

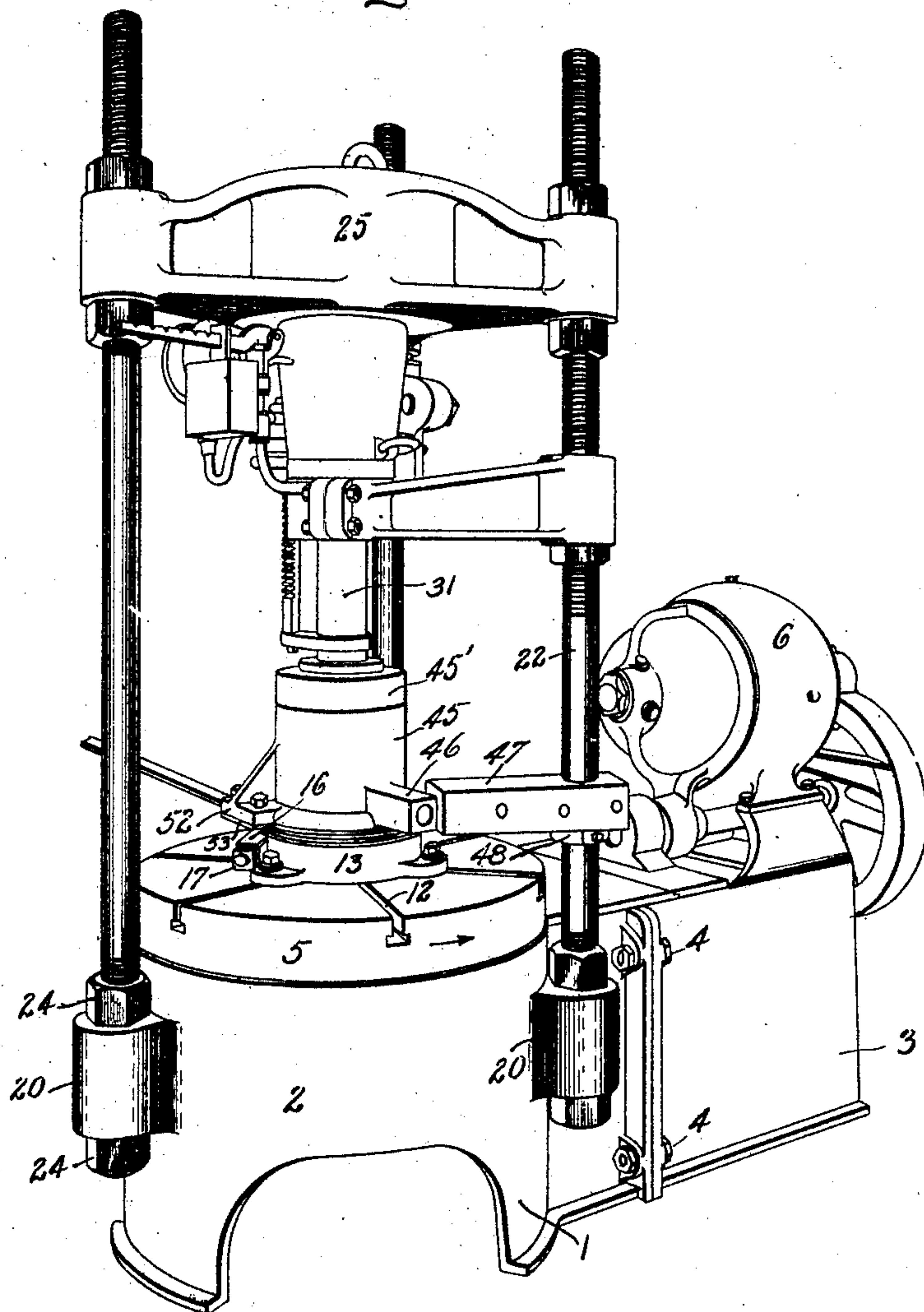
No. 840,050.

PATENTED JAN. 1, 1907.

T. E. DROHAN.
HELIX FORMING MACHINE.
APPLICATION FILED AUG. 1, 1904.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 3.

Fig. 3.

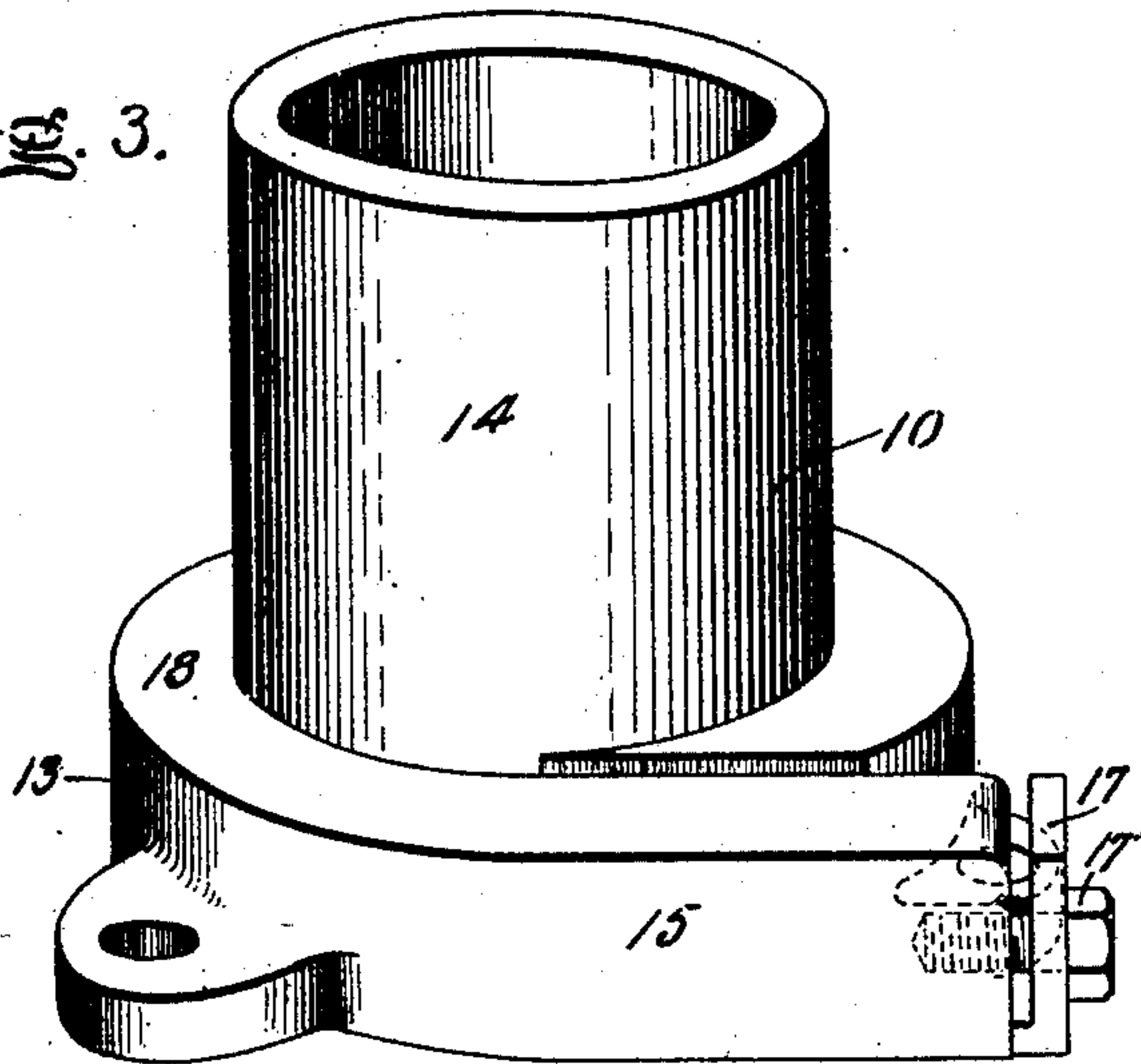


Fig. 4.

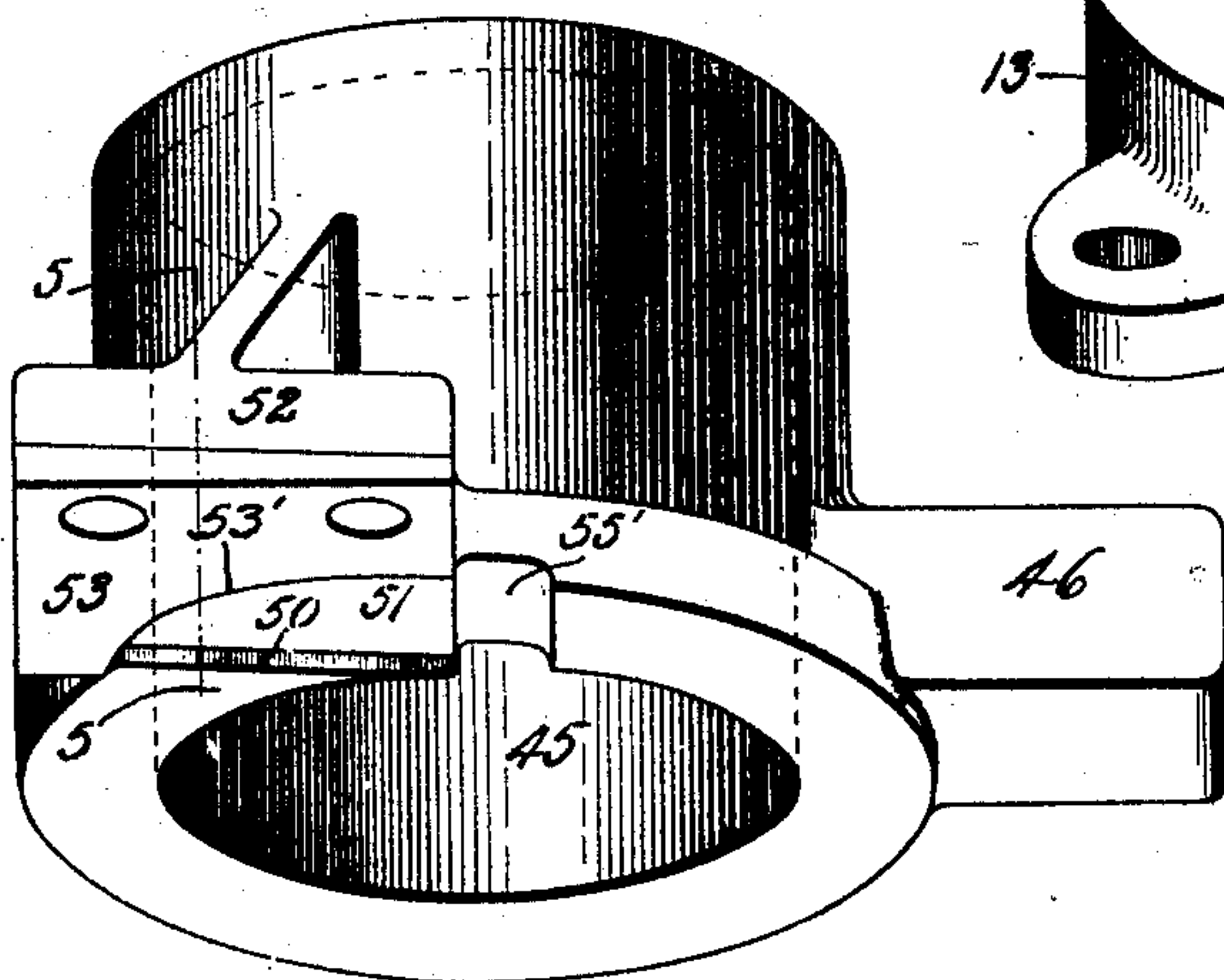


Fig. 5.

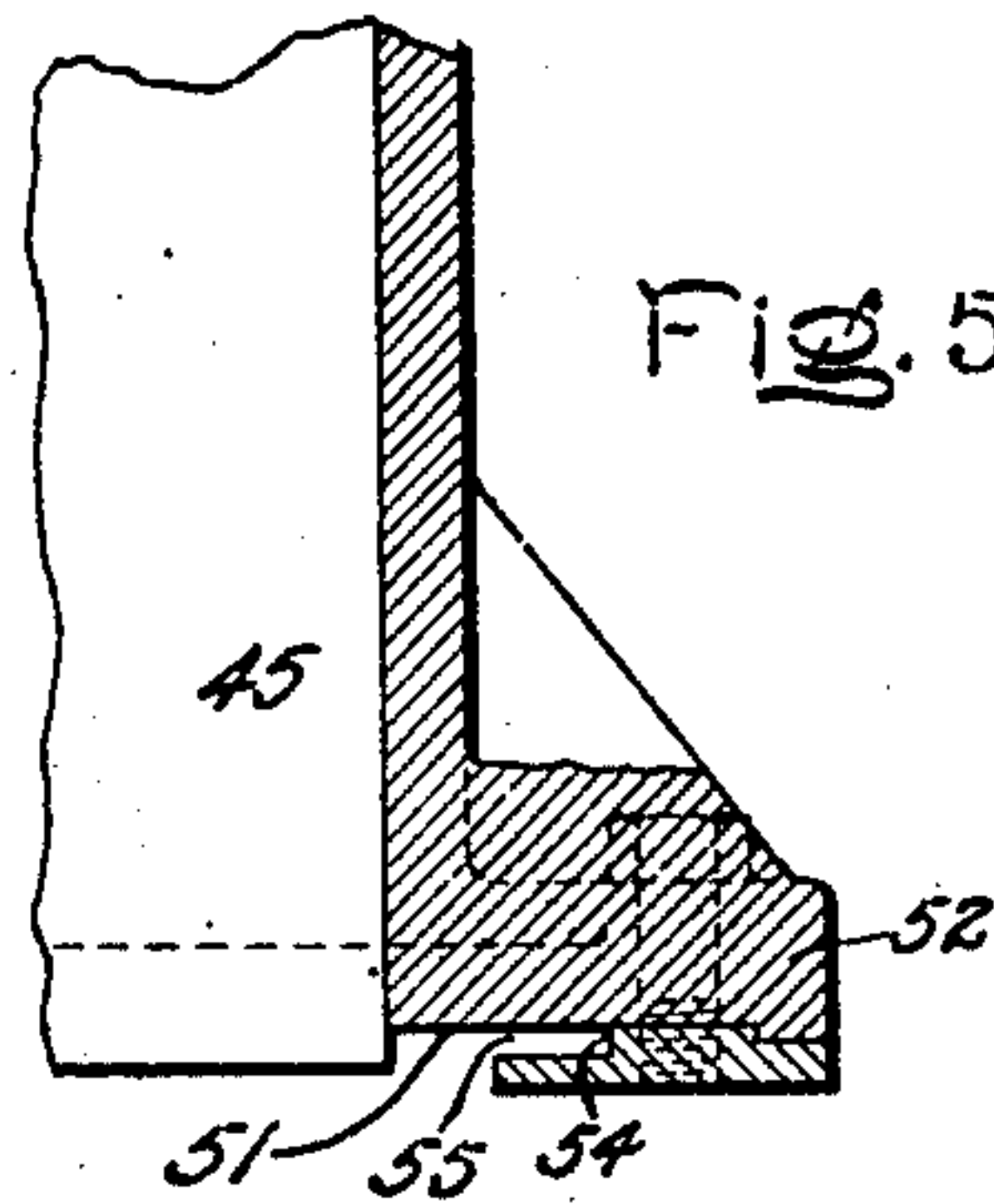
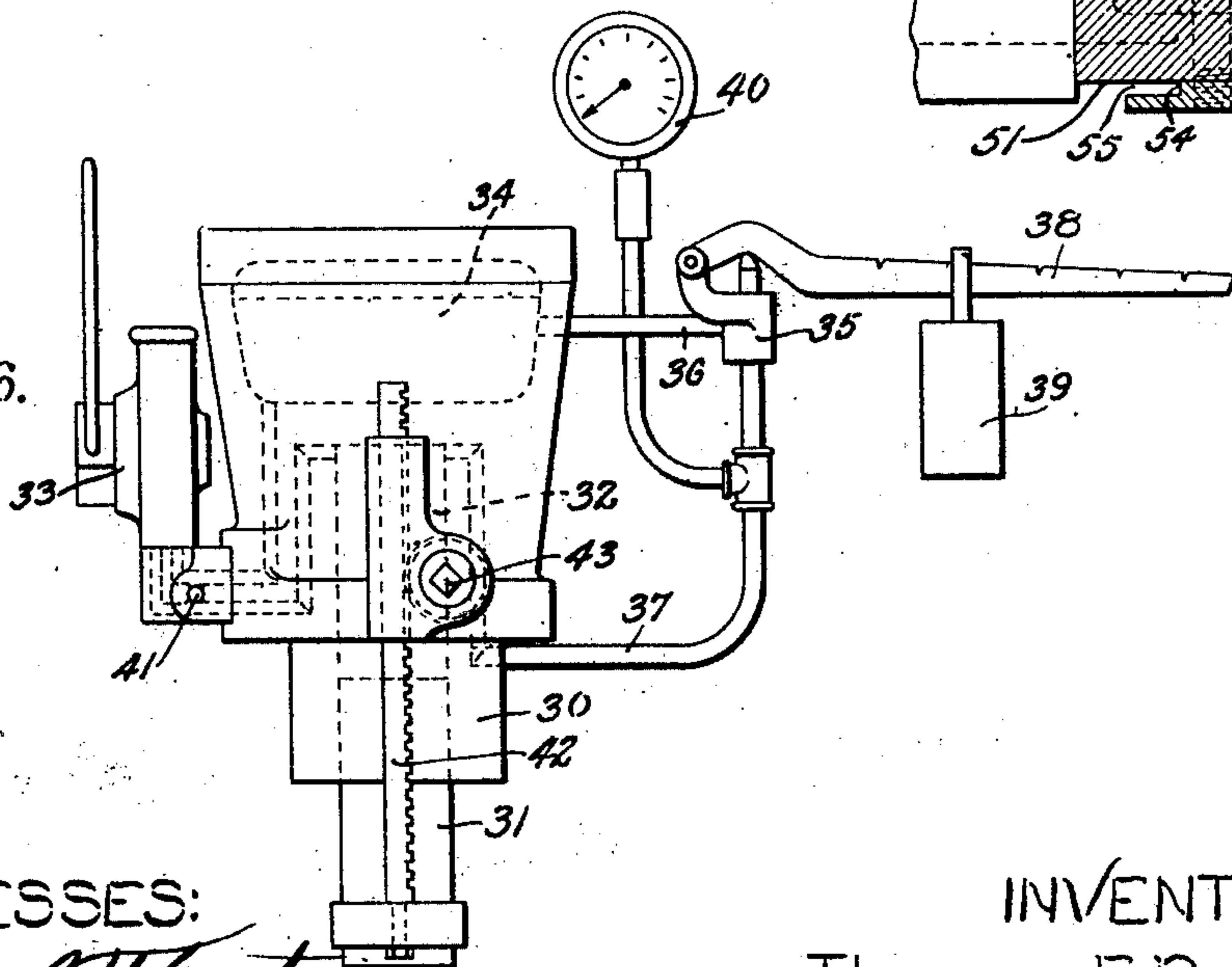


Fig. 6.



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UNITED STATES PATENT OFFICE.

THOMAS E. DROHAN, OF MADISON, WISCONSIN, ASSIGNOR TO NORTHERN ELECTRICAL MANUFACTURING COMPANY, A CORPORATION OF WISCONSIN.

HELIX-FORMING MACHINE.

No. 840,050.

Specification of Letters Patent.

Patented Jan. 1, 1907.

Application filed August 1, 1904. Serial No. 219,013.

To all whom it may concern:

Be it known that I, THOMAS E. DROHAN, a citizen of the United States, residing at Madison, county of Dane, State of Wisconsin, have invented certain new and useful Improvements in Helix-Forming Machines, of which the following is a specification.

My present invention relates to a bending-machine, and more particularly to machines for bending strips or bars of metal edgewise into the helices—such, for instance, as are used for magnetizing purposes in electromagnetic apparatus.

My present invention comprises means for applying pressure to the ends of the helix in the process of its manufacture sufficient to prevent buckling of the turns of the helix and to insure uniformity in the helix.

My invention also comprises many novel and useful features of construction and arrangement whereby a powerful, but simple and efficient, machine is obtained.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of my invention, however, reference may be had to the accompanying description and drawings, in which I have described and illustrated one embodiment of my invention.

Of the drawings, Figure 1 is a perspective elevation of a machine embodying my invention. Fig. 2 is a perspective view of the machine shown in Fig. 1, but taken from a different point of view and with parts of the machine broken away and in section. Fig. 3 is a perspective of the mandrel or arbor. Fig. 4 is a perspective of the sliding follower. Fig. 5 is a partial section on the line 5 5 of Fig. 4, and Fig. 6 is a diagrammatic view illustrating the construction of the fluid-pressure device employed.

Referring to the drawings, 1 represents the base of the machine. The base 1 comprises a vertical cylindrical portion 2 and a lateral extension 3. The base may be formed in two parts secured together by bolts 4, as shown. The upper end of the cylindrical portion 2 carries a pivotally-mounted disk-shaped table, head, or platform 5. A back-gear electric motor 6, mounted on the lateral extension 3 of the base, rotates the table

5 through suitable speed-reducing gearing 7, which may be mounted within the base 1. 55

A vertical mandrel or arbor 10, which may be made tubular, as shown, is secured to the table 5 by clamping-bolts 11, the heads of which are located in the radially-extending T-shaped slots 12, formed in the upper surface of the table 5. 60

The mandrel 10 comprises a lower base portion 13 and an upper cylindrical portion 14 of reduced diameter. A portion 15 of the base 13 extends tangentially to the periphery of the portion 14. The lower end of the bar 16, out of which the helix is formed, is bent over the end of the extension 15, to which it is secured by a clamp 17 and horizontal bolt 17', tapped into the extension 15. 65 The bar 16 is wound about the portion 14 of the mandrel to form a helix in a manner hereinafter described. The upper surface 18 of the base 13 forms a shoulder against which the lower end of the helix bears. The surface 18, which is of a width about equal to the width of the bar or strap 16, is machined to have the same shape as the lower side of one turn of the helix to be formed on the mandrel. The upper surface of the extension 15 is a continuation of the portion of the surface 18 corresponding to the lower end of the turn of the helix. 75

Apertured lugs 20 are formed on the side of the cylindrical portion 2 of the base. In these lugs vertical rods or bars 21, 22, and 23, threaded at their ends, are secured by nuts 24. The rods 21, 22, and 23 may be spaced equally apart and be of the same diameter, though in the construction shown the rods 21 and 23 are slightly thicker than the rod 22 and are separated from each other by an angle of rather more than one hundred and twenty degrees. A cross-head 25 is adjustably secured to the upper ends of the rods 21, 22, and 23 by nuts 26. An arm 27 is swiveled on the rod 22 between its ends, being supported against downward movement by a nut 28. The outer end of the arm 27 carries the fluid-pressure device 29. 85 90 95

The fluid-pressure device 29 comprises a member 30, secured to the arm 27, and a piston member 31, which slides in a cylindrical chamber 32, formed in the member 30. A hand-operated pump 33 forms a means for forcing oil or other suitable working fluid 100 105

from a reservoir 34, located in the upper end of the member 30, into the cylindrical chamber 32 to force the piston 31 downward. An automatic pressure-relief valve 35 allows a flow of the working fluid from the upper end of the cylindrical chamber 32 to the reservoir 34, through pipes 36 and 37, whenever the pressure in the cylindrical chamber 32 exceeds a predetermined amount. The pressure at which the valve 35 operates is controlled by an arm 38, on which an adjustable weight 39 is carried. A pressure-indicator 40, connected to the pipe 37, shows the pressure of the working fluid in the chamber 32 at any instant. A by-pass valve 41 forms a means for connecting the reservoir 34 and chamber 32 to allow the piston 31 to be adjusted. A rack-bar 42, the teeth of which mesh with the teeth of a pinion carried by the squared shaft 43, to which an operating-handle may be applied, serves as a means for adjusting the piston 31.

A movable tubular follower or sleeve 45 slides on the portion 14 of the mandrel 10. The follower 45 is formed with a projection 46, which bears against the end of a stop 47, adjustably carried by the rod 22. The stop 47 is held up by an adjustable collar 48, clamped to the rod 22. The lower end of the follower 45 is machined to have the same shape as the upper side of one turn of the helix formed on the mandrel 10. A shoulder 50, extending tangentially from the periphery of the portion 14 of the mandrel, is formed at the intersections of the portions of the end surface of the follower corresponding to the ends of the turn of the helix. The lower surface 51 of an integral extension 52 from the sleeve 45 forms a continuation of the portion of the surface which corresponds to the upper end of the turn of the helix. A guide-plate 53, formed of steel, is secured to the extension 52 by bolts passing through the extension 52 and tapped into the plate. This plate is grooved at 54 to form the bottom and one side wall of a passage or channel 55, through which the bar 16 passes. The lower surface of the extension 52 forms the top wall of this passage. The shoulder 50 forms the other side wall of the passage. The guide-plate 53 is cut away at 53' to clear the outer periphery of the helix.

In the use of my invention the bar or rod 16 to be formed into a helix is passed through the channel 55 and the inserted end is secured to the extension 15, as described. The bar then extends tangentially in each direction from the periphery of the portion 14 of the mandrel. It will of course be understood that in removing or replacing the follower 45 the arm 27 is swung into the position shown in Fig. 2, in which case the piston 31 is out of line with the mandrel 10. After the follower 45 is in place the arm 27 is swung around to bring the piston 31 in line

with the follower 45. The upper end of the member 30 then bears against the abutment formed by the cross-head 25. The pump 33 is then operated to force the lower end of the piston against a spacer or follower 45', located between it and a follower 45 with any desired amount of pressure. The motor 6 is then started to revolve the table 5 in the direction indicated by the arrow in Fig. 1. Owing to the engagement between the extension 46 and the stop 47, the follower 45 cannot participate in this rotation. As a result the bar 16 is wound about the portion 14 of the mandrel 10.

To facilitate the formation of a smooth helix, the channel or passage 55 is inclined at a somewhat greater angle to a plane transverse to the axis of the helix than is the main under end surface of the follower. A recess 55' is formed in the end of the follower adjacent the intersection of the channel and the helical end surface of the follower.

As the pressure increases in the cylinder, owing to the elevation of the follower 45 by the increase in length of the helix being formed, the valve 35 will allow the transfer of the working fluid from the chamber 32 to the reservoir 34 just fast enough to maintain the pressure exerted upon the upper end of the helix at any desired constant amount. The yielding pressure thus exerted is sufficient to prevent any buckling or distortion of the turns of the helix, thus insuring a perfect helix.

When the helix is completed, the pressure on the piston 31 is released by the proper operation of the valve 41 and the arm 27 is swung back into the position shown in Fig. 2. The follower 45 may then be removed, and after loosening the bolt 17 the helix may be removed from the mandrel.

It will of course be understood that different sized and shaped mandrels and followers may be employed to form helices of different dimensions. While I have hereinbefore described in detail the best form of my invention now known to me, it is obvious that many changes can be made in the form in which my invention is embodied without departing from its spirit, and I do not intend the claims hereinafter made to be limited more by the embodiment shown than is made necessary by the state of the art.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a coil-forming machine, a rotating head or table, an arbor carried thereby, an abutment, and a pressure-applying device movable into and out of the position in which it is in line with said arbor and engages said abutment.

2. In a bending-machine, a former about which an object may be bent, a follower, an abutment, a device for applying pressure to the object being bent about said former, and

supporting means for the device which permit said device to be moved into and out of the position in which it engages said follower and said abutment.

5 3. In a bending-machine, a rotating arbor, a pressure-applying device, a follower mounted on said arbor and positioned independently of said device, and means for moving said device into and out of the position in
10 which it engages said follower.

4. In a bending-machine, a support, a rotating arbor mounted thereon, a follower, a cross-head carried by the support, and a pressure-applying device pivoted to the support
15 and movable into and out of position in which it engages said follower and said cross-head.

5. In a bending-machine, an arbor, a follower sliding thereon, said follower and said
20 arbor being rotatable with respect to each other, and a pressure-exerting device for engaging said follower mounted to swing into and out of line therewith.

6. In combination, a support, a rotating head mounted thereon, an abutment also
25 carried by the support, an arbor about which a helix is wound with one end engaging said head, and a yielding pressure-exerting device extending between said abutment and the
30 end of the helix remote from said head.

7. In a machine for forming coils out of bars, a mandrel upon which the bar is bent into a coil, and means for applying a constant pressure to the ends of the coil as its
35 length increases, said means comprising a fluid-pressure device provided with a pressure-relief device.

8. In a bending-machine, a support, a table pivotally mounted thereon, an arbor carried thereby, a follower cooperating with the
40 arbor, a cross-head extending parallel to the table and connected to the support by bolts or posts, an arm pivotally connected to one of said posts, and a fluid-pressure device carried thereby and adapted to be swung into
45 and out of the position in which one end engages the cross-head and the other end engages the follower.

9. In a coil-forming machine, an arbor
50 about which a helix is formed, a follower engaging one end of the helix during the process

of its formation and being moved in one direction as the length of the helix increases, and a fluid-pressure device engaging said follower and opposing the movement of the follower. 55

10. In a coil-forming machine, an arbor about which a helix is formed, a follower engaging one end of the helix during the process of its formation and being moved in one
60 direction as the length of the helix increases, and a fluid-pressure device engaging said follower, said fluid-pressure device comprising a piston, a work-chamber and a pressure-relief valve for controlling the pressure of the
65 working fluid in said chamber.

11. In a coil-forming machine, a rotating mandrel about which the coil is formed, and a fluid-pressure device for engaging the end
70 of the coil formed mounted to be swung into and out of line with said mandrel.

12. In combination, a rotating head, an abutment in line with the axis of rotation of said head, and a yielding pressure-exerting device engaging said abutment and extending toward said head, whereby the turns of a
75 helix formed by the rotation of said head are compressed between said head and said pressure device.

13. In a bending-machine, a continuously-rotating head supporting an object to be
80 shaped, an abutment in line with the axis of rotation of said head, and a yielding pressure-exerting device movable into and out of the position in which it engages said abutment and extends toward said head to engage said
85 object.

14. In a coil-bending machine, a support, a rotating head mounted thereon, an abutment carried by the support, an arbor about which a helix may be formed with one end
90 engaging said head, and a yielding pressure-exerting device pivoted to said support and movable into and out of the position in which it engages said abutment and the end of said helix remote from said head. 95

In witness whereof I have hereunto set my hand this 27th day of July, 1904.

THOMAS E. DROHAN.

Witnesses:

THOS. WM. LITTLEWOOD,
EDW. J. REYNOLDS.