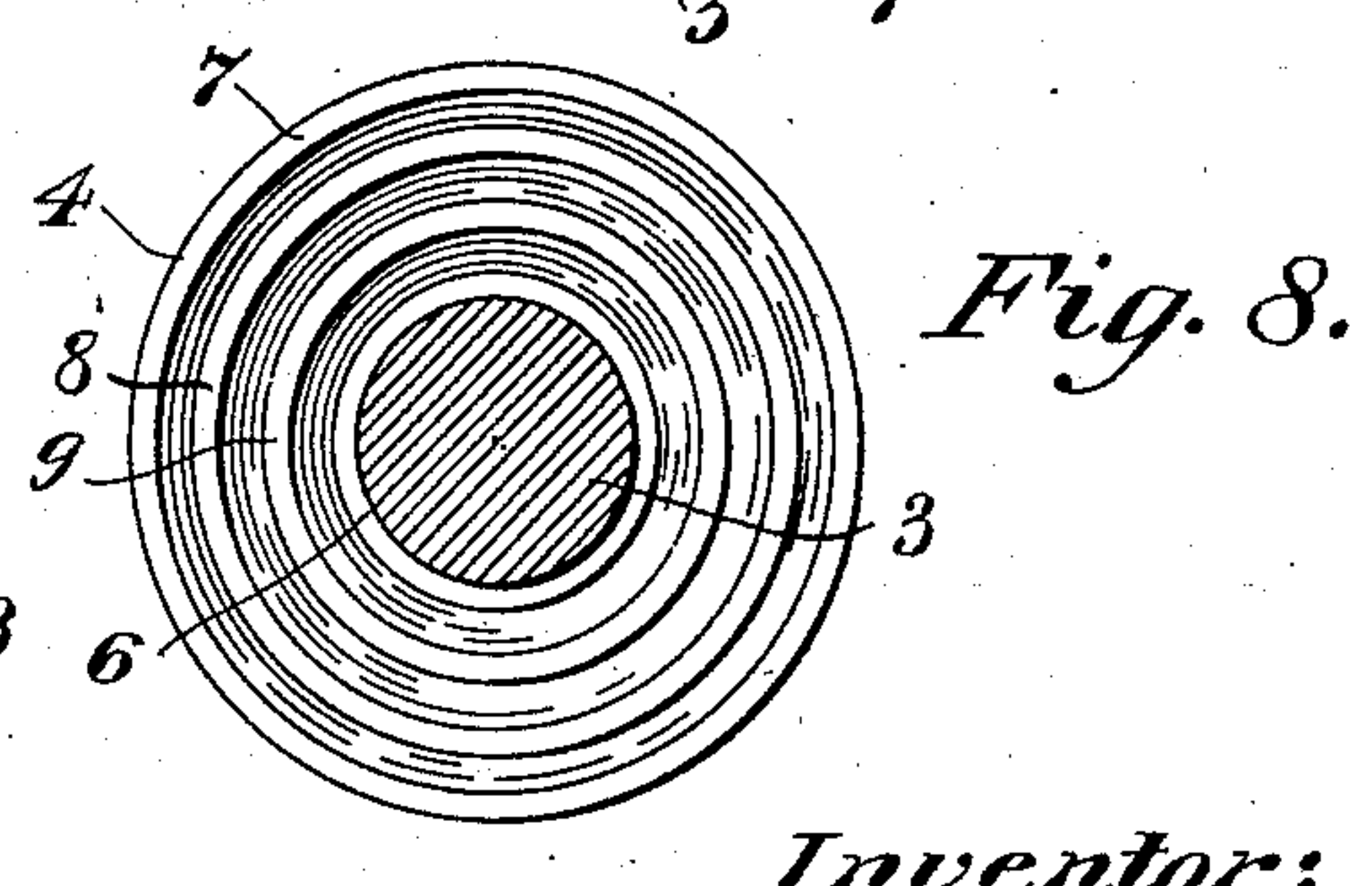
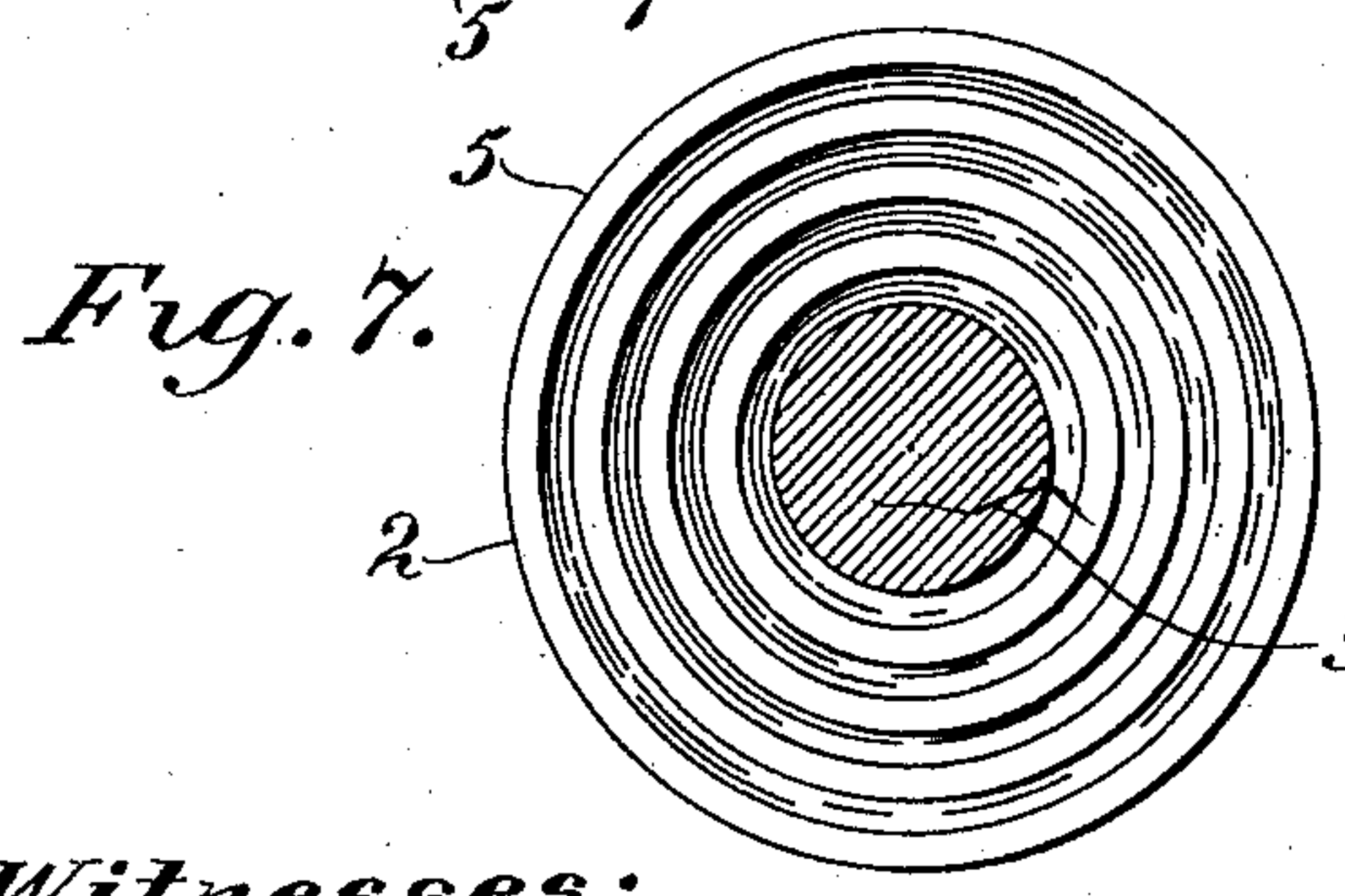
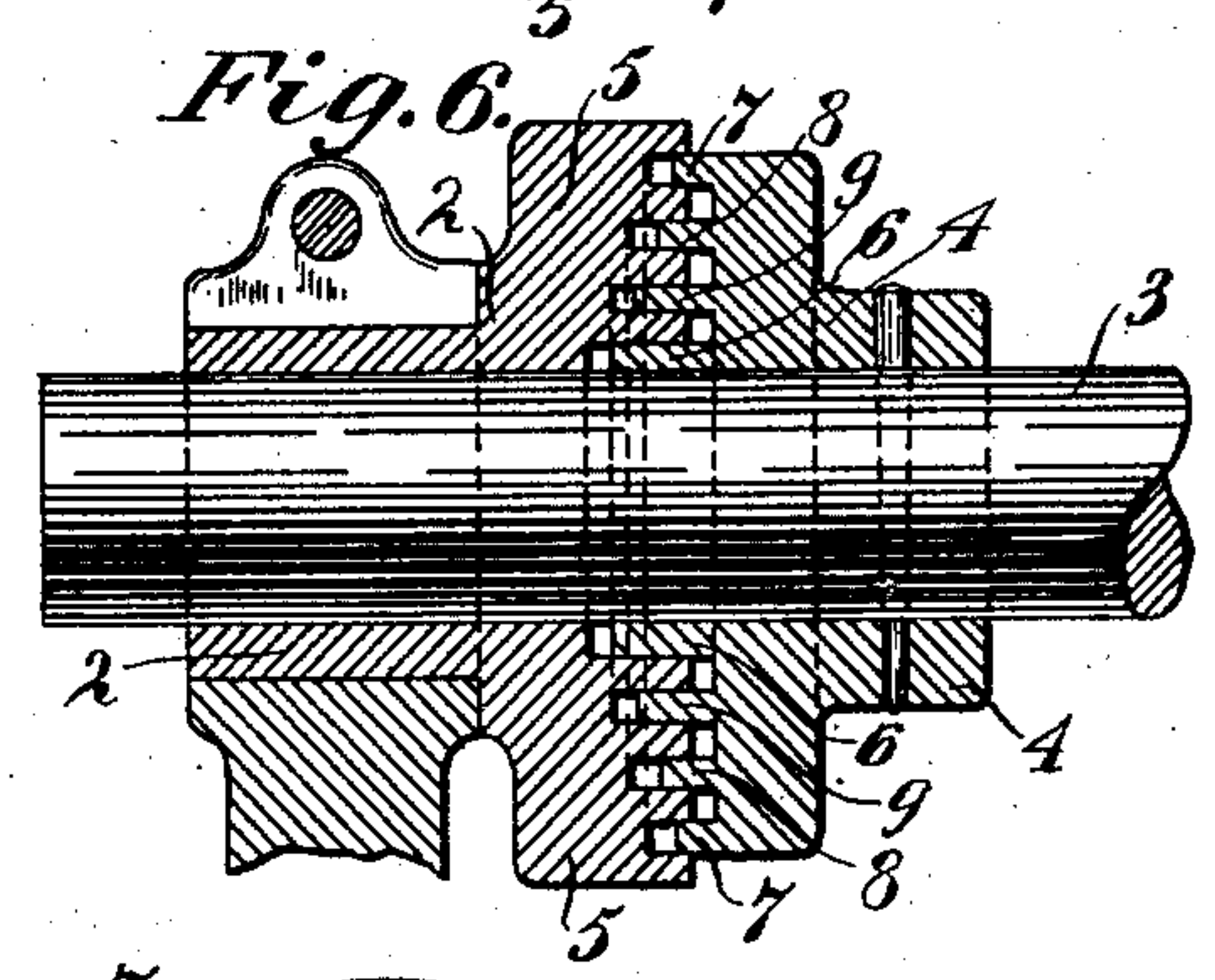
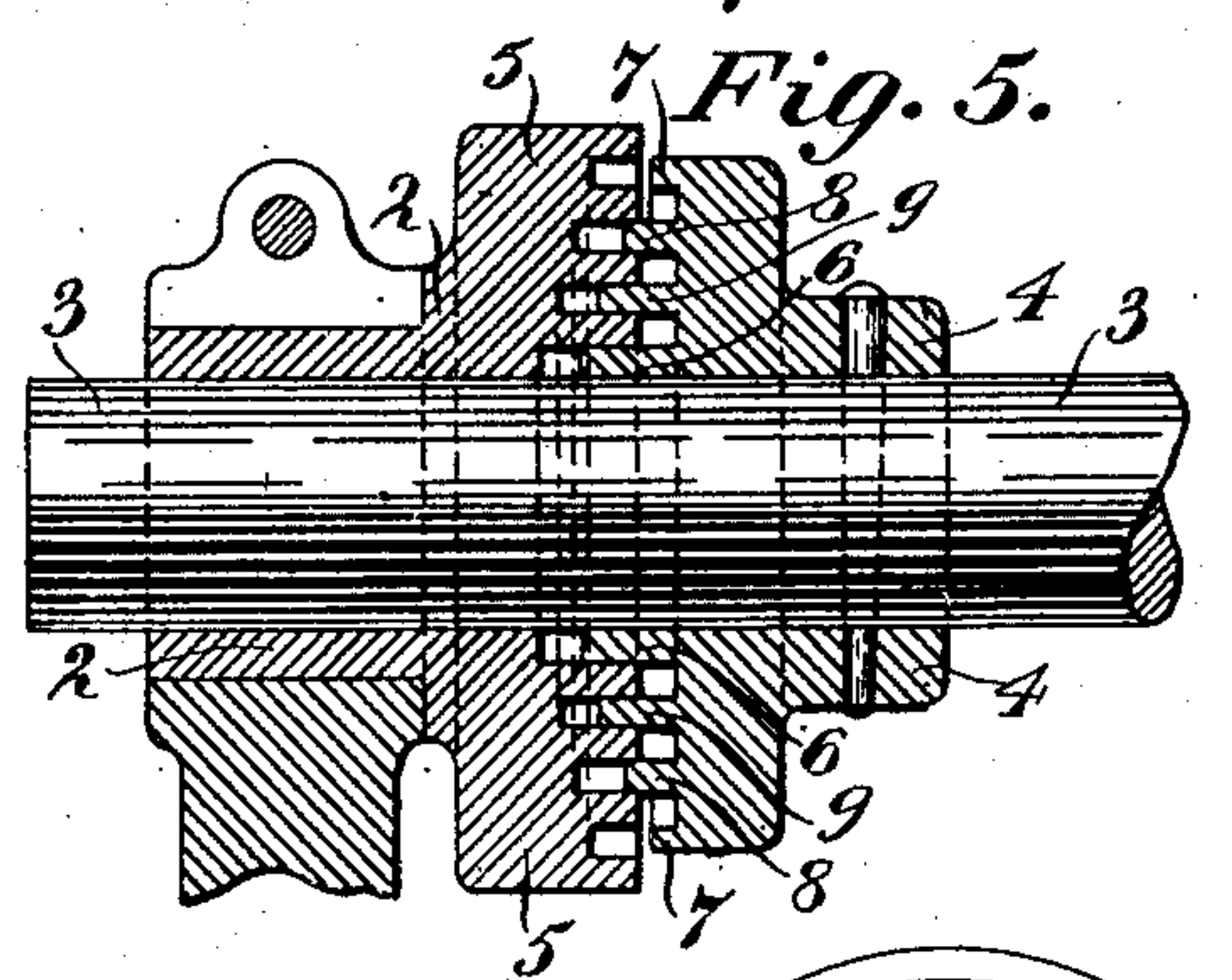
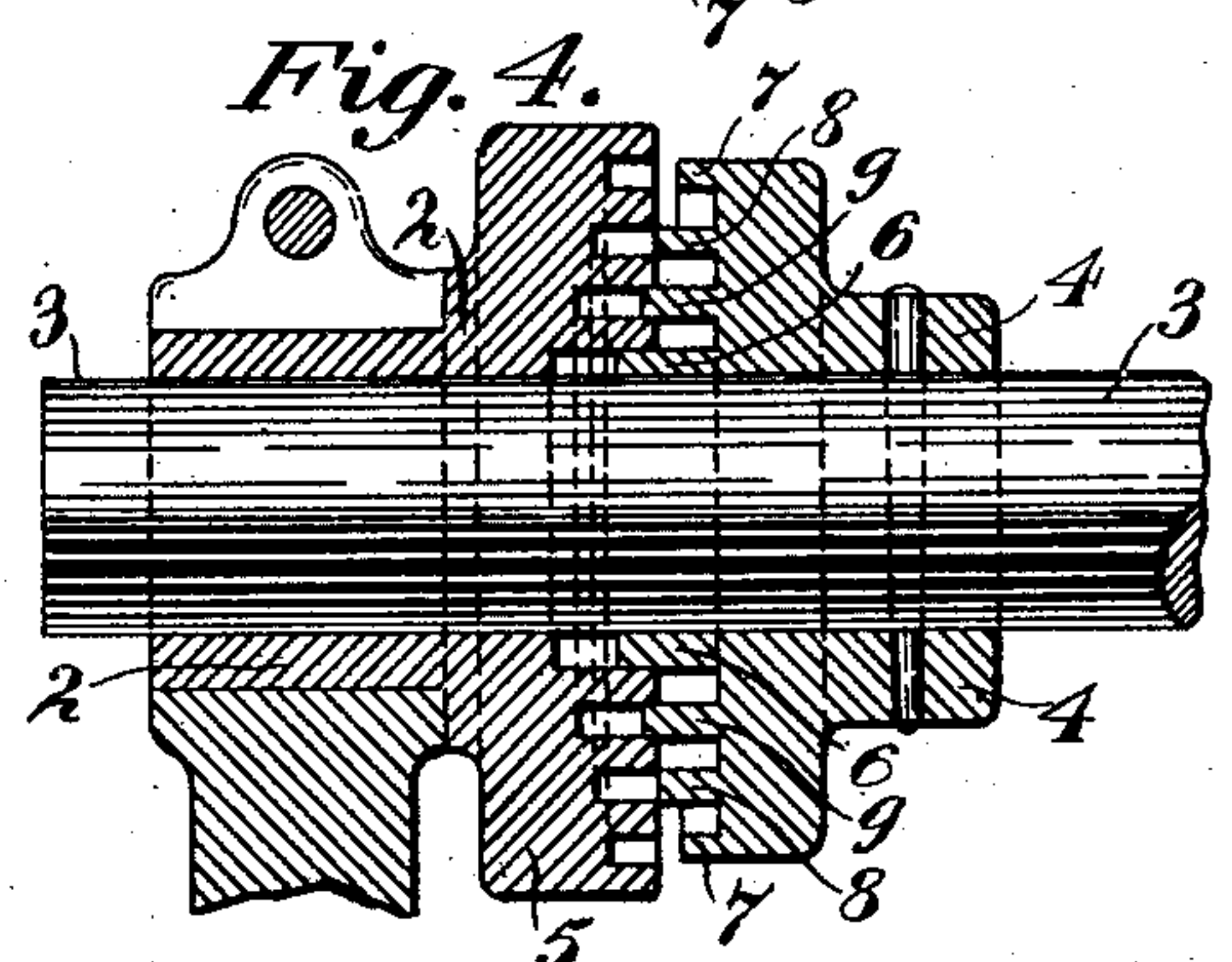
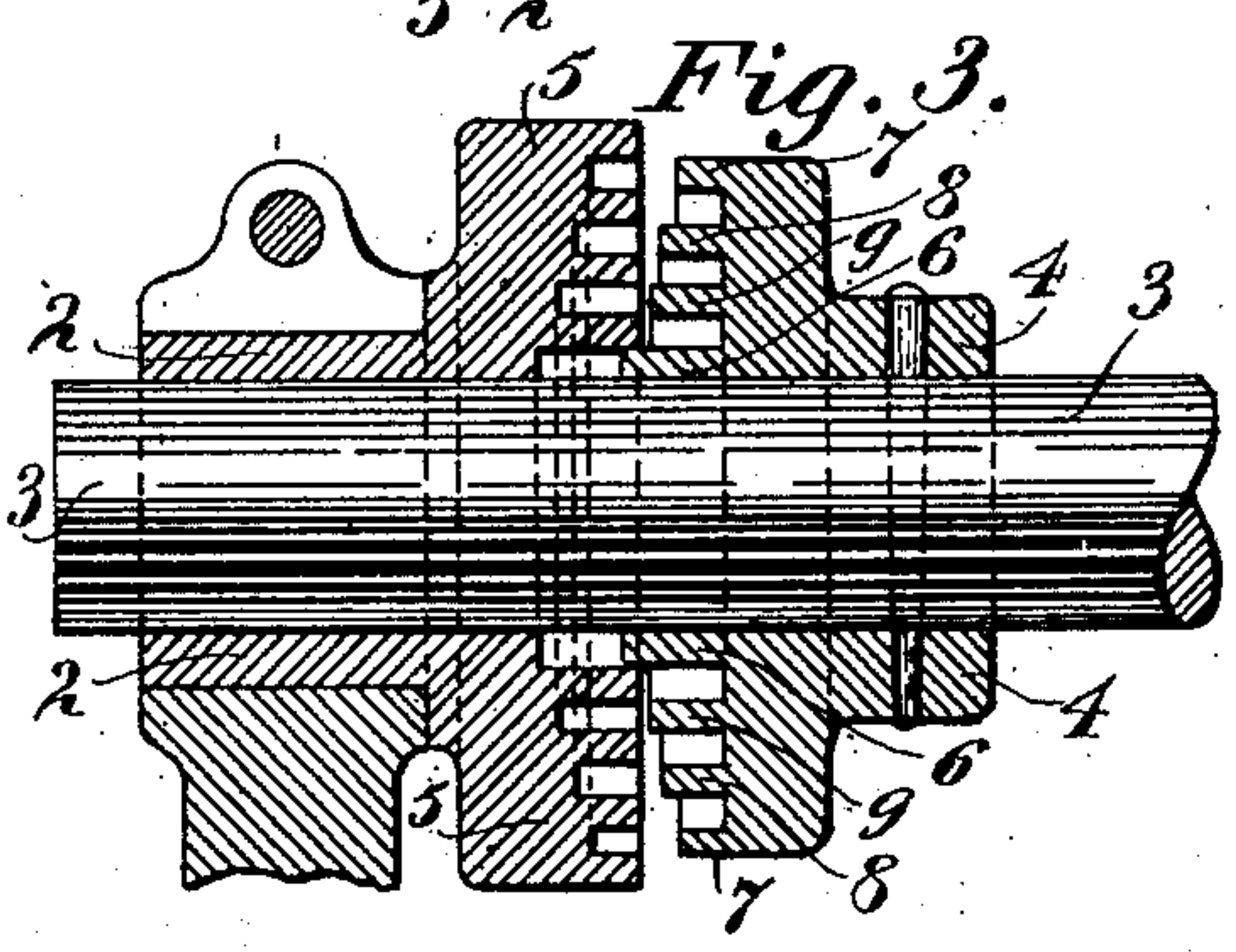
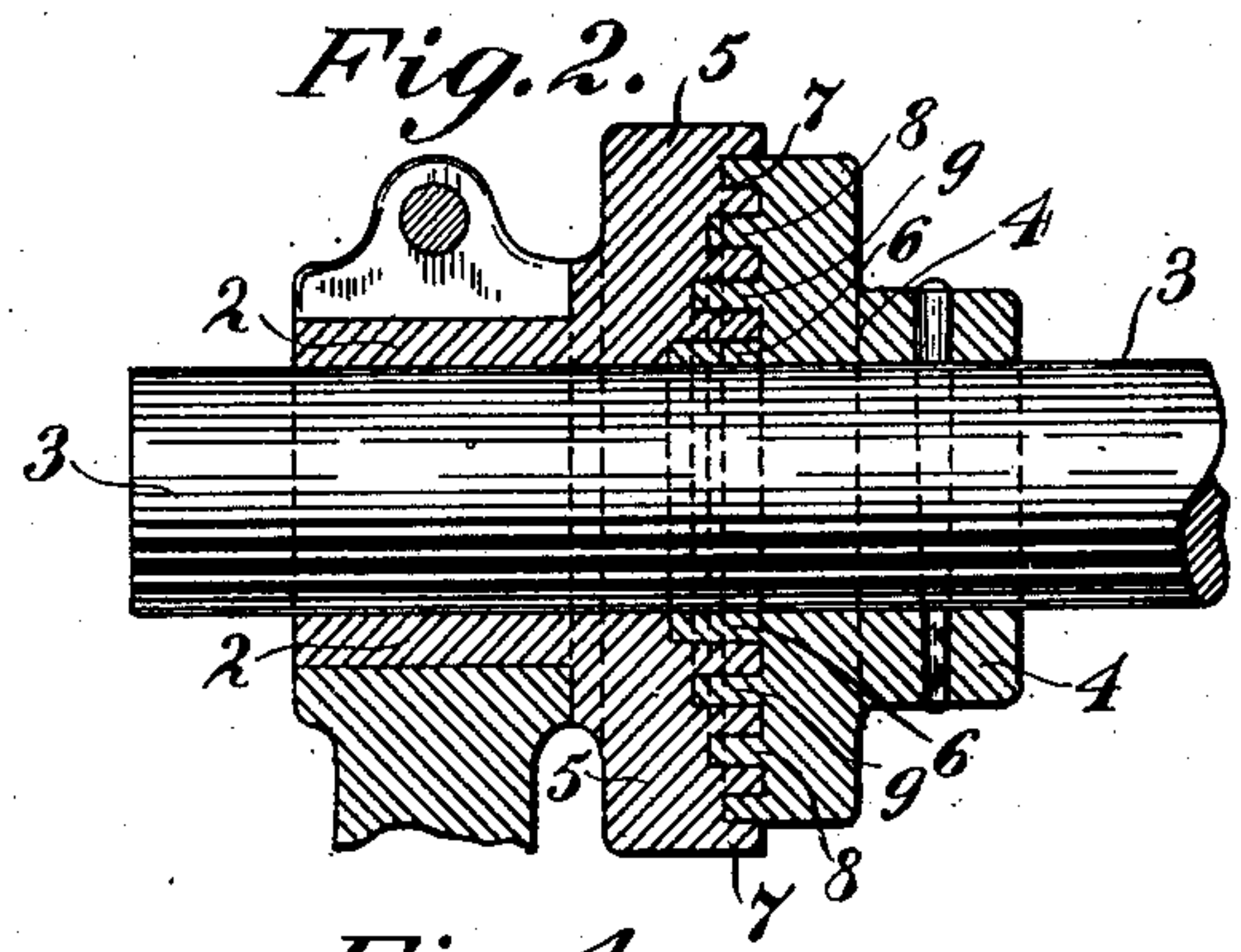
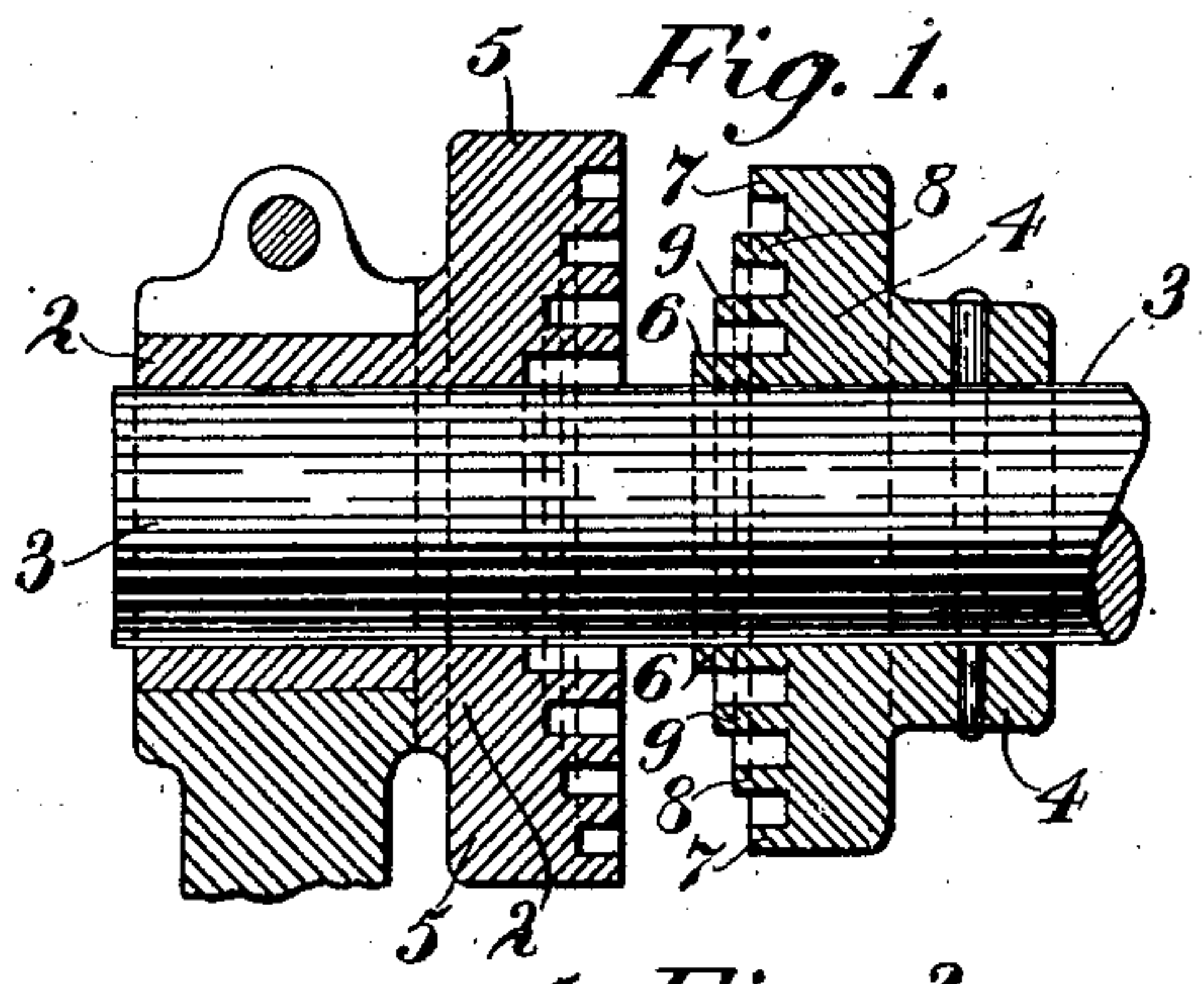


F. H. RICHARDS.
STOP DEVICE.
APPLICATION FILED DEC. 20, 1900.

992,804.

Patented May 23, 1911.



Witnesses:
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UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

STOP DEVICE.

992,804.

Specification of Letters Patent.

Patented May 23, 1911.

Application filed December 20, 1900. Serial No. 40,573.

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Stop Devices, of which the following is a specification.

This invention relates to means for cushioning the force of the blow of a moving part of a mechanism when its motion is changed or it is brought to rest, and has for an object the furnishing of an improved construction whereby the condition of motion of the moving part or parts may be altered with a minimum shock and the parts brought together with a minimum noise. This result is attained according to the present invention by combining, with the moving member or parts and the part which co-operates therewith to effect a change in motion, devices in the nature of dash-pots, which, according to one feature of the invention, are so disposed with relation to each other as to coöperate one with another. Means for this purpose, and which embody the features of the present invention, will be described in the following specification with the aid of the accompanying drawing, in which—

Figure 1 is an axial or longitudinal section through a stop collar and its abutment constructed and coöperating according to my present improvements, and shows the same in a position separated one from the other. Fig. 2 is a similar view, but shows the collar and abutment as brought together in their closest relation. Fig. 3 is a similar view and shows the parts in a position in which they first begin to coact one with the other. Figs. 4, 5, and 6 are similar views and illustrate various successive stages of the actual coaction between the parts. Fig. 7 is a face view of the abutment set forth in the previous figures, and Fig. 8 is a similar view of the collar.

Similar characters of reference designate corresponding parts in all the figures.

For the purpose of the present illustration and description, and for exhibiting an embodiment of the invention, the latter is shown applied to a relatively fixed abutment 2 here having the form of a sleeve, and constituting a bearing for the shaft 3, which has a longitudinal sliding movement there-

in. The shaft 3 may also have a revolving movement either continuous or intermittent as required in any particular case. To this shaft 3 is affixed a stop collar 4 whose radial face, in conjunction with the adjacent radial face of the lateral extension 5 of the abutment 2, constitutes the stop faces for arresting the longitudinal movement of the shaft 3.

To minimize the shock and noise naturally incident to the prompt stopping of the longitudinally moving shaft and parts carried thereby, these stop-faces are provided with a device or series of devices analogous to dash-pots which preferably are designed to be successively brought into action with the result of gradually increasing the force opposing such longitudinal motion. These dash-pot devices may consist of plungers or pistons upon one face, which are adapted to enter corresponding cylinders on the opposite face, and they may be disposed in suitable groups on their respective faces, and are of suitable character. They will furthermore be so related according to one feature of the present invention as to be brought into action gradually and progressively, thereby bringing the moving parts to rest in the smoothest manner.

The plungers or pistons may be located upon one side of the shaft 3, or they may be disposed upon more than one side, and are adapted to fit into their respective cylinders, freely but closely, the closeness depending somewhat upon the pressures which are to be brought to bear, so that the flow of the fluid in the cylinder past the entering piston may not be cut off entirely but merely restricted or throttled.

In the present instance, and more especially for the purpose of balancing the force with respect to the longitudinal moving shaft or bar 3, the plungers and cylinders are disposed symmetrically around the shaft. The plungers or pistons may be conveniently made in the form of ribs preferably annular to form rings concentric to the shaft 3 but separated by grooves or channels which form cylinders for the ring-like plungers or pistons on the opposite face. And the pistons and cylinders may in practice be made as illustrated and have parallel sides, that is having their perimeters parallel with the axis of the shaft.

Referring to collar 4, four such rings are

shown, an inner ring 6, an outer ring 7, and intermediate rings 8 and 9, all of which are adapted to enter corresponding annular channels in the face of the lateral extension 5 of the abutment 2. Of course, a greater or lesser number of these rings may be provided upon the collar 4 as thought desirable. For the purpose of bringing these ring-like plungers or pistons 6, 7, 8, and 9 successively into action for the purpose specified, and in this aspect they may be regarded as forming a single dash-pot, they may be made of varying height if the outer edges of the rings formed by the channels in the abutment all lie substantially in the same plane as shown with such height progressively increasing from outward radially inward.

Disposed and related as shown and described, upon the approach of the collar 4 sufficiently near to the abutment to coact therewith the first ring to enter its corresponding channel or cylinder will be ring 6, see Fig. 3. The movement of this ring toward the bottom of its channel displaces the fluid therein, which fluid in some instances will be lubricant, preferably oil. The movement of the ring will cause this fluid to flow outwardly through the restricted clearance space between the side of the entering ring and the channel. Ring 9 will during this time act as a deflector to direct the flow of the fluid in the direction of the next channel, which is the one adapted to receive the ring 9, see the arrow in Fig. 3. This action will continue until this latter ring 9 has entered its proper channel. The fluid now displaced by ring 6 will pass through the clearance space between the ring 9 and the side of its channel to supply or increase the pressure of the fluid therein. (See Fig. 4). This action will progress outwardly until all the rings are brought into concurrent action, (see Figs. 5 and 6,) under which conditions the fluid displaced from any channel is compelled to pass successively through all the remaining channels beyond it. It is manifest, therefore, that from the commencement of the action up to the time that all the rings are brought into play, the resistance to longitudinal movement is an increasing resistance as each ring enters its respective channel, augmenting with a nearer and nearer approach of the collar 4 to the abutment 2, and even after all the rings are brought into action this resistance increases, since the length of the tortuous restricted passage traversed by the fluid is increased by the closer and closer approach of the several rings to the bottoms of their respective channels. Motion is therefore checked by an increasing resistance opposed to such motion, and the parts are brought to rest gradually with little or no shock, and practically without noise.

In practice, the amount of clearance space

between the rings or plungers and their several channels or cylinders; that is to say, the amount of their freedom of movement, will be regulated by the weight of the parts to be brought to rest, their velocity, the nature of the fluid used in the device, and the various forces to be controlled. Preferably, also, a uniform bearing of one part upon the other when the parts have been brought to rest will also exist; that is, in the present instance the several rings 6, 7, 8, and 9 upon the collar 4, or the rings formed on the abutment by the channels therein, will all bear slightly against the several surfaces opposed to their radial edges.

Having described my invention, I claim—

1. A dash-pot comprising a plurality of successively operative sets of plungers and corresponding cylinders, said sets being disposed adjacent to each other, whereby the fluid is displaced from one cylinder into another.

2. A dash-pot comprising a plurality of sets of plungers and corresponding cylinders, said sets being disposed adjacent to each other and arranged to inaugurate their action in sequence, whereby the fluid is displaced from one cylinder into another.

3. A dash-pot comprising a plurality of plungers or pistons of varying length or height and corresponding cylinders, one cylinder being placed to receive a fluid displaced from an adjacent cylinder.

4. A dash-pot comprising a plurality of successively operative sets of plungers and cylinders, each set embodying a continuous substantially parallel sided rib, and a corresponding channel.

5. A dash-pot comprising a plurality of successively operative sets of plungers and cylinders, each set embodying a continuous rib and a corresponding channel, and the several sets being disposed adjacent to each other, whereby the fluid is displaced from one cylinder into another.

6. A dash-pot comprising a plurality of successively operative concentrically disposed sets of plungers and cylinders, each set embodying a ring and a corresponding cylinder, and the several sets being disposed adjacent to each other whereby the fluid is progressively displaced from one cylinder into another.

7. The combination with a longitudinally movable shaft, of a bearing therefor, a collar attached to the shaft and provided with a series of concentric ribs and intervening channels, and an abutment fixed to said bearing and provided with a series of concentric ribs substantially equal in width to and adapted to cooperate with the channels in the collar and intervening channels substantially equal in width to and adapted to cooperate with the ribs extending from the collar.

8. The combination with a longitudinally movable shaft, of a bearing therefor, a collar attached to the shaft and provided with a series of concentric ribs and intervening channels, and an abutment fixed to said bearing and provided with a series of concentric ribs adapted to successively cooperate with the channels in the collar and intervening channels adapted to successively cooperate with the ribs extending from the collar.

9. The combination with a longitudinally movable shaft, of a bearing therefor, a collar attached to the shaft and provided with a series of concentric ribs decreasing in height as their distance from the shaft increases and with intervening channels, and an abutment fixed to said bearing and provided with a series of concentric ribs adapted to cooperate with the channels in the collar and with intervening channels of decreasing depth as their distance from the shaft increases, the channels being adapted to cooperate with the ribs extending from the collar.

10. The combination of a plurality of concentrically disposed cylinders, a series of mating pistons, means for closing the series at the center, the outer side of the series being exposed, and the pistons arranged to act in sequential order commencing adjacent to the closed side for successively closing the inner sides of the cylinders while the outer sides remain exposed.

11. The combination with a body provided with a series of concentric ribs and intervening channels, another body provided with a series of concentric ribs adapted to successively cooperate with the channels in first body, and intervening ribs adapted to successively cooperate with said former ribs, the exit from one side of the channel to be

first engaged being more restricted than the exit from the channel last to be engaged.

12. The combination with a movable body and a fixed body being open respectively at one side and closed at the other, the movable body being provided with a series of concentric ribs decreasing in height as the distance from the closed side increases and intervening channels, the fixed body being provided with a series of concentric ribs adapted to cooperate with the channels in the movable body and with intervening channels of decreasing depth as their distance from the closed side increases, the channels being adapted to cooperate with the ribs extending from the movable body.

13. The combination with a member having a plurality of concentrically disposed cylinders and pistons, of a member cooperative therewith having a plurality of mating cylinders and pistons and these being located in such position one relative to the other that they will progressively become operative.

14. The combination with a pair of members each provided with a plurality of cylinders and a plurality of pistons, these being so arranged that cylinders will progressively become active alternately from the respective members.

15. The combination with a shaft, of a bearing therefor, a collar carried by the shaft, and a plurality of pistons and a plurality of cylinders carried by each of these and adapted for progressively becoming active from alternate sides.

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Witnesses:

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