(No Model.) 6 Sheets—Sheet 1.

# L. COOK.

## MACHINE FOR SWAGING WIRE.

No. 591,454. Patented Oct. 12, 1897.

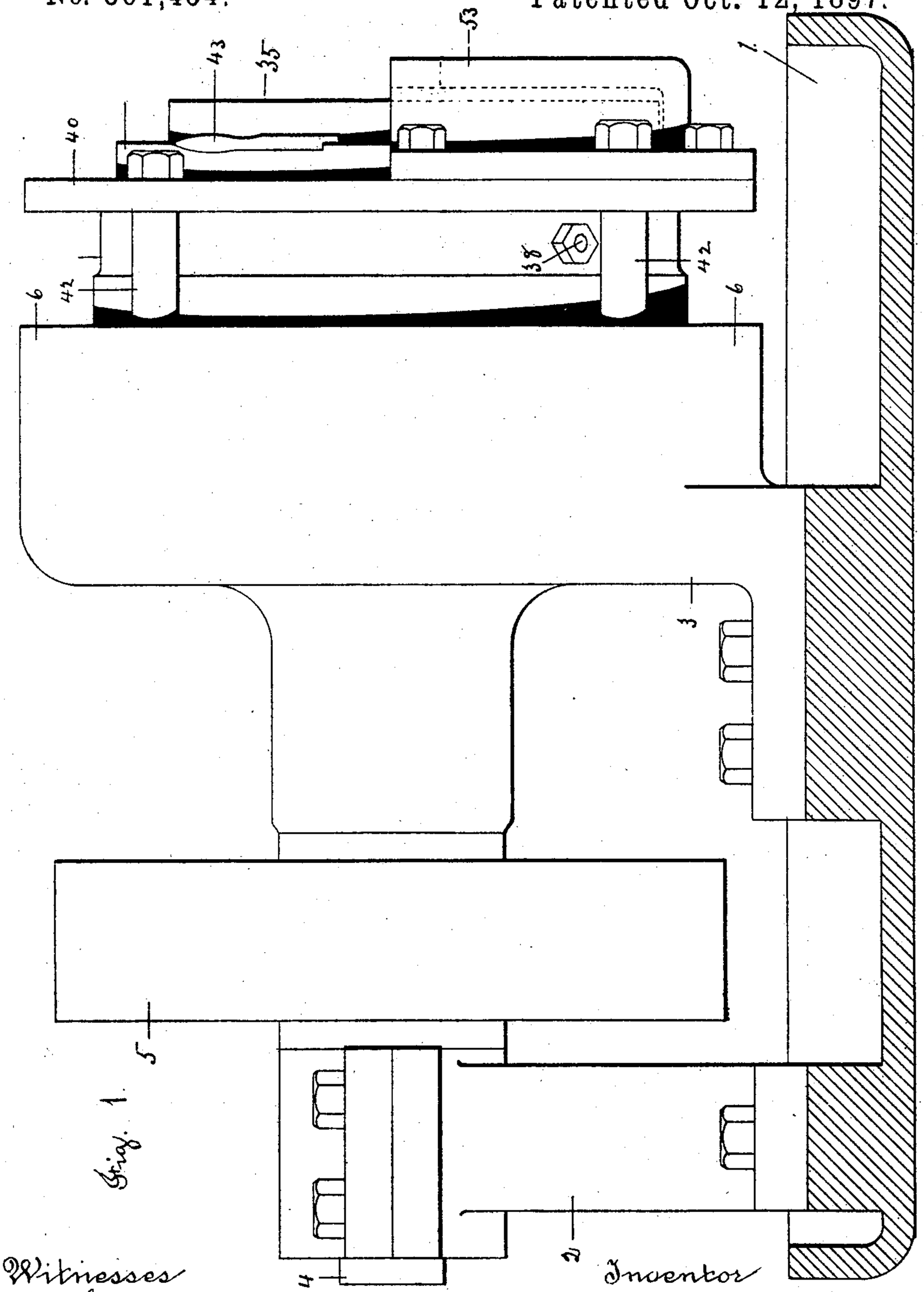


Fig. 1.

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(No Model.) 6 Sheets—Sheet 2.

# L. COOK.

## MACHINE FOR SWAGING WIRE.

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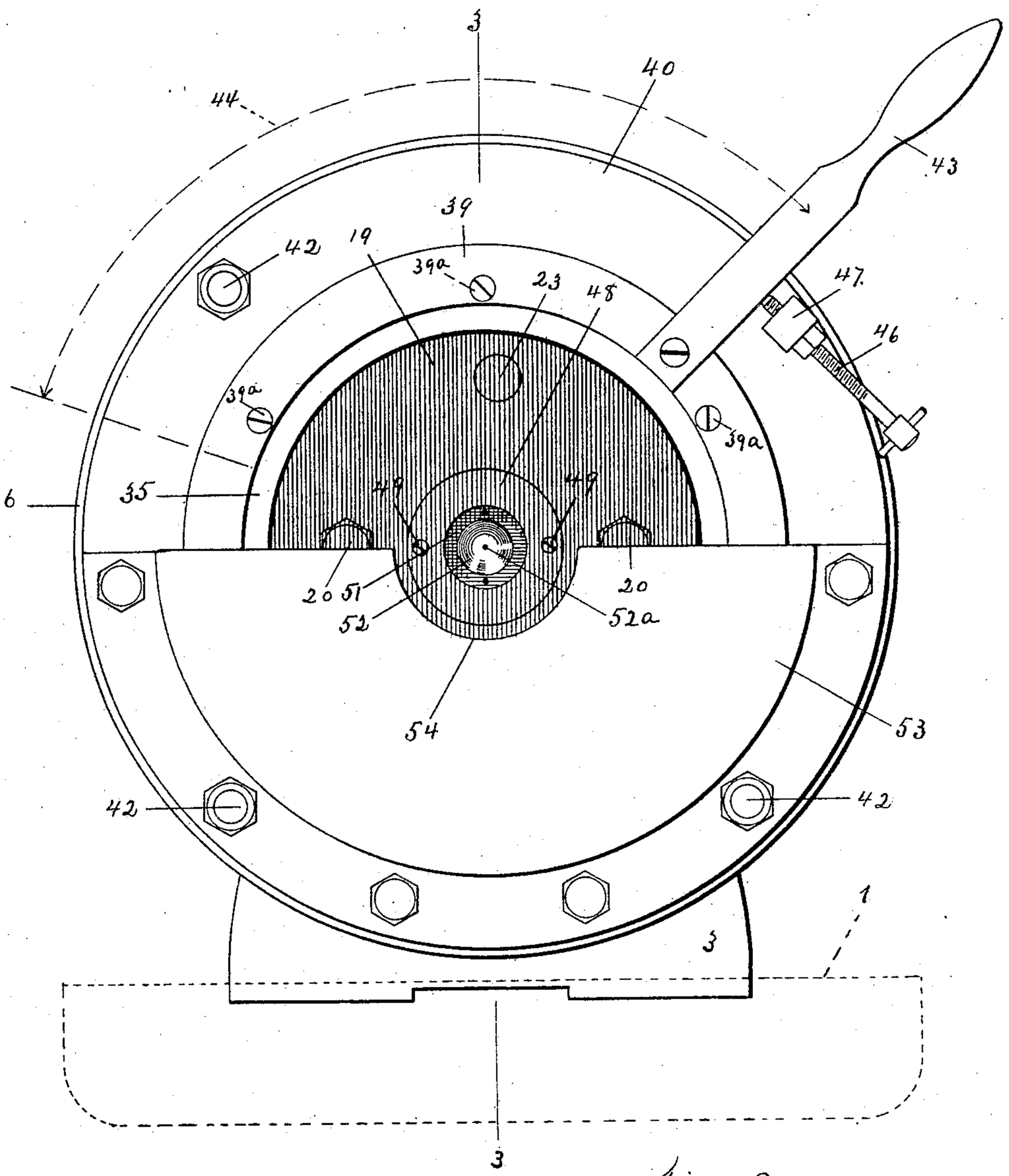


Fig. 2.

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6 Sheets—Sheet 3.

# L. COOK.

## MACHINE FOR SWAGING WIRE.

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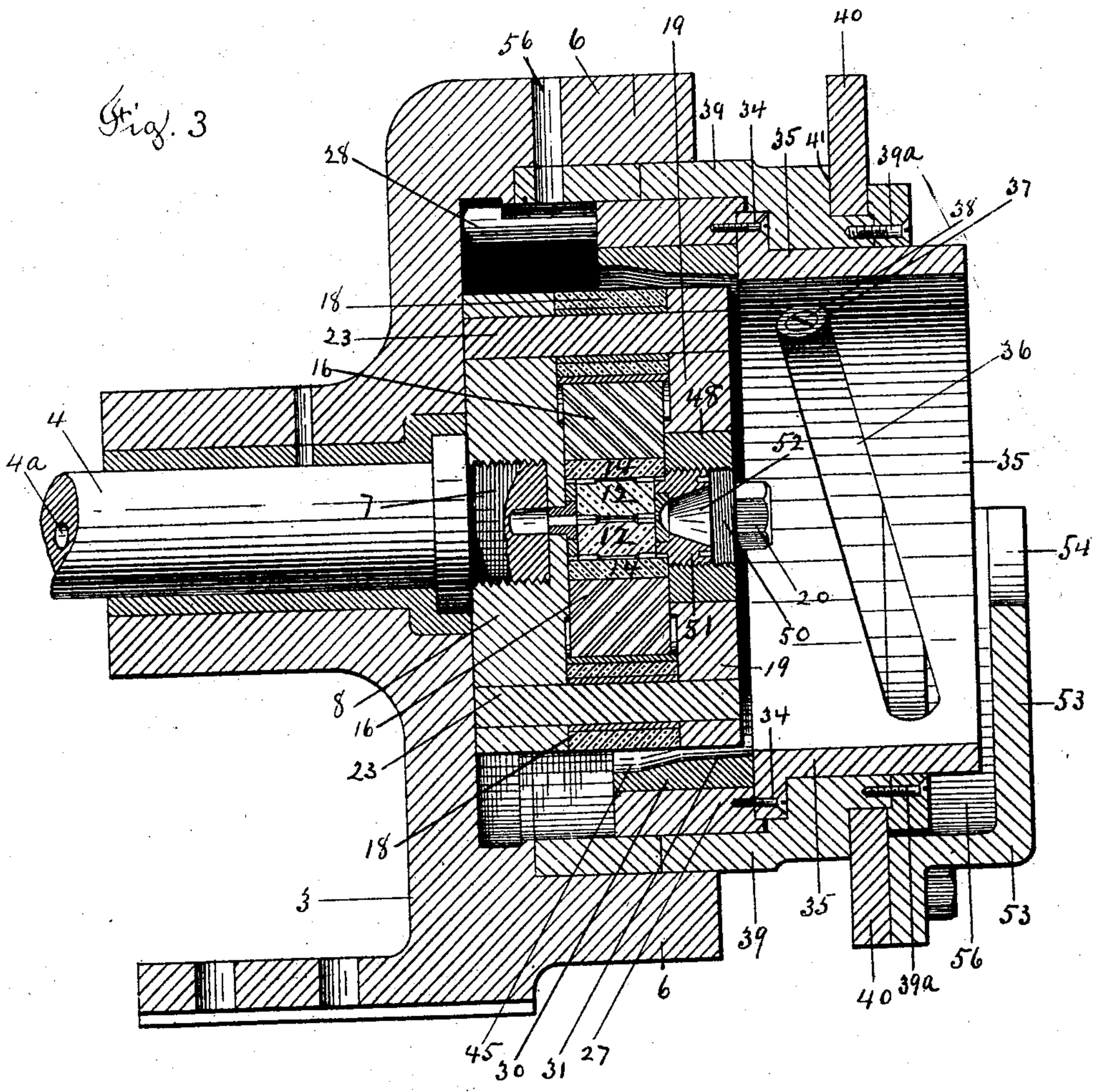
Fig. 3

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(No Model.) 6 Sheets—Sheet 4.

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## MACHINE FOR SWAGING WIRE.

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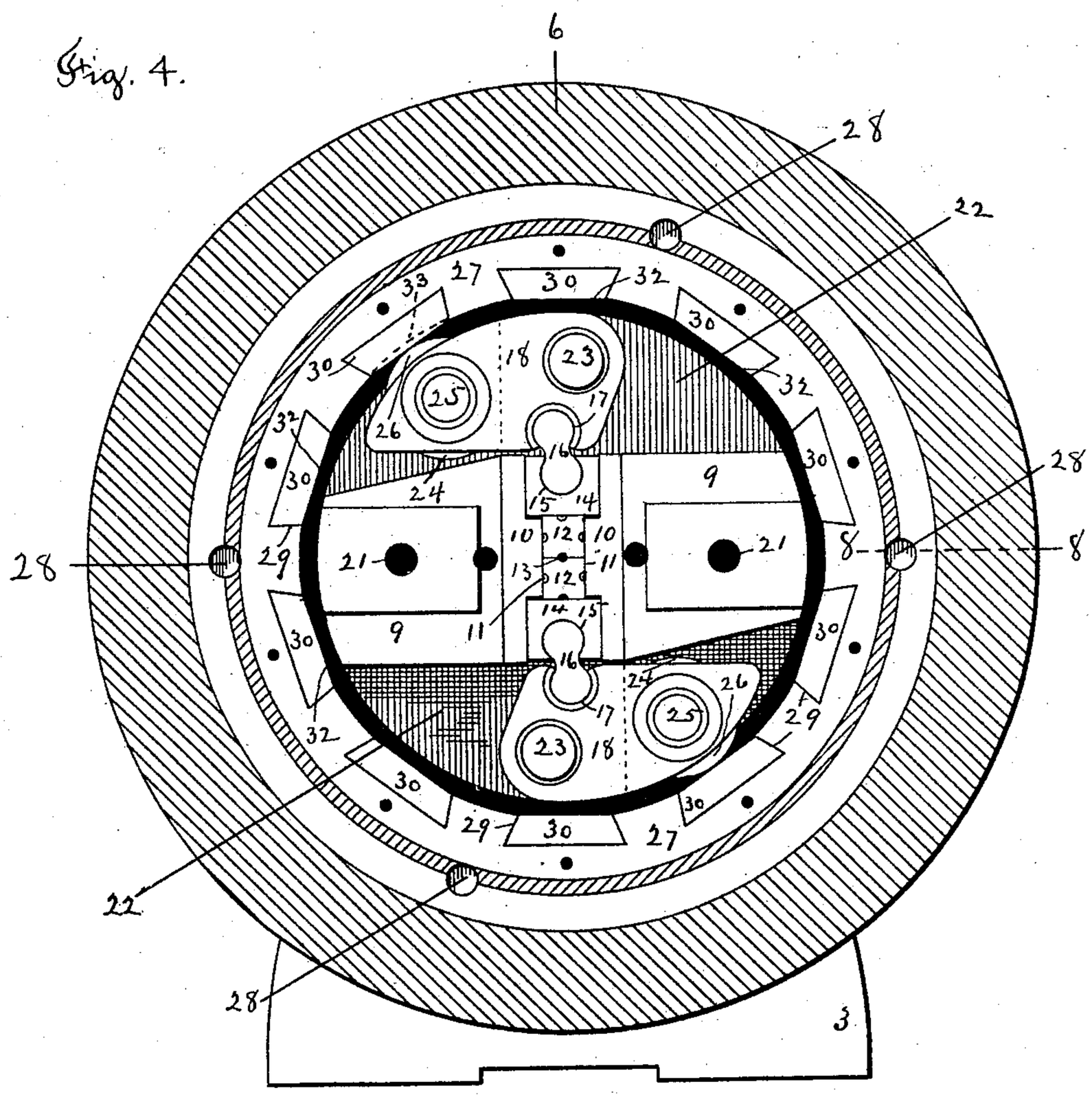
Fig. 4.

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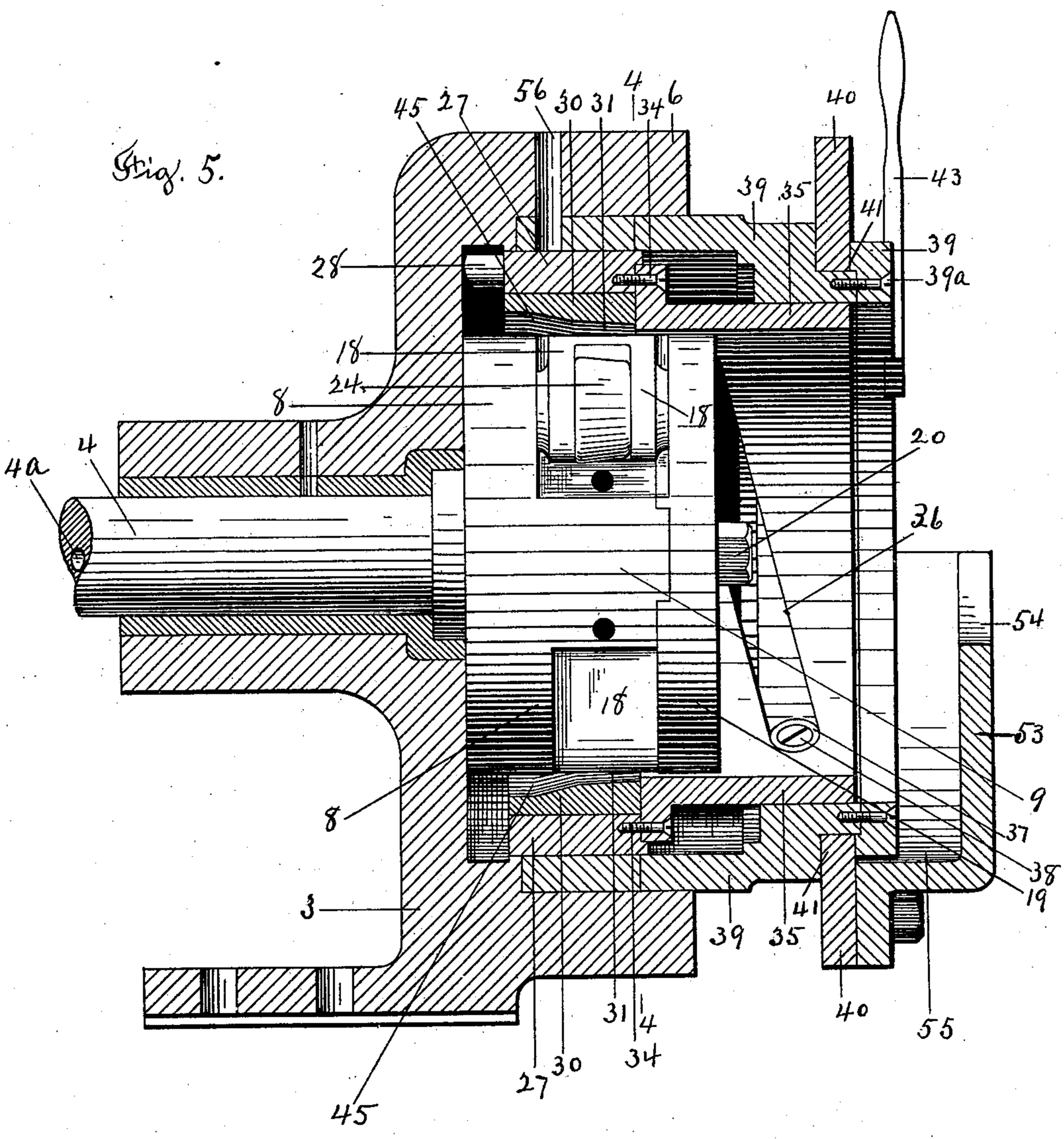
(No Model.) 6 Sheets—Sheet 5.

# L. COOK.

## MACHINE FOR SWAGING WIRE.

No. 591,454. Patented Oct. 12, 1897.

Fig. 5.

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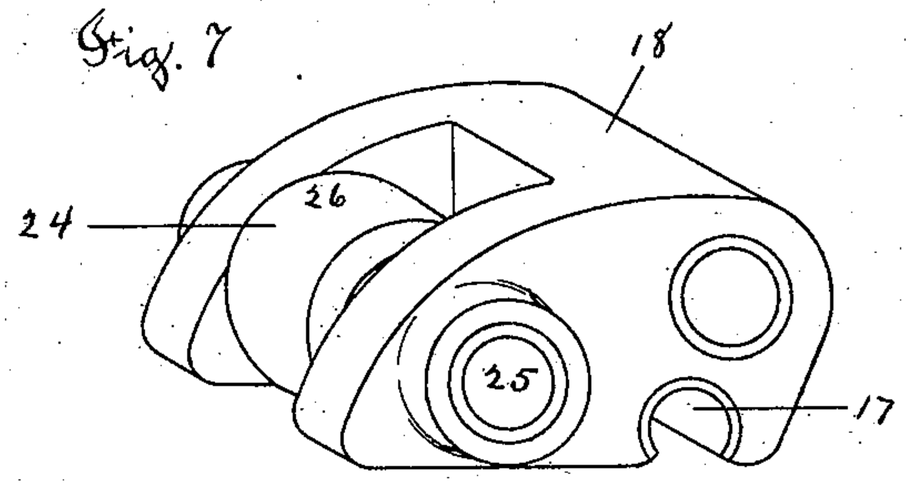
(No Model.) 6 Sheets—Sheet 6.

# L. COOK.

## MACHINE FOR SWAGING WIRE.

No. 591,454. Patented Oct. 12. 1897.

Fig. 7



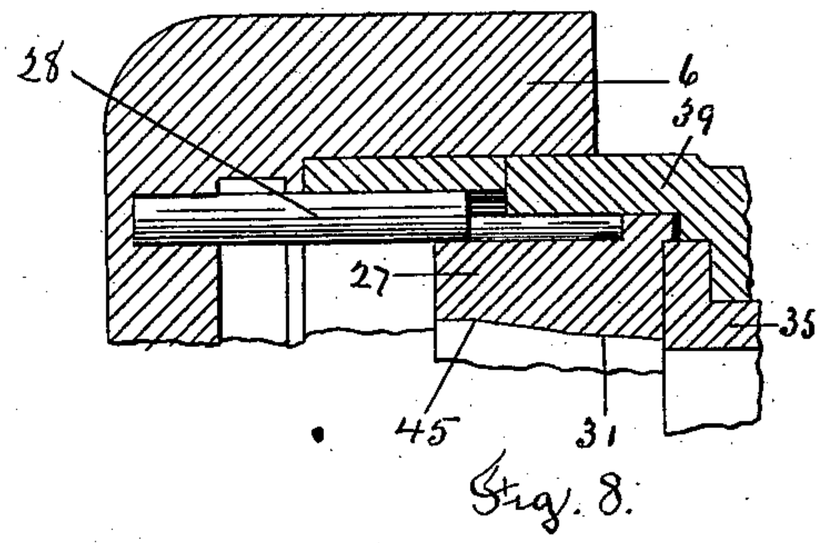
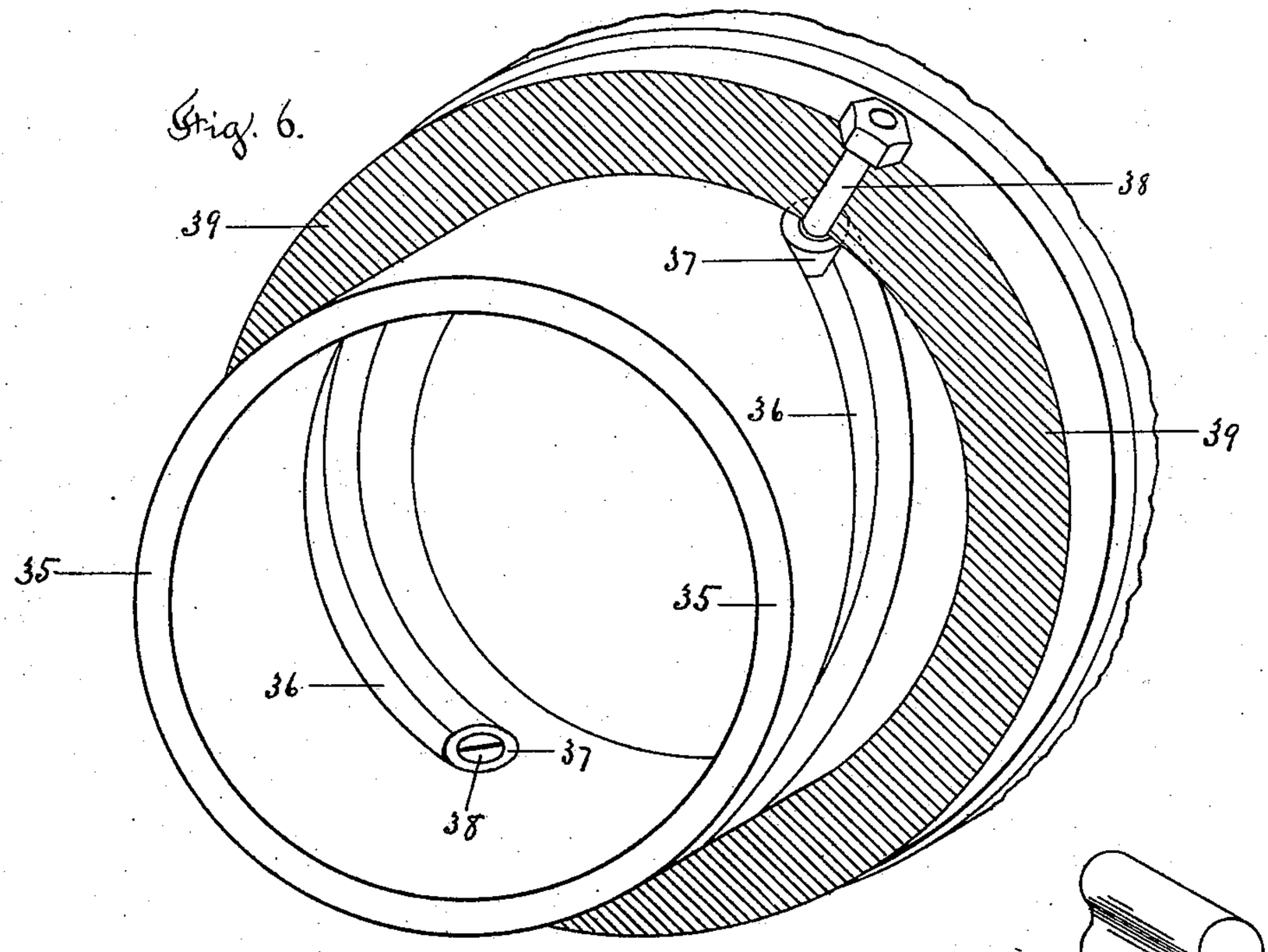




Fig. 8.

Fig. 6.



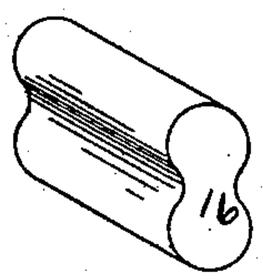




Fig. 9.

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# UNITED STATES PATENT OFFICE.

LEROY COOK, OF WORCESTER, MASSACHUSETTS.

## MACHINE FOR SWAGING WIRE.

SPECIFICATION forming part of Letters Patent No. 591,454, dated October 12, 1897.

Application filed June 15, 1895. Serial No. 552,970. (No model.)

*To all whom it may concern:*

Be it known that I, LEROY COOK, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Improvement in Machines for Swaging Wire, of which the following is a specification, reference being had to the accompanying drawings, forming a part of the same, and in which—

Figure 1 represents a side elevation of a wire-swaging machine embodying my invention. Fig. 2 is an end view of the same. Fig. 3 is a central sectional view on line 3 3, Fig. 2, the cam-ring being shown as drawn out. Fig. 4 is a vertical sectional view of the fixed shell on line 4 4, Fig. 5, the rotating portion of the head and the cam-ring inclosed by said shell being shown in full, but with the front plate removed from the rotating portion of the head in order to disclose the pivoted hangers and swaging-dies. Fig. 5 is a central sectional view of the non-rotating portion of the head shown on line 3 3, Fig. 2, with the cam-ring moved in so it will be engaged by the rolls of the hanger, the rotating portion of the head being shown in full. Fig. 6 is a perspective view of the spirally-grooved barrel which is attached to the sliding cam-ring, a portion of the inclosing ring which carries the rolls engaging the spiral slots of the barrel being shown in sectional view. Fig. 7 is a perspective and detached view of one of the hangers. Fig. 8 is a sectional view of a portion of the fixed shell and sliding cam-ring on line 8 8, Fig. 4; and Fig. 9 is a perspective view of one of the links by which the angular movement of the hangers is imparted to the swaging-dies.

Similar figures refer to similar parts in the different views.

My present invention relates to that class of wire-swaging machines employed in the manufacture of needles, bicycle-spokes, and other purposes in which a pair of swaging-dies are rotated about a piece of wire held between them and are made to impart a series of blows upon the wire, by which it is compressed and reduced in size; and my invention consists in the features of construction and arrangement of parts, as hereinafter described, and specifically pointed out in the annexed claims.

Referring to the accompanying drawings, 1 denotes a base-plate upon which the machine is mounted and having its edges turned up to form an oil pan or reservoir. Mounted upon the base-plate 1 is a bracket 2 and a stand 3, each having a journal-bearing for a rotating hollow shaft 4, provided with a concentric hole $4^a$ and carrying a belt-pulley 5, by which power is applied to the machine.

Projecting from the side of the stand 3 is a cylindrical flange forming a shell or case 6 and inclosing the operative mechanism, which, with the inclosing shell 6, I term the "head" of the machine.

The end of the shaft 4, projecting within the shell 6, is provided with a screw-thread 7, upon which is secured the circular back plate 8, having ribs 9 9 projecting from the side of the back plate 8 and extending from opposite sides toward the center of the plate. To the inner ends of the ribs 9 are preferably attached the hardened-steel plates 10 10, their opposing faces forming the side walls of a central slot 11, in which are placed the swaging-dies 12 12, with the faces of the dies provided with semicircular recesses, those on the faces in contact forming a cylindrical opening 13 with its axis coincident with the axis of the rotating shaft 4. The slot 11 is enlarged at its ends to afford room for the pressure-blocks 14 14, which bear against the dies 12 12 and are provided with circular recesses 15 15 to receive the inner ends of the links 16 16. The outer ends of the links 16 are received in similar circular recesses 17 17, formed in the pivoted hangers 18 18.

Upon the face of the ribs 9 I place a circular plate 19 of the same diameter as the back plate 8 and forming the front plate, which is attached to the ribs 9 by bolts 20, entering the screw-holes 21 in the ribs. The spaces between the back plate 8 and the front plate 19 and upon either side of the ribs 9 9 form chambers 22, in which are placed the hangers 18, pivoted upon pins 23 23, which are held in the plates 8 and 19. The free ends of the hangers 18 are forked to receive the rolls 24 24, which are carried upon spindles 25 25, held in the hangers, with the edge of

the rolls projecting beyond the outer edge of the hangers, as at 26 26.

Within the cylindrical shell 6 I place a ring 27, capable of a sliding motion within the shell 6 in a line parallel with the axis of the rotating shaft 4, but held from rotation within the shell by means of the splines 28. The inner surface of the ring 27 is cylindrical and concentric with the axis of the rotating shaft 4 and the plates 8 and 19, and is provided with the equidistant transverse dovetailed grooves 29, in which are placed hardened-steel cam-plates 30.

The cam-plates 30 have their inner surfaces beveled in the direction of their length, as shown at 31, Figs. 3 and 5, but transversely to the cam-plates the inner surfaces are straight, so that in the plane of the rotation of the plates 8 and 19 the inner surfaces of the cam-plates 30 constitute the chords 32 of short circular arms formed by producing the inner surface of the ring 27, as shown by the broken line 33, Fig. 4. The cam-ring 27 is capable of sliding on the splines 28, so as to bring different sections of its inner beveled surface into the plane of the rolls 24, carried by the hangers 18.

The cam-ring 27 is attached by screws 34 to a barrel 35. (Shown in perspective view in Fig. 6.) The barrel 35 is provided on opposite sides with spiral slots 36 36, which are engaged by rolls 37 37, carried upon studs 38 38, held in a ring 39, which surrounds the barrel 35 and is capable of a limited oscillating movement thereon.

The oscillating ring 39 is held from endwise movement by means of an annular plate 40, entering an annular groove 41 in the oscillating ring and held in a fixed position by means of bolts 42. A handle 43 is attached to the oscillating ring 39, and the movement of the handle 43 from the position shown in Fig. 2 through the arc indicated by the broken line 44 carries the rolls 37 through the spiral slots 36 in the barrel 35, thereby imparting an endwise movement to the barrel 35 and connected cam-ring 27 and moving the cam-ring from the position shown in Fig. 5 to that shown in Fig. 3.

The periphery of the rolls 24 are slightly tapering, as represented in Fig. 5, to correspond with the beveled surfaces of the cam-plates 30. When rotary motion is applied to the shaft 4 and the plates 8 and 19 are revolved, carrying the hangers 18, the centrifugal force during the rotation of the shaft 4 will throw the free ends of the hangers 18 outward with the rolls 24, running against the inner surface of the cam-ring 27, and also separating the swaging-dies 12 12 and allow the wire to be swaged to be entered through the concentric opening 13. As the rolls 24 move across the cam-plates 30 the rolls 24 are gradually forced inward until the roll reaches the center of the cam-plate, as represented in Fig. 4, the centrifugal force carrying the roll outward against the inner surface of the cam-ring 27 as it leaves the cam-plate 30. The inward movement of the rolls 24, as they pass over the cam-plates 30, is equal to the versed sine of the arc subtended by a line traveled by the roll and extending from the edge of the cam-plate to its center. As the rolls 24 pass over each of the cam-plates 30 in succession during the revolution of the hangers about the axis of the shaft 4 a slight inward movement will be imparted to the hangers 18, and the inward movement of the free ends of the hangers 18 as the rolls 24 pass over the cam-plates 30 will cause the swaging-dies 12 12 to be pushed toward each other by means of the pressure-blocks 14 14 and links 16 16, causing the wire inserted between the dies to be successively compressed as the rolls 24 pass over the cam-plates, the cam-plates 30 being so arranged that the rolls 24, upon opposite sides of the machine, will bear simultaneously against the center of the cam-plates, so that the compression of the wire will be accomplished by simultaneous and successive movements of the swaging-dies 12 12. The inner ends of the cam-plates 30 are cut away at 45, Figs. 3 and 5. When it is desired to relieve the wire from the compressing action of the swaging-dies during the rotation of the shaft 4, the lever-handle 43 is carried from the position shown in Fig. 2 through the arc indicated by the broken line 44, thereby withdrawing the cam-ring 27 from the position shown in Fig. 5 to that shown in Fig. 3 and bringing the inner ends of the cam-plates 30 over the rolls 24, allowing the centrifugal force of the hangers to throw their free ends outward and permitting the separation of the swaging-dies 12 12. When the cam-ring 27 and cam-plates 30 are moved inward, so as to bring the beveled surface 31 over the tapering peripheries of the rolls 24, an adjustment of the swaging-dies is accomplished by means of an adjusting-screw 46, which is held in a screw-threaded hole in a stud 47, projecting from the side of the annular plate 40, the inward movement of the cam-plates 30 being limited by the contact of the lever-handle 43 with the end of the adjusting-screw 46.

The front plate 19 is provided with a concentric opening to receive a ring 48, which is attached by screws 49 to the ribs 9 9 and is provided with an internal screw-thread 50 to receive a screw-threaded ring 51, provided with a funnel-shaped depression 52, which terminates in a concentric hole in alinement with the cylindrical opening 13 between the swaging-dies 12. Bolted to the lower side of the annular plate 40 is a semicircular plate 53, provided with a semicircular opening 54 to afford space for feeding wire to the machine and inclosing a trough-shaped chamber 55. The shell 6 is provided with an oil-hole 56 at the top, through which a stream of oil is fed to the rotating parts of the head inclosed

within the shell 6, and the plate 53 serves as a dam to check the flow of oil from the operating parts of the machine and form a reservoir of oil extending from the bottom of the trough-shaped chamber 55 up to the lowest point of the semicircular opening 54, so that the rotation of the shaft 4 will cause the hangers 18 to be successively submerged in a reservoir of oil held back by the plate 53. The plate 53 is carried some distance forward of the operating mechanism, so that it not only prevents the escape of oil from the machine, but forms a reservoir with a portion exposed at the front of the machine, thereby permitting access to the reservoir and allowing the oil contained therein to be removed when it becomes gritty.

The operation of my improved swaging-machine is as follows: Rotary motion is applied to the shaft 4, and the lever-handle 43 is moved from the position represented in Fig. 2 toward the left through the arc indicated by the broken line 44, thereby rotating the ring 39. The rotation of the ring 39 moves the rolls 37 along the spiral slots 36 in the barrel 35, thereby imparting an endwise movement to the barrel 35 and sliding the cam-ring 27 from the position shown in Fig. 5 to that shown in Fig. 3, allowing hangers 18 to be thrown outward, carrying the rolls 24 outward into the space 45 and allowing the centrifugal force to separate the swaging-dies 12 12. The wire to be swaged is then inserted through the concentric opening 13 between the swaging-dies, and the lever-handle 43 is moved over against the adjusting-screw 46 into the position shown in Fig. 2, thereby reversing the motion of the barrel 35 and cam-ring 27 and moving the cam-ring into the position represented in Fig. 5, bringing the beveled surfaces 31 of the cam-plates 30 over the rolls 24, causing a slight angular motion to be imparted to the hangers 18 as the rolls 24 pass over the cam-plates 30, causing the wire to be squeezed between the swaging-dies 12 12 at each angular movement of the hangers 18, the amount of compression of the wire being determined by the adjustment of the adjusting-screw 46. The swaging of the wire in my improved machine is effected by means of a compression or squeezing action and not by a blow. The rolls 24 are continually in contact with either the cam-ring 27 or the cam-plates 30, and as the motion of the free end of the hangers is reduced at the swaging-dies by the leverage of the hanger any irregularity in the motion of the hanger due to wear upon the bearing-surfaces of the rolls 24 and cam-plates 30 is reduced in amount at the swaging-dies. By pivoting the hangers 18 upon the rotating plates 8 and 19 I accomplish the swaging of the wire by the use of two hangers only and produce as many compressions of the wire during each rotation of the shaft 4 as there are cam-plates 30 in the ring 27, enabling me to largely increase the swaging action of the machine for each revolution of the shaft 4. I pivot the hangers 18 with their axes parallel to the axis of the rotating head, so the rocking motion of the hangers will lie in their plane of rotation, thereby relieving the hangers from torsional strain.

I am also able by the construction of my machine to greatly decrease the wear of the bearing-surfaces by increasing the area of the surfaces subjected to pressure during the swaging action of the dies.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a machine for swaging wire, the combination of a rotating plate, swaging-dies carried by said rotating plate, pins projecting from the side of said plate with their axes parallel with the axis of said rotating plate, hangers pivoted upon said pins and operatively connected with said dies to bring them together, and an inclosing ring provided with a series of stationary cam-surfaces arranged in the path of said pivoted hangers whereby said hangers are successively brought into contact with said cam-surfaces, thereby imparting a rocking motion to said hangers in the plane of said inclosing cam-plate, substantially as described.

2. In a machine for swaging wire, the combination with a rotating plate provided with ways for a pair of swaging-dies, of a pair of swaging-dies capable of sliding in said ways, pins projecting from the side of said rotating plate with their axes parallel with the axis of said plate, hangers pivoted upon said pins and operatively connected with said dies, rolls carried by the free ends of said hangers, and an inclosing ring provided with cam-surfaces arranged in the path of said rolls, whereby said hangers are given a rocking motion in the plane of their rotation, substantially as described.

3. In a machine for swaging wire, the combination of a rotating plate, swaging-dies carried by said rotating plate, pivoted hangers carried by said rotating plate and operatively connected with said dies, whereby said dies are brought together by the angular motion of said hangers, an inclosing ring provided with stationary cam-surfaces arranged concentrically to said rotating plate and in the path of said hangers, said ring being capable of a sliding motion in a direction parallel with the axis of said rotating plate, and means for moving said ring, whereby said cam-surfaces are withdrawn from the path of said hangers, substantially as described.

4. In a machine for swaging wire, the combination of a rotating plate, swaging-dies carried by said rotating plate, pivoted hangers carried by said rotating plate and operatively connected with said dies, whereby the angular motion of said hangers will bring said dies together, a ring concentric with said rotating plate and provided with a series of

transverse dovetailed grooves, and a series of detachable hardened-steel plates held in said grooves and provided with cam-surfaces arranged in the path of said hangers, substantially as described.

5. In a machine for swaging wire, the combination of a rotating plate, swaging-dies carried by said rotating plate, pivoted hangers carried by said rotating plate and operatively connected with said hangers, whereby said dies are brought together by the angular movement of said hangers, a ring concentric with said rotating plate and capable of sliding in a direction parallel with its axis, but held from rotation, tapering rolls carried by the free ends of said hangers, said ring having a series of cam-surfaces arranged in the path of said rolls, said cam-surfaces being beveled to correspond with the tapering surfaces of said rolls and means for moving said ring in a direction parallel with its axis, whereby the angular motion of said hangers is varied, substantially as described.

6. In a machine for swaging wire, the combination with a rotating plate, swaging-dies and die-operating mechanism, substantially as described, carried by said plate, of a concentric ring provided with a series of cam-surfaces arranged in the path of said die-operating mechanism, said ring being held from rotation, but capable of sliding in a direction parallel with its axis, a barrel attached to said ring and provided with spiral slots, an oscillating ring concentric with said barrel, rolls carried by said oscillating ring and entering said spiral slots, whereby an endwise motion is imparted to said barrel by the rotation of said oscillating ring, substantially as described.

7. In a machine for swaging wire, the combination of a rotating plate and swaging-dies and die-operating mechanism, substantially as described, carried by said plate, of a concentric ring provided with beveled cam-surfaces arranged in the path of the die-operating mechanism carried by said rotating plate, a barrel attached to said concentric ring and provided with spiral slots, an oscillating ring, rolls carried by said oscillating ring and entering said spiral slots, a lever-handle projecting from said oscillating ring and an adjusting-screw held by the fixed framework of the machine in the path of said handle, substantially as described.

8. In a machine for swaging wire, the combination of a rotating plate provided with ways for a pair of swaging-dies, swaging-dies capable of sliding in said ways, pressure-blocks bearing against said dies, pins projecting from the side of said rotating plate, hangers pivoted upon said pins and having their axes parallel with the axis of said rotating plate, links entering between said hangers and said pressure-blocks, rolls carried by the free ends of said hangers, a ring concentric with said rotating plate and provided with cam-surfaces arranged in the path of said rolls, whereby an angular motion is imparted to said hangers in the plane of their rotation and said dies brought together, substantially as described.

9. In a machine for swaging wire, the combination of a shaft, a plate carried by said shaft, swaging-dies and die-operating mechanism carried by said rotating plate, a shell inclosing said rotating plate and provided with an oil-hole at the top and a semicircular plate attached to the fixed portion of the machine and at some distance forward of the operating mechanism and serving as a dam to check the flow of oil from the interior of said shell and form an oil-reservoir in which a portion of the die-operating mechanism is submerged, substantially as described.

10. In a machine for swaging wire, the combination of shaft 4, plate 8 attached to said shaft, having ribs 9, 9, inclosing a slot 11, swaging-dies 12, 12, held in said slot, plate 19 attached to said ribs 9, 9, and forming chambers 22, 22, hangers 18, 18, pivoted to said plates 8 and 19, pressure-blocks 14, 14 bearing against said dies, links 16, 16 inserted between said pressure-blocks and said hangers, rolls 24, 24, held in the free ends of said hangers and a concentric ring provided with a series of cam-surfaces in the path of said rolls, substantially as described.

11. In a machine for swaging wire, the combination of a rotating shaft, a head carried by said shaft, swaging-dies carried by said rotating head, levers pivoted at one end on said head and operatively connected with said swaging-dies, a shell or case inclosing said rotating head, a ring held in said shell concentrically with said rotating head and provided with transverse grooves, cam-plates held in said transverse grooves and provided with tapering inner surfaces, rolls carried by said pivoted levers and provided with tapering peripheries corresponding with the tapering surfaces of said cam-plates, said cam-plates having their ends abutting against said shell, whereby they are held from endwise movement in said ring, substantially as described.

12. In a machine for swaging wire, the combination of a rotating shaft, a rotating head carried by said shaft and provided with ways for a pair of swaging-dies, swaging-dies capable of sliding in said ways, pressure-blocks resting against said dies and provided with semicircular recesses, levers pivoted in said rotating head and provided with semicircular recesses, links 27 provided with circular ends fitting said semicircular recesses, in said levers and pressure-blocks, and an inclosing ring provided with cam-surfaces arranged in the path of said levers, as they are carried by said rotating head, whereby said swaging-dies are crowded together, substantially as described.

13. In a machine for swaging wire, the combination of a rotating shaft, a plate attached to said shaft and provided with a rib extend-

ing diametrically across said plate, said rib having a transverse slot forming ways for a pair of swaging-dies, swaging-dies capable of sliding in said ways, a plate detachably attached to said rib, pins held in said plates, levers pivoted on said pins and held in the spaces between said plates, said levers being operatively connected with said swaging-dies, and means for successively imparting an angular motion to said levers and actuating said swaging-dies, substantially as described.

Dated this 7th day of June, 1895.

LEROY COOK.

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