

No. 767,149.

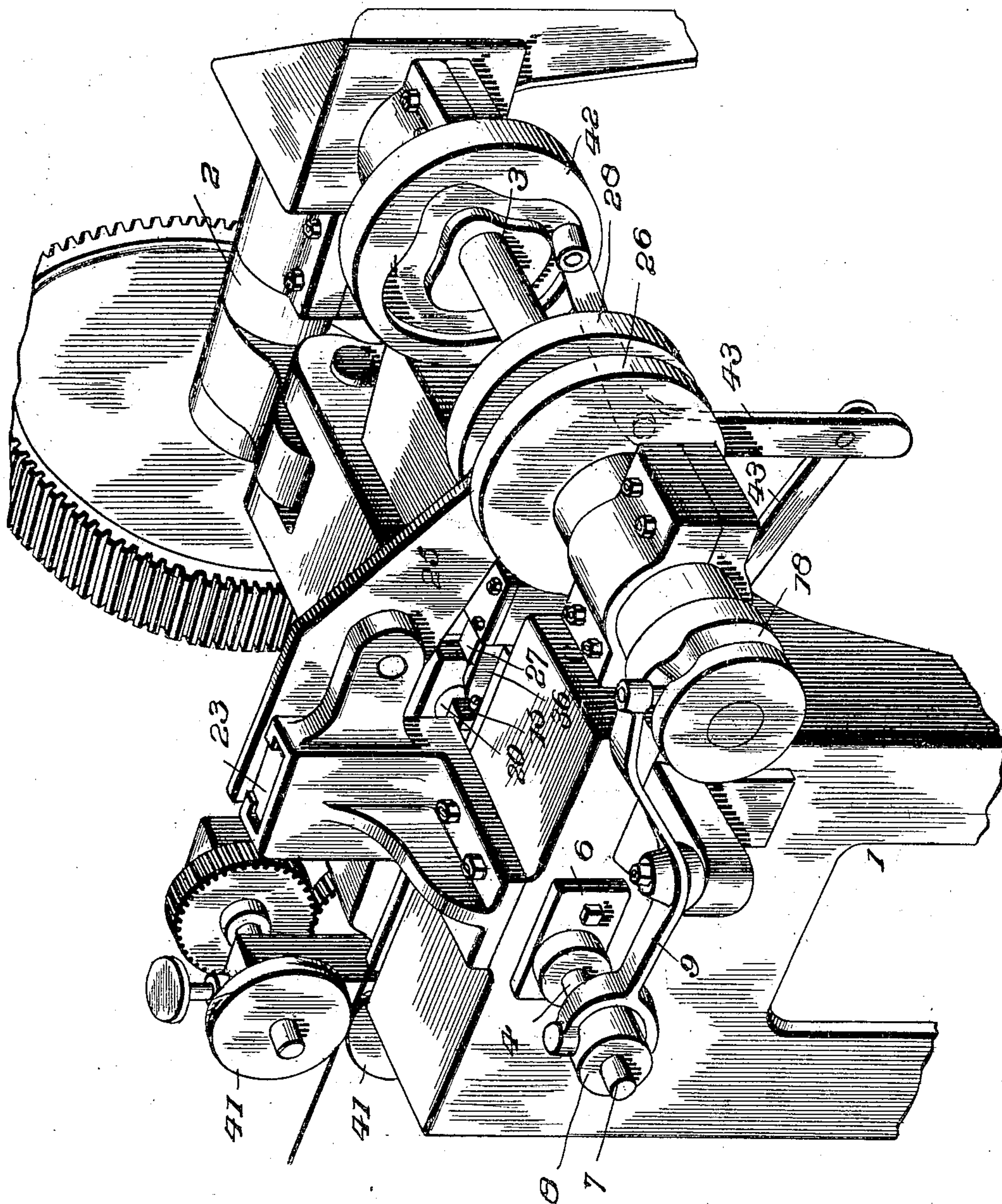
PATENTED AUG. 9, 1904.

H. C. HART.  
MACHINE FOR MAKING WASHERS.

APPLICATION FILED JUNE 20, 1903.

NO MODEL.

3 SHEETS—SHEET 1.



WITNESSES:

*Reiya Matthews.*  
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*FIG. 1.*

INVENTOR

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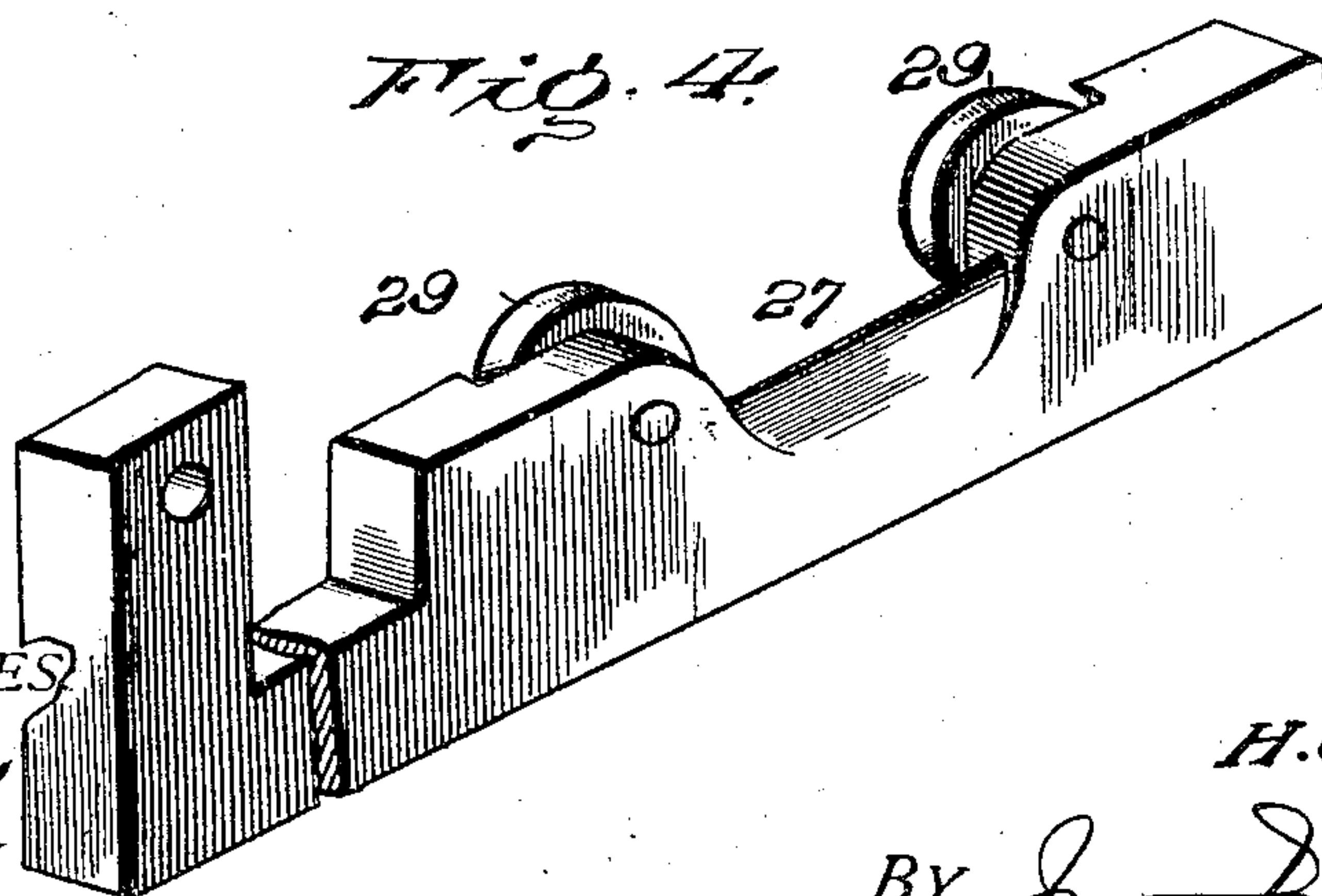
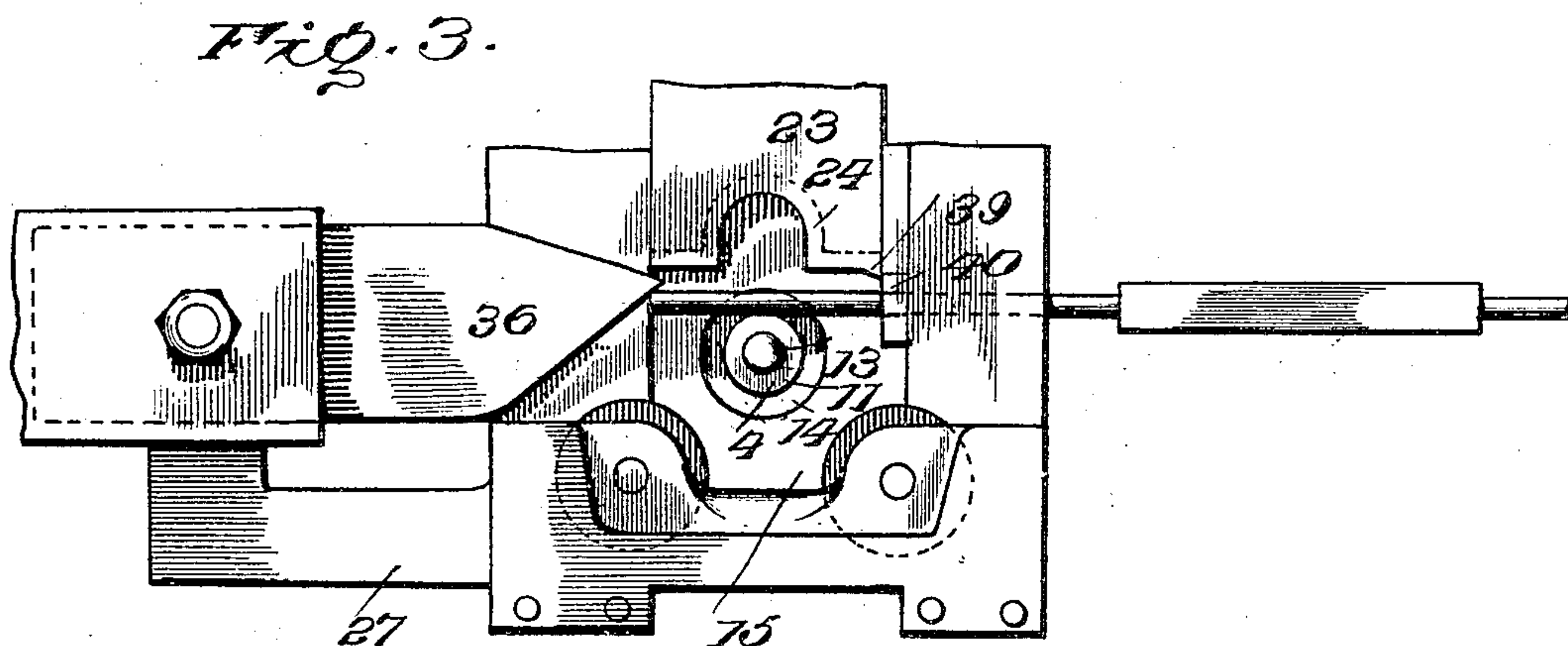
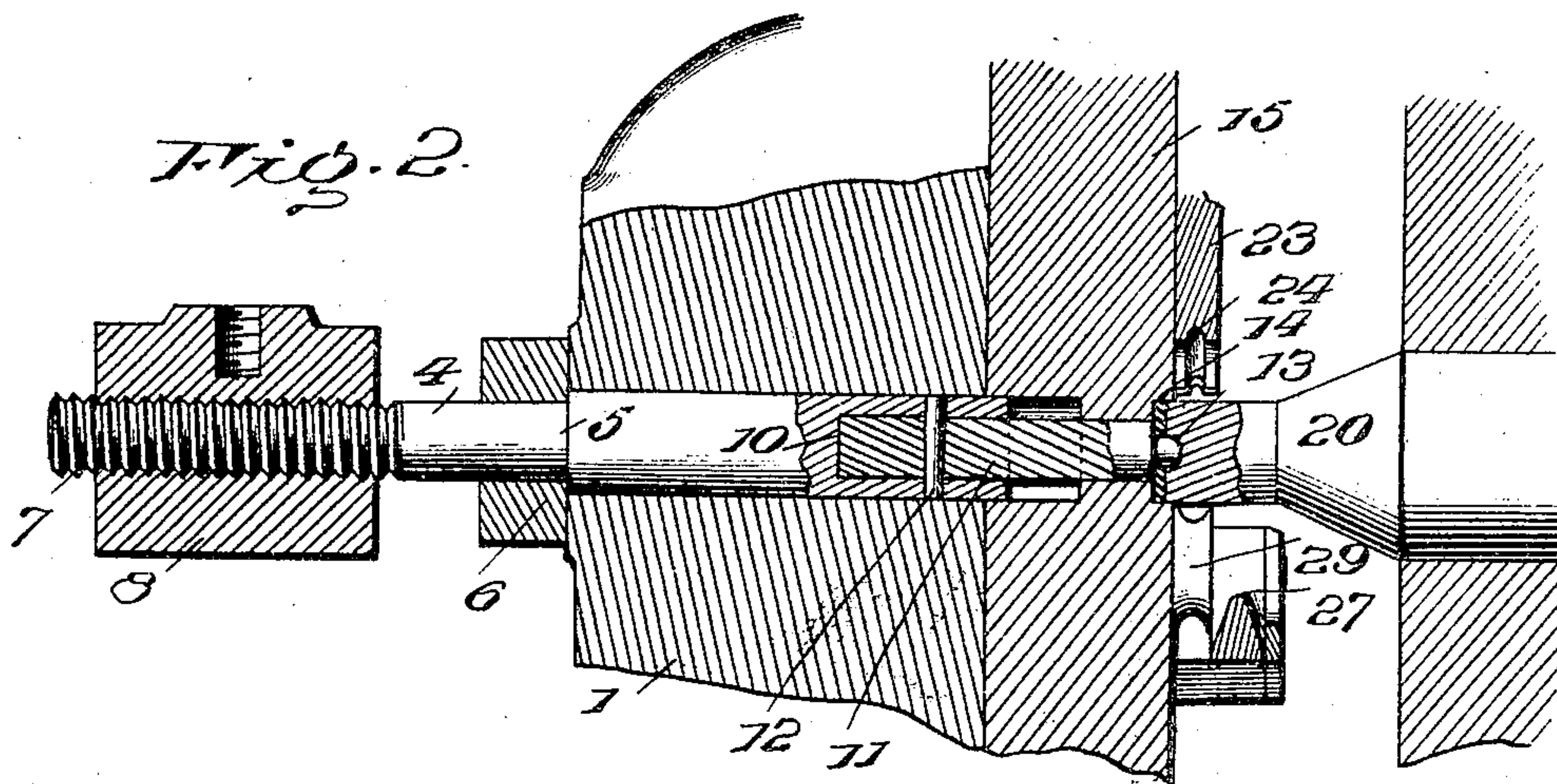
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3 SHEETS—SHEET 2.



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3 SHEETS—SHEET 3.

Fig. 5

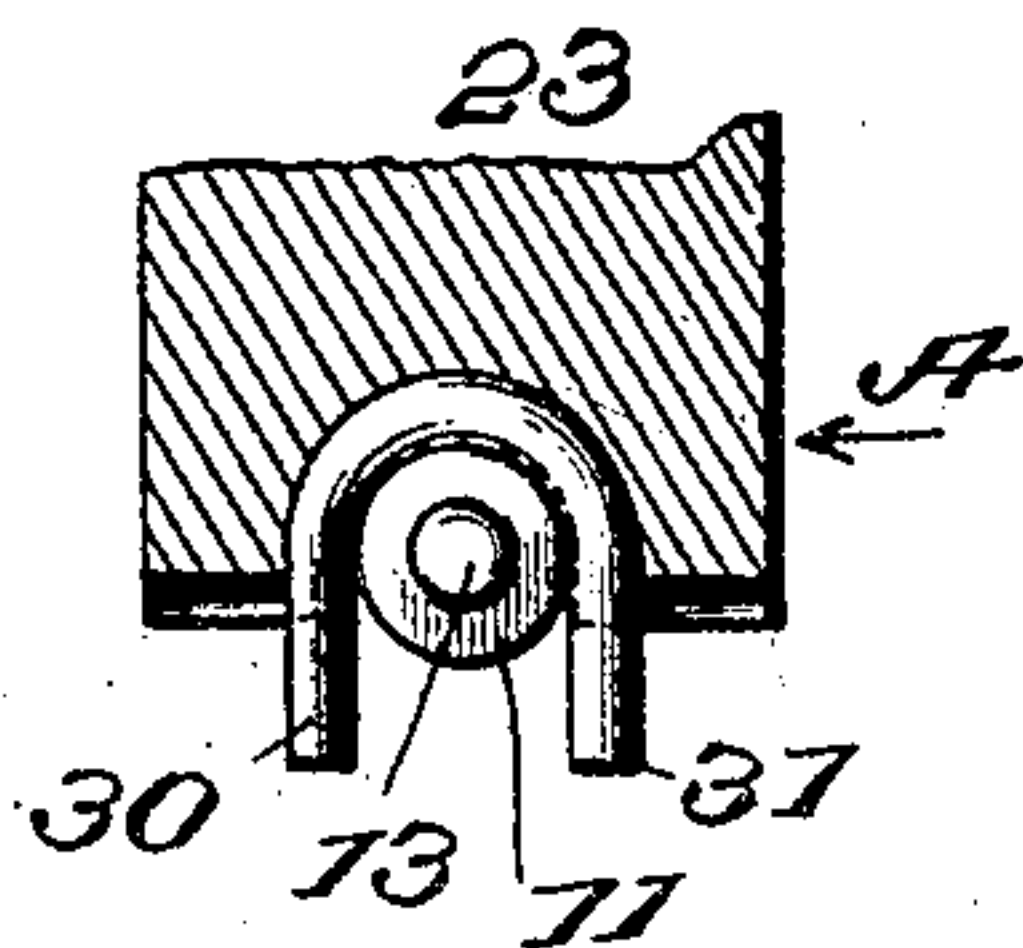


Fig. 6

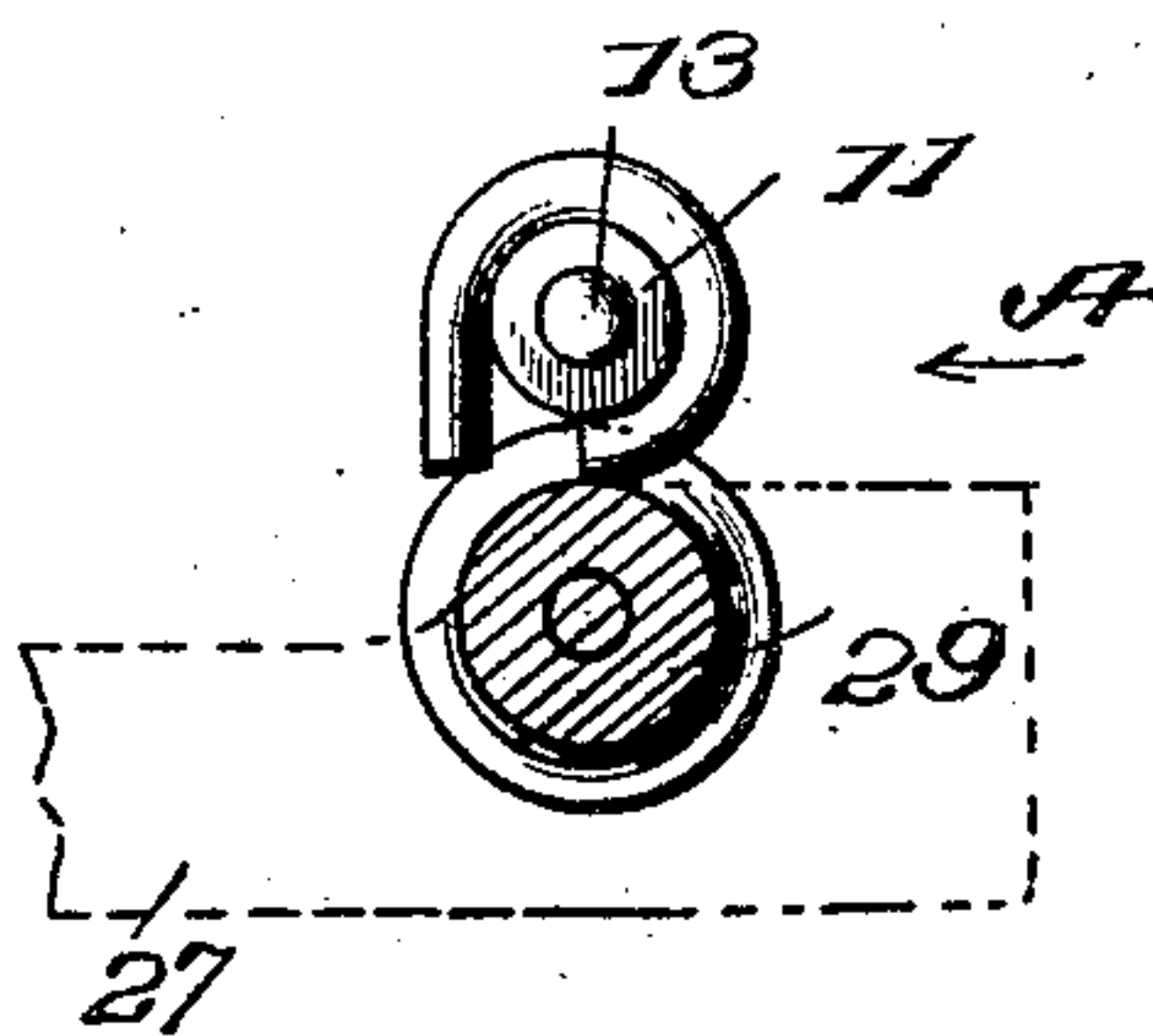


Fig. 7

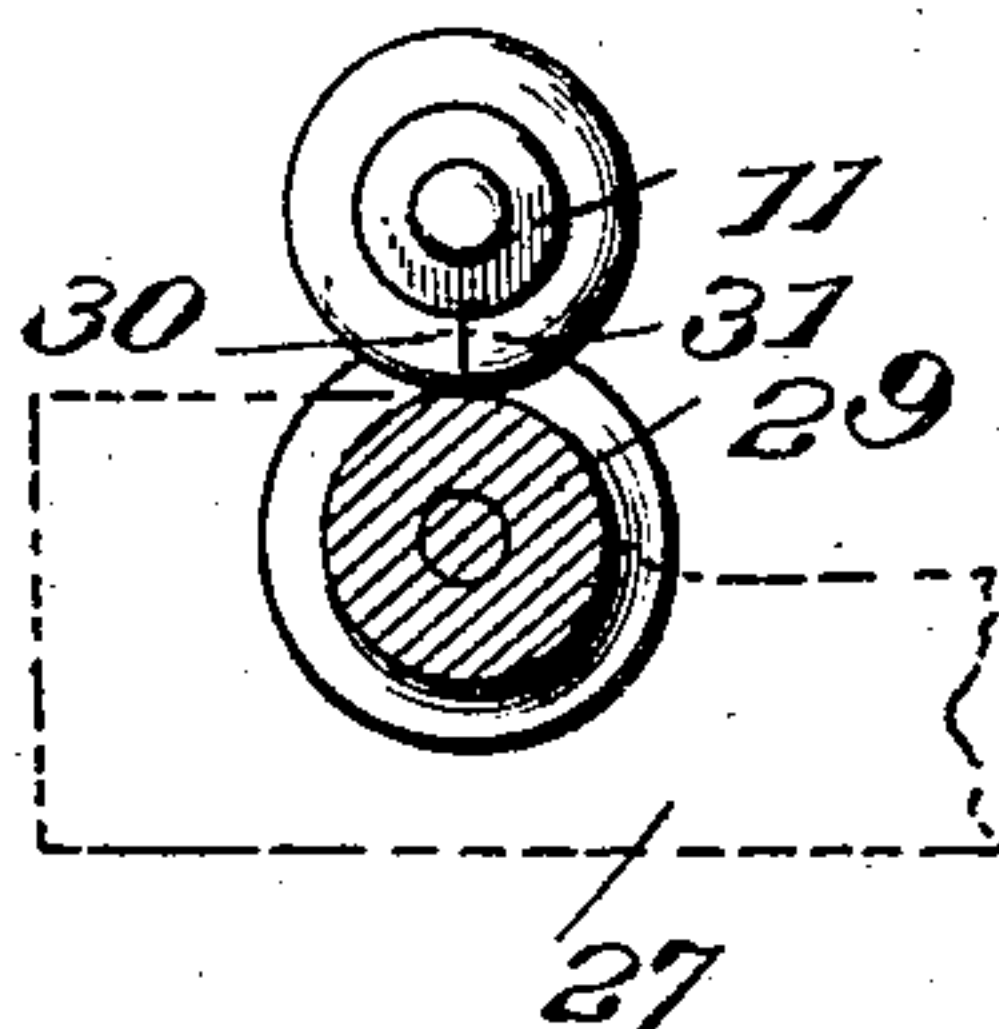


Fig. 9

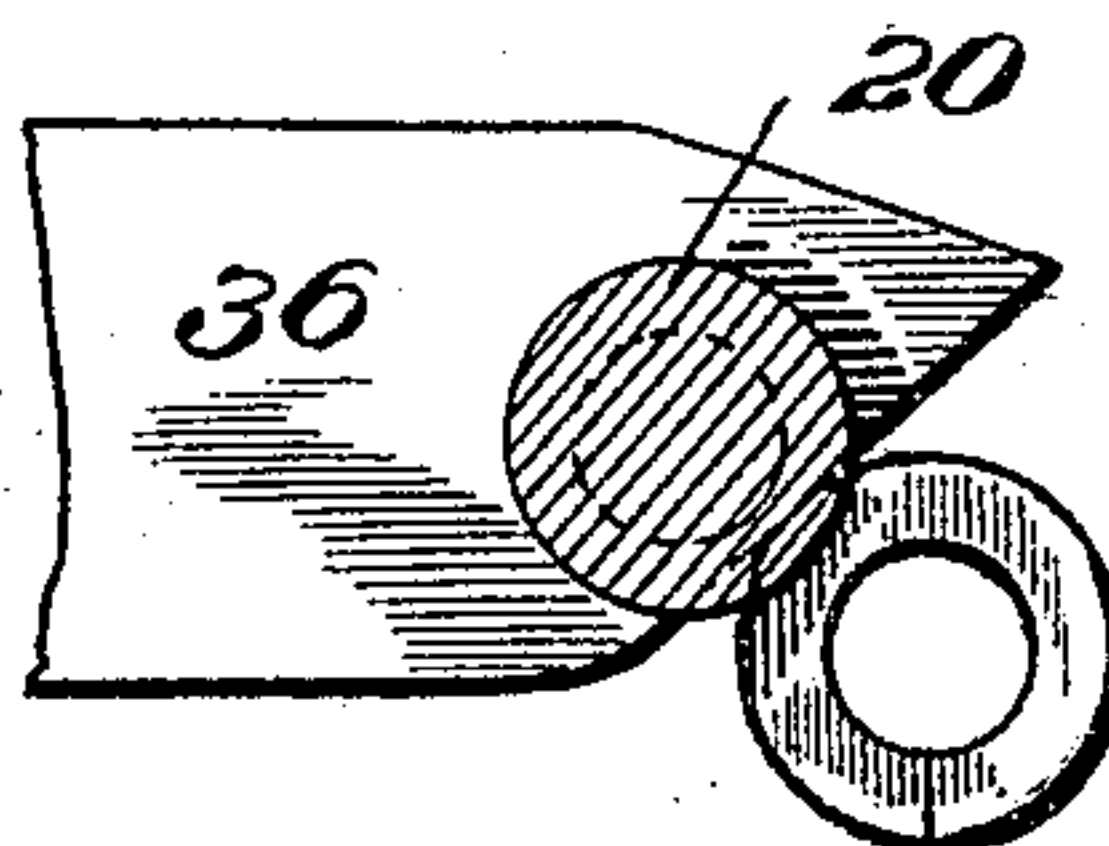
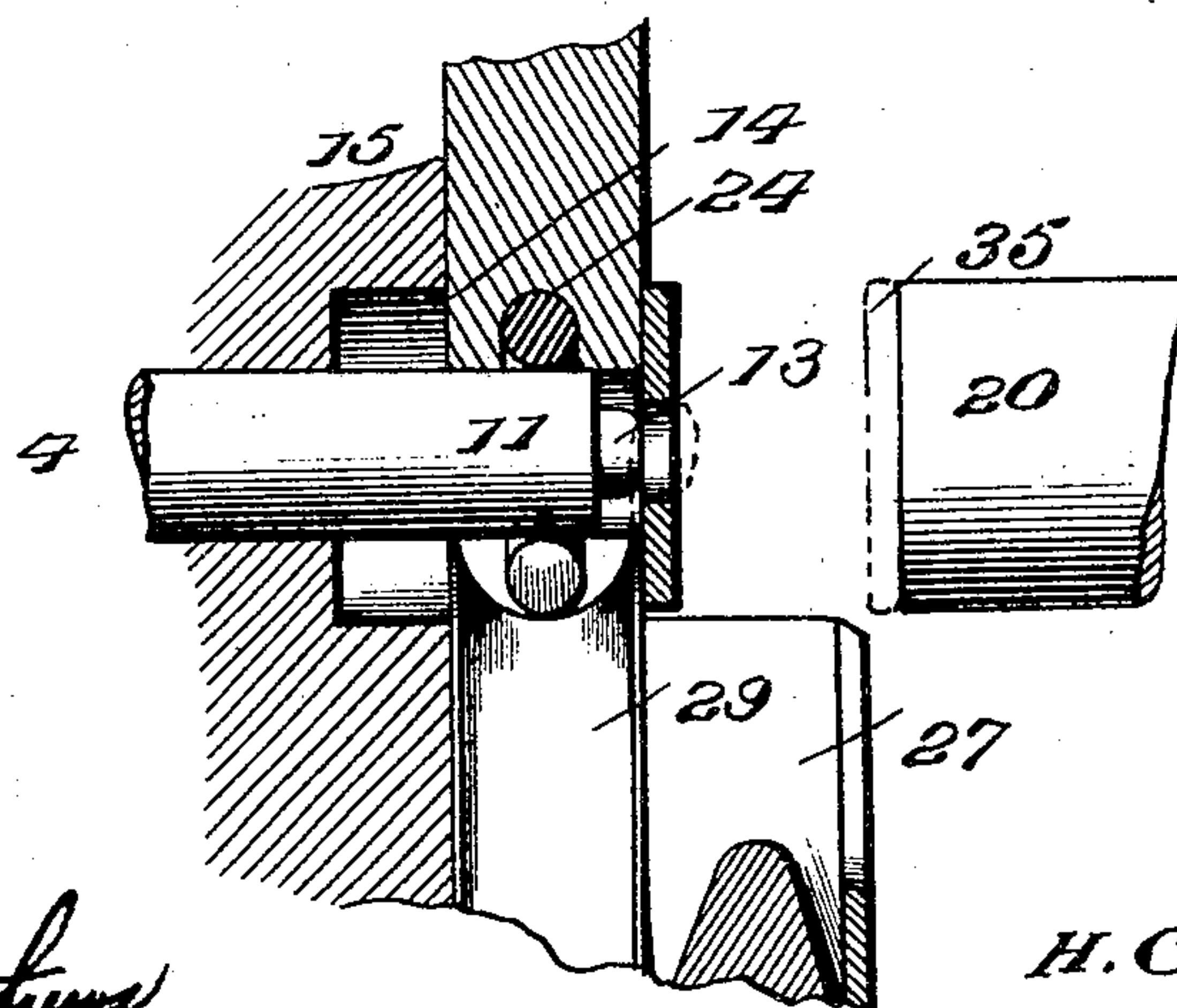


Fig. 8



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# UNITED STATES PATENT OFFICE.

HUBERT C. HART, OF UNIONVILLE, CONNECTICUT.

## MACHINE FOR MAKING WASHERS.

SPECIFICATION forming part of Letters Patent No. 767,149, dated August 9, 1904.

Application filed June 20, 1903. Serial No. 162,443. (No model.)

*To all whom it may concern:*

Be it known that I, HUBERT C. HART, a citizen of the United States, residing at Unionville, in the county of Hartford and State of Connecticut, have invented new and useful Improvements in Machines for Making Washers, of which the following is a specification.

This invention relates to machines for making washers from wire or the like and is an improvement of the structure shown in my Patent No. 682,070, bearing date of September 3, 1901.

The object of the invention is to provide specific mechanism for bending the wire from which the washer is to be made into a ring and the construction of the flattening device.

In the above-referred-to patent a construction was set forth in which the diameter of the washer and its hole were maintained the same as before compression of the metal took place. However, I now find it expedient to preserve the exterior diameter of the ring in the completed washer and vary its interior diameter.

To this end it is one of the objects of this invention to provide mechanism whereby the exterior diameter of the washer may be maintained and its interior diameter increased or decreased, as desired.

The invention also comprehends improvements in the specific construction and arrangement of a device for insuring the completed washer being ejected from both the mandrel and the plunger.

Many other objects and advantages will be hereinafter referred to and be particularly pointed out in the claims.

In the drawings, Figure 1 is a perspective view of my improved machine for making washers. Fig. 2 is an enlarged vertical section of the same, a washer being flattened between the mandrel and plunger. Fig. 3 is a view looking toward the ring-forming devices. Fig. 4 is a detail perspective view of the device for completing the bending of the wire to form a ring. Fig. 5 is a diagrammatic view showing the first step in the formation of a ring. Fig. 6 is a similar view, but showing the second movement toward forming a

ring. Fig. 7 is a similar view showing the last movement to complete a ring. Fig. 8 is an enlarged vertical section illustrating a ring as having been formed on the mandrel and the latter being quickly withdrawn or "jerked" to free a completed washer from its end. Fig. 9 is a diagrammatic view showing the ejecting device pushing a completed washer from the plunger.

The same numerals refer to like parts in all the figures, and while I have shown specific mechanism for accomplishing the desired movements I do not desire to be in any way limited thereto.

The numeral 1 represents the main frame, having suitably mounted thereon bearings for two power-shafts 2 and 3, connected to each other by appropriate bevel-gears. The mandrel 4 has a shoulder 5, which abuts at the proper time against a box 6, made fast to the frame 1. On the reduced and threaded portion 7 of the mandrel is an adjustable nut 8, to which an operating-lever 9 is pivotally fastened. The opposite end of the mandrel is provided with an opening 10 to receive a removable end 11, rigidly fastened to the mandrel by a pin or the like 12. The end 11 is reduced, as at 13, which determines the diameter of the washer.

The purpose of making the end of the mandrel removable is to provide a convenient means for increasing or decreasing the diameter of the washer-hole. The end 11 will be uniformly of one size for making washers of a predetermined diameter, and when the hole of a washer is to be increased or decreased the mandrel is taken out, the pin 12 removed, and the end 11 taken out and another, whose end 13 is of the proper size, is inserted in its place. The seat 14, surrounding the end 11, in which the washer is flattened, is formed in a plate 15, attached to the frame. Of course it will be understood that the size of the seat always determines the diameter of the washer. The lever 9 is pivoted to a boss on the frame 1, and its end engages a cam-groove 18 in a disk fast on the shaft 3. The groove is so shaped that when the mandrel is out and a ring is formed on it that it will be quickly jerked in,



which causes the ring-former to eject the completed washer, as shown in Fig. 8. The further movement of the cam causes the mandrel to be drawn entirely in until the shoulder 5 engages the box 6. The plunger 20 is connected to a crank on the power-shaft 2, and its end is of the same diameter as the seat 14 and is provided with an opening to receive the reduced portion 13 of the end 11.

The ring-forming device comprises a U-shaped plunger 23, having its lower end bifurcated to straddle the end 11 of the mandrel. The bottom of the plunger, as well as the bifurcated intermediate portion, is slightly grooved, as at 24, to tightly grip the wire. This plunger is connected to an operating-lever 25, pivoted to the frame 1, and said lever has its end engaged by a cam 26 on the shaft 3.

The plunger 23 bends the wire into a U shape, as shown in Fig. 5, and to complete the ring I find it necessary to do so by two separate movements. This operation I accomplish with a slide (indicated at 27) which receives its movement from a cam 28, mounted on the power-shaft 3. Slide 27 is cut away at its center and each side thereof, and abutting against the face of the plate 15 is an antifriction grooved roller 29. These rollers 29 are arranged in alignment with the wire and the subsequent ring formed therefrom, so that after the descent of the plunger 23 the ends 30 and 31 of the bent section of wire extend below the top horizontal line of the rollers 29. At the proper time the cam moves the slide in the direction of the arrow A, Fig. 6, which engages the end 31 of the U held on the mandrel 4 by the plunger 23 and completes the second step in the formation of the ring. The cam now reverses the direction of movement of the slide, and the opposite roller 29 impinges the leg 30 of the bent U and completes the third and last step in the formation of the ring on the mandrel.

In a machine of this character the parts have to be freely oiled, which frequently results in the washers sticking to the mechanism, especially to the end of the plunger, as shown in dotted lines 35, Fig. 8, and unless the washer is removed serious evil results follow. To this end I attach a V-shaped ejector 36 to the slide 27 in line with and just beyond the end of the plunger, so that when the slide moves to make the third and last step in the formation of the ring the ejector 36 will gradually but positively push the washer 35 out of engagement with the plunger, as will be readily understood.

The plunger 23 carries a shear 39, which, with a companion shear 40, forms the means for severing the wire into the desired sections.

41 41 indicate rolls for feeding the wire step by step to the mandrel. These rolls are periodically revolved by a cam 42 and connection 43; but as this feature, as well as the cutting mechanism, forms no part of my present in-

vention it is not deemed necessary to describe the parts in detail.

The operation of my invention is substantially as follows: The wire is fed across the mandrel by the rolls 41, as shown in Fig. 3, after which plunger 23 descends, the shears severing the wire, and the bifurcated ends bend the severed section into U-shaped form, as shown in Fig. 5. It may be well to state at this point that the mandrel is extended out toward the plunger, as shown in dotted lines in Fig. 8. Plunger 23 having given the wire its initial bend and at the same time tightly gripping it on the mandrel, the proper cam now moves the slide in the direction of the arrow A to give the second step of the bending operation, Fig. 6, whereupon the movement of the slide is reversed and the opposite roller 29 engages the leg 30 and gives the final bend to the wire to complete the ring, Fig. 7, as before described. Should a washer stick to the end of the plunger, the reverse movement of the slide will eject it, while if the washer hangs on the reduced portion 13 it is sure to be ejected by the jerk of the mandrel, so that the clogging of the mechanism is effectually prevented. In the formation of the ring I find that by grooving the end of the plunger 23 and the rolls 29 the wire is guided. The ring thus formed, the mandrel is moved by its cam toward the seat 14 until the face of the end 11 is in a plane with the plane of said seat. When in this position, the shoulder 5 is against the box 6, so that the faces of seat 14 and end 11 become the wall against which the washer is to be formed. The plunger 23 is raised out of the way by its cam, and the plunger 20 also moves toward the mandrel. In fact, the plunger and mandrel move together. Consequently the ring is carried into the seat 14. It is at this time the ring is converted into a flat splitting washer. The movement of the plunger 20 is greater than that of the mandrel. Hence the ring is flattened between the walls of the seat 14 and the reduced portion 13. It is to be noted at this time that the metal has been so flattened that it projects over the face of the end 11, which insures the washer being ejected from the seat 14 after the plunger is withdrawn. Obviously the compression of the metal will not be as great if the diameter of the reduced portion 13 be of the smallest type as if said portion 13 were of larger diameter. However, the proportion of the parts and the amount of pressure applied will be such that whenever a ring of wire of a predetermined diameter is fitted in the seat and a washer having a hole within a given sphere is to be made the desired result will be accomplished.

In the formation of the ring I find that by grooving the end of the plunger 23 and the rollers 29 the wire is guided accordingly and a perfect ring is produced. Furthermore, the rollers prevent undue friction in the for-



mation of the ring and naturally assist in gradually bending the wire around the mandrel.

What I claim as new is—

5 1. In a machine for forming ring-washers, a bed-plate, a mandrel, means to reciprocate the mandrel through the bed-plate, means to form a ring about the mandrel when the latter is projected or in forward position, means  
10 to flatten the formed ring when the mandrel is withdrawn, and means independent of the ring-forming part of the mandrel to determine the interior diameter of the ring during the flattening operation.

15 2. In a machine for forming ring-washers, a bed-plate, a mandrel having a reduced end, means to project the mandrel through the bed-plate, means to form a ring about the mandrel, means to withdraw the mandrel to leave  
20 the reduced end within the formed ring and means to flatten the ring about said reduced end.

3. In a machine for forming ring-washers, a bed-plate formed with a ring-receiving recess, a mandrel, means for reciprocating the  
25 mandrel through the recess in the bed-plate, means for forming a ring about the mandrel when projected, a size-determining stud projecting from the end of the mandrel, and  
30 means for flattening the ring in the recess of the bed-plate and about the size-determining stud when the mandrel is withdrawn.

4. In a machine for forming ring-washers, a bed-plate, a mandrel having a reduced end,  
35 means to project the mandrel through the bed-plate, said mandrel being removably secured to the operating means, means to form a ring about the mandrel, means to withdraw the mandrel to leave the reduced end within the  
40 formed ring, and means to flatten the ring about said reduced end.

5. A machine of the class described comprising a mandrel, means to bend a metal strip about the mandrel to partially form a ring  
45 and clamp the strip to the mandrel, and means operative to contact successively with the respective ends of the partially-formed ring to complete the ring, substantially as described.

6. A machine of the class described comprising a mandrel, means to bend a strip about the mandrel to partially form a ring and hold the strip against movement, a reciprocating  
50 slide carrying means to successively engage the depending ends of the partially-formed ring, and means to operate the slide.

7. In a machine of the class described, a mandrel, means for partially forming a ring about the mandrel from a metal strip and holding the strip against bodily movement, and a  
60 reciprocating slide operable to complete the ring, said slide carrying rollers to serve as movable contacts and adapted respectively to successively contact with the depending terminals of the partially-formed ring and bend the  
65 same about the mandrel.

8. In a machine of the class described, a mandrel, means for partially forming a ring about the mandrel from a metal strip and holding the strip against bodily movement and a  
70 reciprocating slide operable to complete the ring, said slide carrying rollers, means to move the slide to successively contact the rollers with the depending terminals of the partially-formed ring and bend the same about the mandrel, said slide having two distinct and  
75 independent movements, in each of which one of the ring-terminals is bent around the mandrel.

9. A machine for making washers comprising means for partially forming a section  
80 of metal into a ring and securing the metal against bodily movement, a slide bearing roller-contacts to complete the formation of the ring in two separate movements of the slide.  
85

10. A machine for making washers comprising a mandrel having a reduced portion, a die-recess formed in the bed of the machine and surrounding the reduced portion of the  
90 mandrel, means to project the mandrel through the die-recess, means for forming a section of metal into a ring about the projected mandrel, means to move the mandrel to aline its face with one wall of the die-recess, a plunger adapted to enter said recess, mechanism for  
95 forcing the plunger into the recess to flatten the formed ring about said reduced portion, and mechanism for moving the mandrel to eject the ring from the die-recess, substantially as described.  
100

11. A machine for making washers comprising a frame, a movable mandrel having a reduced portion, a die-recess formed in the machine-bed and surrounding the reduced portion, means to project the mandrel through  
105 the die-recess, means for forming a section of metal into a ring about the projected mandrel, means to move the mandrel to aline its face and one wall of the die-recess, said recess being of larger diameter than the mandrel, a  
110 plunger adapted to force the completed ring into the die-recess and against the face of the latter and the face of the mandrel to flatten the formed ring, and mechanism to move the mandrel to eject the washer from the seat,  
115 substantially as described.

12. A machine for forming washers comprising a mandrel, a die-recess formed in the machine-bed, means to project the mandrel through the die-recess, means for forming a  
120 section of metal into a ring about the projected mandrel, means to move the mandrel to aline its face with one wall of the die-recess, mechanism for compressing said ring against the face of the recess and mandrel to flatten  
125 the formed ring, and means for moving the mandrel to eject the washer, substantially as described.

13. A machine for making washers, comprising a movable member having a detachable  
130



mandrel provided with a reduced end, a die-recess formed in the machine-bed and surrounding said reduced portion of the mandrel, means for holding the mandrel to maintain its end as  
 5 a part of the face of said recess, a plunger for compressing the ring against the face of the recess, and means for moving the mandrel to eject the washer, substantially as described.

14. A machine for making washers having  
 10 a bed-plate formed with a die-recess, a mandrel through the recess, means for projecting the mandrel through the recess, means for forming a ring about the mandrel of the same exterior diameter as the recess, means for with-  
 15 drawing the mandrel to aline its forward end with the wall of the recess, a plunger to compress the ring in said recess, and means to regulate the interior diameter of the ring during such compression.

20 15. A machine for making washers comprising a frame, a mandrel having a reduced end to determine the diameter of the hole of a washer, a die-recess formed in the machine-bed of larger diameter than the mandrel and  
 25 surrounding the same, means to project the mandrel through the die-recess, means for forming a section of metal into a ring about the projected mandrel, means for alining the face of the mandrel and the die-recess, a plun-  
 30 ger whose diameter equals that of the die-recess, and mechanism for forcing the plunger into the recess to flatten the ring against the face of the mandrel about the reduced end and

against the face of the die-recess to flatten the formed ring, substantially as described. 35

16. A machine for making washers comprising a mandrel, a die-recess formed in the machine-bed of larger diameter than the mandrel and surrounding the same, means to project the mandrel through the recess, means to  
 40 retract the mandrel and aline its face and one wall of the die-recess, a plunger for forcing the ring into the recess against the face thereof and the face of the mandrel and compress the said ring, such pressure flattening the metal  
 45 over the face of the mandrel, and mechanism for moving the mandrel to eject the completed washer from the seat, substantially as described.

17. A machine for making washers, com- 50  
 55 prising a bed-plate, a mandrel having a reduced end, means to reciprocate the mandrel through the bed-plate, a horizontally-movable plunger to flatten the formed ring about said reduced end when the mandrel is withdrawn, the mandrel moving fully rearward to eject the ring therefrom, and means to force the ring from the end of the plunger, substantially as described.

In testimony whereof I have signed my name 60  
 to this specification in the presence of two subscribing witnesses.

HUBERT C. HART.

Witnesses:

GEORGE E. TAFT,  
 JNO. IMIRIE.