

No. 652,518.

Patented June 26, 1900.

P. LINDEMEYR.

MACHINE FOR FORMING SHEET METAL ARTICLES.

(Application filed Feb. 24, 1899.)

5 Sheets—Sheet 1.

(No Model.)

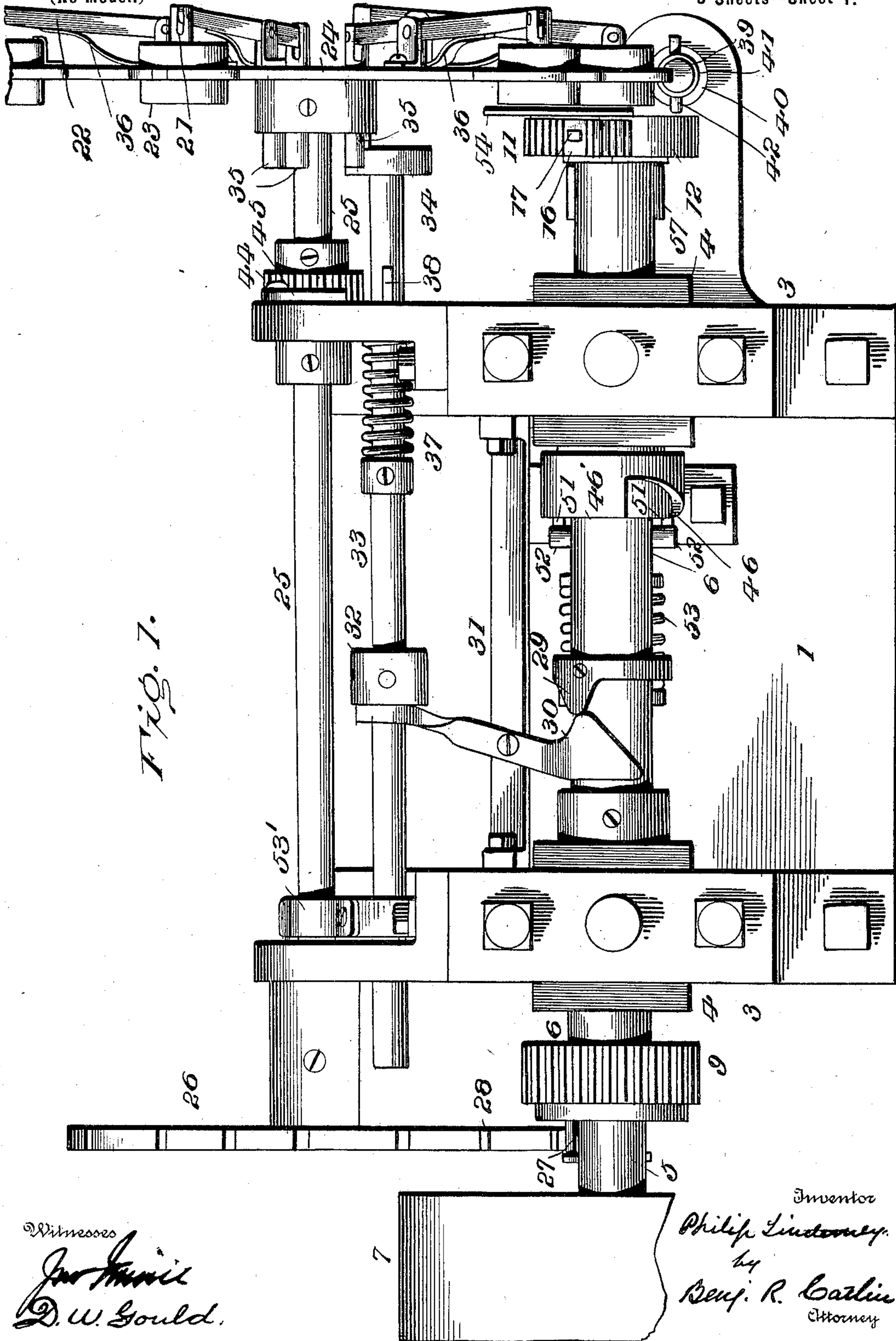


Fig. 1.

Witnesses

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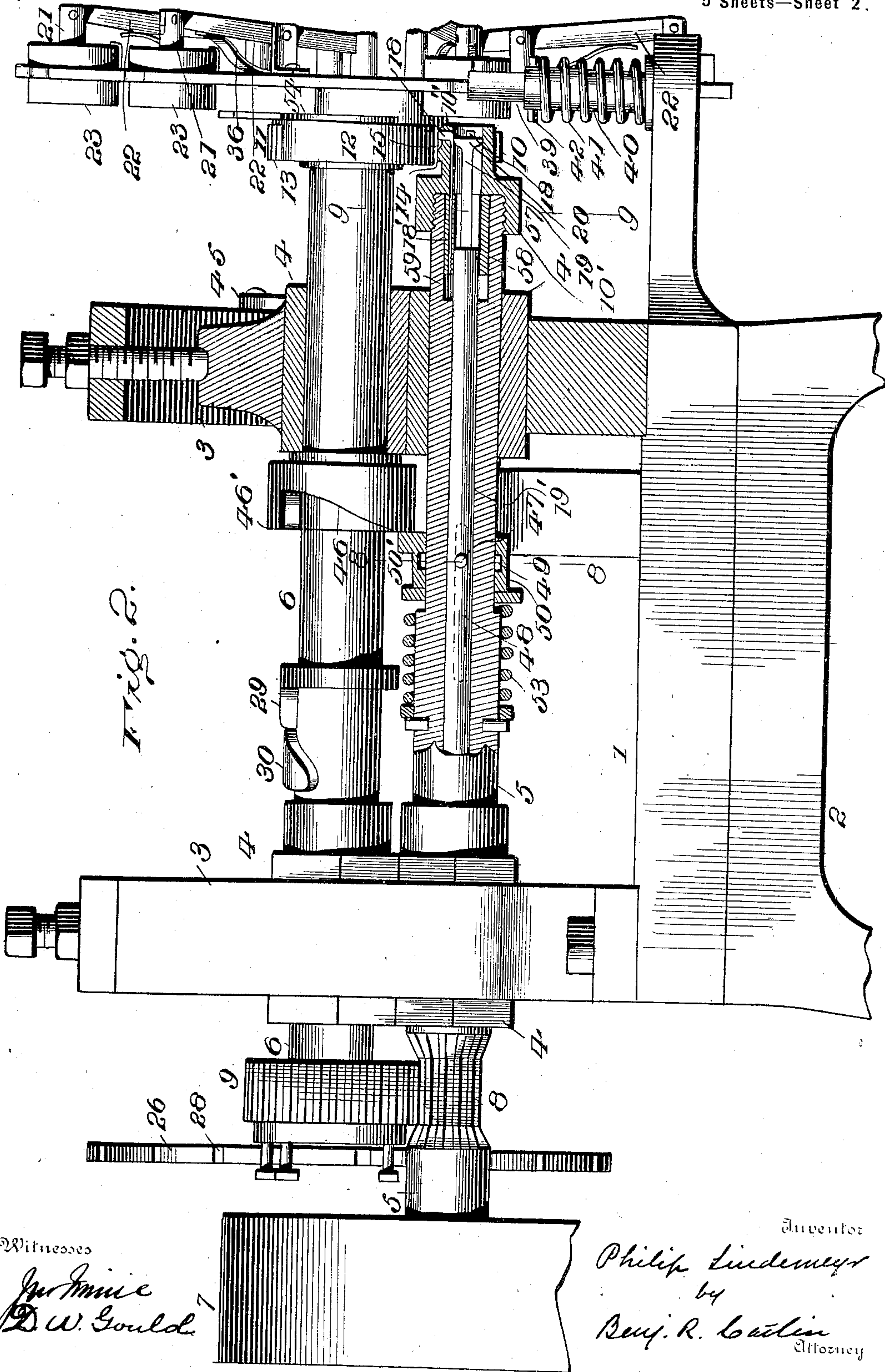
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5 Sheets—Sheet 2.



Witnesses

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Fig. 3.

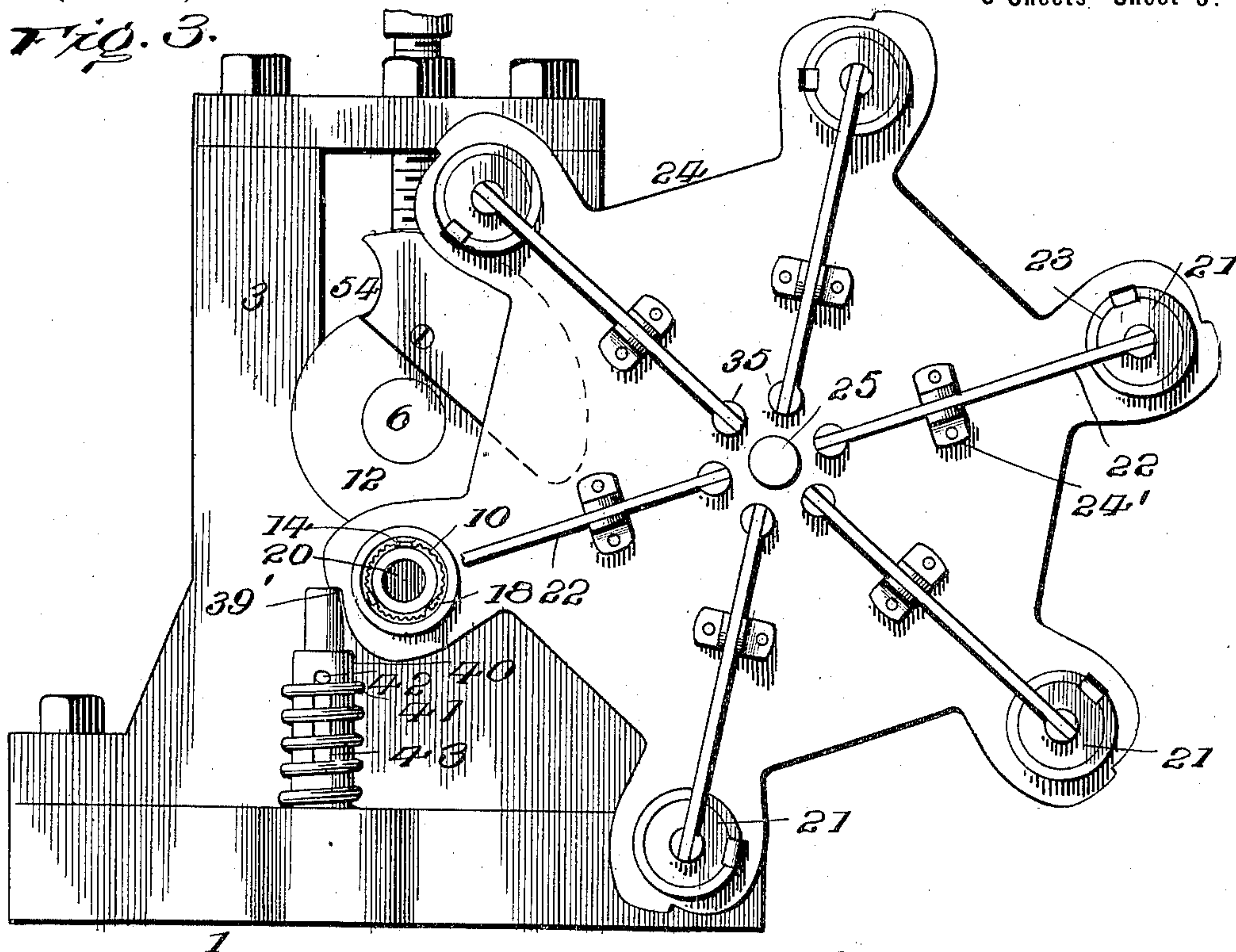
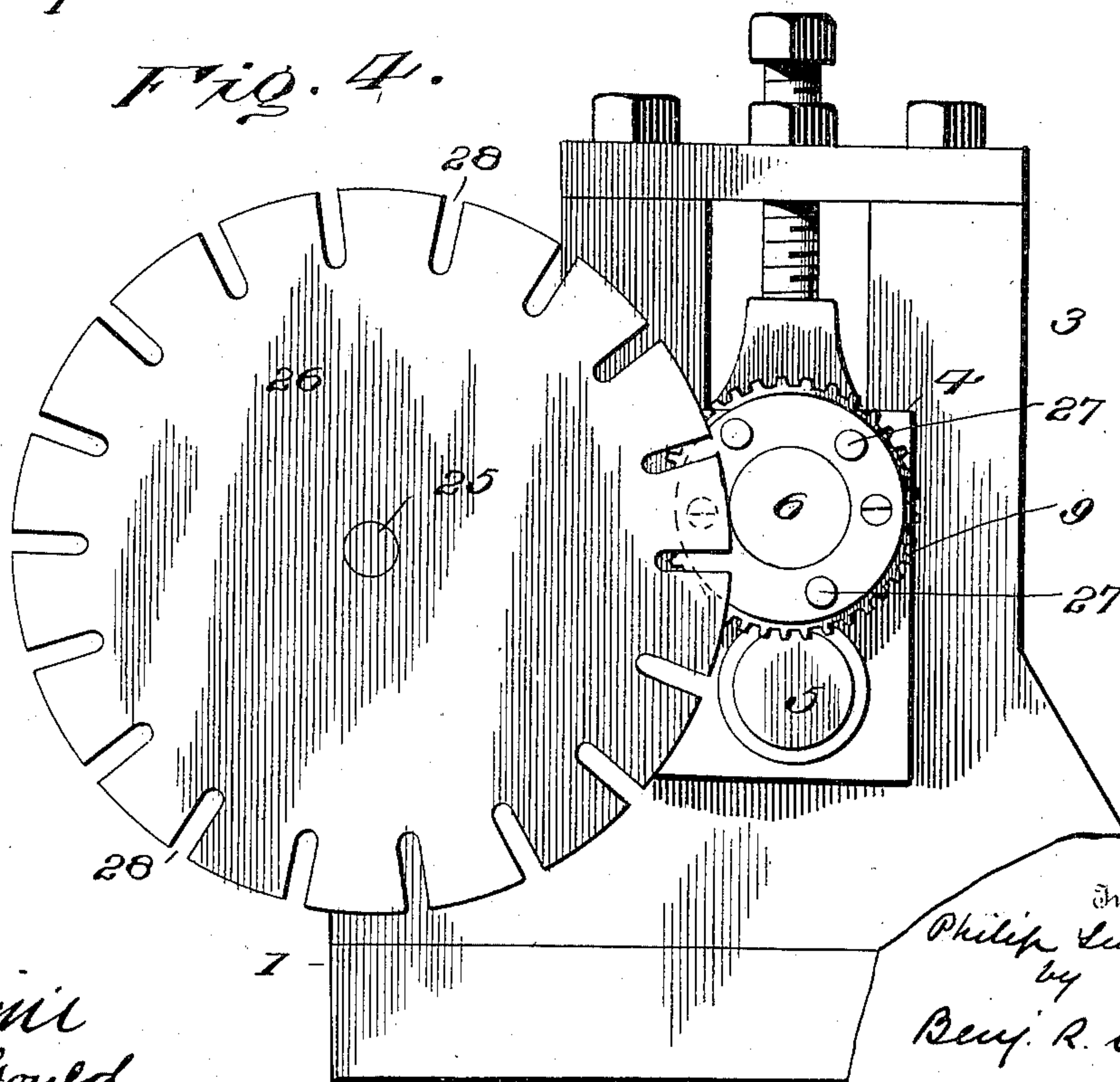


Fig. 4.



Witnesses

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Fig. 5.

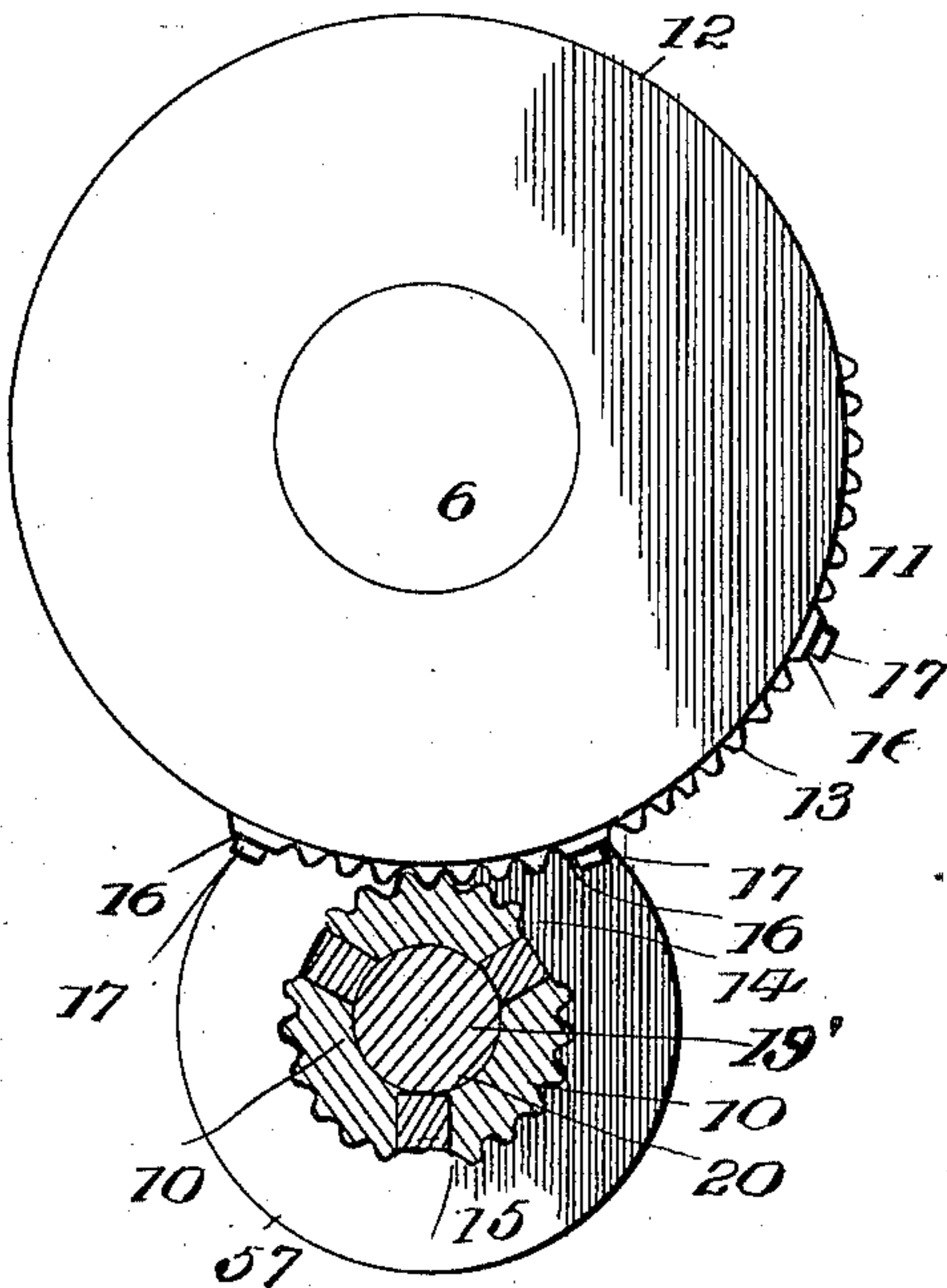


Fig. 6.

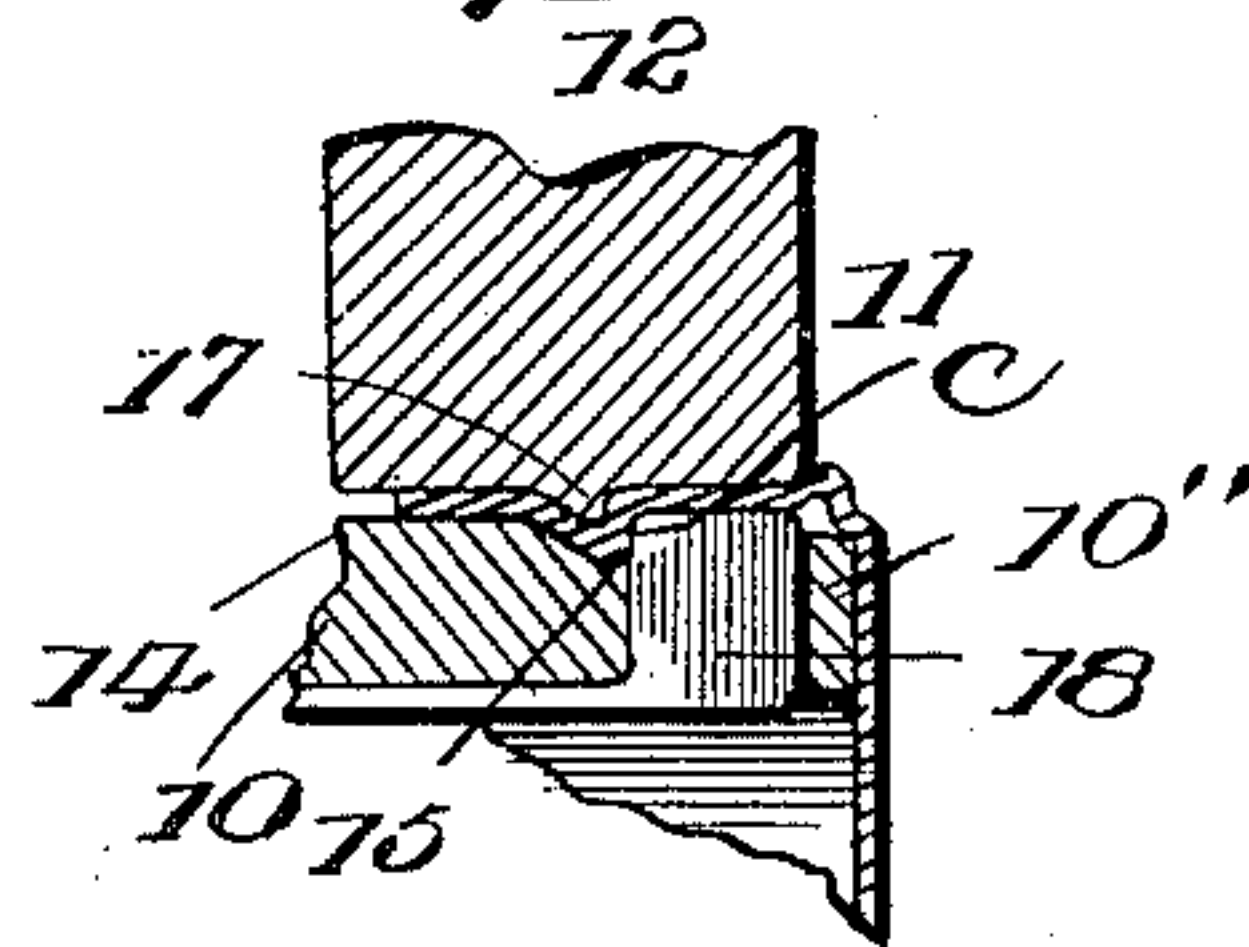


Fig. 7.

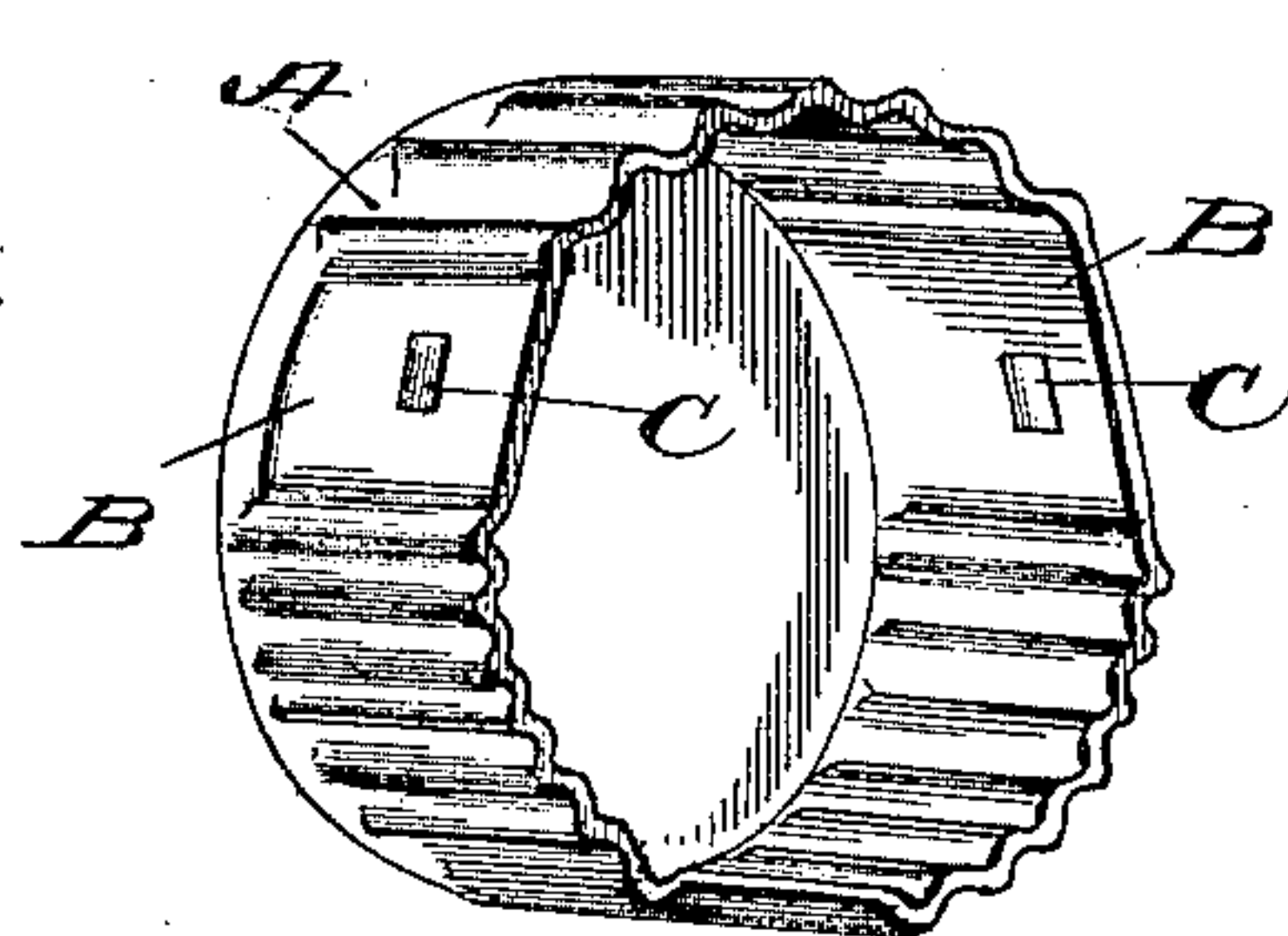


Fig. 8.

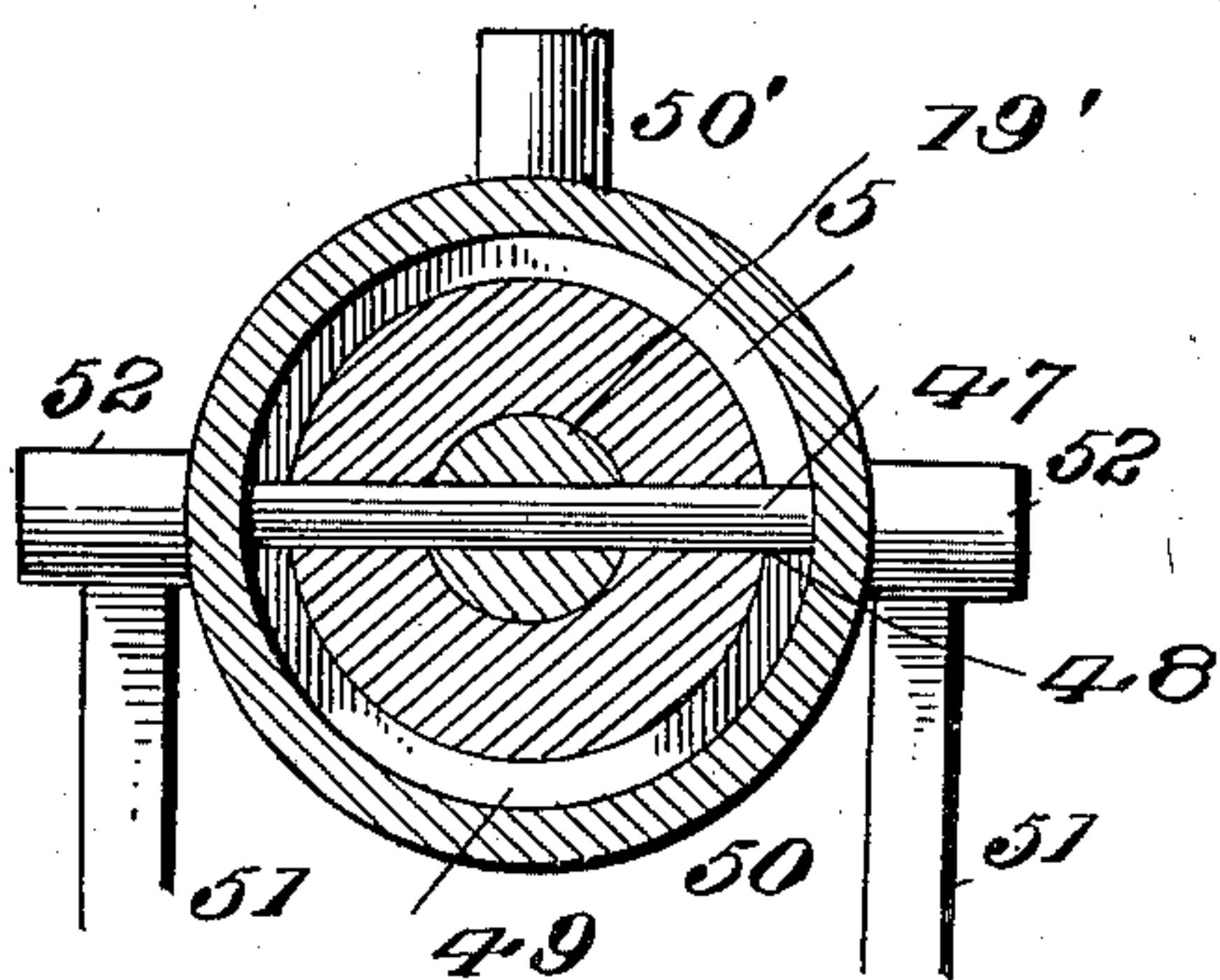


Fig. 9.

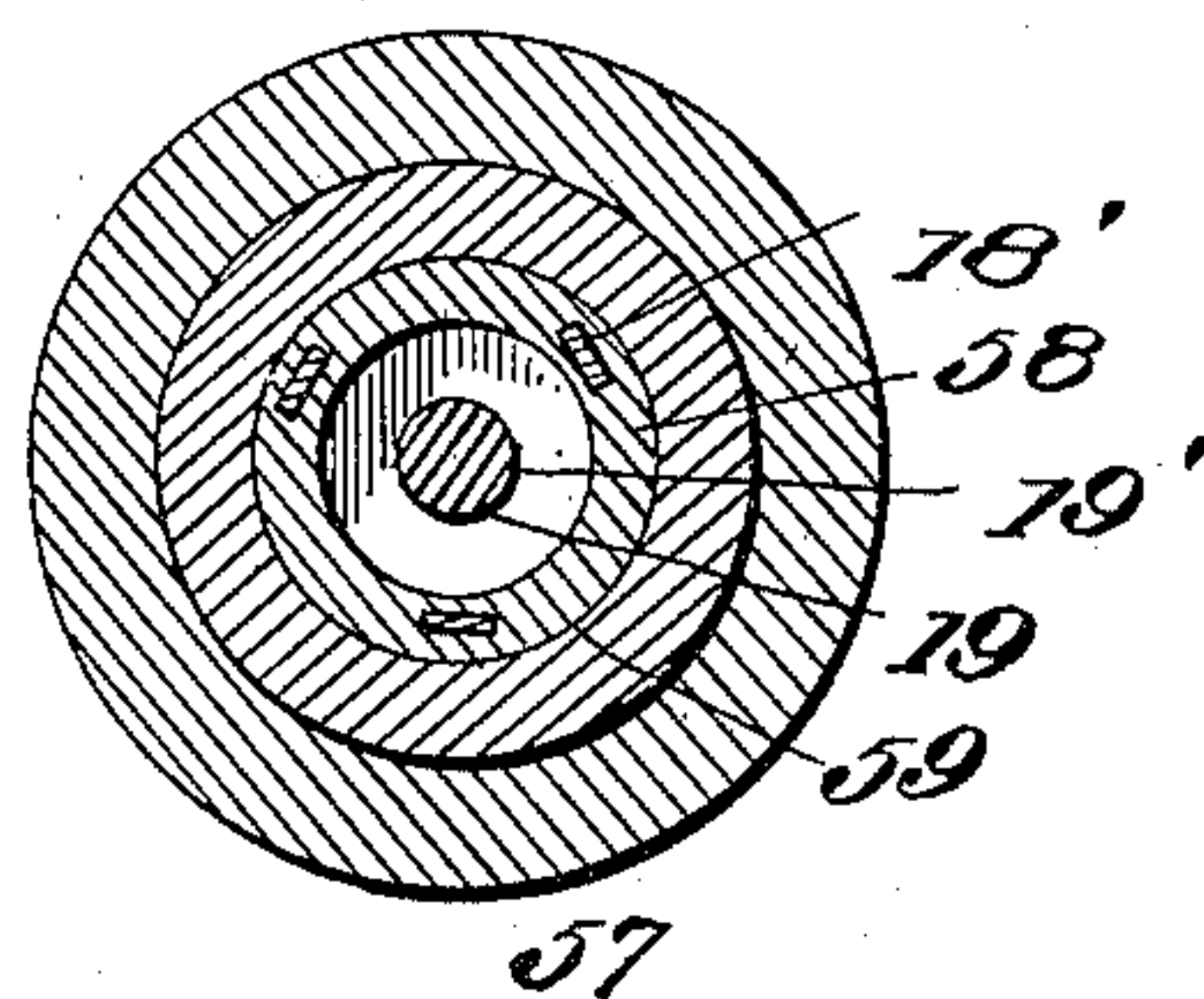


Fig. 10.



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5 Sheets—Sheet 5.

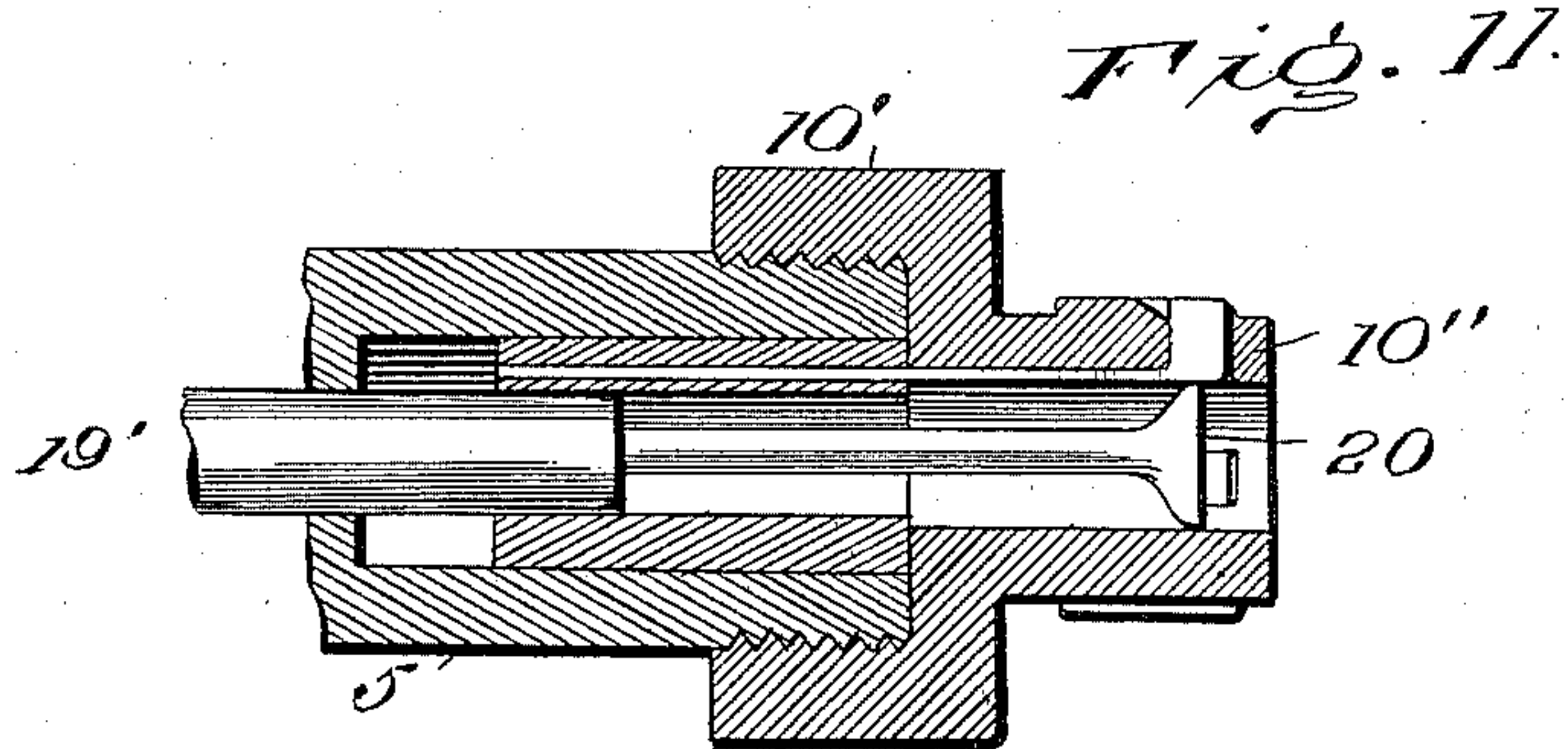


Fig. 12.

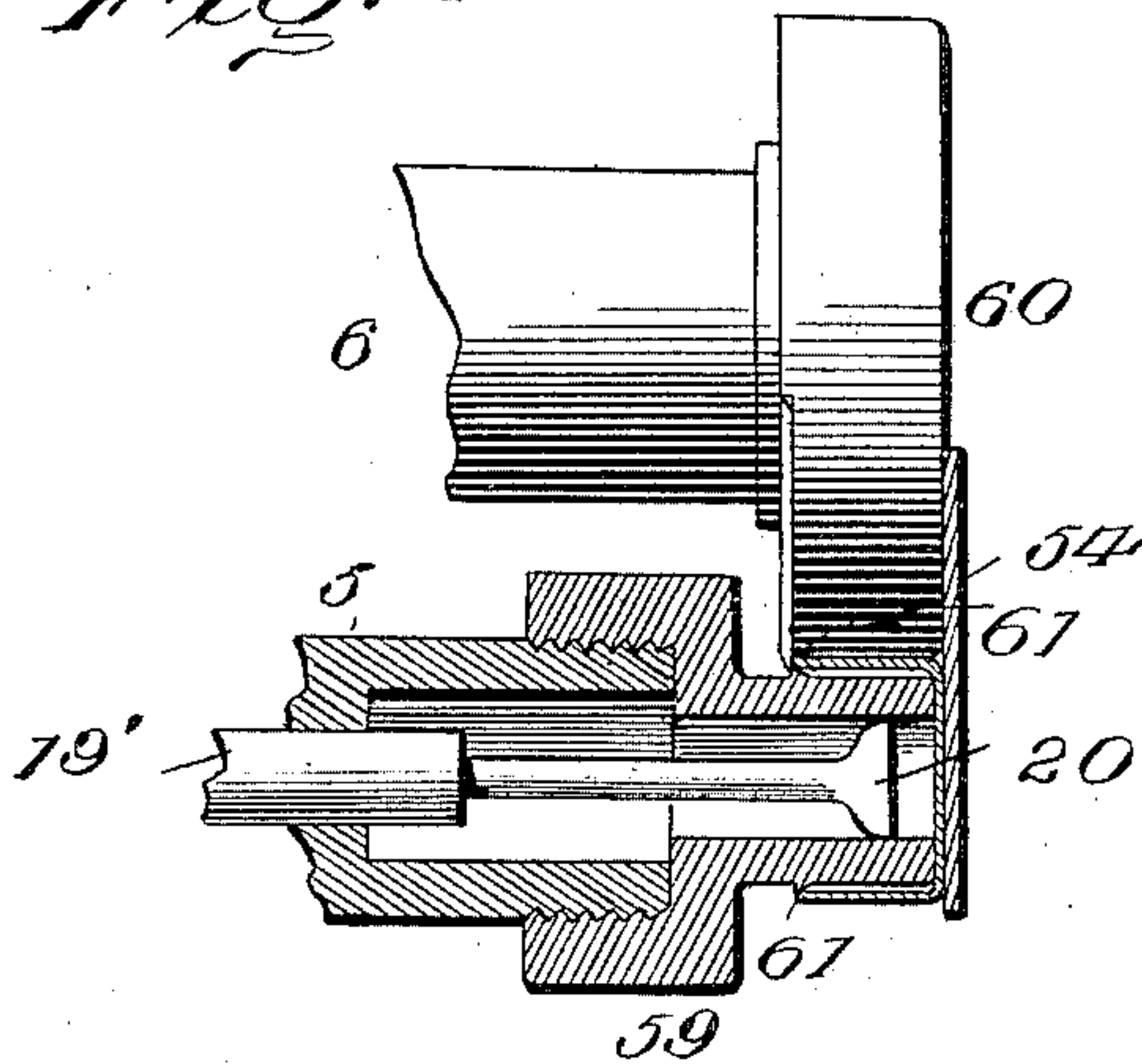


Fig. 13.

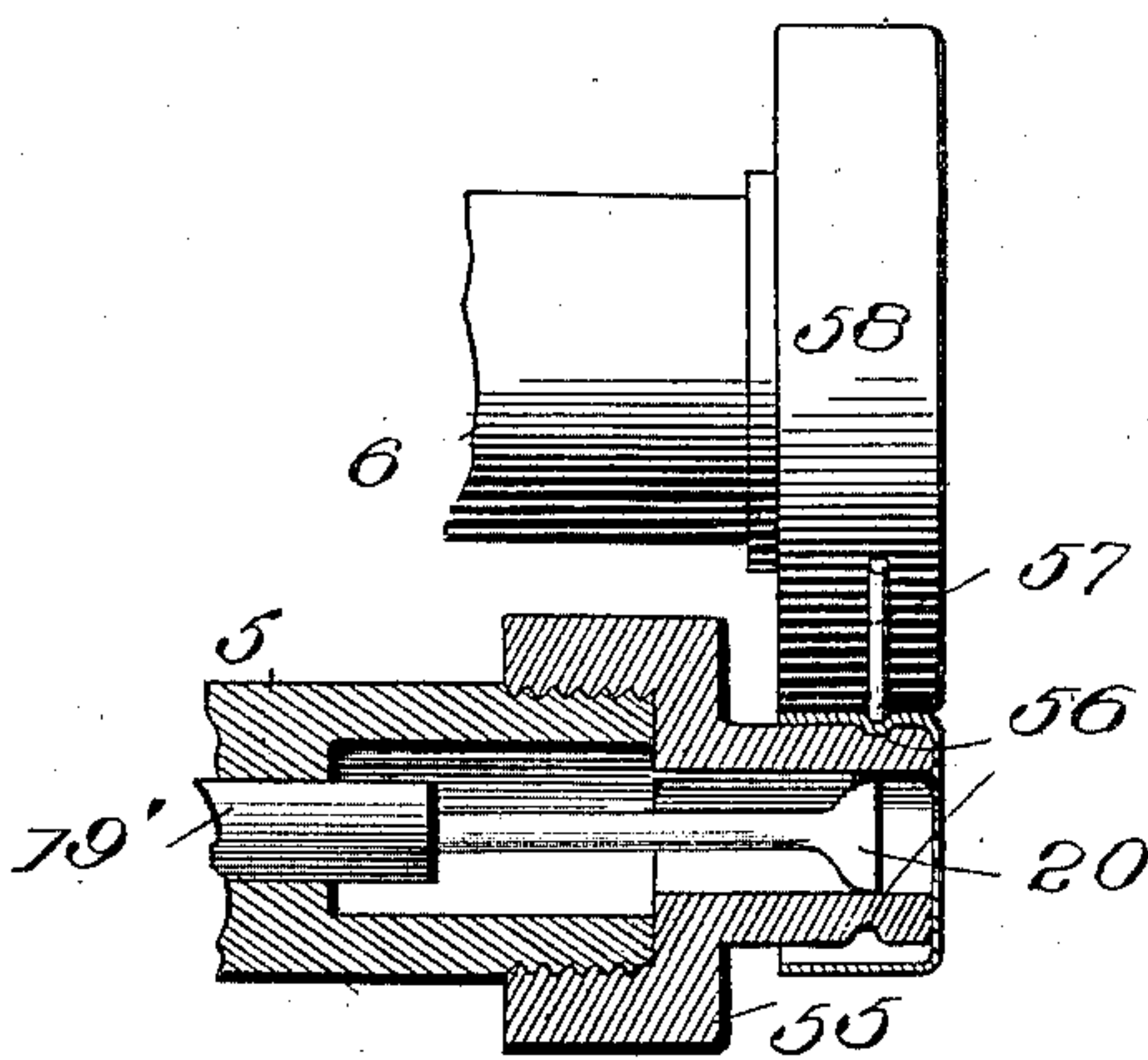
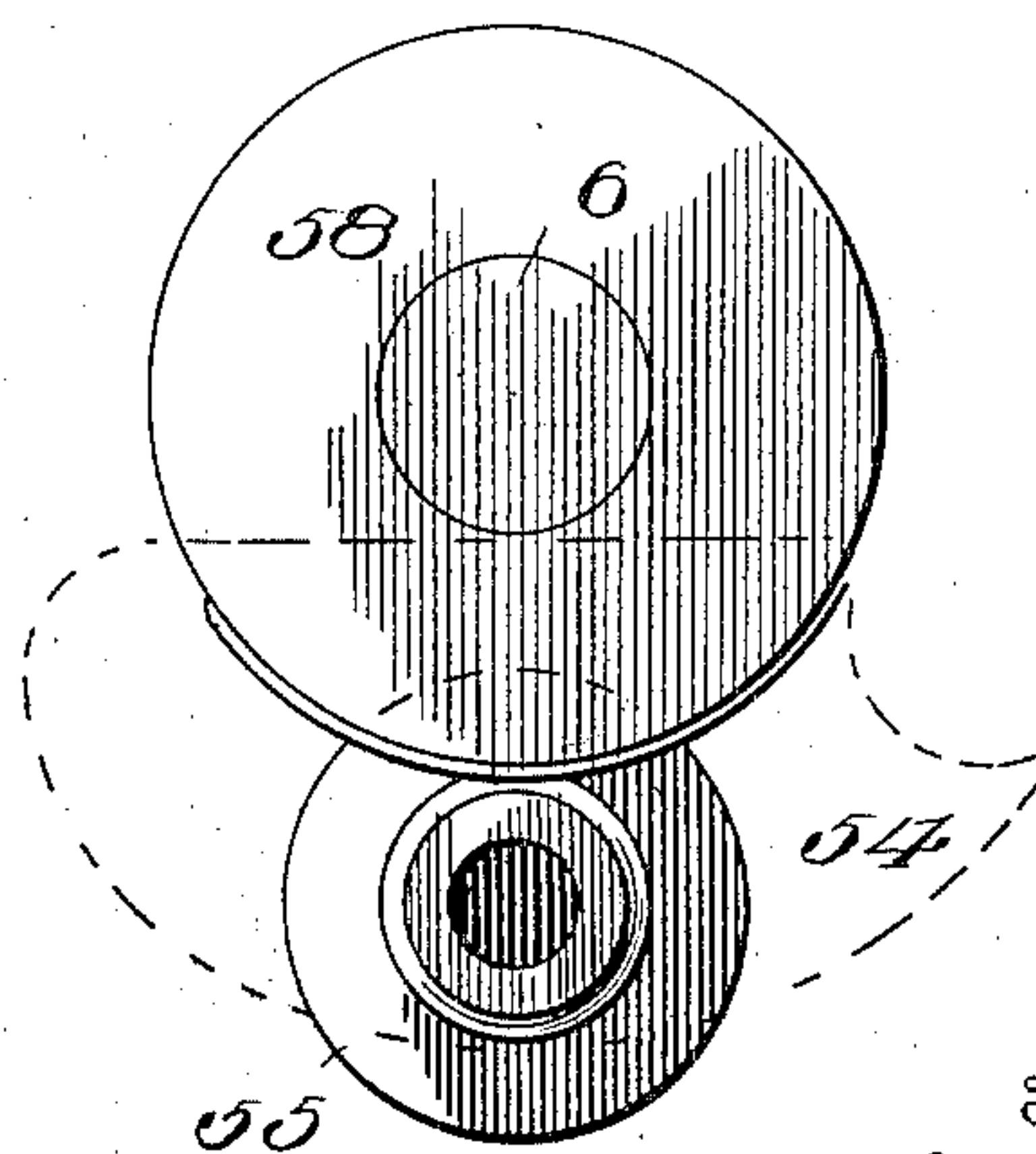


Fig. 14.



Witnesses
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UNITED STATES PATENT OFFICE.

PHILIP LINDEMEYR, OF BALTIMORE, MARYLAND, ASSIGNOR TO THE
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MACHINE FOR FORMING SHEET-METAL ARTICLES.

SPECIFICATION forming part of Letters Patent No. 652,518, dated June 26, 1900.

Application filed February 24, 1899. Serial No. 706,734. (No model.)

To all whom it may concern:

Be it known that I, PHILIP LINDEMEYR, a resident of Baltimore, in the State of Maryland, have invented certain new and useful
5 Improvements in Machines for forming Sheet-Metal Articles; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable
10 others skilled in the art to which it pertains to make and use the same.

The invention relates to machines for forming, trimming, beading, or completing articles such as sheet-metal caps, covers, vessels, and the like, and has for its object to increase the
15 efficiency and economy of such machines and to avoid injury to operatives.

The invention consists in the construction hereinafter described and pointed out.

In the present instance the invention, as
20 shown and described, is embodied in a machine adapted to form in a previously-produced plain bottle-cap a plurality of series of longitudinal corrugations A, separated by plain faces B, said plain faces being provided
25 with lugs C. The improvement, however, is not limited to forming bottle-caps, nor to the particular faces, crimps, and indentations represented, nor to forming in a limited sense, it being adapted for trimming, beading, and
30 other operations.

In the accompanying drawings, Figure 1 is a plan of the improved machine. Fig. 2 is a side elevation, partly broken away. Fig. 3 is a front elevation. Fig. 4 is a rear elevation.
35 Fig. 5 is a front elevation of the main dies, one being cut away to show die-sections. Fig. 6 is a partial enlarged section of the main dies, a supplemental die-section and a portion of a bottle-cap with a lug formed therein
40 being shown. Fig. 7 is a perspective view of a cap formed by the machine. Fig. 8 is a section on line 8 8 of Fig. 2. Fig. 9 is a section on line 9 9 of Fig. 2. Fig. 10 is an elevation of a die-section. Fig. 11 is an enlarged
45 section of the lower die-carrier. Fig. 12 is an elevation, partly in section, of trimming devices. Fig. 13 is a similar view of beading devices; and Fig. 14 is an end elevation of the beading devices, a cap-holding
50 plate being indicated in dotted lines.

Numerals 1 denotes the base of the machine; and 2 a supporting table, bench, or the like.

In the standards 3 are situated bearings 4 for two shafts 5 and 6. On the shaft 5 is a driving-pulley 7, and 8 is a gear formed on
55 shaft 5, whereby gear 9 and its shaft 6 are driven, preferably, at the rate of one rotation of shaft 6 for three rotations of shaft 5. These shafts actuate dies for crimping, trimming, beading, or otherwise finishing the caps; also,
60 a rotating carrier to present the plain caps to a die and pushers to put the caps on a die and an ejector that discharges the cap when finished.

10 denotes a die fixed to a head 10', secured
65 on shaft 5. Said die receives and supports the caps singly. This die, in coöperation with a die 11 on die carrier or wheel 12, fixed to shaft 6, crimps or corrugates and otherwise finishes the cylindrical bodies of the caps.
70 The dies have suitable ribs or corrugations 13 for similarly corrugating or crimping a cap, which is effected by rotating the shafts 5 and 6 to cause the ribs thereon to mesh. Power for this purpose is transmitted by the
75 pulley or in any suitable manner. These ribs in die 10 are arranged (in the present instance) in three groups, separated by faces 14, which are plain except for a depression 15, constituting in the main a supplementary
80 female die for forming a lug C. The faces 14 are situated in a plane passing through the base of the corrugations 13 of die 10. Similar plain die-faces 16, having supplemental
85 male dies 17, are provided in the die 11 between groups of corrugations and are arranged to coact with the die-faces 14, having depressions constituting a female die 15, to form, in coöperation with faces 16 and male
90 dies 17, the plain faces and lugs of the caps. The die-faces 16 are situated in a plane passing through the vertices of the corrugations of the die 11.

The dies 15 each comprise a movable die-section 18, bounding one end or side of the de-
95 pression, which section is moved into operative position and held to its work and subsequently pushed out of position to permit the discharge of the cap.

The caps are placed upon the die 10 by plun- 100

gers 21, suitably moved through cap-holders 23 by levers 22. These cap-holders are situated in a rotating carrier 24 and are normally supplied with partially-formed caps, which
5 are successively moved by the rotation of the carrier into alinement with die 10 and then pushed onto the die by a plunger 21.

The cap-carrier 24 is fixed upon a shaft 25, which has a wheel 26, driven by shaft 6 through
10 the medium of pins 27, engaging the slots 28 in the periphery of wheel 26. This motion is not continuous; but the situation and arrangement of the driving-pins with respect to the slots are such that the carrier rests while
15 one of the holders is in alinement with die 10 to permit its contained cap to be transferred by a plunger 21. The carrier also rests to permit the cap to be ejected from the die. These rests of the carrier are caused by a suitable
20 arrangement of the driving-pins 27 with respect to the slots of wheel 26. As shown in Fig. 4, the two upper pins are nearer each other than the others and are so disposed as to act continuously upon the wheel. The two
25 pins at the right, which of course include the right-hand upper pin, are separated more widely to permit the wheel and following parts to rest while the lower pin is advancing to overtake and engage a slot. The cap is
30 discharged from the die during this rest. In similar manner immediately after the lower pin leaves a slot the wheel and all parts driven by it rest until the upper left-hand pin engages a slot. During this interval a cap is
35 placed upon the die. Figs. 3 and 4 illustrate the position of these parts just prior to the termination of the rest last described. The plungers are operated by a cam 29 on shaft 6, which acts upon cam-lever 30, having a
40 fulcrum in bar 31 and provided with a fork engaging a collar 32, fixed on a sliding bar 33. The bar 33 has a head 34, which at the appropriate time is moved against the free end of one of the pins 35, which are supported to
45 move back and forth through the cap-carrier and have their inner ends pivoted to the levers 22, which actuate the cap-charging plungers 21.

38 is a spline cooperating with the bearing
50 for bar 33 in such manner as to prevent the rotation of the bar.

36 denotes springs to return said levers, and 37 is a spring to return the bar 33.

39 denotes a pin sliding in a support 40 and
55 held up by a spring 41, normally forcing the pin-arms 42 to the upper end of slots 43. The pin 39 is situated in the path of the cap-carrier and adapted to prevent overrunning of the holders. When the rotation of the carrier 24 is resumed after a cap has been placed
60 on die 10, the spring-pin yields and the carrier readily slips over its beveled face 39'.

By the medium of the carrier 24 and its shaft 25 the spring 41 holds the ratchet-wheel
65 44 against the stop-pawl 45, thereby insuring exact alinement of the cap-holder with the die 10.

To permit a cap to be placed on the die 10 and to move the die-sections 18 into an operative situation and hold them to their work, 70 the frusto-conical head 20 of the spreader 19 is suitably moved within the die and between the sections. The latter have stems 18' lying in seats formed in a sleeve situated in a recess in the interior of die-shaft 5. The detachable head 10' provides for the insertion
75 of the sleeve and die-section.

The crimped cap is discharged at the proper time by the spreader, which simultaneously relieves the die-sections and permits them
80 to be moved inwardly by the escaping cap.

The spreader 19, having a die-spreading head 20, is actuated by a cam 46, fixed on shaft 6. The spreader has a stem 19' situated in the interior of the shaft and provided
85 with a pin 47, guided by a longitudinal slot 48 in the shaft. Said pin extends into a circumferential race 49, formed on the interior of a sleeve 50, sliding on shaft 5. The spreader is compelled to rotate with shaft 5 by the engagement of the pin 47 with slot 48, said pin
90 at all times moving freely in the circumferential sleeve-race 49 and said latter engagement compelling the spreader to move lengthwise the shaft with the sleeve. 95

The sleeve 50 is movably supported on posts 51, as by means of lugs 52. It is moved lengthwise the shaft by cam-face 46 acting on the sleeve projection 50' with the effect to draw the spreader within the die and spread the
100 die-sections 18. The spreader is held to its work by the part 46' of the cam during the operation of the dies. As soon as the sleeve projection is by the rotation of the shafts made free to drop from cam-face 46' to cam-
105 face 46 the spring 53 forces this movement and the sleeve by the spreader stem-pin 47 pushes the spreader-head out of die 10 and from between the die-sections 18 and discharges the cap, the said sections being moved
110 inwardly by the cap and out of the path of the cap-lugs.

53' denotes a spring friction device to prevent overrunning of the wheel 24, being simply a spring-plate bearing on the shaft of
115 wheel 24 in a usual manner.

54 is a plate fixed to wheel 12. Its office is to hold the cap on the die 10 during the operation of forming. This plate is so proportioned and situated with reference to the
120 movement of the wheel that it is moved opposite the die 10 after the cap has been placed on said die and removed before the spreader discharges the cap.

As illustrated, the cap-carrier is provided
125 with six holders to be charged with caps by hand or in any suitable manner. The wheel 26 has eighteen slots cooperating with three pins; but the capacity of the carrier may be varied and other merely mechanical changes
130 adopted without departure from the invention.

It is important that the caps be placed upon the die and removed therefrom by mechan-

ism, and one of the main purposes of the invention is to avoid the customary injuries to operatives incident to the use of prior machines of the same general character having no mechanical means for charging and discharging articles formed thereby. In effecting this the inwardly-moving die-sections and the cap charging and discharging devices are important, and obviously the cap, in case it fits die 10, could neither be placed on nor removed from said die 10 were both lug-dies (or the like) made entire and without a retreating section. The devices for insuring the positive alinement of the cap-holder and the die are an important subsidiary improvement.

In practice the die-carrying wheel 12 will be made much larger in circumference than the die 10. As shown, it has a circumference three times larger, and as it has the same speed the die 10 rotates three times while the head or die-carrier 12 rotates once. By this construction two-thirds of the surface of the die-carrier 12 is left without die-ribs, and provision is made for placing a cap on die 10 without altering the relation of the die carriers or shafts, the cap being placed and removed while the plain surface of carrier 12 is adjacent to the die 10. The die-shafts have stationary bearings always occupying the same position in operation, and it is not necessary to swing one of the dies aside to permit a cap to be placed on or removed from its supporting-die.

It is a further incident to the construction that the shafts can be conveniently provided with cams and movable cooperating parts—such as the sleeve, spring, and lever—for charging and discharging the caps and other purposes.

Referring again to plate 54, (see Figs 1, 2, and 3,) its office is important, since it holds the cap exactly in place. This insures that the cap lug or lugs will always be formed in the same situation in the cap-flange, which is important to make them register with a bottle-groove. This desirable accuracy and uniformity of the lugs is also insured by making both the male and female dies integral with the main dies. The transversely-movable piece of the supplemental female die is securely held to its work by the spreader situated immediately beneath it, and its endwise movement is prevented by the outer wall 10' of the opening in die 15, through which said movable piece projects.

The die-carrying heads 10' and 12 are made removable to permit the substitution of other heads, which may be provided with die-faces or with devices for trimming, beading, and the like.

In Figs. 13 and 14 is illustrated a head 55, having a portion or carrier having a groove 56 cooperating with a circumferential bead or rib 57 on a coacting head 58, the construction being adapted for beading various articles. The article to be beaded is supported on the head 55, which can be made smaller

than the article, as indicated, to permit its free discharge. In Fig. 12 are shown two heads 59 and 60, provided with coacting cutters 61 for trimming articles supported on the smaller head. In each of these modifications one head is made larger than the other. The smaller head should rotate faster than the larger in the inverse ratio of one to some multiple of one, the ratio in the present instance being three to one, as described in connection with the corrugating-dies and for similar purposes. The cutter 61 on the head 60 in one case and the rib 57 in the other extend but partially about the head to provide a free space between the heads during a part of the rotation of the larger one to permit the article to be charged and discharged.

Having thus described my invention, what I claim is—

1. In a machine for forming sheet-metal articles, a carrier for the article, the main cooperating dies, and means for intermittently revolving said carrier, said means being adapted to give the carrier rests of variable duration.

2. In a machine for forming sheet-metal articles, the main cooperating dies, a revolving carrier for the article, a device to transfer an article from the carrier to one of the dies, and a stop to determine the position of the carrier to aline the article with the die.

3. In a machine for forming sheet-metal articles, the main cooperating dies, a revolving carrier for the article, a device to transfer the article from the carrier to a die, a stop to determine the position of the carrier to aline the article with the die, and means to insure the action of the stop.

4. In a machine for forming sheet-metal articles, the main cooperating dies, a revolving carrier for the article, a device to transfer an article from the carrier to a die, a stop to determine the position of the carrier to aline an article with the die, and a spring to insure the action of the stop.

5. In a machine for forming sheet-metal articles, the main cooperating dies, the revolving carrier for the article, a device to transfer an article from the carrier to a die, a stop to determine the position of the carrier to aline the article with the die, and a spring compressible by the carrier to insure the action of the stop.

6. In a machine for forming sheet-metal articles, the main cooperating dies, a revolving carrier for the article, a device to transfer an article from the carrier to a die, a stop to determine the position of the carrier to aline the article with the die, and means to insure the action of the stop, said means comprising a spring compressible by the carrier and automatically releasable.

7. In a machine for forming sheet-metal articles, the main cooperating dies, a carrier for the article, means for revolving said carrier intermittently, and a device to transfer an article from the carrier to one of the dies during a period of rest of the carrier, said device

being supported on and revolving with the carrier.

8. In a machine for forming sheet-metal articles, the main continuously-rotating dies adapted for shaping the article, an intermit-

9. In a machine for forming cylindrical articles, a main die approximately filling the article, supplementary male and female dies, for forming a lug or other indentation both in-

10. In a machine for forming cylindrical articles, a main die approximately filling the article, supplementary male and female dies for forming a lug or other indentation, one of said supplementary dies having a part trans-

11. In a machine for forming cylindrical articles, a main die, approximately filling the article, supplementary male and female dies for forming a lug or other indentation, one of said supplementary dies having a part trans-

12. In a machine for forming cylindrical articles, a main die approximately filling the article, supplementary male and female dies for forming a lug or other indentation, one of said supplementary dies having a part trans-

13. In a machine for forming sheet-metal articles, the combination of a rotating die, the movable die-sections, the die-section spreader rotating with the die, and means operative in the revolution of the die for automatically moving the spreader endwise.

14. In a machine for forming sheet-metal articles, a rotating shaft 6, a shaft 5 having a cap-receiving die, transversely-movable die-sections, a die-section spreader, a non-rotatable sleeve surrounding said shaft 5 and loosely connected to the spreader, and a cam fixed on said first-named shaft and cooperating with the sleeve to actuate the spreader.

15. In a machine for forming cylindrical articles, a main die approximately filling the article, supplementary male and female dies in-

supplementary dies having a part transversely movable to permit the discharge of the article after the lug is formed.

16. In a machine for forming cylindrical articles, a main die approximately filling the article, supplementary male and female dies integral with the respective main dies for forming a lug or other indentation, one of said supplementary dies having a part trans-

17. In a machine for forming sheet-metal articles, a rotating shaft 6, a shaft 5 having a cap-receiving die, transversely-movable die-sections, a die-section spreader, a non-rotatable sleeve surrounding said shaft 5 and loosely connected to the spreader, and a cam fixed on said shaft 6 and cooperating with the sleeve to actuate the spreader, said cam having a face adapted to hold the spreader to its work during the operation of forming the article.

18. In a machine for forming sheet-metal articles, the combination of the die-shaft 6, the cam fixed on said shaft, the lever moved by the cam and engaging the sliding rod, a revolving carrier for the articles, and a cap-

19. In a machine for forming sheet-metal articles, the main continuously-rotating dies adapted for shaping the article, an intermit-

20. In a machine for forming cylindrical articles, a main die approximately filling the article, supplementary male and female dies in-

21. In a machine for forming sheet-metal articles, the combination of the rotary shafts, one provided with a slotted wheel and the other with driving-pins, said pins being disposed to give an intermittent motion to the wheel, and two coacting die-carrying heads or the like, one of said heads having a portion of its surface plain to provide for placing and removing articles.

22. In a machine for forming sheet-metal articles, cooperating die-shafts each carrying a main die provided with groups of corrugations, the corrugations of one die meshing with those of the other, and plain male and female die-faces situated intermediate said groups in the respective dies, one of said dies being of larger diameter than the other but

having equal impression-surfaces, whereby the smaller is adapted to receive a cap and coöperate to form it during a partial rotation of the larger die.

23. In a machine for forming sheet-metal articles, the combination of the coöperating die-shafts each carrying a main die provided with groups of corrugations, the corrugations of one meshing with those of the other; and plain male and female die-faces situated intermediate said groups in the respective dies, and supplemental male and female lug-forming dies situated in said plain die-faces, said supplemental female die having a part of its wall transversely movable to permit the cap to be ejected from the die.

24. In a machine for forming sheet-metal articles, the combination of rotary die-carriers and coacting rotary dies, the said dies being adapted to permit the placing of a cap upon one of them without separating the die-carriers, a cap-carrier intermittently rotatable with relation to the dies, and devices for transferring an article from the cap-carrier to one of the dies during a period of rest of the cap-carrier.

25. In a machine for forming sheet-metal articles, the combination of rotary die-carriers and coacting rotary dies, the said dies being adapted to permit the placing of a cap upon one of them without separating the die-carriers, a cap-carrier adapted to hold a cap in alinement with the die, and devices for moving the carrier intermittently to permit a cap to be transferred therefrom to a die and also to be ejected from a die while the carrier rests.

26. In a machine for forming bottle-caps and the like, the combination of rotary die-carriers and coacting rotary dies, the said dies being adapted to permit the placing of a cap upon one of them without separating the die-carriers, a cap-carrier adapted to hold a cap in alinement with a die, and devices for moving the carrier intermittently to permit a cap to be transferred therefrom to a die and also to be ejected from a die while the carrier rests.

27. In a machine for forming sheet-metal articles, the combination of a slotted rotating die-shaft, the movable die-sections, a die-section spreader within the shaft, a sleeve sliding on the shaft, said sleeve being formed with a raceway adapted to receive a pin projecting from the spreader, and a cam for actuating said sleeve, whereby the spreader and pin rotate with the shaft and are movable endwise thereof for the purposes stated.

28. In combination the rotating shafts, means for driving them intermittently, heads carrying coacting dies or other devices, said heads being detachable to permit substitution of others, one of said heads being larger than the other and having a plain surface partially surrounding it to provide for charging and discharging the article acted upon.

29. In a machine for forming sheet-metal articles, coacting rotary die-carriers having equal impression-surfaces, and means for

charging an article upon one of the die-carriers without independent movement of either die-carrier.

30. In a machine for forming sheet-metal articles, coacting rotary dies and die-carriers, a device to charge the article upon one of the carriers, and a plate carried by the other carrier for holding the article in place during its formation, said plate being of greater extent than the impression-surface of either die, whereby the article is positively held during the full operation of the impression-surface.

31. The combination of unequal rotary die-carriers, and equal rotary dies on said carriers, said dies being adapted to act on the article in identical time and speed, and intermittently-operated means for charging an article upon one of the dies during the continued revolution of the carriers.

32. In a machine for forming sheet-metal articles, the combination with two die-carrying shafts having circumferentially-unequal die-carriers, of equal coacting dies on the carriers the smaller die-carrier being a multiple of the other in circumference, and means to charge an article upon the smaller die-carrier during the movement of the carriers.

33. The combination with die-carriers, equal identical coacting dies thereon, one of said carriers being larger than the other and having a plain surface of greater extent than the impression-surface to permit charging and discharging of the article, and means to charge an article upon the smaller carrier while the plain surface of the larger carrier is adjacent thereto.

34. The combination of unequal rotary die-carriers fixed against other movement, equal impression-surfaces upon the carriers adapted for simultaneous and identical operation upon the article, the larger die-carrier being formed with a plain surface, an intermittently-operated cap-carrier, and means to charge an article upon the smaller die during a period of rest of the carrier.

35. The combination with the dies, of a carrier adapted to receive a plurality of blanks, means for intermittently moving said carrier with reference to the dies to bring the blanks successively into alinement therewith, and means operating automatically to deliver the blanks from the carrier to the dies as they are brought into alinement therewith.

36. The combination with coöperating dies, of a movable carrier adapted to hold a plurality of blanks, means for intermittently moving said carrier to bring the blanks into alinement with the dies, means for delivering the blanks from the carrier to the dies as they are successively brought into alinement therewith, and an actuating device common to all the said delivering means successively brought into operative relation thereto by the movement of the carrier.

37. The combination with the dies, of a rotatable carrier adapted to receive a plurality

of blanks, means for intermittently rotating said carrier with reference to the dies to successively bring the blanks into alinement therewith, devices on the carrier one for delivering each blank to the dies, and means for automatically operating said devices respectively as the blanks are brought into alinement with the dies.

38. The combination with the dies, of a carrier movable with reference to the dies and adapted to receive a plurality of blanks, devices mounted on and movable with the carrier one for delivering each blank to the dies, actuating mechanism common to all of said devices, and means for intermittently moving the carrier to bring the blanks successively into alinement with the dies and the delivery devices successively into operative relation with the common actuating mechanism therefor.

39. The combination with the dies, of a carrier movable with reference to the dies and adapted to receive a plurality of blanks, devices mounted on and movable with the carrier one for delivering each blank to the dies, actuating mechanism common to all of said devices, means for intermittently moving the carrier to bring the blanks successively into alinement with the dies and the delivery devices successively into operative relation with the common actuating mechanism therefor, and means for automatically discharging each formed article from the dies before a succeeding blank is delivered thereto.

40. The combination with coöperating dies, of a carrier adapted to hold a plurality of blanks, means for imparting intermittent movement to the carrier for successively pre-

senting said blanks to the dies, means for successively delivering the blanks from the carrier to the dies during a period of rest as they are presented thereto, and means for discharging the formed article from the dies during a second period of rest and before a succeeding blank is presented to the dies.

41. In a machine for forming bottle-caps and the like, the combination with two rotating dies, of a carrier adapted to receive a plurality of cup-shaped blanks, means for intermittently rotating the carrier with reference to the dies, and for delivering the blanks in succession from the carrier so that they fit over one of the two dies, and means for automatically discharging each formed article from the dies before a succeeding blank is delivered thereto.

42. The combination with two coöperating dies, one of which has a blank surface partly around its circumference, and means for continuously rotating the same, of a movable carrier adapted to hold a plurality of blanks, means for intermittently moving said holder to successively present said blanks to the dies, means operating upon said blanks for transferring them to the dies as they are successively presented thereto, and while the blank surface on the one die is opposite the acting surface on the other.

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

PHILIP LINDEMEYR.

Witnesses:

G. W. BALLOCH,
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