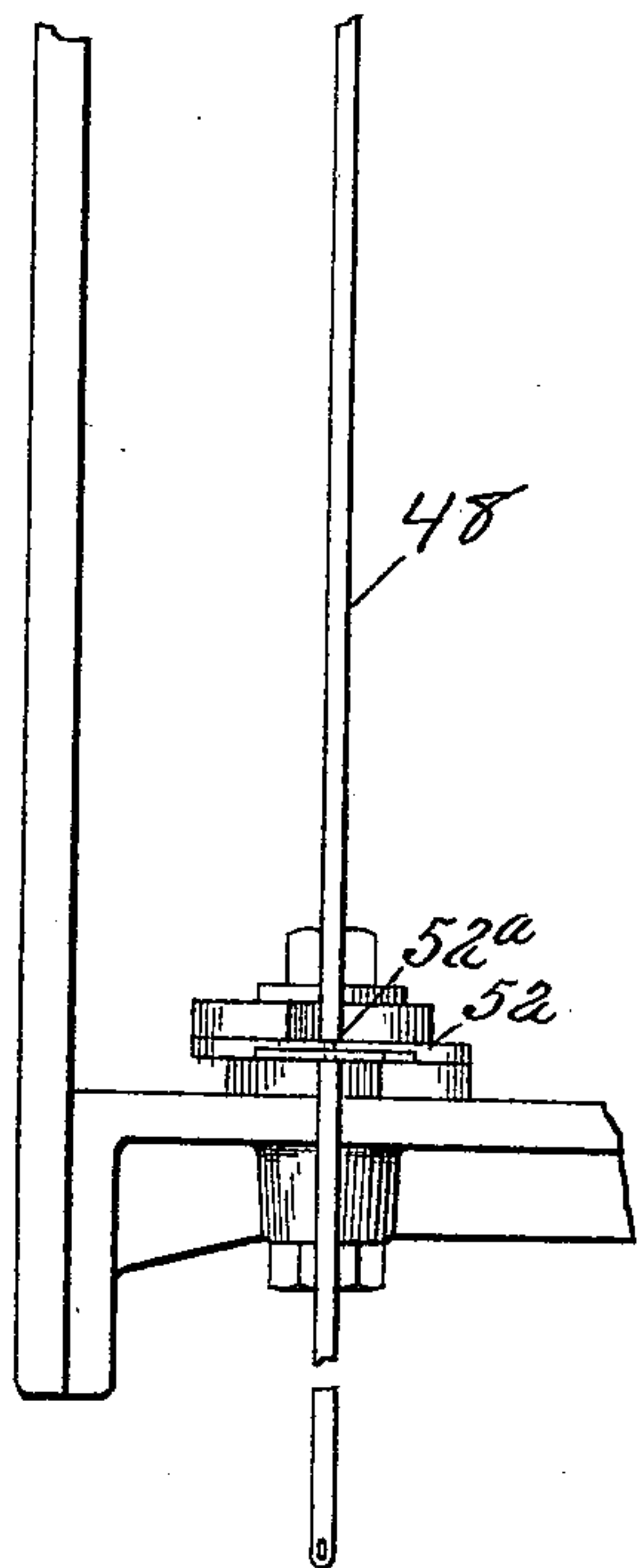
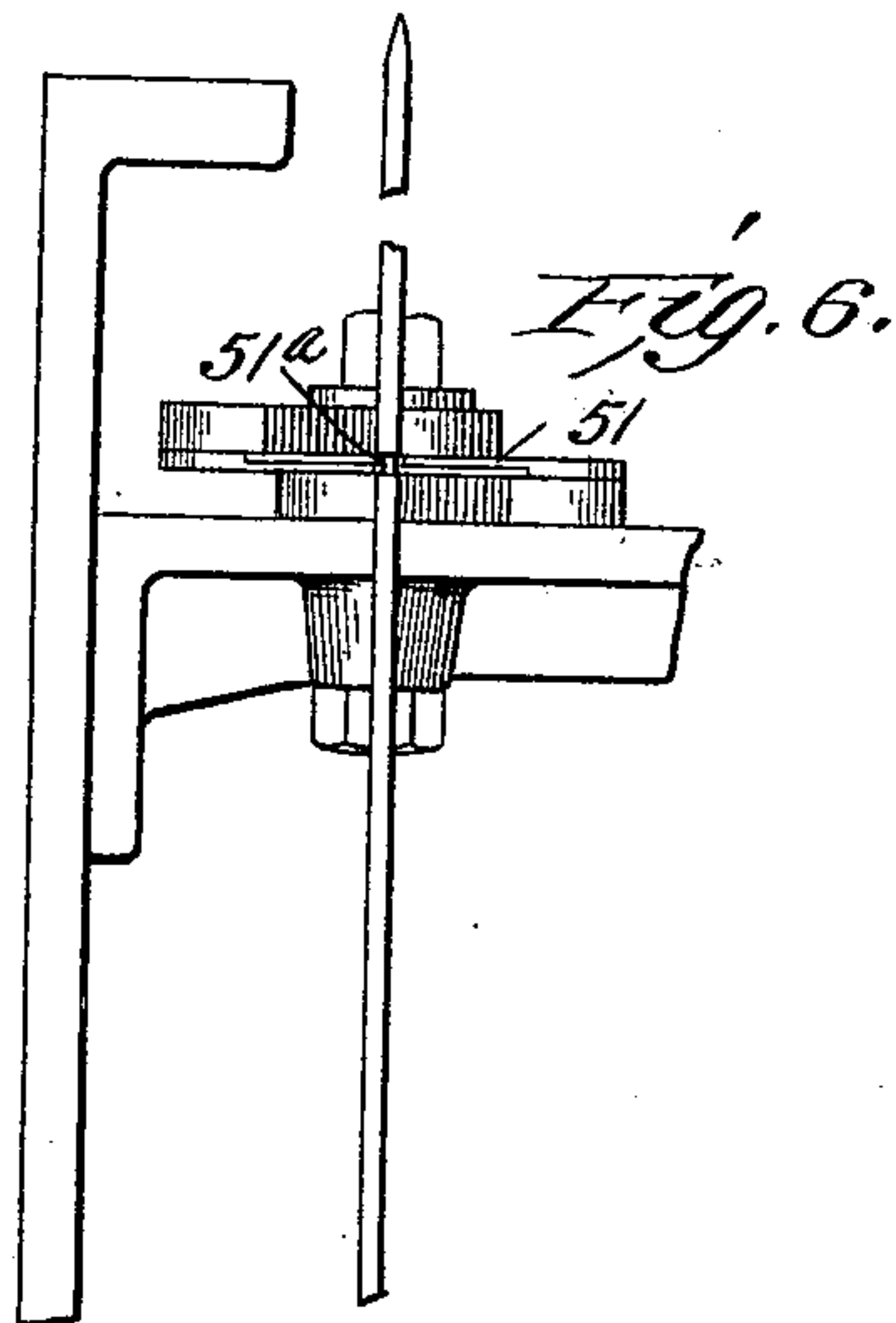
W. R. FOX.

MACHINE FOR FORMING NIPPLE WASHERS.

(Application filed Dec. 18, 1898.)

(No Model.)

4 Sheets—Sheet 4.



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UNITED STATES PATENT OFFICE.

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

MACHINE FOR FORMING NIPPLE-WASHERS.

SPECIFICATION forming part of Letters Patent No. 636,655, dated November 7, 1899.

Application filed December 16, 1898. Serial No. 699,503. (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, Kent county, State of Michigan, have
5 invented certain new and useful Improvements in Machines for Forming Nipple-Washers, of which the following is a specification.

My invention relates to an improved blanking and forming die designed for forming
10 nipple-washers for bicycle-rims and designed also for stringing said washers upon a wire as fast as they are formed, and also to the method of forming such washers. Heretofore
15 in forming these washers it has been customary to first punch the hole in the center and feed it along to a second position, where it was blanked out entirely. In proceeding in this manner, however, there is a tendency
20 of the metal to draw away from the hole, which makes the washer weak at the point where greatest strength is required, and this it is an object of the present invention to avoid. I have also aimed to provide a construction in which the washer will be positively
25 moved to its various positions and all liability of its sticking at any point of the machine will be absolutely removed.

The invention is illustrated in the accompanying drawings, in which—

30 Figure 1 is a plan view of the lower portion or bed of the machine. Fig. 2 is a section on line *a b* of Fig. 1, showing the forming and expelling plungers lowered into forming position. Fig. 3 is a partial section on line *h h*
35 of Fig. 1. Fig. 4 is a detail view, partly in section. Fig. 4^a is a further detail view. Fig. 5 is a side elevation of the washer-stringing mechanism. Fig. 6 is a view a quarter-turn from Fig. 5. Fig. 7 is a plan view of the
40 upper jaws open. Fig. 7^a is a similar view of the lower jaws closed.

Referring more particularly to the figures, the parts about to be described are mounted upon a suitable frame, of which only a small
45 portion is shown, as at A, and are operated by suitable gearing, also not shown.

The strip of metal from which the washers are to be formed is fed upon a supporting-plate *x* and between the upper and lower
50 dies 1 and 2, which form the depression of the washer without rupturing the metal at any

point. The upper die 1, with the perforating-punch 13, blanking punch or die 14, formers 20, and washer-ejectors 23, are carried by the head or slide block 3, which may be caused
55 to reciprocate vertically in any desired manner. The lower die 2 is screwed into a plunger 4, which terminates in a yoke at the bottom, carrying roller 5, operated by rotating shaft 7. On the continued movement of the
60 strip of metal the portion in which the depression is formed is carried rearward beneath the perforating-punch 13, which, acting in conjunction with stationary die 13', on the next reciprocation of the head-block, punches
65 a hole centrally of the previously-formed depression. At the next step the said depressed portion arrives beneath the blanking punch or die 14, provided with suitable teeth, which, cooperating with stationary die-opening 14',
70 completely severs the washer from the strip.

It will be understood that the strip is fed in by any suitable feed mechanism which imparts a step-by-step movement thereto timed to correspond with the movements of the
75 head-block.

The die 14, as will be seen on referring to Fig. 3, is of such a length as to pass completely through opening 14', thus carrying
80 with it the washer, which is deposited thereby within a reciprocating slide or shuttle 18. The washer, however, is prevented from passing completely through the shuttle by reason of the opening therein being formed slightly tapered or contracted at its lower end. This
85 shuttle is moved in a line at right angles to the line of feed of the strip by means of a cam 41, operating against rollers 43 of a yoke 43^a. The shuttle is provided with six holes, lettered *a*, *b*, *c*, *d*, *e*, and *f*, respectively, the two nearest
90 the center, *c* and *d*, being designed to receive the washers from the blanking-die and convey them, respectively, to the forming-dies 20' and 20, by which the washer is completely formed. Referring to Figs. 1 and 2 it will be seen that
95 the hole *c* is shown as in position to receive the washer, the movement of the shuttle having carried the hole *d* to the right, and the top forming-die 20 has passed down through the shuttle, forcing the washer from the hole
100 *d* into the bottom forming-ring 21. As this ring is fastened to the lower die-block the

teeth of the washer are drawn down between the upper die 20 and the ring 21, the plunger 22' maintaining the form of the central depression. As the head-block and dies rise the washer just formed remains in the ring 21, being prevented from lifting out by the stripper-rod 22, and the shuttle moves to the left, bringing the hole *d* in line with die or punch 14 to receive another washer and simultaneously the hole *e* in line with the former 20. As the head-block rises for the next cycle of operation a cam 25, acting upon a roller 26, raises a plunger 27, the top of which bears against a cross-bar 28. (See Figs. 4 and 4^a.) This cross-bar connects the two sides of a frame 29, which has mortised into it at 30 two pins 31, which are connected to an expelling-die 32. It will thus be seen that by means of the expelling-die the washer resting on former 22 is forced up into the shuttle, and as the shuttle moves to the right the hole *e* is brought into line with an expelling-plunger 23, which on the next downward movement of the head-block forces the washer into a receiving-chamber 24.

It will of course be understood that the two sides of the machine are duplicates and that the cycle of operations just described for the right-hand side is simultaneously being performed upon the other side, the shuttle conveying the blanked washer first from the center to the right on one stroke and then from center to the left on the next, so that a complete washer is formed at every stroke of the machine.

I find it desirable to provide a spring 45 under the former 32, so that it will be held flush with the top of the forming-ring 21, so as to present a smooth surface for the deposit of the next washer, it remaining in this position until forced down by the forming-die 22, which carries the washer before it. When forced to the lowest position, as shown in Fig. 2, the ring 32 rests solidly on portion *x'*, and a spring-pin 46 enters into a depression 47 in the frame 29 (see Fig. 4) with sufficient force to prevent spring 45 from raising the ring 32 until the cam 25 again comes into operation, when the washer is quickly expelled.

It is desirable that the washers as fast as they come from the machine be threaded upon a wire. In order to accomplish this, I provide the construction shown at the right of Fig. 2 and in Figs. 5, 6, and 7.

Referring first to Fig. 2, it will be observed that the completed washer as it is delivered by expelling-plunger 23 enters a chamber 24, in which are a plurality of pieces or bars 35, having rounded upper ends. These are carried by screws 37, pressed upon by springs 38, serving to exert a side pressure upon the washers and prevent their overturning. A rod 48 is provided for stringing the washers, which has its pointed upper end located in proximity to the upper end of the yielding plates, its lower end being provided with an

eye for the reception of the wire upon which the washers are to be threaded. The rod is held by lower and upper gripping-jaws 51 and 52, located beneath the supporting-frame, which engage notches 51^a and 52^a in the rod to prevent any vertical movement thereof. The jaws are operated by two reversely-arranged cams 53 and 54, (see Figs. 7 and 7^a), mounted upon a rocking shaft 55, having an operating-handle 56. Normally the cams stand in such a position that the lower jaws are closed upon the rod, while the upper jaws are opened, thus permitting the washers to be threaded upon the rod. After the requisite number have been threaded thereon the handle is turned, first closing the upper jaws upon the rod, and on the continued movement opening the lower jaws, permitting the washers to run down onto the wire.

Having thus described my invention, what I claim is—

1. The herein-described method of forming nipple-washers consisting in first forming a depression in the under face of a piece of sheet metal, second in piercing the center, third in blanking out the washer, and finally drawing the edges of said blank upwardly into upwardly-turned teeth, substantially as described.

2. In combination, the stationary die-plate, the head-block moving toward and from said die-plate, a die carried by said block for forming a depression in the under face of the blank, a piercer also carried by said head-block, a blanking-die also carried by said head-block, and stationary dies in said die-plate cooperating with said movable dies, and a set of dies for drawing the edges of said blanks upwardly to form teeth, substantially as described.

3. In combination, the stationary die-plate, a head-block reciprocating toward and from the same, a concave die carried by said head-block, a convex die in the die-plate corresponding thereto, a second convex die carried by the die-plate and having a central opening, a piercer carried by the head-block in line with said central opening, a blanking-die also carried by said head-block, and a die-opening in the die-plate through which said blanking-die acts to blank out the metal, substantially as described.

4. In a machine for forming nipple-washers and the like, the combination with the blanking-dies, of a forming-chamber and die arranged on each side of the blanking-die a reciprocating shuttle arranged to receive the washers from the blanking-die and convey them alternately to said forming-dies and also to receive the formed washers from the forming-dies and convey them therefrom, and means for alternately expelling the washers from the forming-chambers into the shuttle, substantially as described.

5. In a machine for forming nipple-washers and the like, the combination with the blank-

ing-dies, of a forming-chamber and die, a shuttle arranged to receive the blank from the blanking-dies and convey it to the forming-chamber and also to receive the formed washer from the forming-chamber and deliver the same, an expelling-die located in said chamber yielding to a limited extent on the downward movement of the forming-die, and means for raising said expelling-die into the shuttle to deliver the formed washer thereto on every alternate reciprocation of the shuttle, substantially as described.

6. In a machine for forming nipple-washers and the like, the combination with the blanking-dies, of a forming chamber and die, a shuttle arranged to receive the blank from the blanking-dies and convey it to the forming-chamber and also to receive the formed washer from the forming-chamber and deliver the same, an expelling-die located in said chamber, means for holding said expelling-die normally flush with the surface of the forming-chamber but adapted to yield on the downward movement of the forming-die, and means for raising said expelling-die above the surface of the forming-die to deliver the formed washer into the shuttle, substantially as described.

7. In combination, the blanking-dies, the forming chamber and die, the receiving-chamber, the shuttle reciprocating between said parts and arranged to receive the blank from the blanking-dies and convey it to the forming-chamber, positively-operated expelling means for expelling the formed washer from said forming-chamber back into the shuttle, and a plunger adapted to expel the washer from said shuttle into the receiving-chamber, substantially as described.

8. In combination, the die-plate having a die-opening therein, a blanking-die, a carrying-shuttle reciprocating beneath said die-plate having an opening arranged to receive the blanked washer therefrom, a forming-chamber arranged beneath said slide, a forming-die arranged to force the blank from said opening into the forming-chamber to form the same, means for forcing the formed washer back into an opening in the shuttle, a receiver and means for forcing the washer from the

shuttle into said receiver, substantially as described.

9. In combination, the die-plate having a die-opening therein, a shuttle reciprocating beneath said die-plate, a blanking-die reciprocating through the shuttle and arranged to deliver the blanked washer into the shuttle, a forming-chamber beneath the shuttle, a forming-die arranged to reciprocate through the shuttle and to deliver the washer from the shuttle into the forming-chamber, means for forcing the completed washer back into the shuttle, a receiving-chamber beneath the shuttle, and an expelling-plunger moving through the shuttle to deliver the completed washer to the receiving-chamber, substantially as described.

10. In a machine for forming nipple-washers, the combination with the nipple-forming mechanism, of a stringing-rod arranged to receive the washers therefrom, upper and lower grippers arranged to separately sustain said rod with means for alternately operating said grippers and means for causing the washers to be threaded all the same side up on said rod, substantially as described.

11. In a machine for forming nipple-washers the combination with the carrying-shuttle, of a receiving-chamber, a yielding plate arranged therein, a plunger for positively expelling the washer from said shuttle into said chamber, a stringing-rod arranged therein, and alternately-operated grippers separately engaging and sustaining said threading-rod, substantially as described.

12. In a machine for forming nipple-washers and the like, the combination with the blanking-dies, of a forming-chamber and die, a receiving-chamber, and a shuttle arranged to receive the blank from the blanking-die and convey it to the forming-die and also to receive the washer from the forming-die and convey it to the receiving-chamber, substantially as described.

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

WILLIAM R. FOX.

Witnesses:

GEORGE S. MILLER,
GEO. K. McMULLEN.