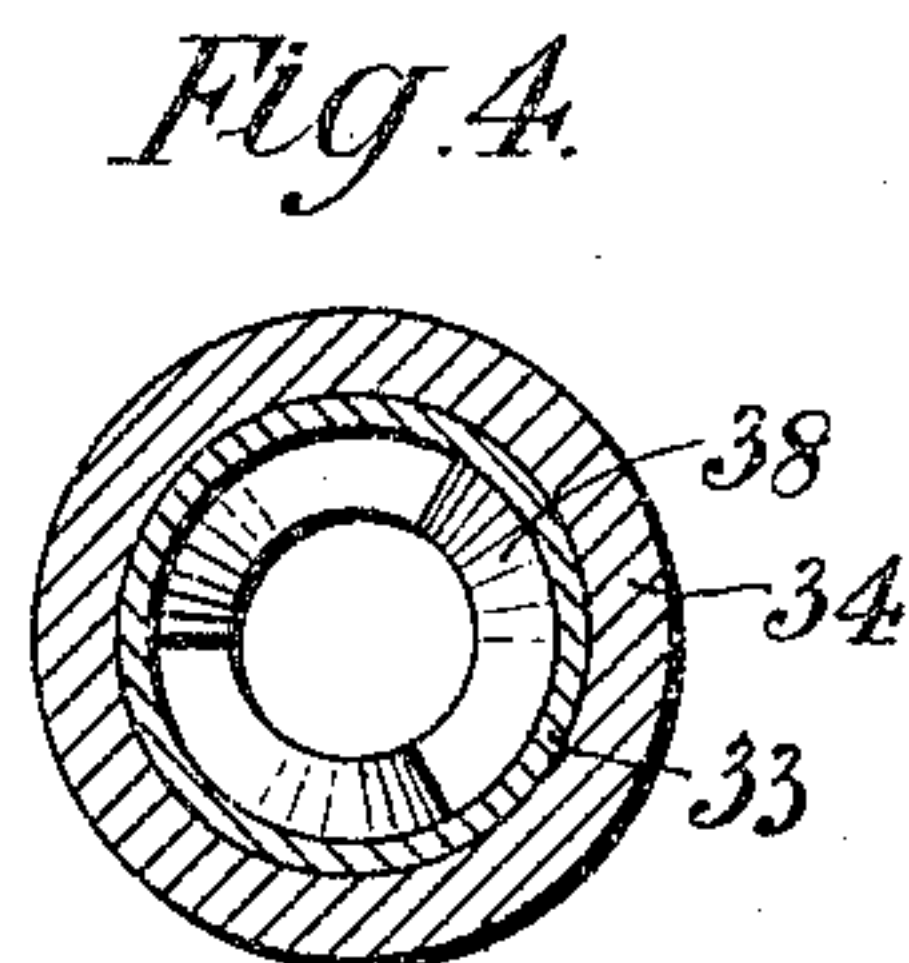
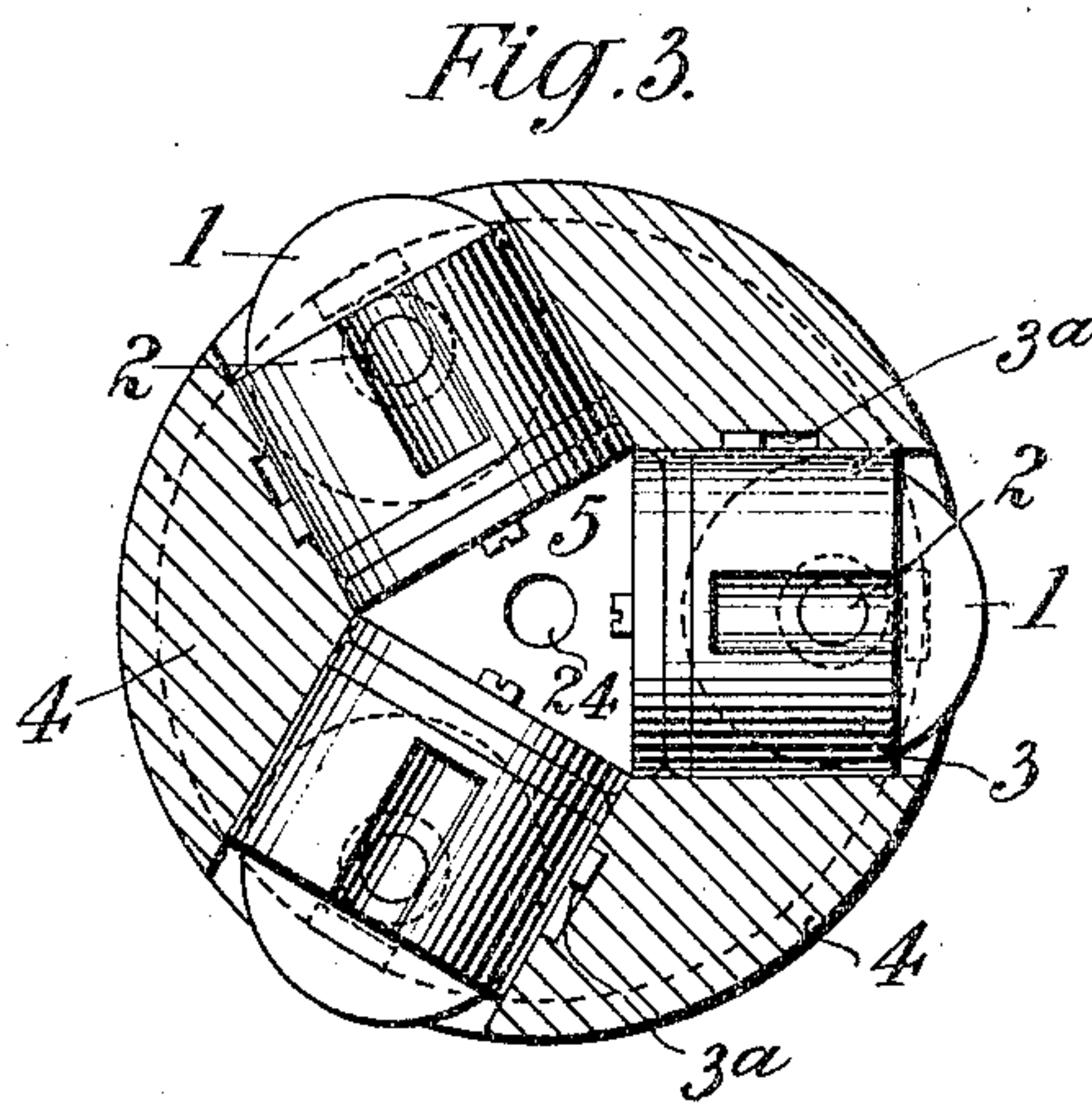
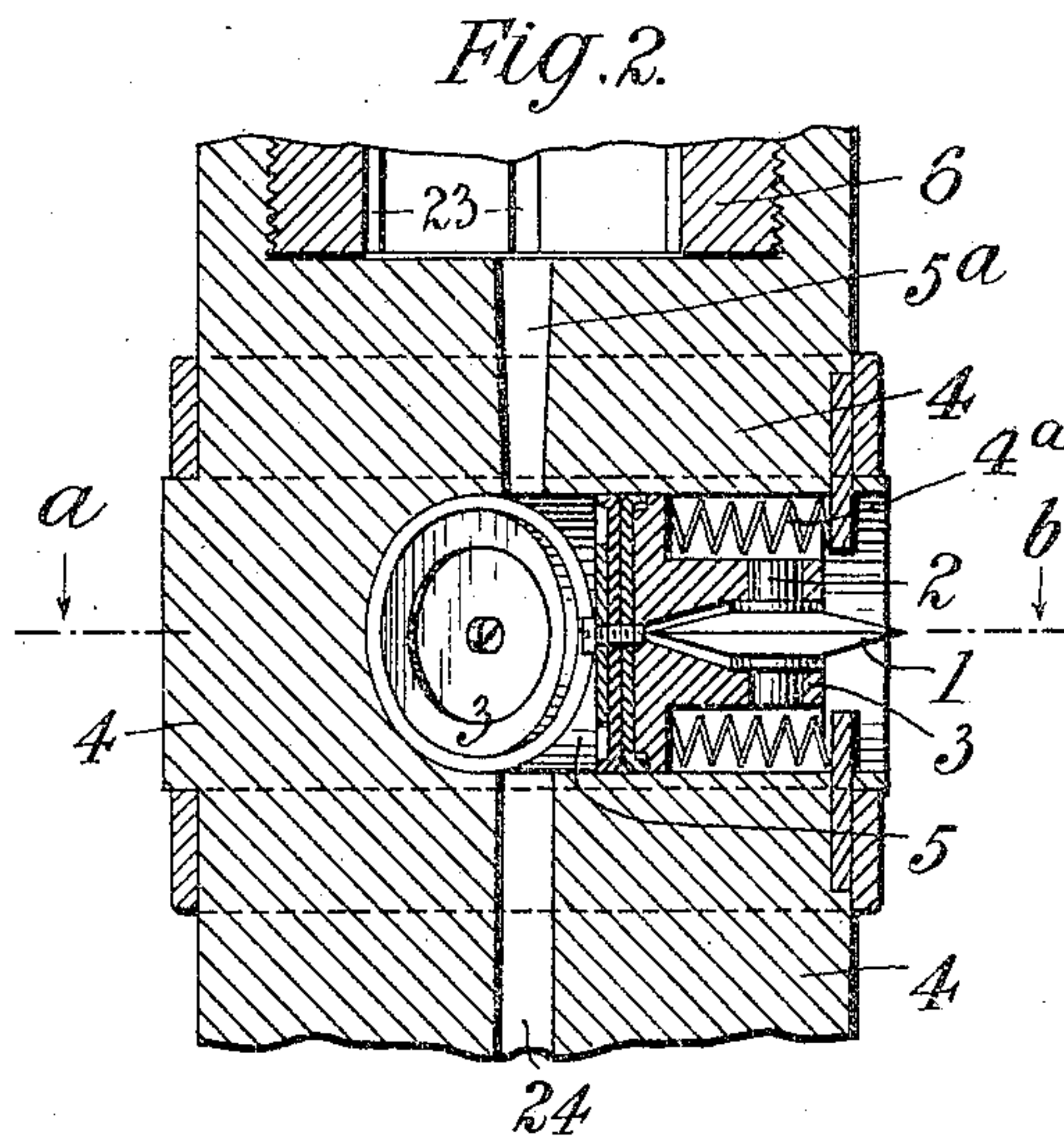
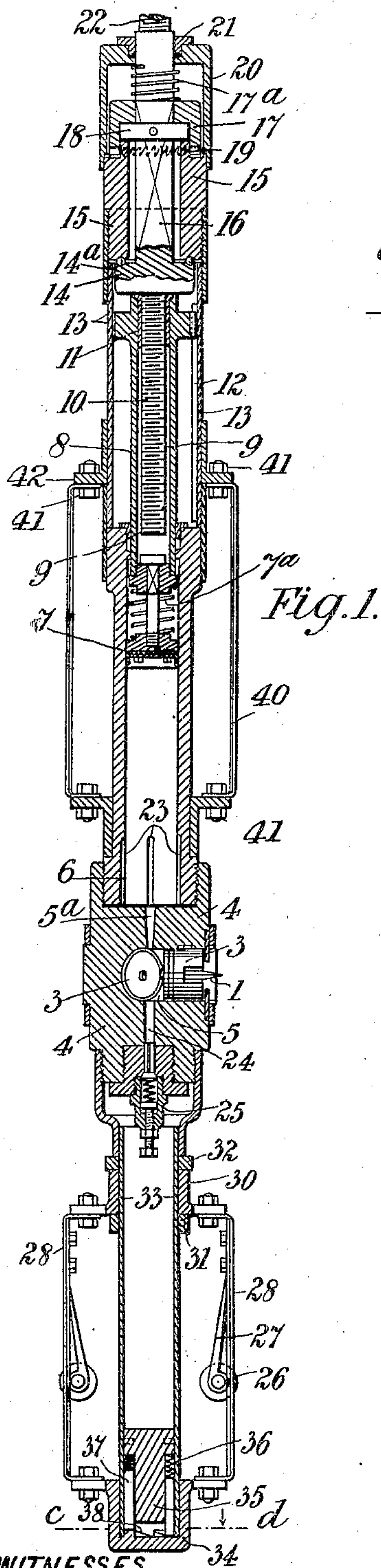


No. 789,867.

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E. A. McCALLUM.
TUBE CUTTING APPARATUS.
APPLICATION FILED JAN. 23, 1905.



WITNESSES.
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TUBE-CUTTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 789,867, dated May 16, 1905.

Application filed January 23, 1905. Serial No. 242,367.

To all whom it may concern:

Be it known that I, EDWARD ALFRED McCALLUM, a subject of the King of Great Britain, residing at Baku, Russia, have invented a certain new and useful Improvement in Tube-Cutting Apparatus, of which the following is a specification.

This invention relates to improvements in tube-cutting apparatus, the object being to provide an improved tool for cutting tubes from the inside thereof, which is particularly applicable to tubes used for lining bore-holes and Artesian wells.

The apparatus comprises a rotatable body part carrying cutters mounted on pistons working in cylinders, chambers, or cavities preferably arranged radially and communicating with a central cavity or chamber in the body, which in turn communicates with a barrel or cylinder for containing the fluid under pressure. Means are provided for putting the fluid in the barrel under pressure to force the pistons outwardly to bring the cutters into contact with the inside of the tube to be cut, and means are also provided whereby the body is held against rotation until the cutters are in their operative position, after which the body is rotated for the cutting operation by any convenient means, such as by attachment to the ordinary boring-rods used in the sinking of Artesian wells.

Referring to the accompanying drawings, Figure 1 is a vertical section through an apparatus constructed in accordance with this invention. Fig. 2 is a similar section through that part of the tool carrying the cutters and drawn to a larger scale. Fig. 3 is a transverse section on line *a b* of Fig. 2, and Fig. 4 is a transverse section on line *c d* of Fig. 1, also drawn to a somewhat larger scale.

The cutters 1, of which three or more may be employed, may consist of circular disks of steel or they may be of other shape or material. In the case of a disk each is carried upon a central spindle 2, mounted vertically in the interior of a hollow cylindrical piston 3, so that the cutting-disk is horizontal and a portion of its periphery projects beyond the open end of the piston.

The pistons 3 are slidably located in cylindrical chambers or cavities formed radially in a metal body 4, as shown in Fig. 3, but are prevented from turning about their longitudinal axes by a feather-key 3^a and communicate with a central cavity 5 therein. Springs 4^a may, as shown, be provided attached to the piston to assist in controlling the return thereof to their initial positions at the close of the cutting operation. The body 4 is screwed onto a vertical cylinder or barrel 6, which also communicates by a passage 5^a with said central cavity 5, and working within said barrel 6 is a plunger 7, having a tubular extension 8 above. Between the plunger 7 and tubular extension 8 a helical spring 7^a (see Fig. 1) may be interposed, which acts to permit an adjustment of the pressure when cutting tubes of oval diameter or having inequalities therein.

Within the tubular extension 8 is a rod 9, which is provided with a screw-thread 10, adapted to work in a threaded nut 11, carried fast on the extension 8 and secured against rotation by means of a feather 12, fixed by screws or the like on the interior of an outer tube 13, surrounding the extension 8 and screwed on or otherwise made fast to the barrel 6 and upon which feather said nut 11 can slide longitudinally. Above the nut 11 the rod carries a collar 14, against the under side of which the upper end of the tubular extension 8 or the nut 11, carried thereby, is adapted to abut. The upper face of the collar 14 bears against the lower half 15 of a clutch having ratchet-teeth thereon, balls or rollers 14^a being interposed between such bearing parts to reduce friction, and said half-clutch 15 is attached to the outer tube 13. An extension 16 of the rod 9 passes freely through the lower half-clutch 15, but is fast to the upper half 17 of said ratchet-clutch, said extension 16 of the rod carrying fast thereon a collar 18, the under face of which bears upon an extension 19 of said lower half-clutch 15, and to this latter, as shown, or to the outer tube 13 may be screwed a cap or cover 20, inclosing the upper half-clutch 17 and a spring 17^a, which serves to keep the two halves of said clutch yieldingly in engagement. The cap 20

is preferably provided with a gland 21, through which passes the extension 16 of the rod 9, the extremity 22 thereof being screw-threaded, as shown, for attachment to the boring-rods usually employed in sinking Artesian wells or to flexible shafting driven from any convenient source of power.

In the lower part of the inside of the barrel 6 vertical grooves 23 are cut somewhat longer than the plunger 7, and a passage 24 is provided in the lower part of the metal body 4, which communicates with a spring-loaded relief-valve 25, attached to the aforesaid body 4.

Means are provided for preventing the rotation of the body 4 of the tool when the boring-rods are rotated in one direction to force the plunger downward in the barrel 6, and such means may conveniently comprise, as shown, an arrangement of guide-rollers 26, carried by spring-arms 27, attached to a guide-frame 28, through openings in which they are adapted to slightly project, so as to contact with the inner surface of the lining-tube of the well or boring, and which frame 28 is carried by bolting or otherwise partly on a sleeve 30, loosely mounted between shoulders or collars 31 32, fast on a lower tube or extension 33, adapted to be screwed to the body 4 of the tool and partly to a cap or part 34, which incloses the lower end of the tube 33. The latter is fitted with a plug 35, having vertical slots 36 therein, within which are slidable spring-controlled blocks 37, which contact with ratchet-surfaces 38, formed on the inside of the cap 34, and are locked thereby when the boring-rods are rotated as aforesaid to lower the plunger, but over which they slide freely when the rotation of said rods is reversed to rotate the body during the cutting operation. Further guiding means, comprising bars or rods 40, bolted by bolts 41 or like suitable fastening means to flanges or collars 42, screwed or otherwise secured to the part 6, may also be provided to steady the apparatus when in use.

The operation is as follows: The apparatus, having been filled with water or other fluid, according to the nature of that contained in the bore-hole, and the pistons 3 drawn back within their cylindrical cavities or chambers, is attached to the boring-rods and lowered into the well until the body carrying the cutters 1 has reached the position at which the tube lining the well is to be cut. The boring-rods are then rotated in one direction, in which the ratchet-teeth of the clutch slip on each other, when the rotation of the screw-threaded rod 9 will cause the nut 11 to ride down the feather 12, thus lowering the tubular extension 8 and plunger 7 within the barrel 6, thereby putting the fluid in the latter and the cavity 5 of the body 4 under pressure and forcing outward the pistons 3 and the cutting-disks 1 until the latter contact with the inner wall of the tube

to be cut. The arrangement of guide-rollers and other means previously described prevent the rotation of the body 4 during the operation. On the direction of rotation of the boring-rods being reversed the ratchet-teeth of the clutch engage, whereby the body of the tool as a whole is caused to rotate within the tube lining the boring, so that the cutting-disks 1 act upon it. By occasionally reversing the direction of rotation of the boring-rods the pressure in the barrel 6 can be kept at such a point as will keep the cutting-disks up to the work, while not being sufficient to open the relief-valve, and such adjustment of the pressure is assisted by the interposition of the helical spring 7^a, which enables the cutters to accommodate themselves to the contour of the tube being operated upon. After the well-tube has been cut through the plunger is forced quite down the barrel 6 until it comes opposite the vertical grooves 23 in the cylinder, the fluid under pressure escaping by the relief-valve. The grooves 23 being longer than the plunger cause the pressure on either side thereof to be equalized, when the pistons 3, carrying the cutters, will be withdrawn into their cavities in the body 4, the hydrostatic pressure in the tube being cut, combined with the partial vacuum produced in the barrel on the descent of plunger, being sufficient to force the pistons inward, and the tool can be raised out of the bore-hole.

What I claim is—

1. In pipe-cutting apparatus operated by fluid-pressure and in combination, radially-arranged cylinders, pistons in same, cutters carried by said pistons, means for moving the pistons in the cylinders to project the cutters outwardly, and means for rotating the cylinders during the cutting operation.

2. In pipe-cutting apparatus operated by fluid-pressure, the combination with radially-arranged cylinders, of pistons located in same, cutters carried by said pistons, a force-pump connected to said cylinders and adapted to operate the pistons therein to project the cutters outwardly, means for rotating the cylinders and their connected parts, and means for relieving the pressure on the pistons to withdraw the cutters.

3. In pipe-cutting apparatus operated by fluid-pressure, the combination with a rotatable chambered body, of pistons carried radially thereby, cutters carried by said pistons, a receptacle for containing a fluid, means for placing said fluid under pressure to operate the pistons, means for holding the body against rotation until the pressure operation is complete, and means for rotating the body on completion of the latter operation.

4. In pipe-cutting apparatus operated by fluid-pressure, the combination with a rotatable body having cylindrical chambers therein communicating with a rearward cavity, of pistons located in said chambers, cutters car-

ried by said pistons, a barrel carried by said body for containing a fluid, a plunger working within said barrel to put the fluid therein under pressure to operate the pistons, means for holding the barrel and the body against rotation when desired, means for rotating said barrel and said body during the cutting operation, and means for withdrawing the cutters at the close of the latter operation.

5. In pipe-cutting apparatus operated by fluid-pressure, the combination with a rotatable body having radially-arranged cylindrical cavities therein communicating with a central cavity, of pistons located within said radial cavities, cutters carried by said pistons, a barrel carried by the body for containing the fluid under pressure and communicating with the central cavity, means for putting pressure on the fluid in the barrel and the cavity, means for preventing the rotation of the barrel and the body until the completion of the pressure operation, means for rotating said barrel and body during the cutting operation, and means for withdrawing the cutters at the close of the latter operation.

6. In pipe-cutting apparatus operated by fluid-pressure, the combination with a rotatable body having cylindrical cavities therein each communicating with a central cavity, of pistons located in said cylindrical cavities, cutters carried by said pistons, a barrel carried by said body for containing the fluid under pressure, a plunger working within said barrel, means for operating said plunger to put pressure on the fluid in the barrel, means for preventing the rotation of the tool-body during the movement of the plunger, means for rotating the tool-body for the cutting operation, and means for withdrawing the cutters at the close of the latter operation.

7. In pipe-cutting apparatus operated by fluid-pressure the combination with a rotatable body having cylindrical cavities therein each communicating with a central cavity, of pistons located in said cylindrical cavities, cutters carried by the said pistons, a barrel carried by said body for containing the fluid under pressure, a plunger working within said barrel, a hollow extension carried by said plunger, a screw-threaded rod within said extension, a threaded nut working on said rod and carried fast on said extension, means for permitting longitudinal but preventing rotating motion of said nut, means for rotating the screwed rod to longitudinally travel the nut thereon to operate the plunger, means for preventing the rotation of the tool-body during the inward movement of the plunger and for rotating the tool-body on the close thereof for the cutting operation, and means for withdrawing the cutters at the close of the latter operation.

8. In pipe-cutting apparatus operated by fluid-pressure the combination with a rotatable body having cylindrical cavities therein

each communicating with a central cavity, of pistons located in said cylindrical cavities, cutters carried by said pistons, springs controlling the inward movement of the latter, a barrel carried by said body for containing the fluid under pressure, means for putting said fluid under pressure to operate said pistons in an outward direction, means for preventing the rotation of the body during the outward movement of the pistons, and means for rotating the tool-body at the close of such movement for the cutting operation.

9. In pipe-cutting apparatus operated by fluid-pressure the combination with a rotatable body having cylindrical cavities therein each communicating with a central cavity, of pistons located in said cylindrical cavities, cutters carried by the said pistons, means for controlling the inward movement of the latter, a barrel carried by the rotatable body for containing the fluid under pressure, means for putting pressure on the fluid to operate the pistons in an outward direction, an extension 33 carried by the tool-body fast thereto, a sleeve rotatably mounted on said extension, a part 34 movable with said sleeve having ratchet-surfaces thereon, spring-controlled blocks 37 carried by the extension 33 adapted to engage the ratchet-surfaces of the part 34 whereby the tool-body is prevented from rotating during the outward movement of the pistons, and means for rotating the tool-body for the cutting operation at the close of such outward movement.

10. In pipe-cutting apparatus operated by fluid-pressure the combination with a rotatable body having cylindrical cavities therein, of pistons located in said cylindrical cavities, cutters carried by said pistons, means for controlling the inward movement of the latter, a barrel carried by the body and connecting with the cavities for containing the fluid under pressure, means for putting the fluid therein under pressure to operate the pistons outwardly, means for holding the body against rotation during such outward movement of the pistons, and a clutch one part of which is fast to the body to rotate the latter during the cutting operation.

11. In pipe-cutting apparatus operated by fluid-pressure the combination with a rotatable body having cylindrical cavities therein, each communicating with a central cavity of pistons located in such cylindrical cavities, cutters carried by said pistons, means for controlling the inward movement of the latter, a barrel carried by the body for containing the fluid under pressure, a plunger working therein, an extension on said plunger, a threaded nut carried by said extension, a screw-threaded rod working in said nut, a two-part clutch having one part fast on the body and the other part fast on said screwed rod whereby the latter is permitted to rotate in one direction to operate the plunger for the outward move-

ment of the pistons, and means for holding the body against rotation during such movement.

12. In pipe-cutting apparatus operated by fluid-pressure, the combination with a rotatable body having cylindrical cavities therein of pistons located in said chambers, cutters carried by said pistons, a barrel carried by the body for containing the fluid under pressure, a plunger working therein, an extension carried by said plunger, a spring interposed between the extension and the plunger to permit of an adjustment of the pressure on the fluid, means for operating the plunger to put pressure on the fluid in the barrel—means for holding the body against rotation during such operation of the plunger and means for rotating said body after such operation for the cutting operation.

13. In pipe-cutting apparatus operated by fluid-pressure, the combination with a rotatable body having cylindrical cavities therein, each communicating with a central cavity, of pistons located in said cylindrical cavities, cutters carried by said pistons, a barrel for containing the fluid under pressure to operate the pistons, means for holding the body against rotation during such operation, and guiding means loosely carried by the body to steady the latter within the tube to be cut.

14. In pipe-cutting apparatus operated by fluid-pressure the combination with a rotatable body having cylindrical cavities therein

each communicating with a central cavity, of pistons located in said cylindrical cavities, cutters carried by said pistons, a barrel for containing the fluid under pressure, means for putting pressure on the fluid, a pressure-relief valve communicating with said body, means for holding said body against rotation during the operation of the pistons, and means for rotating the body during the cutting operation.

15. In pipe-cutting apparatus operated by fluid-pressure the combination with a rotatable body having cylindrical cavities therein, each communicating with a central cavity, of pistons located in said cylindrical cavities, cutters carried by said pistons, a barrel for containing the fluid under pressure and having pressure-equalizing grooves in the lower part, a plunger working in said barrel, means for operating said plunger to put pressure on the fluid in the barrel, means for holding the body against rotation during such operation of the plunger, and means for rotating said body after such operation for the cutting operation.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

EDWARD ALFRED McCALLUM.

Witnesses:

F. G. DIXON,
GEO. P. SIMPSON.