

Jan. 27, 1953

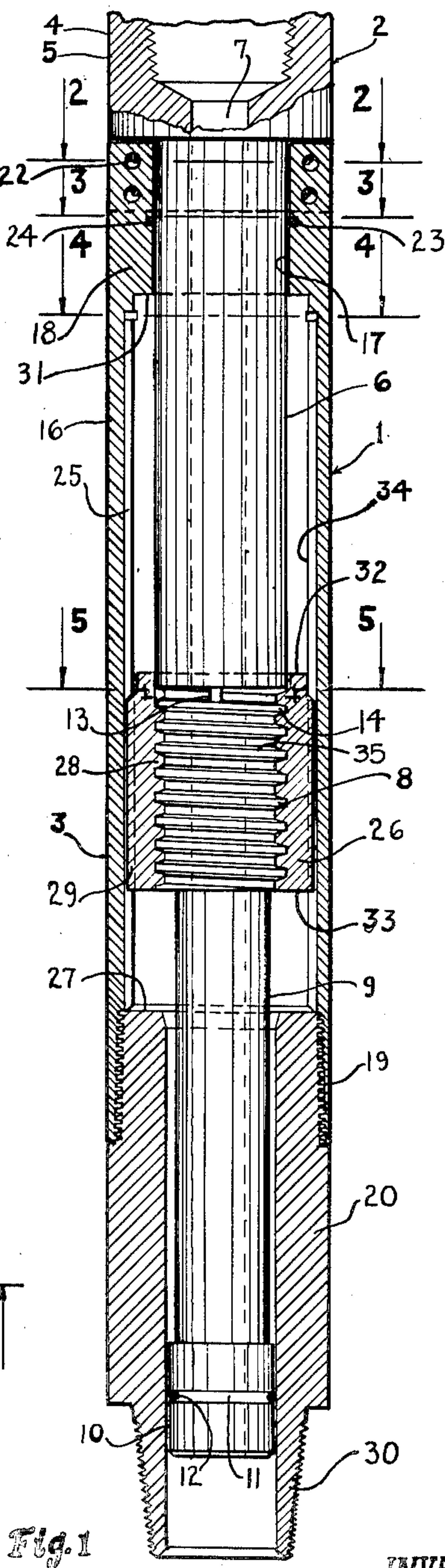
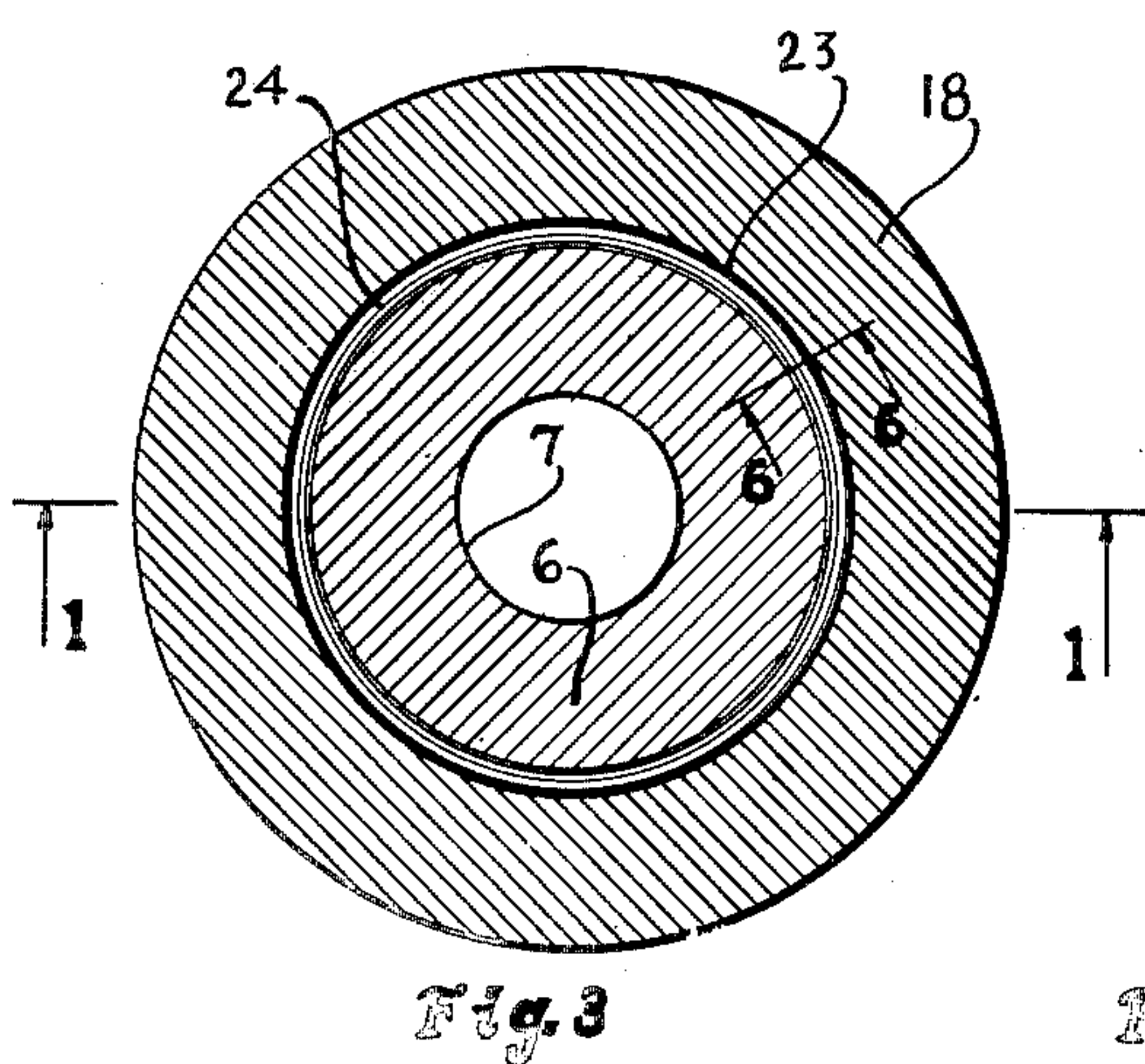
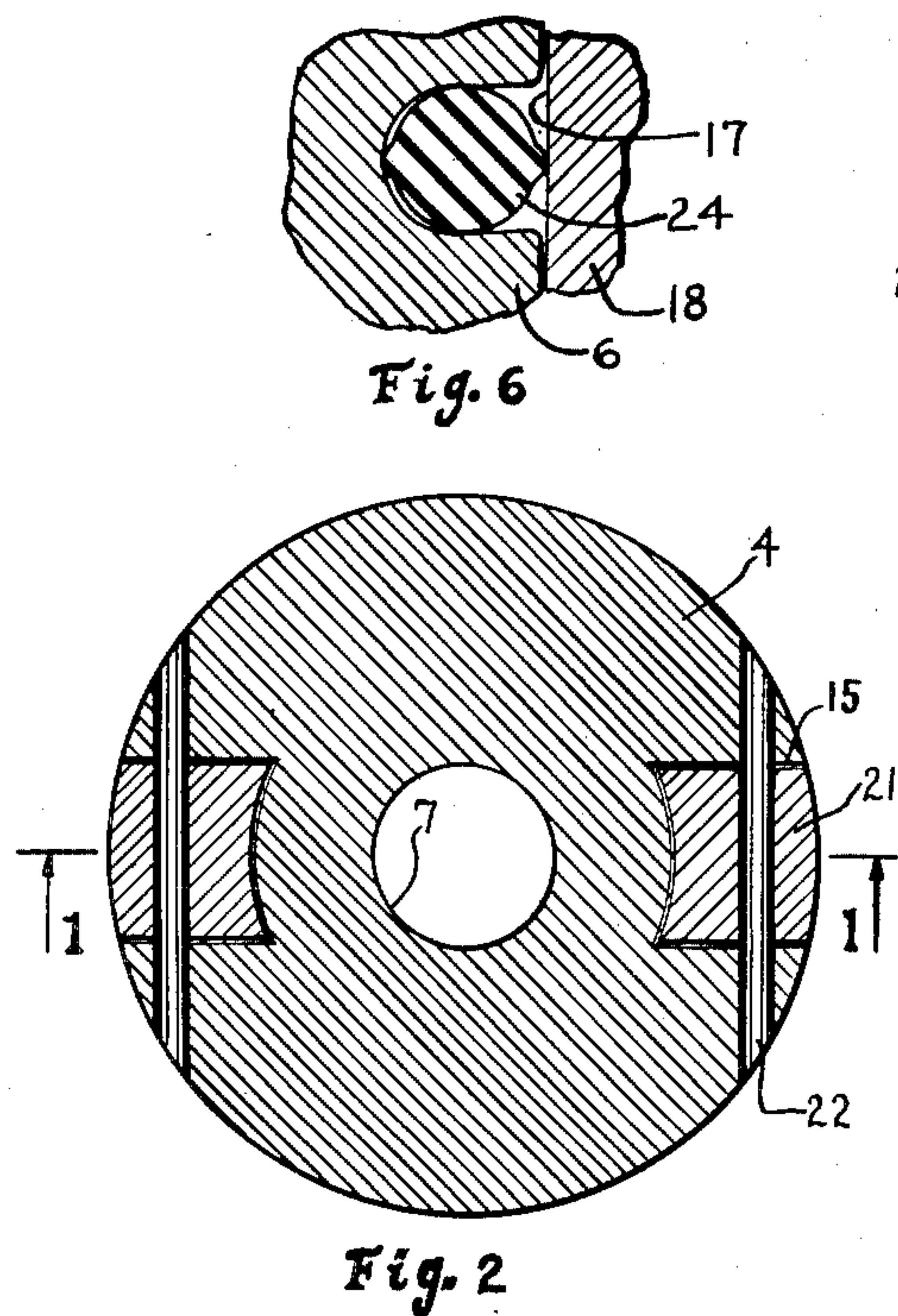
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2,626,781

COMBINATION JAR AND SAFETY JOINT

Filed Dec. 22, 1947

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

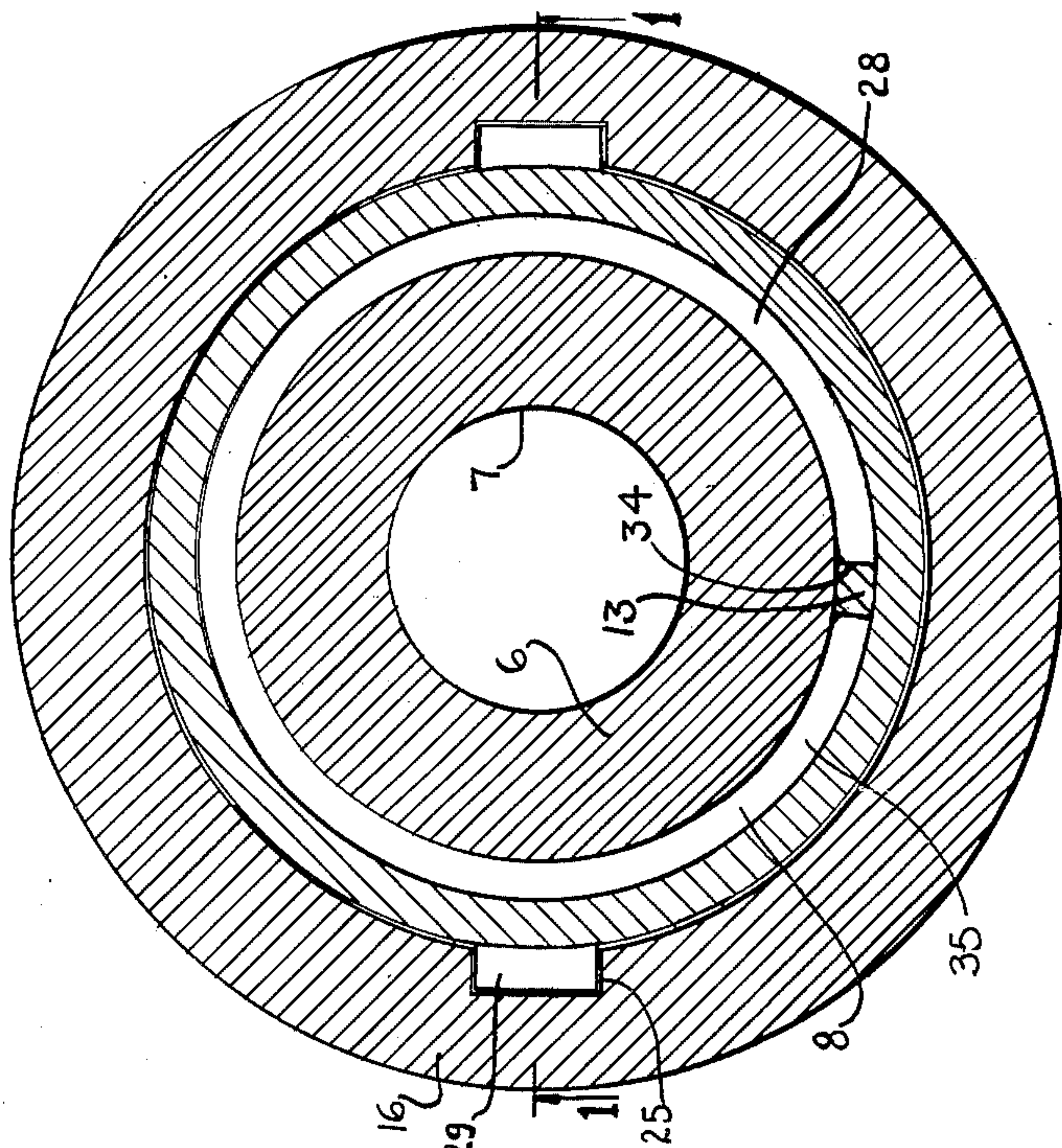


Fig. 5

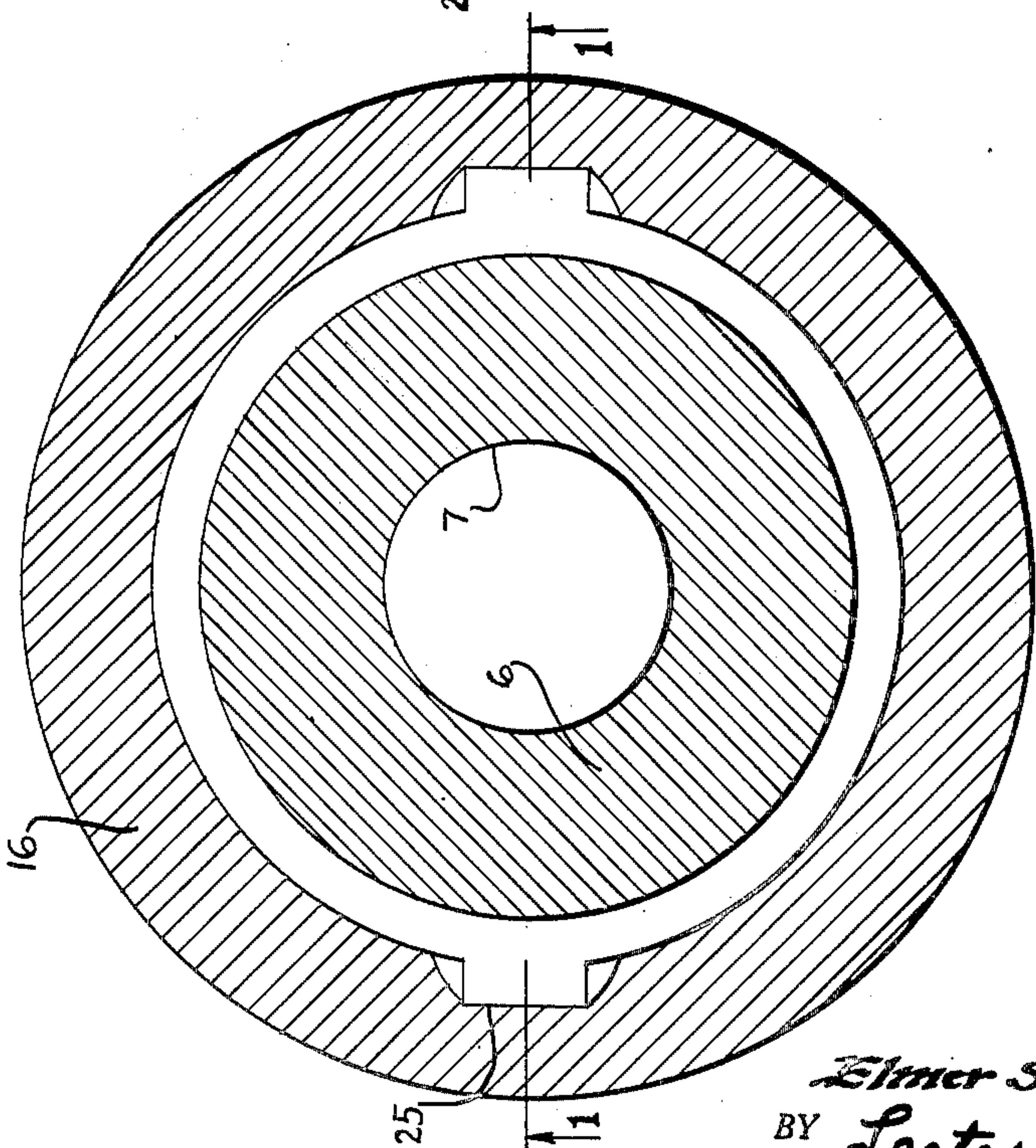


Fig. 4

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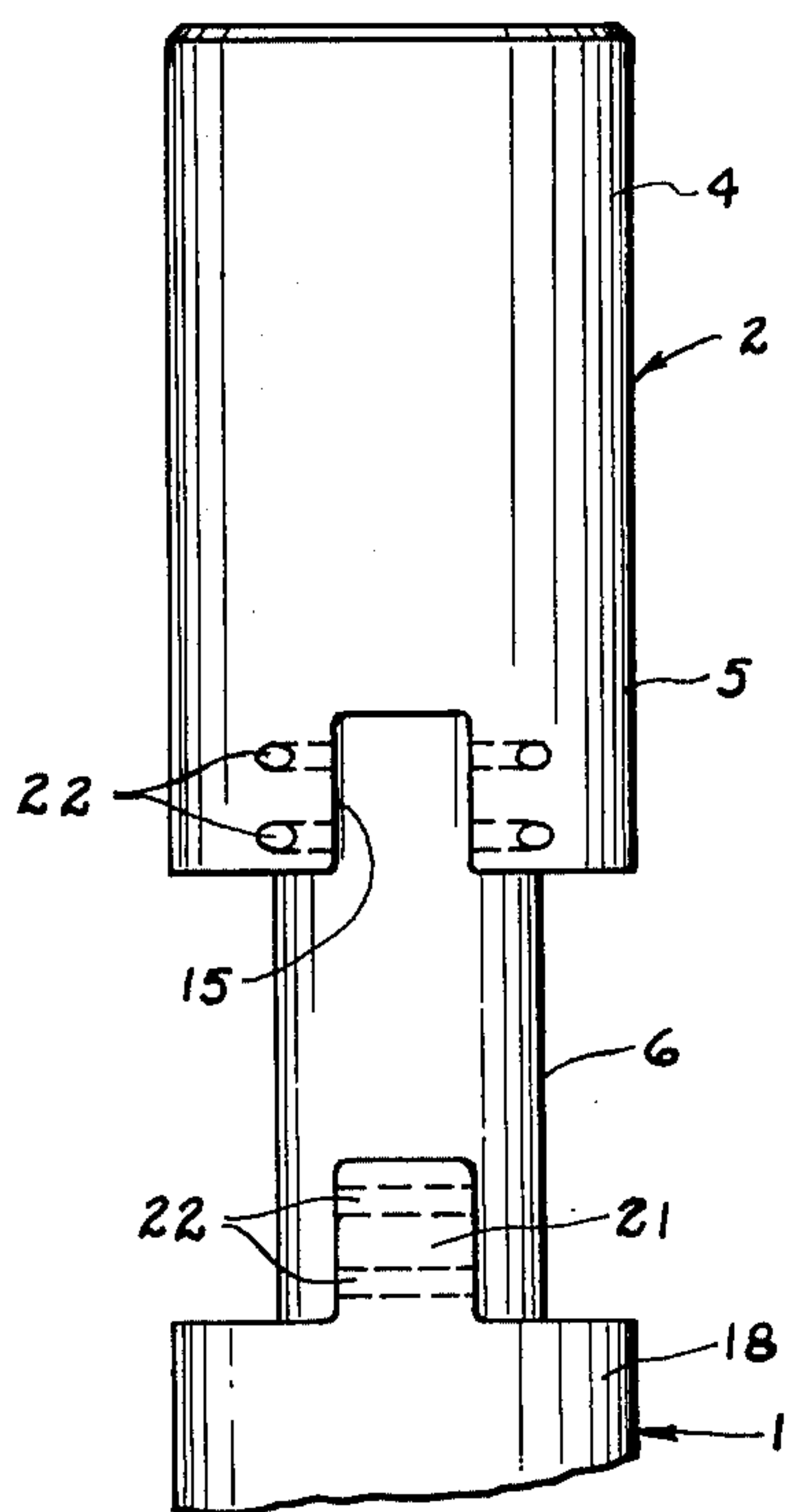


Fig. 8

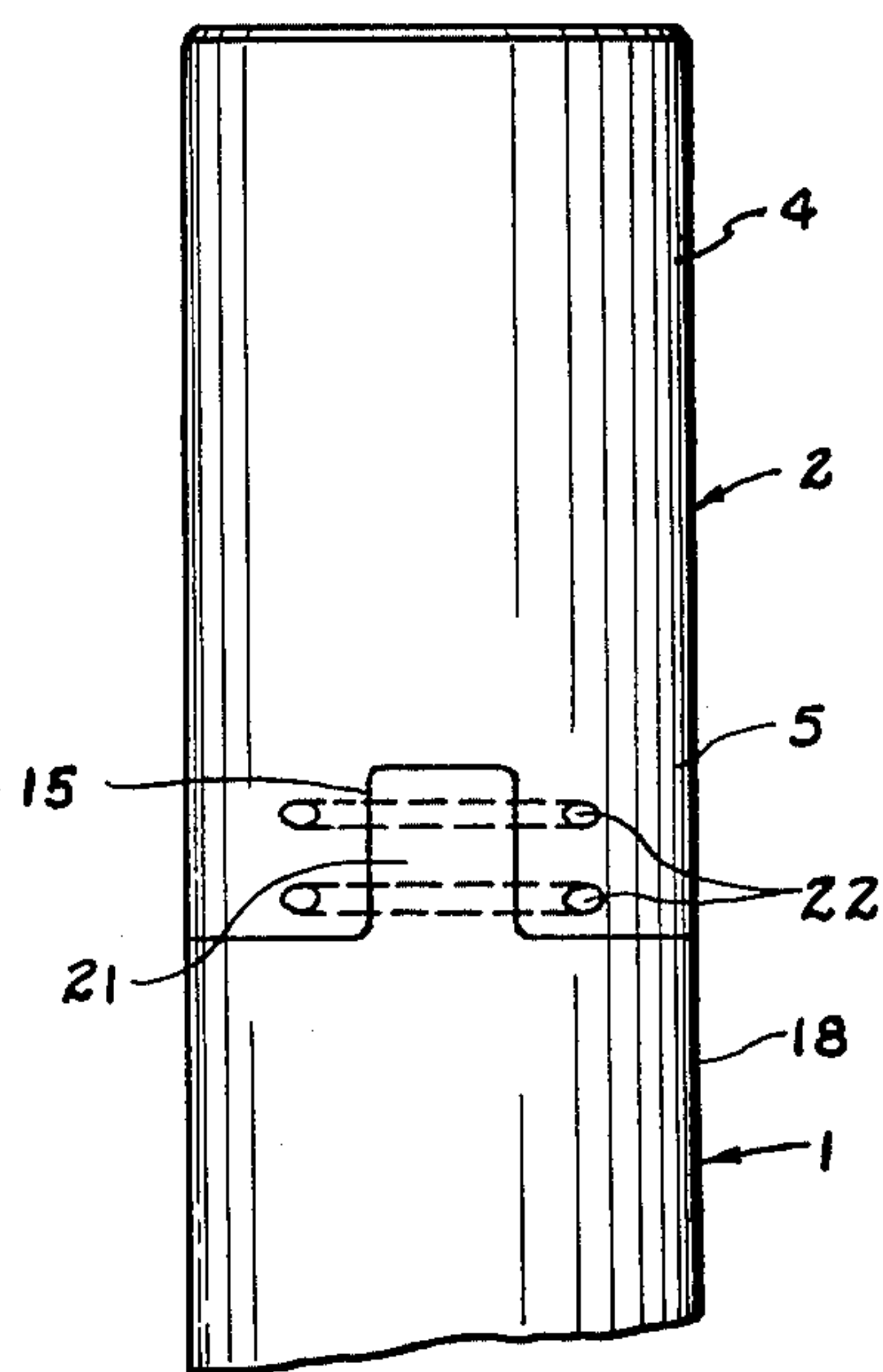


Fig. 7

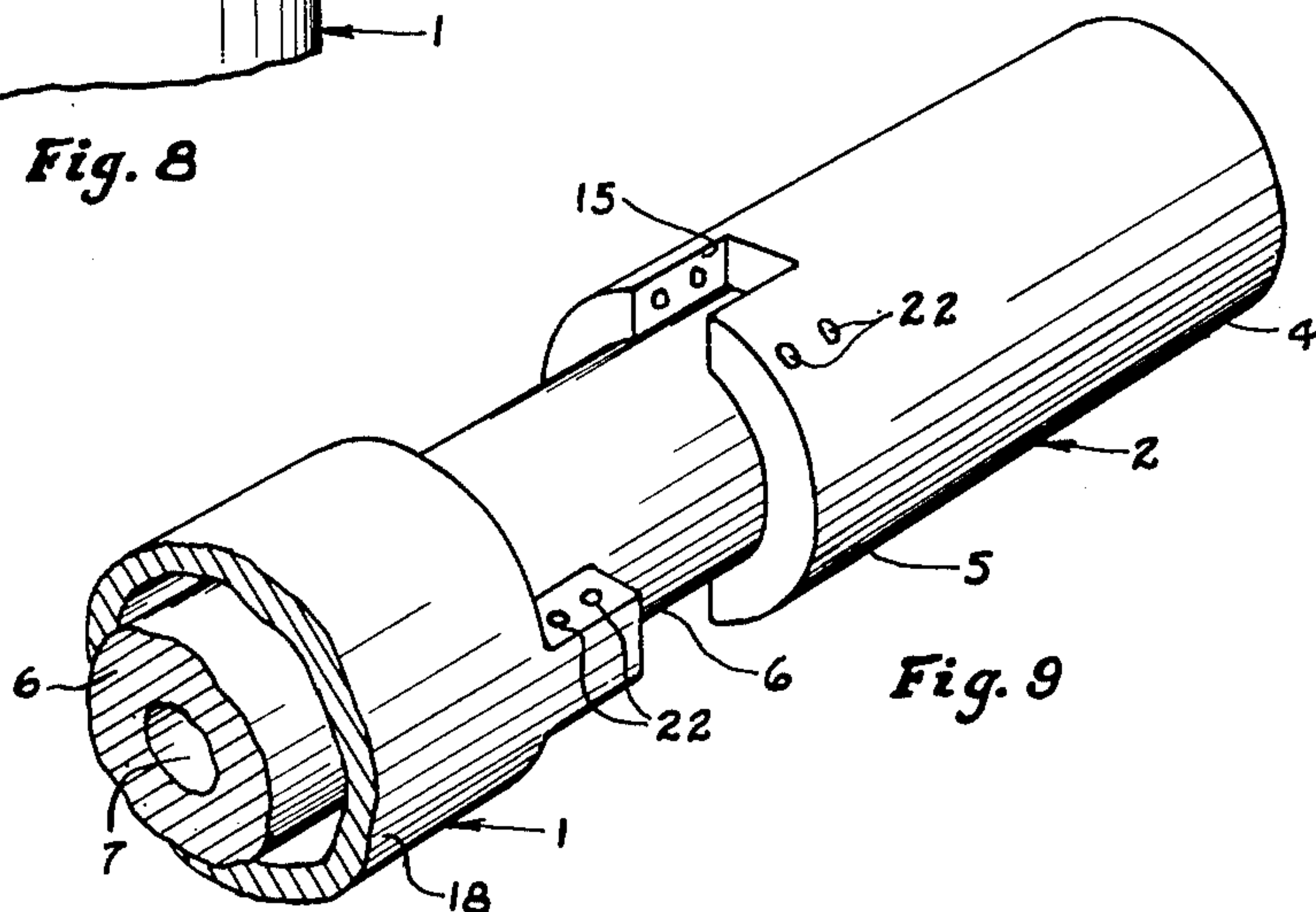


Fig. 9

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2,626,781

COMBINATION JAR AND SAFETY JOINT

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Application December 22, 1947, Serial No. 793,227

10 Claims. (Cl. 255—27)

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This invention relates to a combination jar and safety joint for use in wells, especially in oil wells.

It is an object of this invention to provide, in a fishing tool or drill pipe assembly, a joint having a jar made operable by exerting an upward strain at the top of the well to shear pins rigidly connecting the upper and lower sections of the joint to thus render the sections slidable relative to each other.

It is also an object of this invention to provide, in a fishing tool or drill pipe assembly, a joint having a lower section, and an upper section which comprises a jar made operable by exerting an upward pull on the fishing tool assembly at the top of the well to bring the jar into jarring impact with the lower section.

It is a further object of this invention to provide, in a fishing tool or drill pipe assembly, a combined jar and safety joint in which the jarring element also serves as the coupling from which the upper section of the joint can be unthreaded and withdrawn from the well, along with the pipe above it.

Other and further objects of the invention will be readily apparent when the following description is considered in connection with the accompanying drawings wherein:

Fig. 1 is a sectional elevation of the joint.

Fig. 2 is a horizontal section of the joint taken along line 2—2 of Fig. 1.

Fig. 3 is a horizontal section of the joint taken along line 3—3 of Fig. 1.

Fig. 4 is a horizontal section of the joint taken along line 4—4 of Fig. 1.

Fig. 5 is a horizontal section of the joint taken along line 5—5 of Fig. 1.

Fig. 6 is a section of an O-ring pack off rubber, taken along line 6—6 of Fig. 3.

Fig. 7 is a fragmentary side elevation of the upper portion of the tool illustrating a preferred form of joining the body of the tool to a stem.

Fig. 8 is similar to Fig. 7 but illustrates the body and stem in released position, and

Fig. 9 is a perspective view of the upper end of the body and stem, illustrated in Figs. 7 and 8.

The joint 1 comprises an upper section 2 and a lower section 3. The upper section 2 comprises a stem 4 which has as integral parts thereof an internally threaded head 5 to receive a drill pipe tool joint, not shown, a mandrel 6, which has bore 7 extending therethrough, a threaded length 8, and a reduced external diameter section 9 which terminates in a sealing end 10 having a groove 11 therein to receive an O-ring pack off

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rubber 12. A stop lug 13 is welded on the mandrel between the beginning of the threaded length 8 and the first full thread 14 thereof to act as a stop, as will be hereinafter described.

5 The head 5 has slots 15 therein of the configuration shown in Fig. 2.

The lower section 3 comprises the body 16 which has bore 17 at the upper end 18 thereof to receive the mandrel 6, and the body has an enlarged counter bore 34 which terminates in an internally threaded section 19 into which the sub 20 is threaded. The upper end 18 has upstanding projections 21 therein of a configuration to be received in the slots 15 of the head 5. The two sections 2 and 3 are rigidly joined together by shearing pins 22 which extend through upstanding projections 21 and stem 4, as shown in Fig. 2. The upper end 18 has an inner groove 23 therein into which is inserted the O-ring pack-off rubber 24 to seal off the enlarged counter bore 34 from any fluids which might otherwise pass in through bore 17 between the mandrel 6 and the upper end 18. The body 16 has slots 25 as shown in Fig. 5, formed to extend throughout the length of the enlarged counter bore 34.

A jar or splined releasing sleeve 26 is threaded to the threaded length 8 of the mandrel 6 and is assembled with the upper section 2. During the jarring operation the jar sleeve 26 is moved by the mandrel 6. In the event it is necessary to disconnect the jar sleeve 26 from the mandrel 6, the disconnected jar sleeve 26 rests on the upper end face 27 of the sub 20.

The jar 26 has splines 29 therein to ride in the slots 25 of the body 16, and is internally threaded with general purpose acme threads 28. These threads begin with a transverse thread face 35 slightly below the top of the jar against which the stop lug 13 abuts when the threaded length 8 is threaded into the jar. This stoppage limits the tightness with which the threads of these elements may be engaged and insures that the stem may be easily unthreaded when such is desired. Figs. 1, 2, and 5 indicate how, in assembly, with the jar splines 29 riding in the body grooves 25, the mandrel 6 of the stem 4 may be threaded into the jar 26 until the stop lug 13 contacts the transverse thread face 35 of the jar sleeve 26, at which time the splines 21 of the body 16 and the grooves 15 of the stem 4 are in a position to be interfitted by longitudinal motion therebetween.

The device of this invention has its most general application in cases where the drill pipe, used in the rotary method of drilling oil wells,

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becomes broken off in the process of drilling. When this occurs, the joint is inserted in the assembly of the fishing tool apparatus which is employed to locate the broken off drill pipe in order to pull it out of the well, the insertion being made by threading the lower tool joint of the upper section of the fishing tool assembly, not shown, into the stem 4 of the upper section 2 of the joint. The lower end 30 of the sub 20 of the joint is then threaded into the upper drill pipe tool joint, not shown, of the lower section of the fishing tool assembly.

The fishing tool is then lowered into the well, the fishing operation is commenced, and the broken off drill pipe is located. An upward pull is then exerted on the top of the fishing tool assembly to pull the fishing tool upwardly and this will shear the shearing pins 22 and thus sever the rigid connection between the upper section 2 and the lower section 3 of the joint.

Further exertion of upward pull on the fishing tool assembly may then move the upper section 2 until the upper face 32 of the jar 26 comes into contact with the shoulder 31 of the end section 18 of the body 16. Still further upward pull on the fishing tool assembly may then be further exerted to pull the fishing tool assembly and the drill pipe to which it is attached directly up out of the well.

However, in most cases the drill pipe will be stuck and it will become necessary to jar it loose from the restriction binding it. This can be accomplished by slackening off the pull on the fishing tool assembly exerted at the top of the well to lower away the upper section 2 and then renewing the upward pull on the fishing tool assembly to again bring the jar face 32 against the shoulder 31 with jarring impact. Alternatively, the slackening off of pull on the fishing tool assembly may be continued until the lower face 33 of the jar 26 comes into contact with the upper end face 27 of the sub 20 to exert a downward jar on the lower section 3 and on the pipe below it. The longitudinal dimensions of the enlarged counter bore 34 and of the jar 26 are such as to permit substantial travel of the jar in which it can gain momentum for impacting either shoulder 31 or end face 27, a travel of about 14" being possible in the form of invention disclosed. This jarring process, as described, may be repeatedly employed, using whatever combinations of steps as may be suggested by individual situations until the drill pipe becomes loosened or until it becomes apparent that jarring will not loosen the pipe from the restriction binding it.

Throughout the jarring operation it is pointed out that the counter bore 34 is maintained sealed off from fluids in the well by means of the O-ring pack off rubbers 12 and 24.

If jarring fails to loosen the stuck pipe it then becomes desirable to pull the fishing tool assembly, or the upper part thereof, out of the well before employing some other medium. This is done by imparting right-hand rotation to the fishing tool from the top of the well so as to unthread the threaded length 8 of the stem 4 from the jar 26, the splines 29 of the jar riding in the slots 25 of the body 16 to prevent the jar from rotating with the upper section 2.

When the threaded length 8 becomes completely disengaged from the jar 26, the jar falls to rest on the sub face 27 of the sub 20, and the reduced external diameter section 9 and the sealing end 10 may then be pulled up through

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the jar 26 and the whole upper section 2 can then be pulled up out of the lower section 3, and out of the well.

It is pointed out that in the form of invention disclosed, the jar and mandrel are shown having left hand threads, as is required when a fishing tool or drill string is used having right hand threads, and in this case right hand rotation is imparted to the drill string or fishing tool to unthread the mandrel from the jar. Conversely, a jar and mandrel having right hand threads is provided when a fishing tool or drill string having left hand threads is used, and left hand rotation is imparted to unthread the mandrel from the jar.

Although the most general application of this device is in connection with fishing tools, the device can also be inserted directly into the assembly of a drill pipe which is likely to become stuck during the drilling operation, the insertion being made at a position in the assembly where it is likely to be the most effective. When sticking occurs the jarring operation may be conducted as hereinbefore described in the case of a fishing tool, and if the jarring operation fails to release the stuck pipe the disengagement between upper section 2 and the jar 26 may be accomplished by rotating the drill pipe.

Broadly, this invention contemplates a combination jar and safety joint so that stuck pipe below the joint may be jarred loose, and if these elements cannot be jarred loose, the invention provides for disengaging the upper section of the joint from the jar and consequently from the lower section to thus enable the upper section to be withdrawn from a well, such as an oil well.

What is claimed is:

1. A combination jar and safety joint comprising, a tubular body, longitudinal grooves on the inner portion of and extending substantially the length of such body, an internal shoulder in said body formed at one end thereof, a stem adapted to be secured to a string of pipe, a mandrel extending from said stem into said tubular body, said mandrel having a threaded length intermediate its ends, a reduced diameter section comprising a lower section of said mandrel, a tubular hammer element having keys formed on the outer surface thereof to slide in said grooves, thread means on the inner surface of said tubular hammer threaded on the threaded length of such mandrel, a member affixed to the other end of said tubular body having an anvil surface for closing the other end of such tubular body, and shearable connecting means on said body and said stem for rigidly connecting said body and said stem as a unit, upward movement of said stem serving to shear said connecting means so that said hammer element may be brought into upward impact with such internal shoulder in said body, and downward movement thereafter of said stem serving to bring said tubular hammer into impact with said member, said stem being rendered separable from said body by rotation to unthread said threaded length of said mandrel from said hammer element.

2. A combination jar and safety joint comprising, a tubular body, longitudinal grooves on the inner portion of and extending substantially the length of such body, an internal shoulder in said body formed at one end thereof, a stem adapted to be secured to a string of pipe, a mandrel extending from said stem into said tubular body, said mandrel having a threaded length

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intermediate its ends, a tubular hammer element having keys formed on the outer surface thereof to slide in said grooves, thread means on the inner surface of said tubular hammer threaded on the threaded length of such mandrel, and shearable connecting means on said body and said stem for rigidly connecting said body and stem as a unit, upward movement of said stem serving to shear said connecting means so that said hammer element may be brought into upward impact with such internal shoulder in said body, said stem being rendered separable from said body by rotation to unthread said threaded length of said mandrel from said hammer element.

3. A combination jar and safety joint comprising, a tubular body, longitudinal grooves on the inner portion of and extending substantially the length of such body, an internal shoulder in said body formed at the upper end thereof, a stem adapted to be secured to a string of pipe, a mandrel extending from said stem into said tubular body, said mandrel having a threaded length intermediate its ends, a reduced diameter section comprising a lower section of said mandrel, a tubular hammer element having keys formed on the outer surface thereof to slide in said grooves, thread means on the inner surface of said tubular hammer threaded on the threaded length of such mandrel, a member affixed to the lower end of said tubular body having an anvil surface for closing the lower end of such tubular body, and shearable connecting means on said body and said stem for rigidly connecting said body and stem as a unit, upward movement of said stem serving to shear said connecting means so that said hammer element may be brought into upward impact with such internal shoulder in said body, and downward movement thereafter of said stem serving to bring said tubular hammer into impact with said member, said stem being rendered separable from said body by rotation to unthread said threaded length of said mandrel from said hammer element.

4. The combination jar and safety joint of claim 1 where the shearable connecting means on said body and said stem for rigidly connecting said body and stem as a unit comprises, engaged clutch elements on said body and said stem, and shear pins extending through said engaged clutch elements.

5. The combination jar and safety joint of claim 4 where the engaged clutch elements comprise grooves in said stem and upstanding projections on said body extending into such grooves.

6. The combination jar and safety joint of claim 1 including stop means engaging the thread means on the inner surface of said tubular hammer

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mer and the threaded length of the mandrel limiting interthreading of said thread means on the inner surface of said tubular hammer and the threaded length of such mandrel.

7. The combination jar and safety joint of claim 3 where the lower end of the mandrel is slidable in the member affixed to the lower end of said tubular body.

8. The combination jar and safety joint of claim 7 including a seal contacting said tubular body and said stem and a seal contacting said member affixed to the lower end of said body and said stem.

9. The combination jar and safety joint of claim 7 including a seal at one end of said tubular body contacting said stem and a seal in said stem contacting said member affixed to the lower end of said body.

10. A combination jar and safety joint comprising, a tubular body, an internal shoulder in said body formed at one end thereof, a stem adapted to be secured to a string of pipe, a mandrel extending from said stem into said tubular body, said mandrel having a threaded length intermediate its ends, a reduced diameter section comprising a lower section of said mandrel, a tubular hammer element, thread means on the inner surface of said tubular hammer threaded on the threaded length of such mandrel, interfitting longitudinal keyways and keys on the inner portion and extending substantially the length of such body and on the outer surface of said tubular hammer, a member affixed to the other end of said tubular body having an anvil surface for closing the other end of such tubular body, and shearable connecting means on said body and said stem for rigidly connecting said body and stem as a unit, upward movement of said stem serving to shear said connecting means so that said hammer element may be brought into impact with said member, said stem being rendered separable from said body by rotation to unthread said threaded length of said mandrel from said hammer element.

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