

Sept. 16, 1947.

N. T. BREAU

2,427,438

PIPE PULLER

Filed July 10, 1945

2 Sheets-Sheet 1

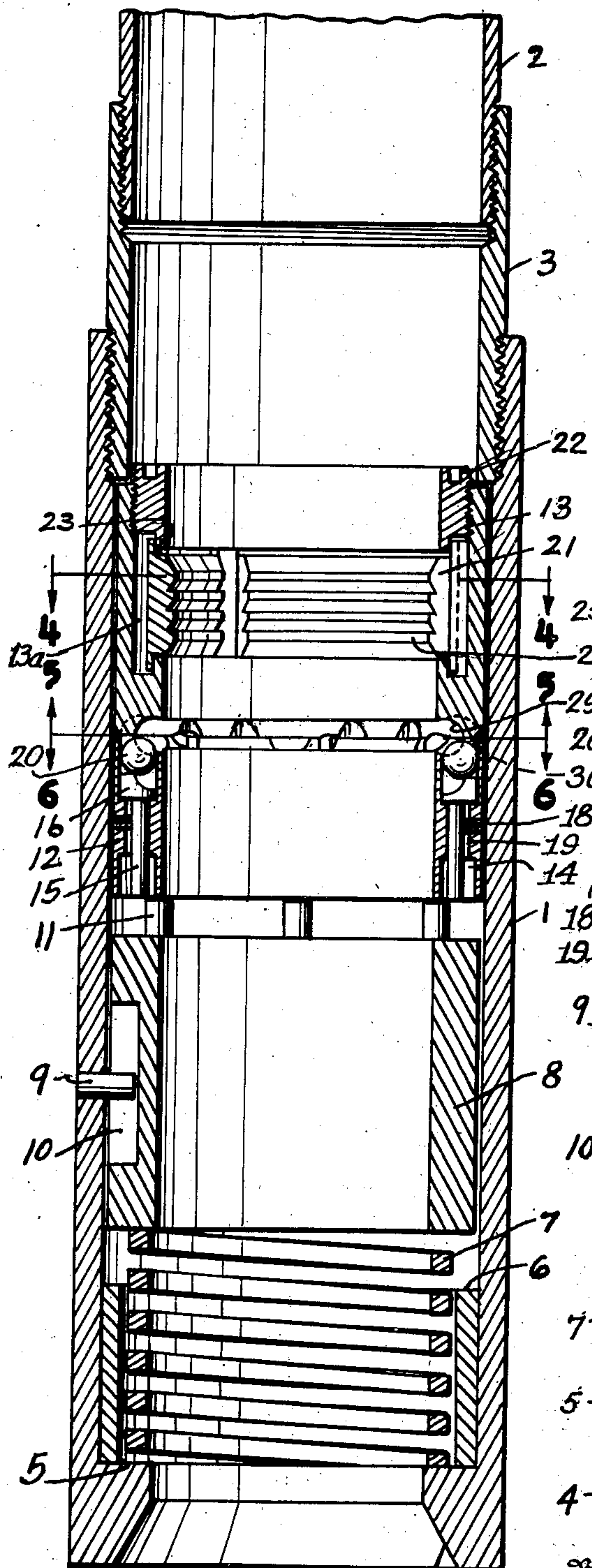


Fig. 1.

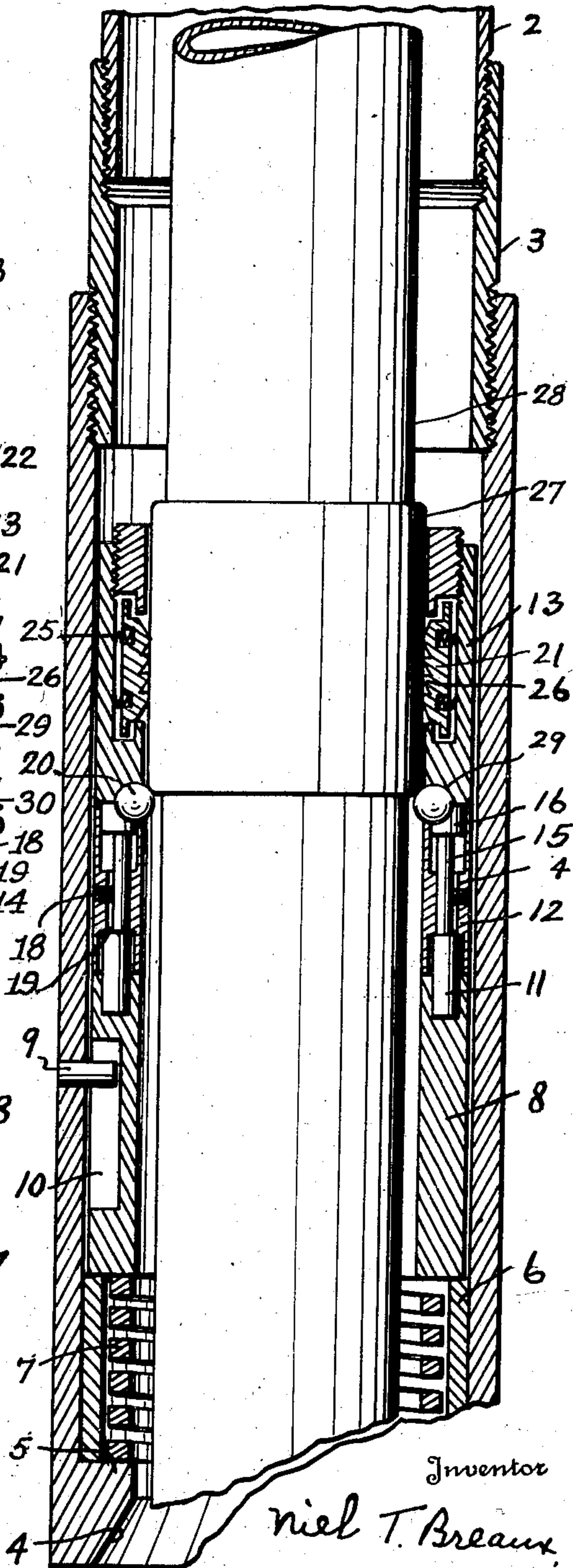


Fig. 2.

Inventor

niel T. Breau.

E. V. Hardway
Attorney

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2 Sheets-Sheet 2

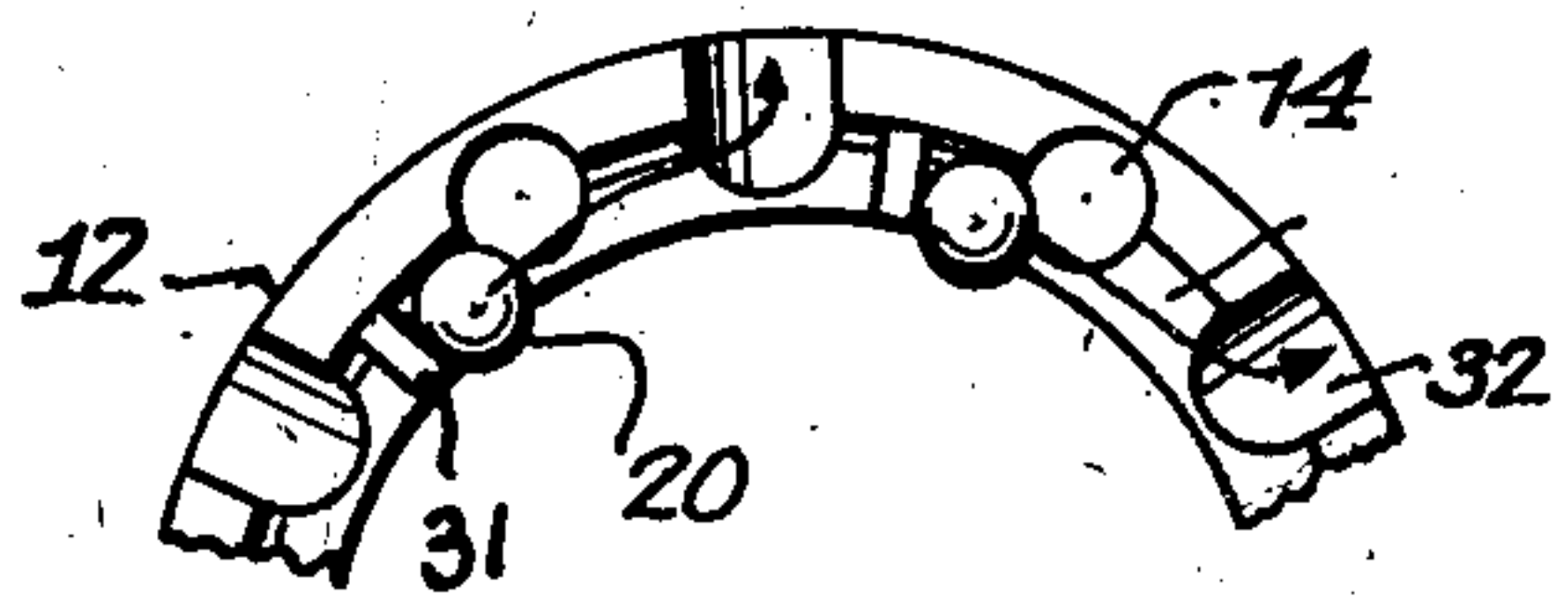


FIG. 7.

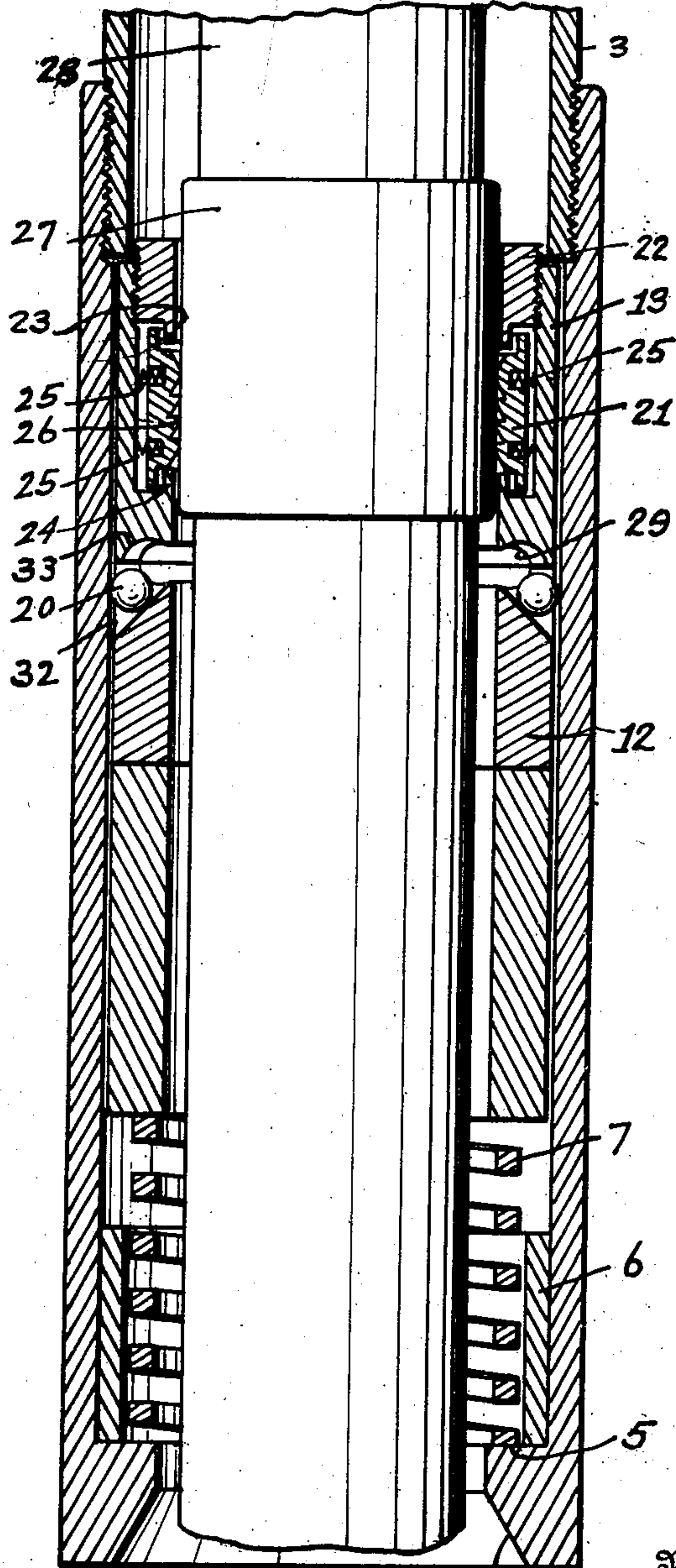


FIG. 3.

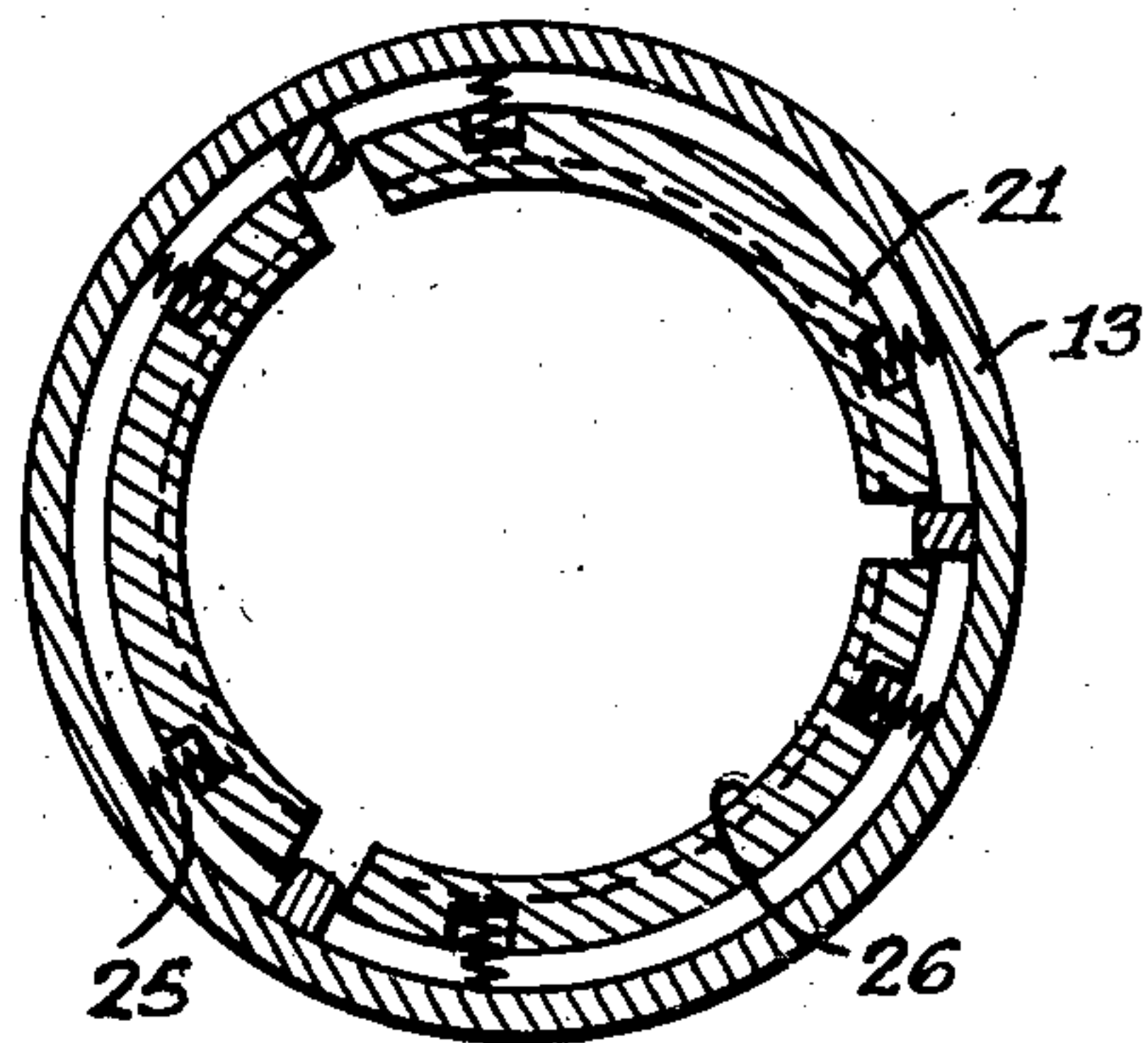


FIG. 4.

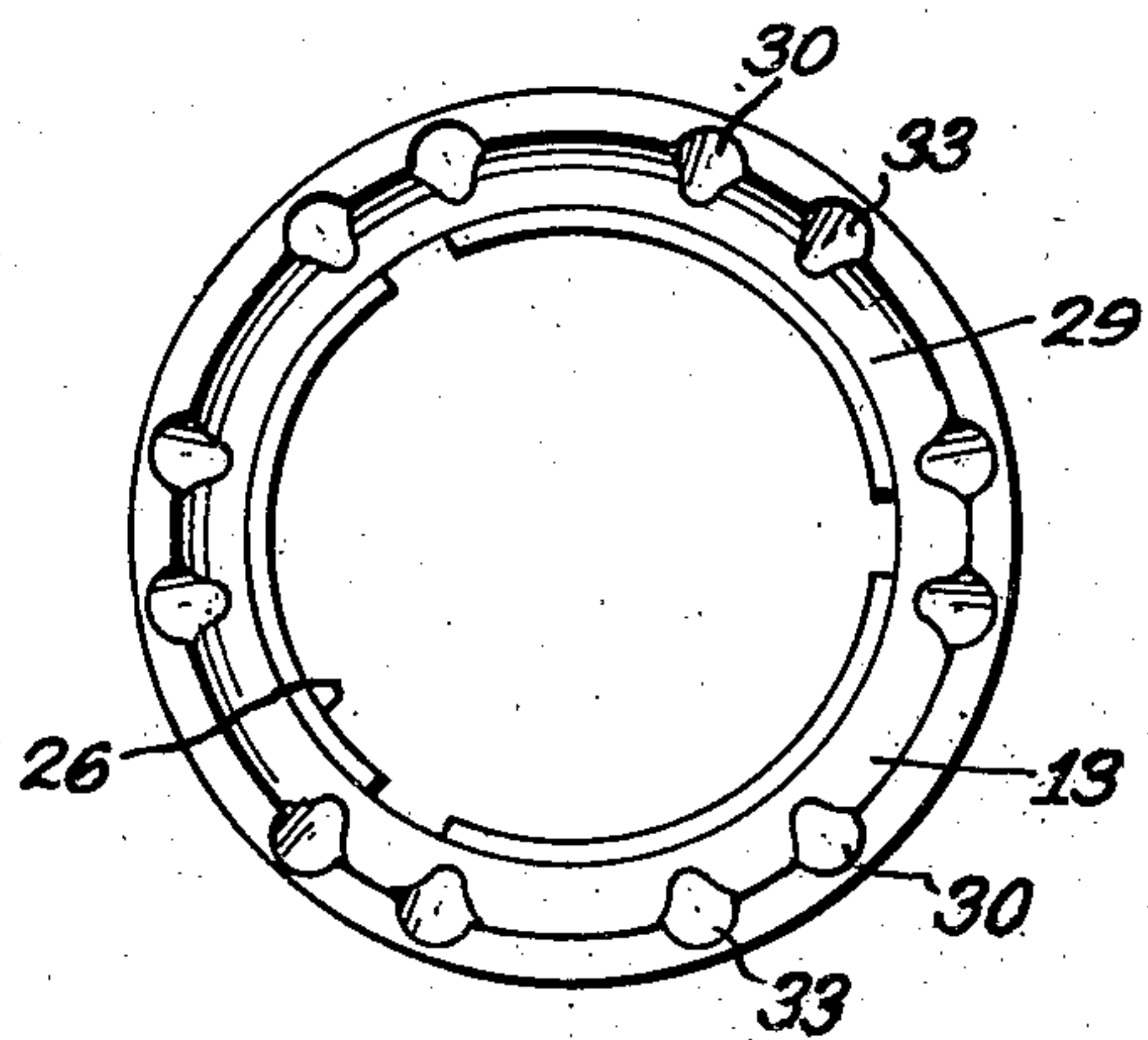


FIG. 5.

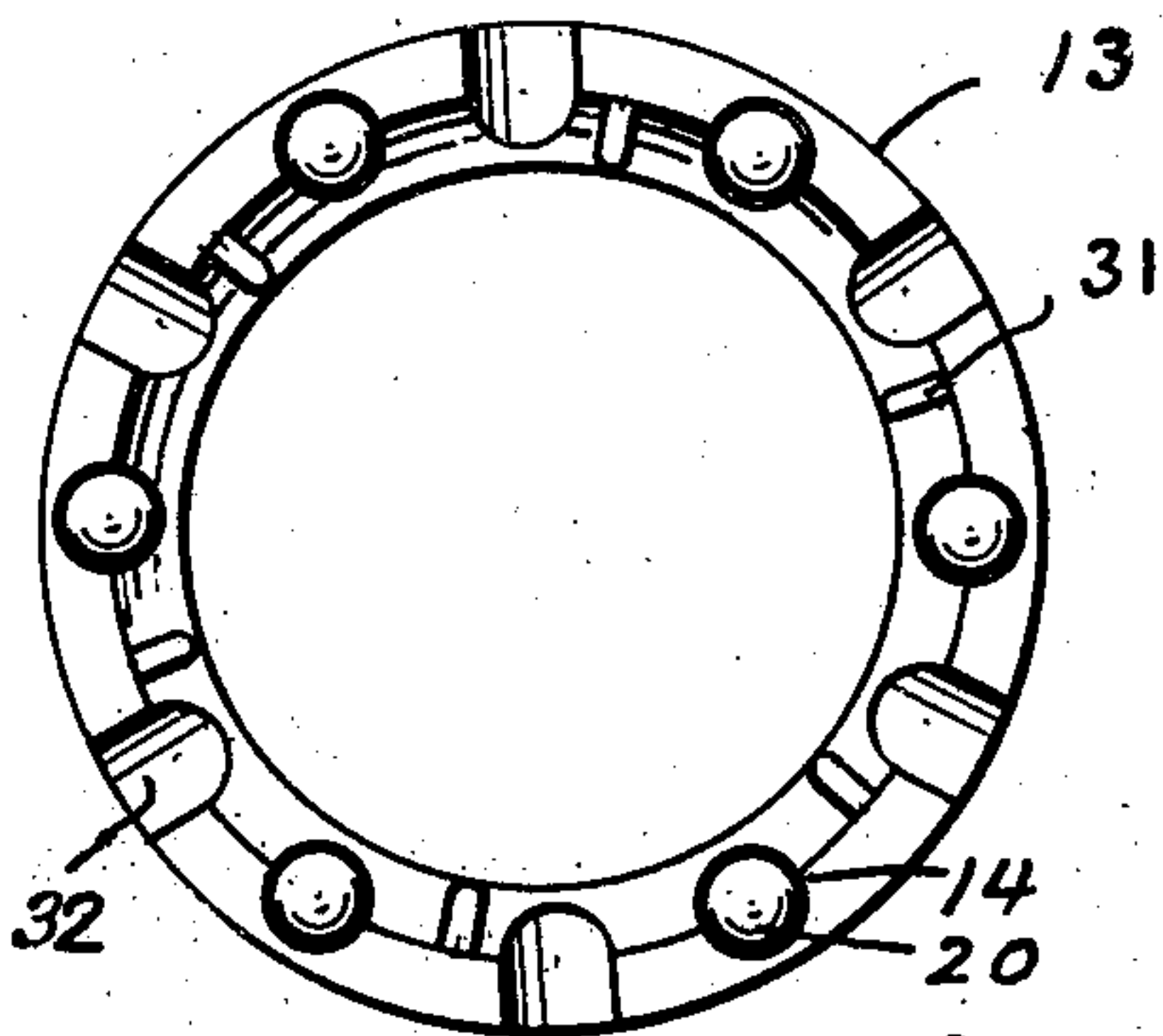


FIG. 6

Inventor

Niel T. Breau

E. V. Hardaway
Attorney

UNITED STATES PATENT OFFICE

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PIPE PULLER

Niel T. Breaux, Houston, Tex.

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7 Claims. (Cl. 294—102)

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This invention relates to a pipe puller.

An object of the invention is to provide a pulling tool of the character described, of the over-shot type, designed to be lowered, by an operating string, over a pipe, or similar object, in a well and to be engaged therewith to pull the same from the well.

Another object of the invention is to provide a tool of the character described embodying a novel type of pipe engaging means arranged to be engaged, at the will of the operator, underneath an external coupling, or other external projection, on the pipe or other object to be pulled.

A further feature of the invention resides in the provision of a tool wherein said pipe engaging means may be readily released, when desired so that the tool may be disengaged from the pipe and removed.

With the above and other objects in view this invention has particular relation to certain novel features of construction, operation and arrangement of parts, an example of which is given in this specification and illustrated in the accompanying drawings wherein:

Figure 1 is a vertical, sectional view of the tool as set, or in position to be engaged with a pipe.

Figure 2 is a vertical, sectional view showing the tool engaged with the pipe, and the operating string under tension.

Figure 3 is a vertical, sectional view showing the tool in disengaged and released position.

Figure 4 is a cross sectional view taken on the line 4—4 of Figure 1.

Figure 5 is a lower end view of the friction-slip cage, as viewed on the line 5—5 of Figure 1.

Figure 6 is a top plan view of the ball carrier as viewed on the line 6—6 of Figure 1, and showing the pipe engaging balls in set up position, and

Figure 7 is a fragmentary, top plan view thereof showing said balls in position to engage underneath a pipe coupling.

Referring now more particularly to the drawings, wherein like numerals of reference designate the same parts in each of the figures, the numeral 1 designates the tubular body which is connected to the lower end of a tubular operating string 2 by a tubular coupling, such as 3.

The lower end of the body is, preferably, provided with a flared guide face 4 to guide the tool over the upper end of the stuck pipe and, above said face, is provided with an inside annular shoulder 5 whereon is seated a sleeve-like stop 6, fitted closely within the body, and within said stop there is a coil spring 7 which is also seated

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on the shoulder 5 and normally extends above the stop 6.

The spring 7 yieldingly supports the tubular elevator 8, which is slidably fitted in the body 1, and which is held against turning therein by the key 9. This key is anchored to the body 1 and its inner end projects into a vertical key way 10 in the elevator. Projecting upwardly from the upper end of the elevator are the elevator pins 11 which are spaced apart and whose upper ends are held yieldingly against the lower end of the tubular carrier 12. This carrier is slidably fitted in the body 1 and above it, and also slidably fitted in the body 1, there is a tubular slip-cage 13. The carrier 12, and cage 13 are made separate for convenience in manufacture and assembly but when assembled may be tack welded together.

When the tool is set for going into the well, the coil spring 7 will be under compression and the assembly above will be in its upper position, as shown in Figure 1, with the upper end of the slip-cage 13 against the lower end of the coupling 3.

The carrier 12 has the vertical bores 14 whose lower ends are enlarged to receive the pins 11. These bores are spaced apart to correspond to the spacing of said pins. In the bores 14 are the slidable plungers 15 whose upper ends are formed with the enlarged heads 16 and the upper ends of the bores are enlarged to receive those heads and to allow the required vertical movement of the plungers.

The upper end of the carrier 12 is beveled downwardly and inwardly forming the annular concaved face 17 and the upper ends of the heads 16 are correspondingly beveled and concaved. The plungers 15 are keyed against turning, so as to maintain their upper beveled faces aligned with the beveled face 17, by the radial keys 18 which are threaded through the wall of the carrier and whose inner ends project into the vertical keyways 19 in the plungers.

When the tool is set for operation, as shown in Figure 1, the plungers will be in their lower position with their heads at the lower ends of the enlarged upper ends of the bores 14.

The numeral 20 designates the interlocking balls which are located in the upper ends of the bores 14 on the heads 16, as shown in Figures 1 and 6.

Within an inside annular recess 13a of the cage 13 are fraction slips 21, arcuate in cross section, three being shown. Screwed into the upper end of the cage there is a ring nut 22 having an inner depending retaining flange 23 and at the lower end of the recess 13a there is an inside upstand-

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ing flange 24 and the upper and lower ends of the slips engage against, and the slips are retained by, said flanges 23 and 24. These slips are seated against the pressure springs 25, between them and the cage and are thereby held yieldingly in the inner, or contracted, position, as shown in Figure 1. The inner sides of the slips 21 have transverse teeth 26, provided to penetrate through any coating of foreign matter that may have collected on the outside of the coupling 27 of the pipe 28, to be pulled, and to frictionally engage said coupling.

The tool assembled as hereinabove explained, and as shown in Figure 1, may be lowered into a well and the guide face 4 will guide it over the stuck pipe 28. When an external coupling, as 27, or an upset end of a pipe section, is reached the cage 13 will pass over the coupling, or upset end, and the slips 21 will frictionally grip it. The tool should be lowered until the balls 20 are beneath the lower end of the coupling, or upset portion, and then turned slowly to the left until the pins 11 register with the bores 14. During this turning movement the slip-cage and carrier will be held against turning by the friction slips 21. It is to be noted in this connection that the lower end of this cage 13 has an inside, upwardly and inwardly beveled face 29 which is concaved in cross section and which has a series of concaved recesses 33 aligned above the bores of the carrier.

When the pins 11 register with the bores 14 they will be forced upwardly by the spring 7 and, in turn, will force the plungers 15 upwardly and the balls 20 will be forced upwardly by the tapering faces of the plunger heads 16 and by reason of the recesses 33 will not hang on the lower end of the cage but will be forced inwardly against the pipe 28 under the coupling 27. As the body of the tool is now turned to the right the ball carrier 12 will be turned with it since said carrier is now interlocked with the elevator by the pins 11 and as the carrier turns the balls 20 will lag, relative to it, by reason of their frictional contact with the pipe 28, the slips 21 slipping around the coupling or upset portion of pipe 28. However, the face 17 of the carrier is provided with spaced stops 31 behind the respective plungers and these stops will limit the lag of the balls.

The tool may be now pulled upwardly by suitable equipment at the ground surface connected to the string 2, and the stuck pipe thus pulled from the well. During this upward pull the spring 7 will be protected from the full load by the engagement of the stop 7 with the lower end of elevator 8. If the stuck pipe cannot be dislodged and removed it is then necessary to release the tool from the pipe coupling and remove it from the well. In order to do this the upper end of the carrier 12 is provided with the release ways 32 leading downwardly and outwardly from the face 17 and spaced forwardly of the respective plungers, and the lower end of the cage 13 has the series of concaved recesses 30 opposite said ways. Therefore upon rotation of the body 1 to the left the balls 20 will roll around the groove formed by the faces 17, 29 until the recesses 30 register with them and thereupon the balls will fall into said release ways 32 out against the body 1 and clear of the coupling 27. The tool may then be removed from the well.

What I claim is:

1. A tool for pulling pipe comprising, a tubular body adapted to be connected to an operating string of pipe and shaped to telescope over a pipe

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to be pulled in a well, a tubular gripping device in the body adapted to grip a coupling of the pipe to be pulled, a tubular ball carrier in the body beneath said gripping device, a series of balls on the carrier, means retaining the balls in outer, or inactive, position, plungers in the carrier beneath the balls, a tubular elevator in the body beneath the ball carrier and having plunger actuating pins, a yieldable member in the body on which the elevator is supported and normally holding said pins in yielding contact with the carrier, said pins being spaced to engage and elevate the plungers, upon rotation of the body whereby said balls will be elevated and means for moving the balls inwardly into engagement with the pipe to be pulled and underneath said coupling upon such elevation of the balls.

2. A tool for pulling pipe comprising, a tubular body adapted to be connected to an operating string of pipe and shaped to telescope over a pipe to be pulled in a well, a tubular gripping device in the body adapted to grip a coupling of the pipe to be pulled, a tubular ball carrier in the body beneath said gripping device, a series of balls on the carrier, means retaining the balls in outer, or inactive, position, plungers in the carrier beneath the balls, a tubular elevator in the body beneath the ball carrier and having plunger actuating pins, a yieldable member in the body on which the elevator is supported and normally holding said pins in yielding contact with the carrier, said pins being spaced to engage and elevate the plungers, upon rotation of the body whereby said balls will be elevated, means for moving the balls inwardly into engagement with the pipe to be pulled and underneath said coupling upon such elevation of the balls, said tool having ball receiving ways through which the balls may be released from such engagement upon a subsequent rotation of the body.

3. A tool for pulling pipe from a well comprising, a tubular body, a tubular operating string to the lower end of which the body is connected, tubular gripping means in the body adapted to grip a coupling of said pipe, a tubular ball carrier in the body beneath said gripping means and having ball retainers therein, balls in said retainer, means for elevating the balls, means in the body arranged to actuate the elevating means, upon rotation of the body, to force the balls upwardly and means in the tool to force the balls inwardly into engagement with the pipe underneath said collar, upon elevation of said balls.

4. A tool for pulling pipe stuck in a well comprising, a tubular body shaped to telescope over said pipe, a tubular operating string to the lower end of which the body is connected, a tubular carrier in the body, pipe engaging balls mounted in the carrier and retained thereby out of contact with the pipe, elevating means effective, upon rotation of the body, to elevate said balls and means arranged to co-act with said balls, as the same are elevated, to force them inwardly into contact with the pipe.

5. A tool for pulling pipe from a well comprising, a tubular body shaped to telescope over a pipe in a well, a tubular operating string to the lower end of which the body is connected, a tubular gripping means in the body adapted to grip an enlargement on said pipe, a tubular ball carrier in the body beneath said gripping means but connected thereto and having ball retainers therein, balls in said retainers, means for elevating the balls, means in the body arranged to actuate the elevating means, upon rotation of the

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body, to force the walls upwardly, means in the tool to force the balls inwardly into engagement with the pipe underneath said enlargement, upon elevation of said balls, said carrier having release ways to allow release of the balls from the pipe upon a subsequent rotation of the body.

6. A tool for pulling pipe stuck in a well comprising, a tubular body shaped to telescope over said pipe, a tubular operating string to the lower end of which the body is connected, a tubular carrier in the body, pipe engaging balls mounted in the carrier and retained thereby out of contact with the pipe, elevating means effective, upon rotation of the body, to elevate said balls, means arranged to co-act with said balls, as the same are elevated, to force them inwardly into contact with the pipe and means for releasing said balls from the pipe upon a subsequent rotation of the body.

7. A tool for pulling pipe from a well comprising, a tubular body shaped to telescope over a pipe in a well, a tubular operating string to the lower end of which the body is connected, tubular gripping means in the body adapted to grip a cou-

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pling of said pipe, a tubular ball carrier in the body beneath said gripping means and having ball retainers therein, balls in said retainers, means for elevating the balls, means in the body arranged to actuate the elevating means upon rotation of the body, to force the balls upwardly and to clutch the carrier with the body, means in the tool to force the balls inwardly into engagement with the pipe underneath said collar, upon elevation of said balls, said carrier having release ways to allow release of the balls from the pipe upon rotation of the body.

NIEL T. BREAUX.

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