

No. 848,380.

PATENTED MAR. 26, 1907.

S. LAKE.  
FRICTION CLUTCH.  
APPLICATION FILED NOV. 16, 1906.

5 SHEETS—SHEET 1.

Fig. 2.

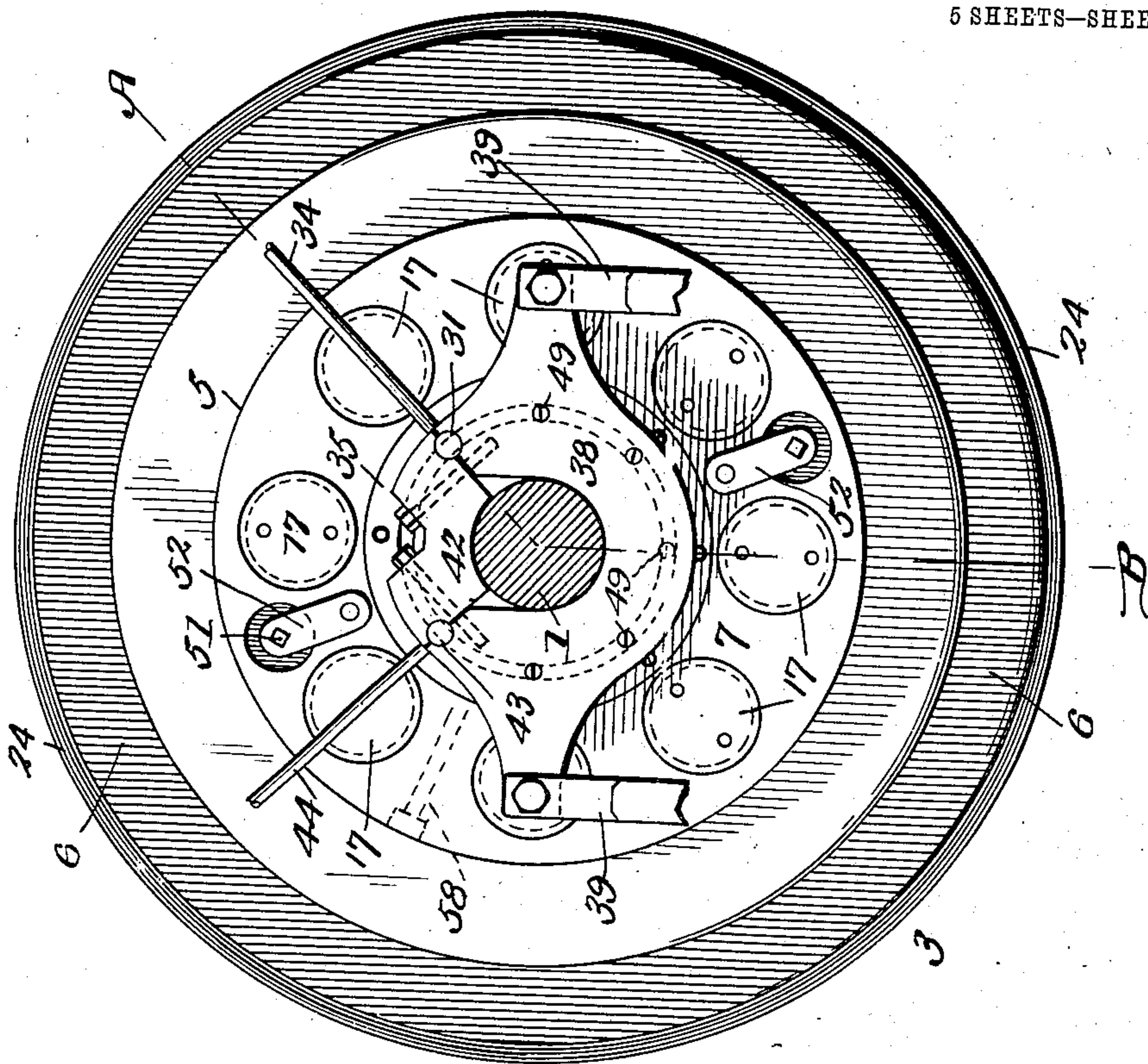
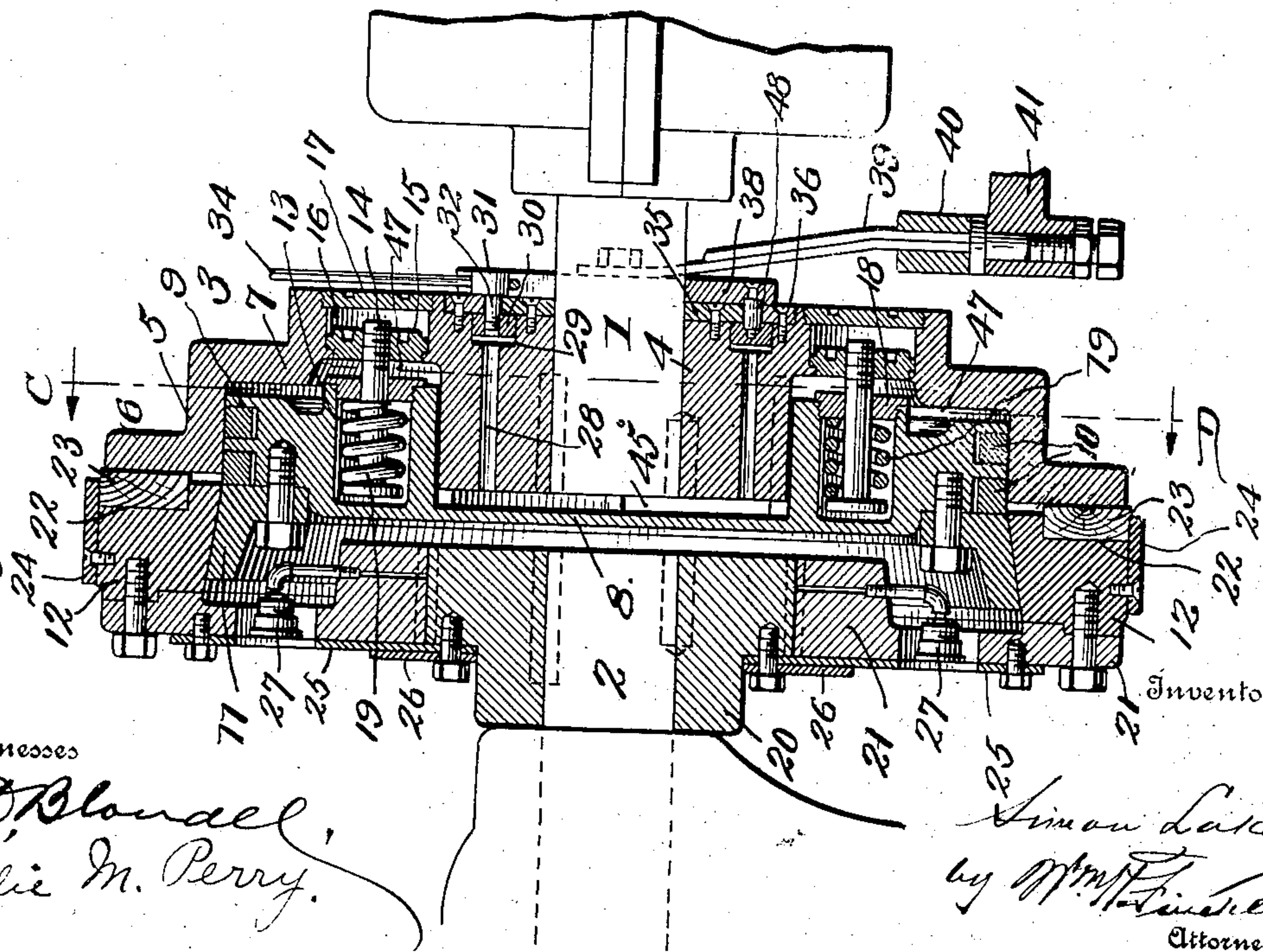


Fig. 1.



Witnesses

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Lillie M. Perry.

Inventor

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by M. B. Blouell  
Attorney



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5 SHEETS—SHEET 2.

Fig. 3.

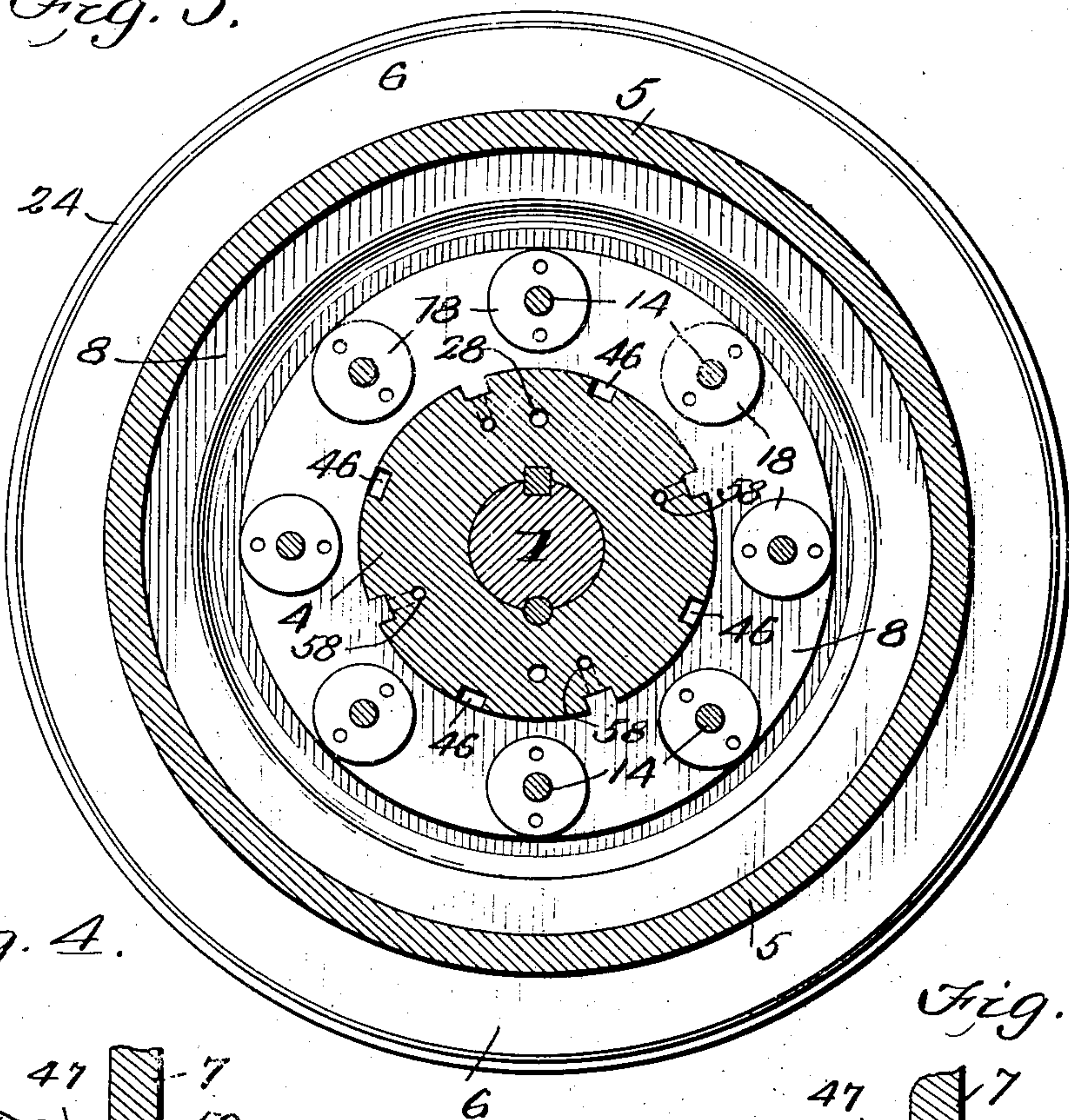
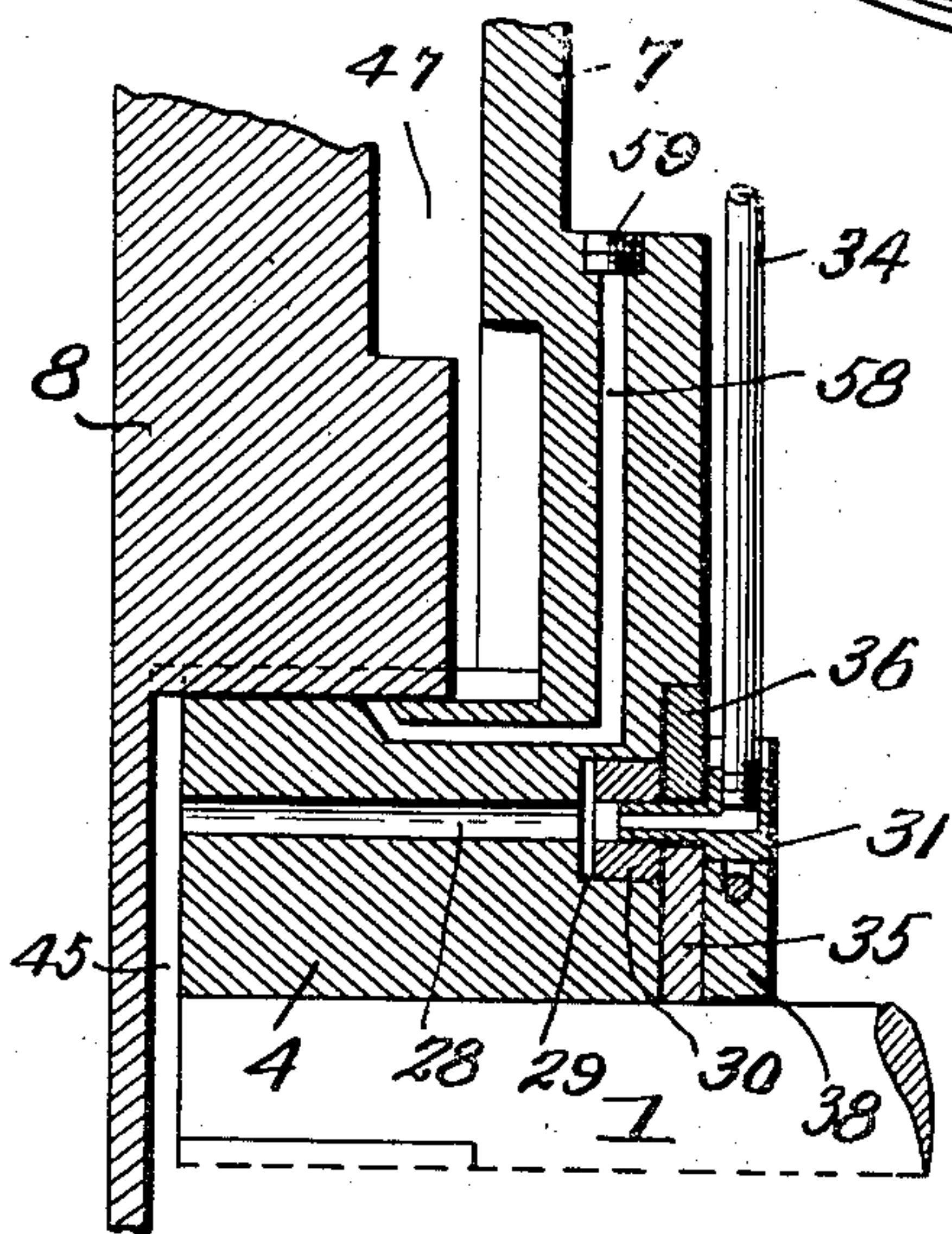


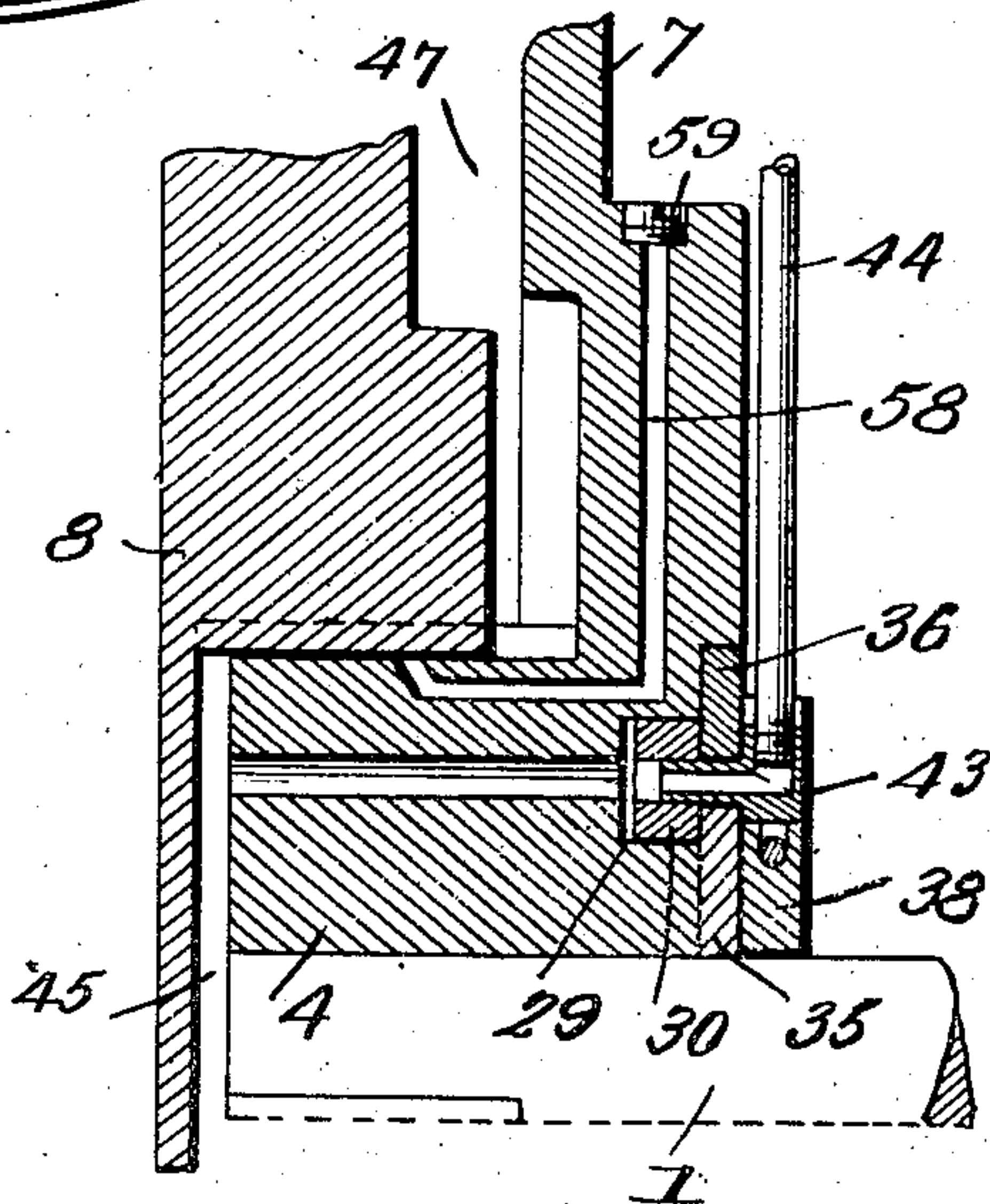
Fig. 4.



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*M. D. R. Landon*  
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Fig. 5.



INVENTOR:

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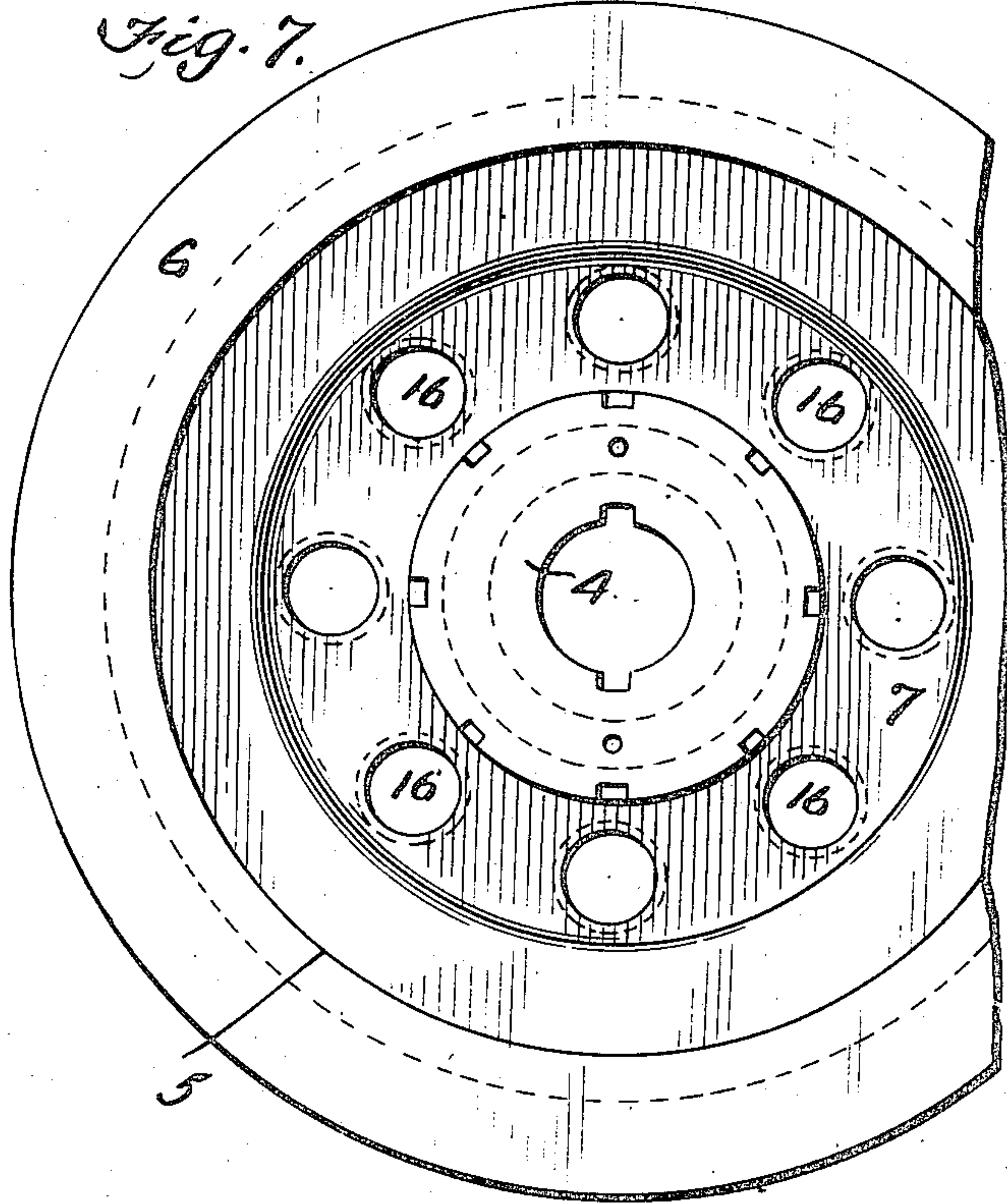
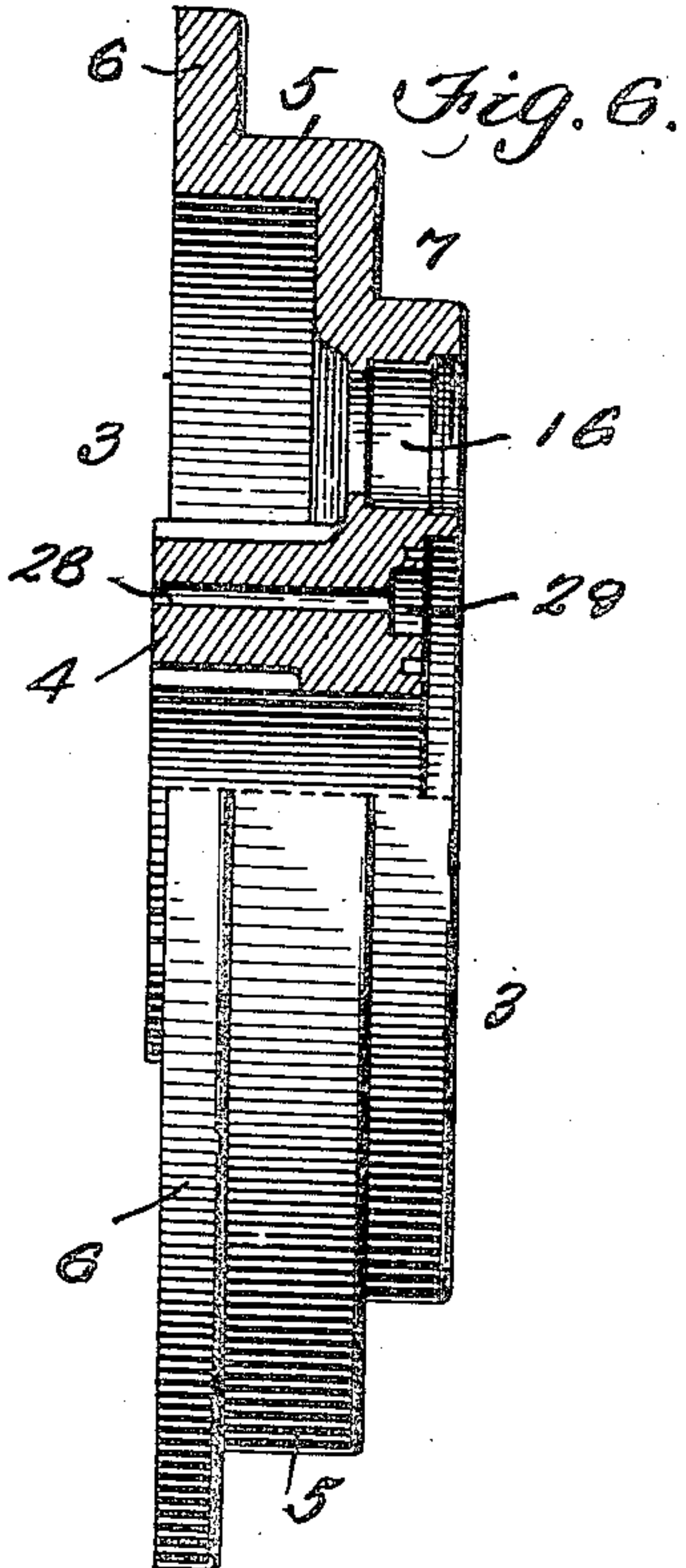


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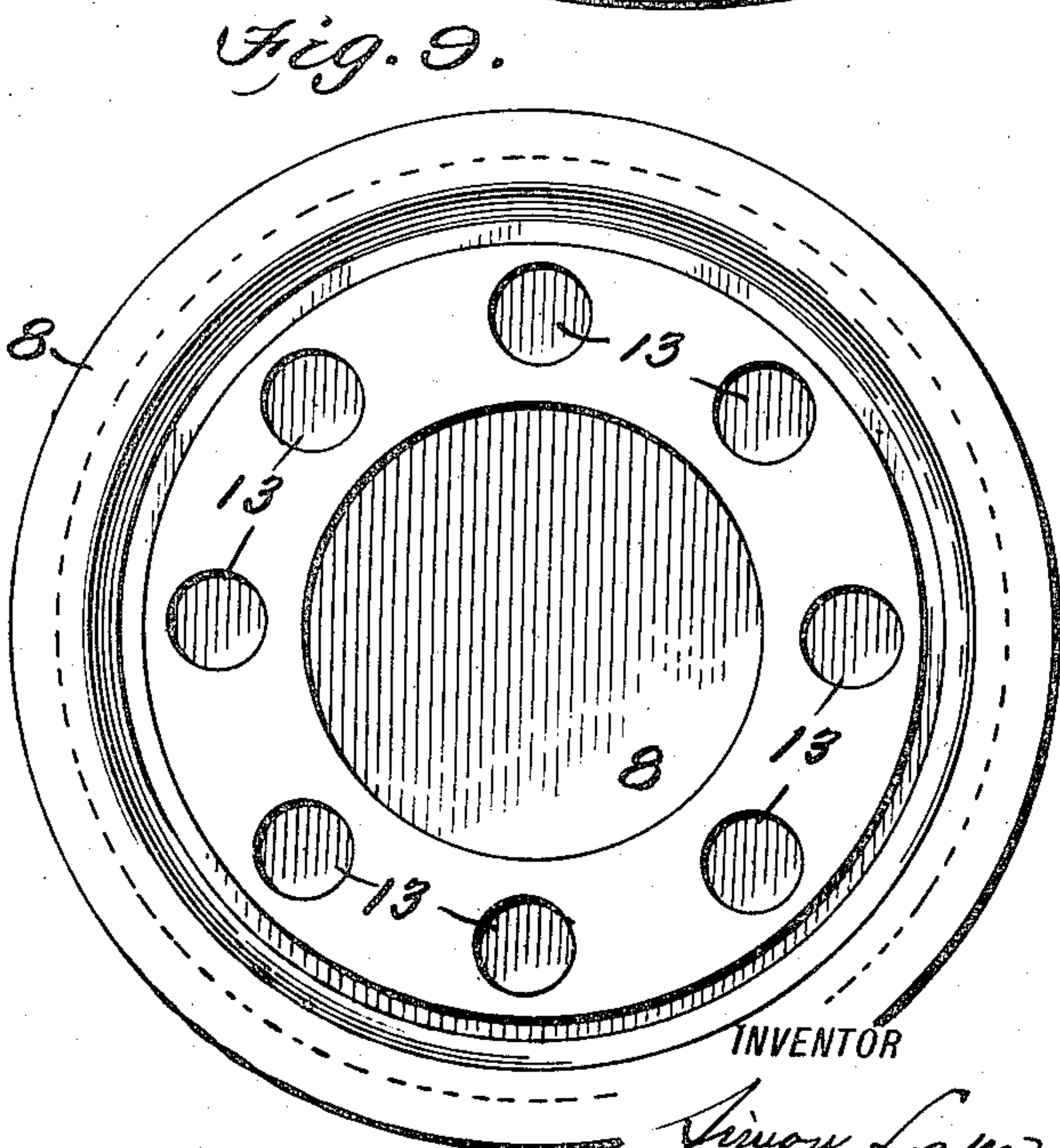
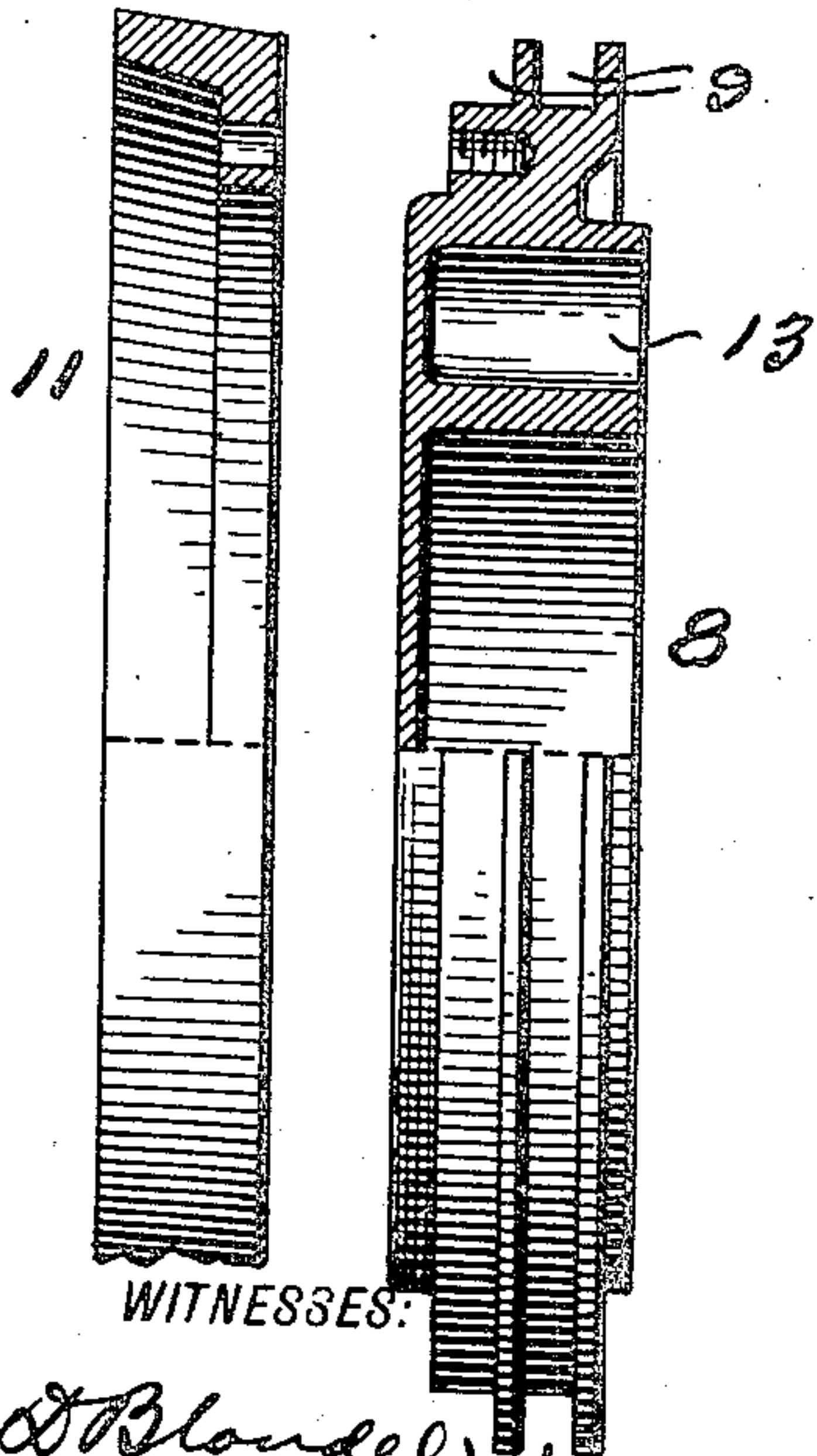
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5 SHEETS—SHEET 3.



*Fig. 10.*      *Fig. 8.*



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5 SHEETS—SHEET 4.

Fig. 77.

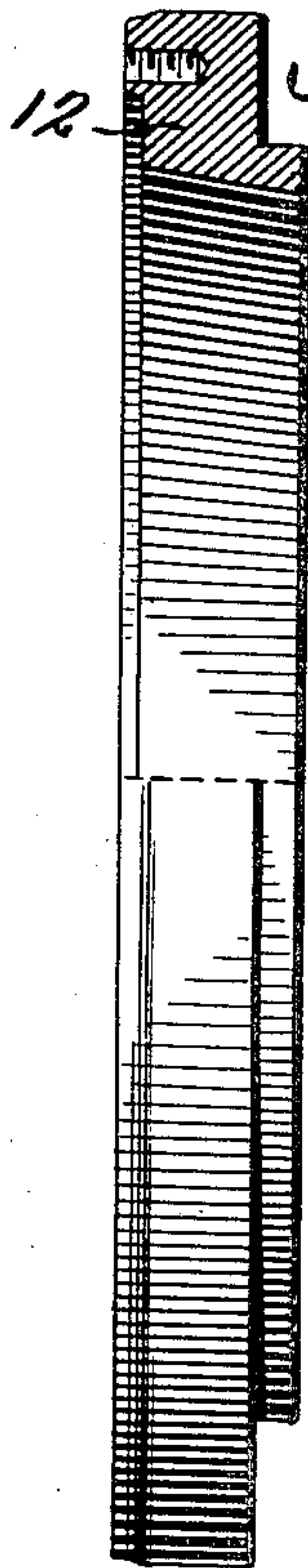
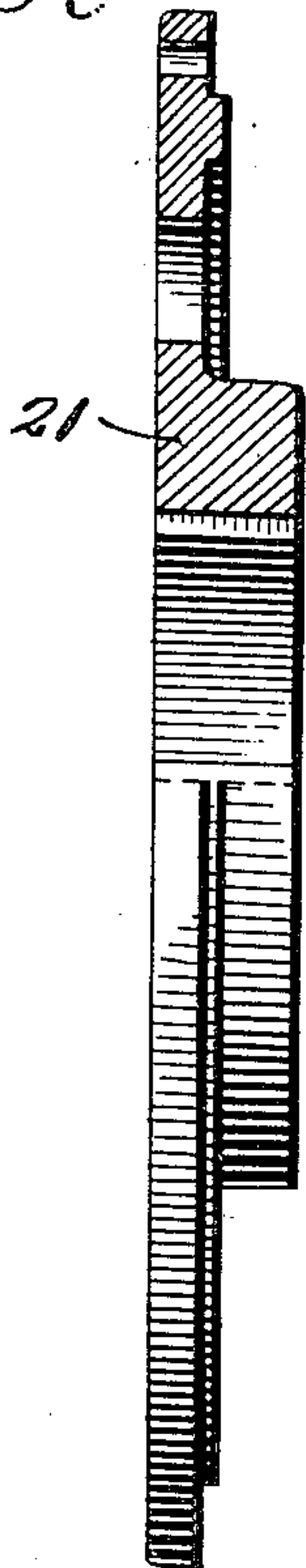


Fig. 72.

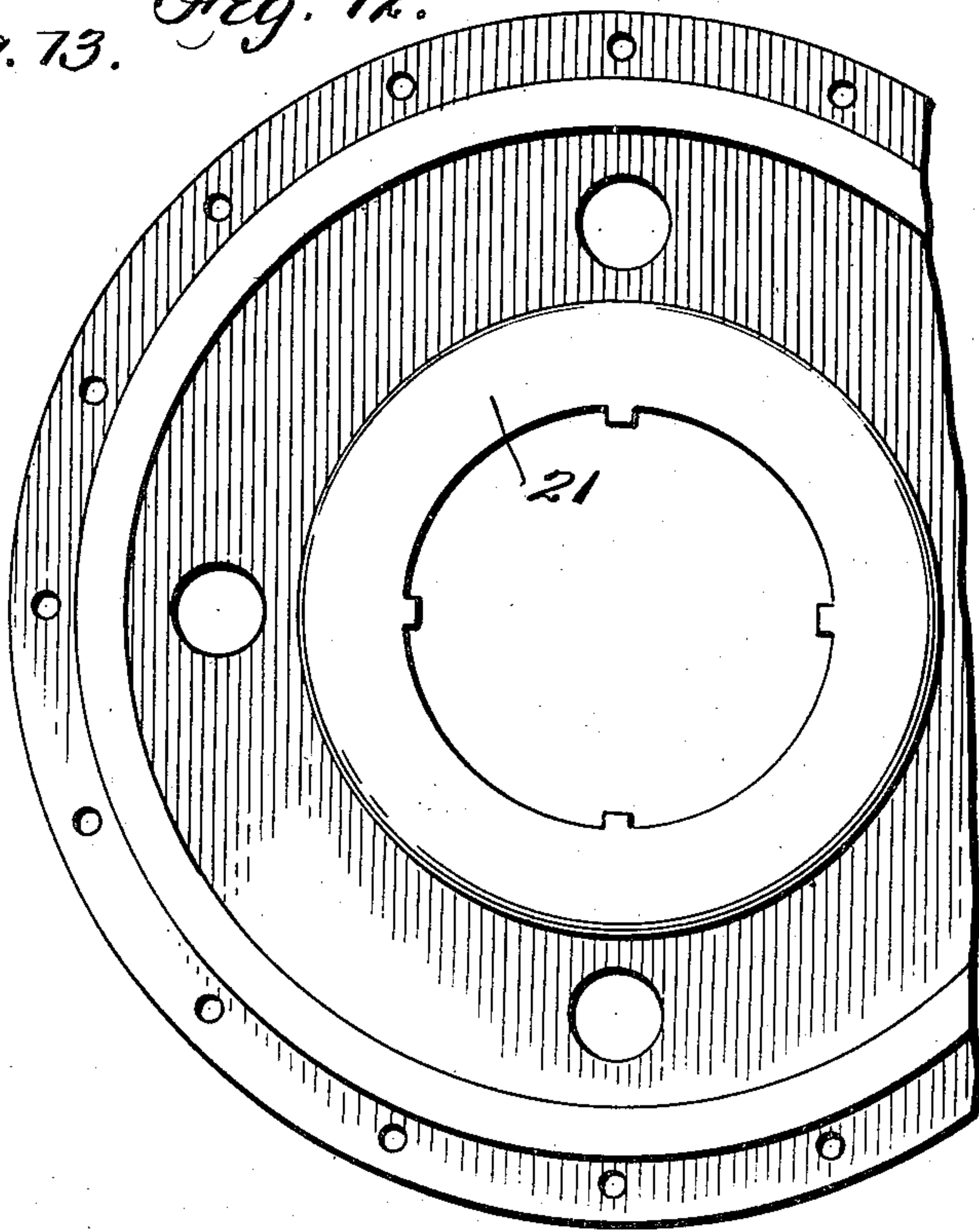


Fig. 74.

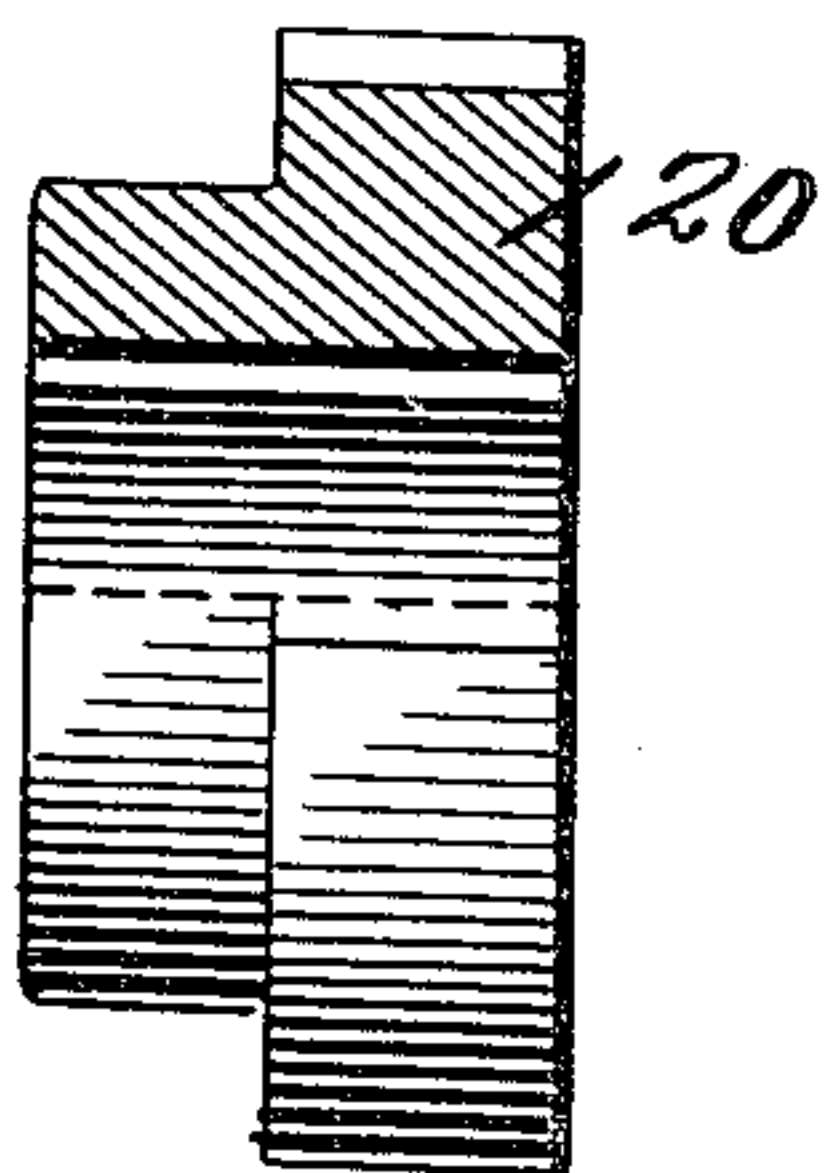


Fig. 75.

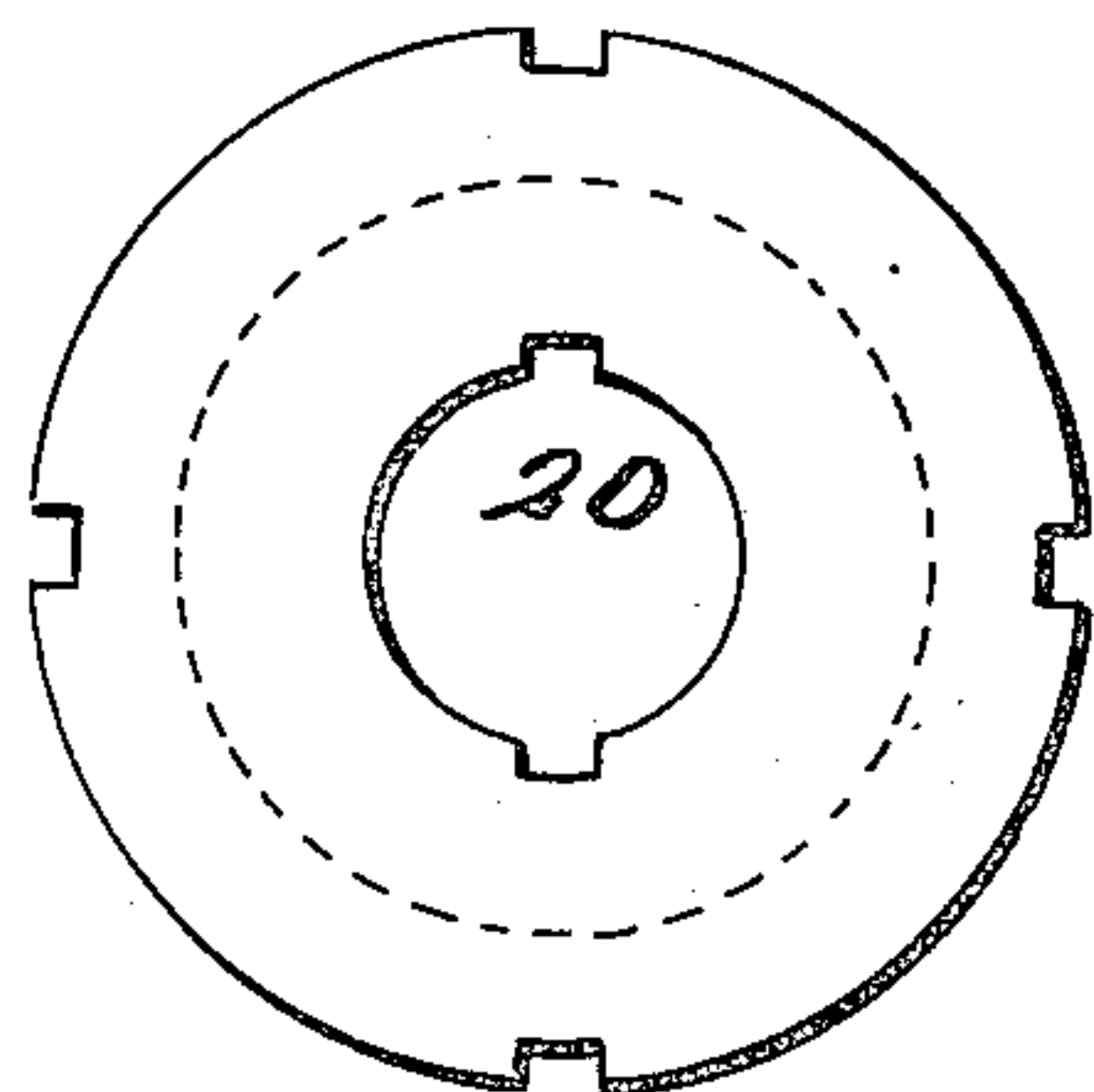
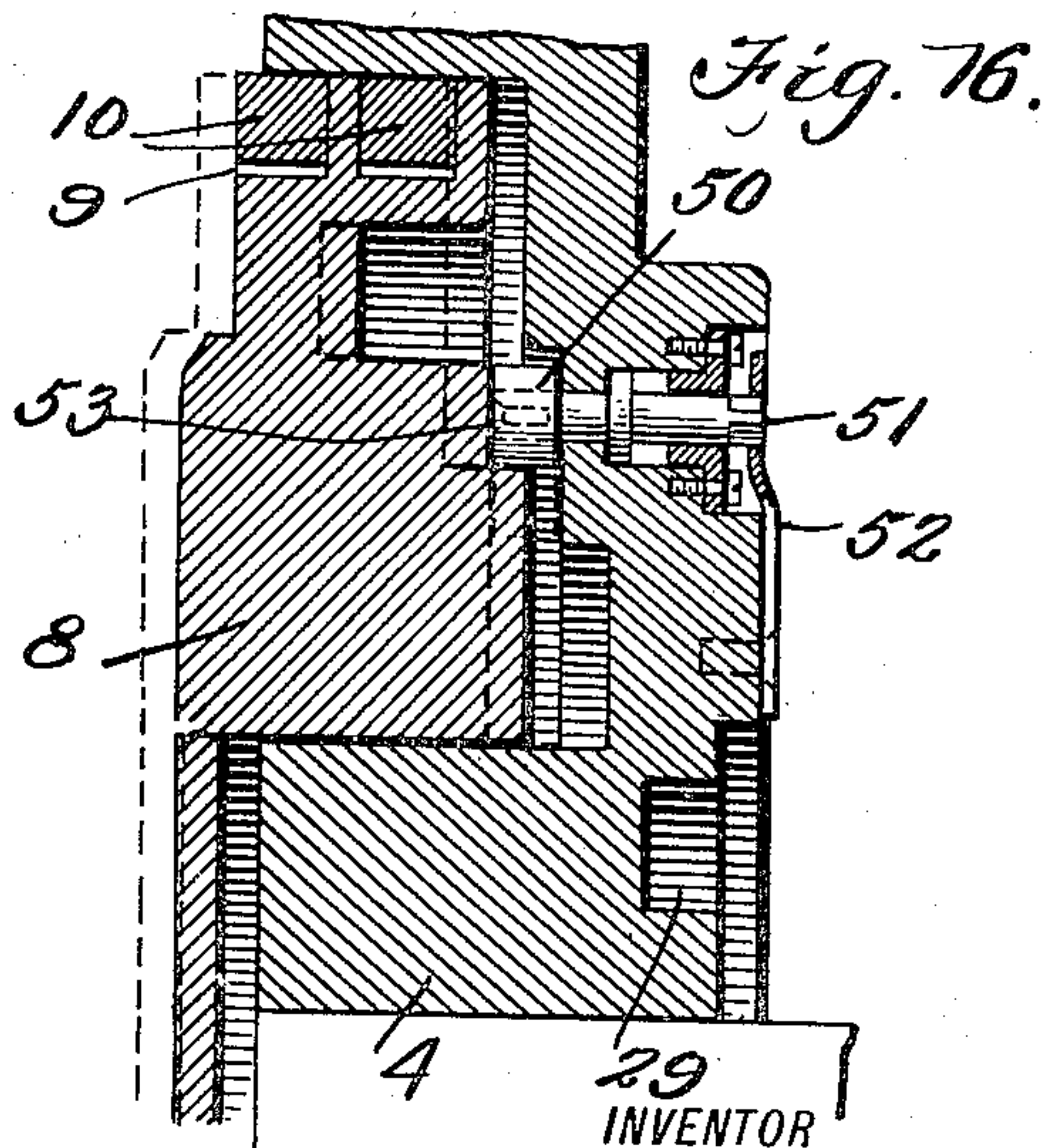
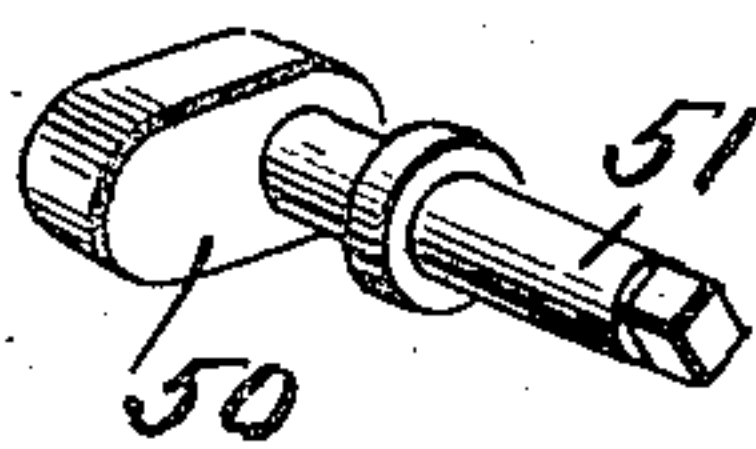


Fig. 77.



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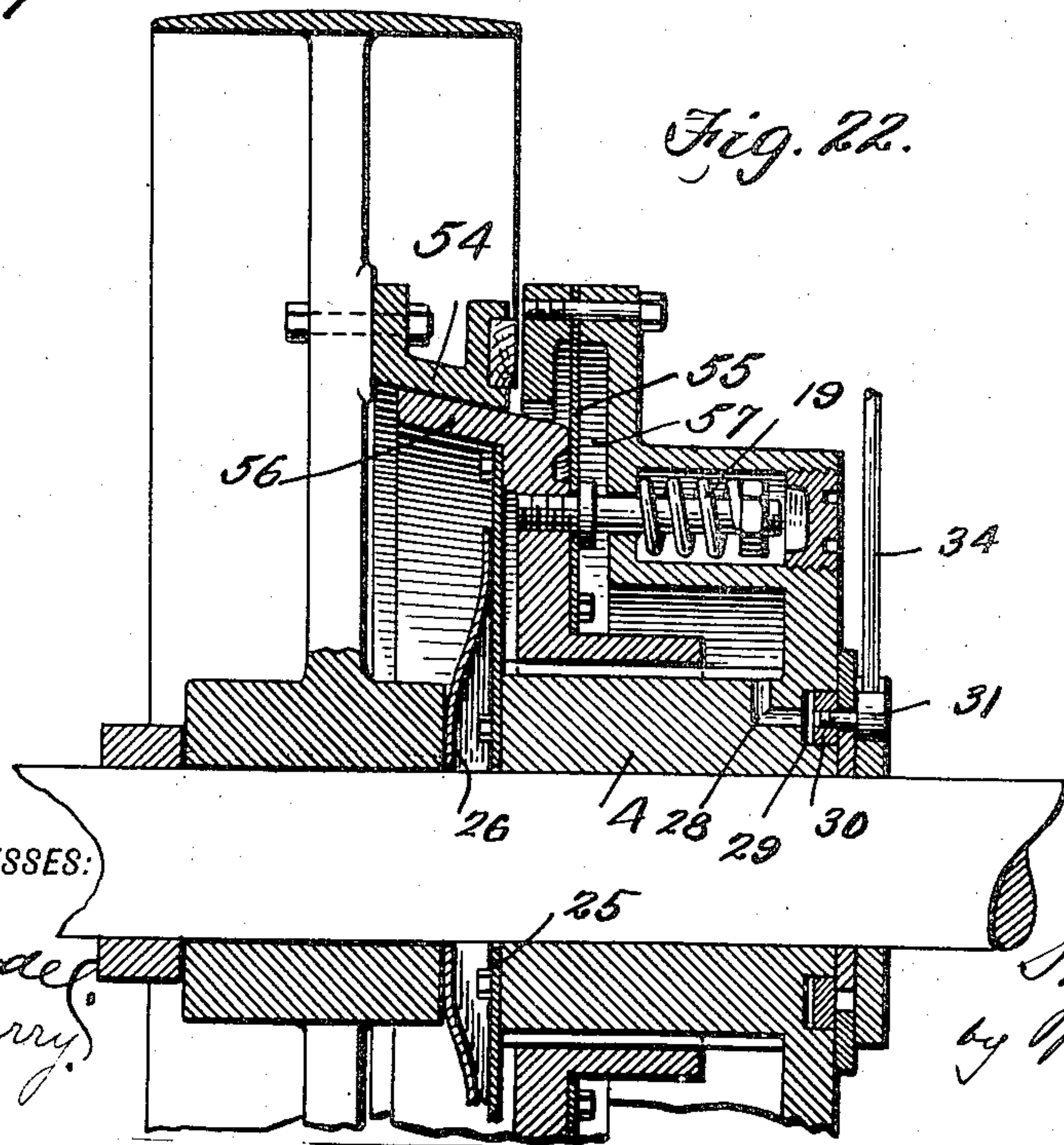
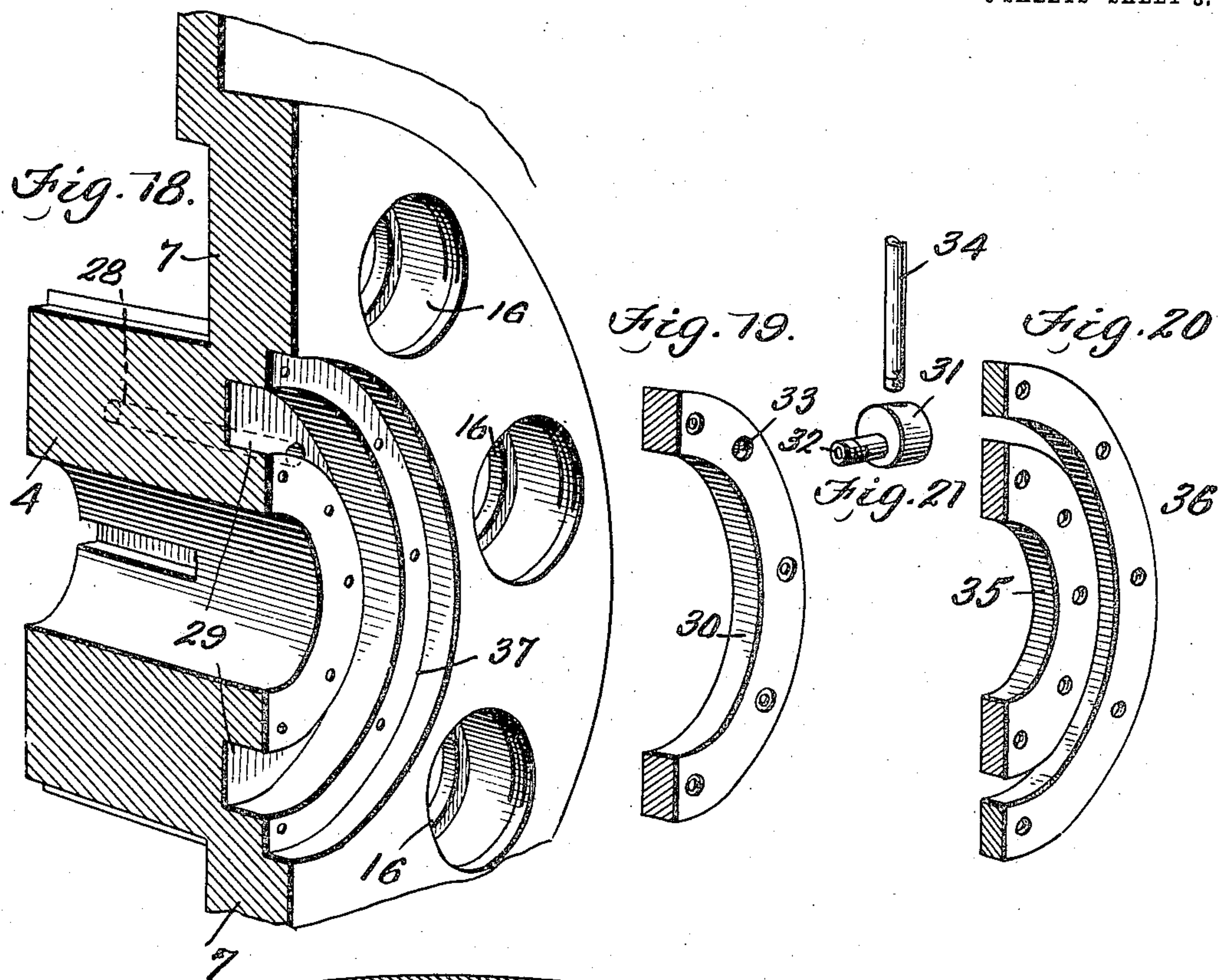


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5 SHEETS—SHEET 5.



WITNESSES:  
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INVENTOR

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# UNITED STATES PATENT OFFICE.

SIMON LAKE, OF BRIDGEPORT, CONNECTICUT.

## FRICITION-CLUTCH.

No. 848,380.

Specification of Letters Patent.

Patented March 26, 1907.

Application filed November 16, 1906. Serial No. 343,758.

*To all whom it may concern:*

Be it known that I, SIMON LAKE, a citizen of the United States, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented a certain new and useful Improvement in Friction-Clutches, of which the following is a full, clear, and exact description.

The object of this invention is to provide a friction-clutch for use particularly in connection with heavy machinery and wherein the male and female members are normally held in operative engagement, the construction and operation being such, substantially as hereinafter more in detail specified, that there is a gradual augmenting of the frictional hold of the clutch members as the driving member revolves, the members being disengaged by the application of fluid-pressure acting against the force of the closing or engaging element and by the bringing into play of a mechanical auxiliary for effecting the final or complete disengagement of the clutch members.

In the accompanying drawings, illustrating the invention, in the several figures of which like parts are similarly designated, Figure 1 is a vertical cross-section of the clutch, taken substantially in the plane of the line A B, Fig. 2. Fig. 2 is a side elevation of the same looking at the driving member. Fig. 3 is a vertical section taken in the plane of the line C D, Fig. 1. Figs. 4 and 5 are vertical cross-sections, on a larger scale, illustrating the arrangement for feeding air into the clutch for separating the clutching-surfaces and for lubricating the clutch, respectively. Fig. 6 is a sectional elevation of the male or driving member of the clutch. Fig. 7 is a side view showing part of the inner face of the driving member. Fig. 8 is a sectional elevation of the piston; and Fig. 9 is a side view of the same, partly broken away. Fig. 10 is a sectional elevation of the clutch-ring to be secured to the piston. Fig. 11 is a sectional elevation of the outer section of the slide-hub section; and Fig. 12 is a face view of the same, partly broken away. Fig. 13 is a sectional elevation of the female clutch-ring, to which the section shown in Fig. 11 is secured. Fig. 14 is a sectional elevation of the hub, upon which the member shown in Fig. 7 is slidably held; and Fig. 15 is an elevation of the same. Fig. 16 is a sectional elevation illustrating the cam for holding the clutch-sections disengaged. Fig. 17 is a

perspective view of the piston-dogging device. Fig. 18 is a detailed sectional perspective view of part of the male clutching-section. Fig. 19 is a similar view of a portion of the pressure-ring, and Fig. 20 is a similar view of the relief-plates. Fig. 21 is a perspective view of one of the studs carried by the pressure-ring and a portion of the pipe for connection with the stud. Fig. 22 is a detail vertical section showing in part the clutch applied to a pulley.

In the drawings, 1 is the driving-shaft, and 2 the driven shaft, both being suitably mounted in bearings. Upon the drive-shaft 1 is keyed the male member 3 of the clutch, comprising the hub 4 and rim 5, from which projects a vertical flange 6 and a web portion 7, connecting the rim and hub.

8 is a piston slidably retained upon the hub and turning with it. This piston is provided with circumferential grooves 9, Figs. 1, 8, and 26, in which are held packing-rings 10. To the piston is bolted a male clutch-ring 11, that engages the female clutch-ring 12. The piston 8 is provided with a series of pockets 13, in each of which is held a headed bolt 14, carried by a circular flanged nut 15, held in a flanged opening 16, formed in the web of the male section of the clutch. Each opening is closed by a threaded disk 17 to provide an airtight closure. In the outer end of each pocket is threaded an apertured disk 18, between which and the head of the bolt is interposed a spring 19. The function of these springs is to normally throw the clutching-surfaces 11 and 12 into engagement.

The female section comprises a hub 20, keyed to the shaft 2, and upon this hub is slidably held a disk 21, fitted to turn with the hub. The discous outer section 21 carries the female clutch-ring 12. The outer vertical surface of ring 12 is rabbeted at 22 to receive a series of wooden blocks 23, that are adapted to engage the vertical face of the extension 6 of the rim of the male section. A circumferential ring 24 is bolted to the clutch-ring 12 and holds the wooden blocks firmly in position.

Annular spring-plates 25 and 26 are bolted to the hub 20 and also to the outer section 21. The function of these plates is to return the outer section of the female member to its normal position. As the piston is moved to disengage the rings the ring 12 yields outwardly by virtue of these plates and releases blocks 23 from part 6, and thus takes off some of the



tractive force from the rings until they are parted, and then the plates restore ring 12 to its proper position.

Suitable oil-cups 27 are provided for lubricating the sliding surfaces between the hub 20 and outer section 21 of the portions of the female member.

So far as described, the operation of the clutch is as follows: The engaging springs 19, preferably eight in number, acting through their bolts 14, force the piston inwardly, so that the male clutch-ring 11 is brought into contact with the female ring 12, this movement continuing until the wooden blocks 23 are forced into engagement with the vertical extension 6 of the rim of the male member. The load is picked up by the rings, and as the clutch turns any tendency of the rings to slip serves to draw the blocks and part 6 into frictional contact, the object of this arrangement being to gradually start the driven machinery and to keep the major part of the thrust self-contained—that is to say, within the clutch itself. The wooden blocks also materially add to the driving power of the clutch.

In order to release the clutch, air is employed, which is fed into the clutch between the male member and piston through a bore 28, which extends entirely through the hub and connects at its outer end with an annular groove 29, in which is held the pressure-ring 30, to which is connected a stud 31. The said stud has a threaded nipple 32, which screws into an aperture 33 in the pressure-ring. A pipe 34 screws into the stud, and this pipe is connected to any suitable tank or other air-supply.

The pressure-ring 30 is held in place by two relief-rings 35 and 36, bolted to the outer face of the hub, and these rings may set in a recess 37, so that they will lie perfectly flush with the outer face of the male member of the clutch. Pressure at the back of these rings is taken up by a pressure-plate 38, that is held against revolution by spring-arms 39, carried by a bracket 40, which is adjustably retained by an arm 41, projecting from a suitable support. (Not shown.) The pressure-plate 38 is made in two sections by cutting out a portion of the plate and fitting in the cut-out portion a segment 42, and between the segment and main or body portion of the plate is held the stud 31. The plate also carries a second stud 43, which is connected to the pressure-ring similar to the stud 31, and this stud 43 is designed for feeding oil into the clutch to thoroughly lubricate all of the parts. A lubricant-supply pipe 44 is connected to the stud 43.

It will be readily apparent that when air is admitted through the pipe 34 and stud 31 it circulates in the recess 29 and escapes through the bore 28 into the space 45 between the end of the hub 4 and the piston and forces the pis-

ton against the tension of the springs 19 and releases the clutch. In order to get a greater releasing pressure, the hub 4 is provided with a series of channels 46, (shown most clearly in Fig. 3,) through which the air may escape into the spaces 47 between the piston and the web 7.

The pressure-ring 30 will be accurately turned to fit snugly within the annular groove 29 and is prevented from turning through its connection by studs 31 and 43 with the plate 38. By reference to Fig. 20 it will be seen the retaining-rings 35 and 36 are set some distance apart, which provides an annular raceway through which the nipples of the studs 31 and 43 pass and also the sleeves 48 of screws 49, further connecting the plate 38 and the ring 30.

In Fig. 16 is shown an eccentric cam 50, operated by a stem 51, which is held against accidental rotation by a spring-plate 52, pivotally held to the hub 4. The eccentric cam 50 normally rests in recess 53 in the piston, and when the piston has been moved over by the air-pressure, as indicated in dotted lines, Fig. 16, the cam 50 is freed from said recess and may be turned down, as indicated in dotted lines, so as to bear upon a solid portion of the piston, and thereby retain the piston in the released position. When it is desired to permanently hold the clutching-rings apart, the plate 52 is released and the stem 51 turned by means of a wrench, after which the plate 52 is fitted over the non-circular end of the stem, which prevents its rotation. This operation occurs before the air-pressure upon the piston is released. The cam 50 by reason of its function is herein referred to as a "piston-dogging device."

Fig. 22 illustrates my improvement coupled to a drive-pulley. The female ring 54 is made in two sections to facilitate attachment. The diaphragm 55 is carried by the driven member and bolted to the piston-section which carries the male clutch-ring 56. When air is admitted through the stud 31, it will find its way into the space 57 and force the piston outwardly, which will disengage the clutching-surfaces.

58 indicates oil-passages in the hub 4 of the driving member, which lead to the surface between the hub 4 and piston 8 for thoroughly lubricating the sliding surfaces. These passages are closed by caps on nuts 59.

This invention is to be distinguished from a prior invention in which fluid-pressure was used to effect and maintain engagement of the clutching members against the normal tendency of springs to disengage the clutching members. In the present invention springs are used to effect the engagement of the clutch members, and fluid-pressure is used to effect disengagement. The engagement, therefore, of the clutch is independent of the fluid-pressure supply and the contin-



gencies accompanying such supply, and such engagement is practically automatic upon the withdrawal of the releasing fluid-pressure. By the provision of the friction-blocks between the vertical faces of the clutch members the engagement of these clutch members takes place gradually, and thus the shock is greatly reduced. Moreover, by this arrangement there is an augmentation of the tractive force by the movement of the driving member of the clutch.

What I claim is—

1. A friction-clutch, having a male and a female member, one of which is fixed to its shaft, a piston slidably mounted upon one of the members and movable relatively to both of such members, complementary clutch-rings carried by the piston and opposite clutch member, springs connecting the piston with the member by which it is carried and serving normally to bring the male and female members into operative engagement, and means to supply fluid-pressure to the piston to move it against the pull of its springs and thereby effect the disengagement of the male and female members.

2. A friction-clutch, comprising a fixed driving member, and a driven member, a piston movable within the driving member and driven member and having a sliding movement upon the driving member, complementary clutch-rings carried by the piston and driven member, expansion-springs connecting the piston with the driving member and serving normally to engage the two members of the clutch for operative purposes, and means to supply fluid-pressure to the piston to disengage the two members from active cooperation.

3. A friction-clutch, comprising a male and a female member, a piston movable within the male member and female member and carried by the male member, expansion-springs connecting the piston with the male member and serving normally to engage the male and female members of the clutch for operative purposes, means to supply fluid-pressure to the piston to disengage the male and female members from active cooperation, and means for dogging the piston and retaining it in its position of disengagement.

4. A friction-clutch, comprising a male and a female member, a piston movable within the male member and female member and carried by the male member, expansion-springs connecting the piston with the male member and serving normally to engage the male and female members of the clutch for operative purposes, means to supply fluid-pressure to the piston to disengage the male

and female members from active cooperation, and friction-blocks interposed between adjacent vertical surfaces of the male and female members to insure a gradual engagement of these members and to augment the tractive force in the movement of the clutch.

5. A friction-clutch, comprising a male and a female member, a piston movable within the male member and female member and carried by the male member, expansion-springs connecting the piston with the male member and serving normally to engage the male and female members of the clutch for operative purposes, and means to supply fluid-pressure to the piston to disengage the male and female members from active cooperation, the said female member including a ring, a disk for supporting it, a hub on which the disk is capable of an axial sliding movement and spring-plates connecting the disk and hub and permitting a yielding movement to the female member.

6. A friction-clutch, comprising a female member having a clutch-ring, and a male member having a complementary clutch-ring and a hub fast to the driving-shaft, a web, a rim on the web and a vertical flange on the rim, a piston packed within the said male member, expansion-springs connecting the piston and male member, said piston normally projecting the said clutch-ring into engagement with the clutch-ring of the female member, and a pressure-chamber interposed between the piston and the hub, web and rim aforesaid and adapted to receive fluid-pressure to act against the piston for disengaging the clutch-rings.

7. A friction-clutch, comprising a female member having an axially-yielding clutching-surface, and a male member having a hub, a web, a rim on the web and a vertical flange on the rim, a piston packed within the said male member, expansion-springs connecting the piston and male member, said piston carrying the active male clutching device and normally projecting the said device into engagement with the female member of the clutch, and a pressure-chamber interposed between the piston and the hub, web and rim aforesaid, and adapted to receive fluid-pressure to act against the piston for withdrawing the male member out of engagement with the female member.

In testimony whereof I have hereunto set my hand this 16th day of November, A. D. 1906.

SIMON LAKE.

Witnesses:

M. D. BLONDEL,  
L. M. Fox.



It is hereby certified that in Letters Patent No. 848,380, granted March 26, 1907, upon the application of Simon Lake, of Bridgeport, Connecticut, for an improvement in "Friction-Clutches," errors appear in the printed specification requiring correction, as follows: On page 1, line 78, the numeral "26" should read 16, and on page 2, line 107, the comma after the word "attachment" should be stricken out and a period inserted instead; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 18th day of June, A. D., 1907.

[SEAL.]

C. C. BILLINGS,  
*Acting Commissioner of Patents.*