

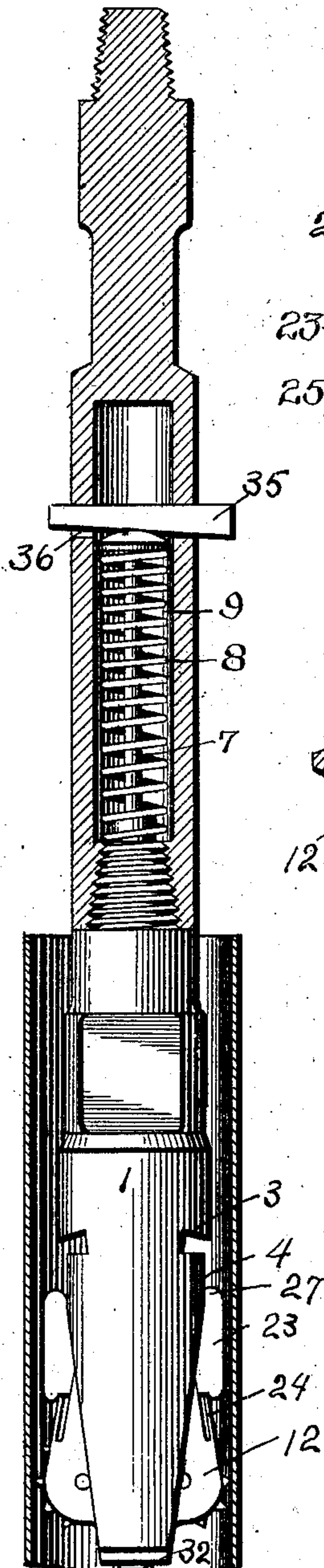
J. C. SWAN.  
CASING PERFORATOR.  
APPLICATION FILED OCT. 20, 1909.

973,994.

Patented Oct. 25, 1910.

2 SHEETS—SHEET 1.

FIG. 1.



WITNESSES:

*Wm. F. Doyle*  
*A. V. Flint*

FIG. 5.

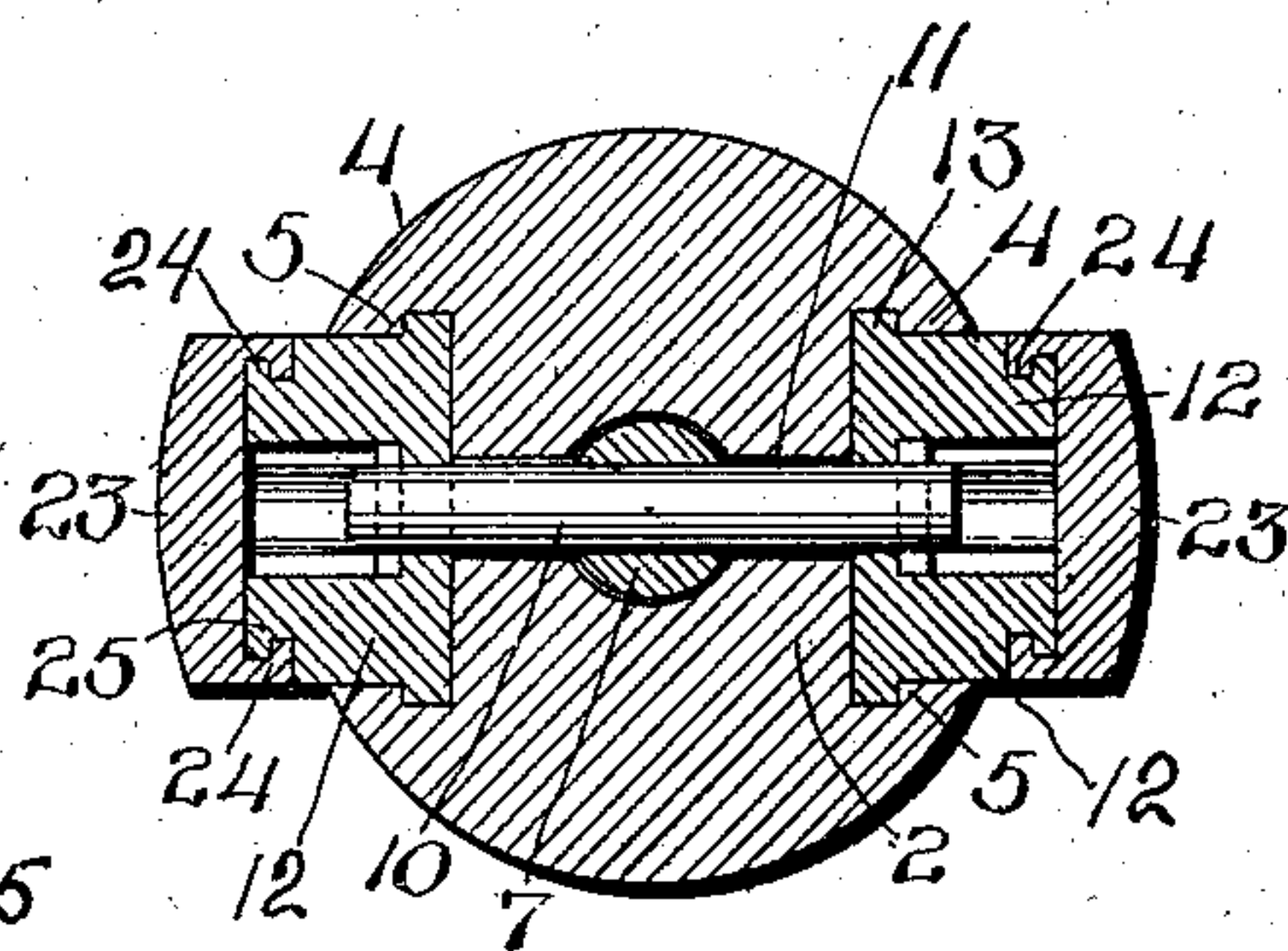


FIG. 6.

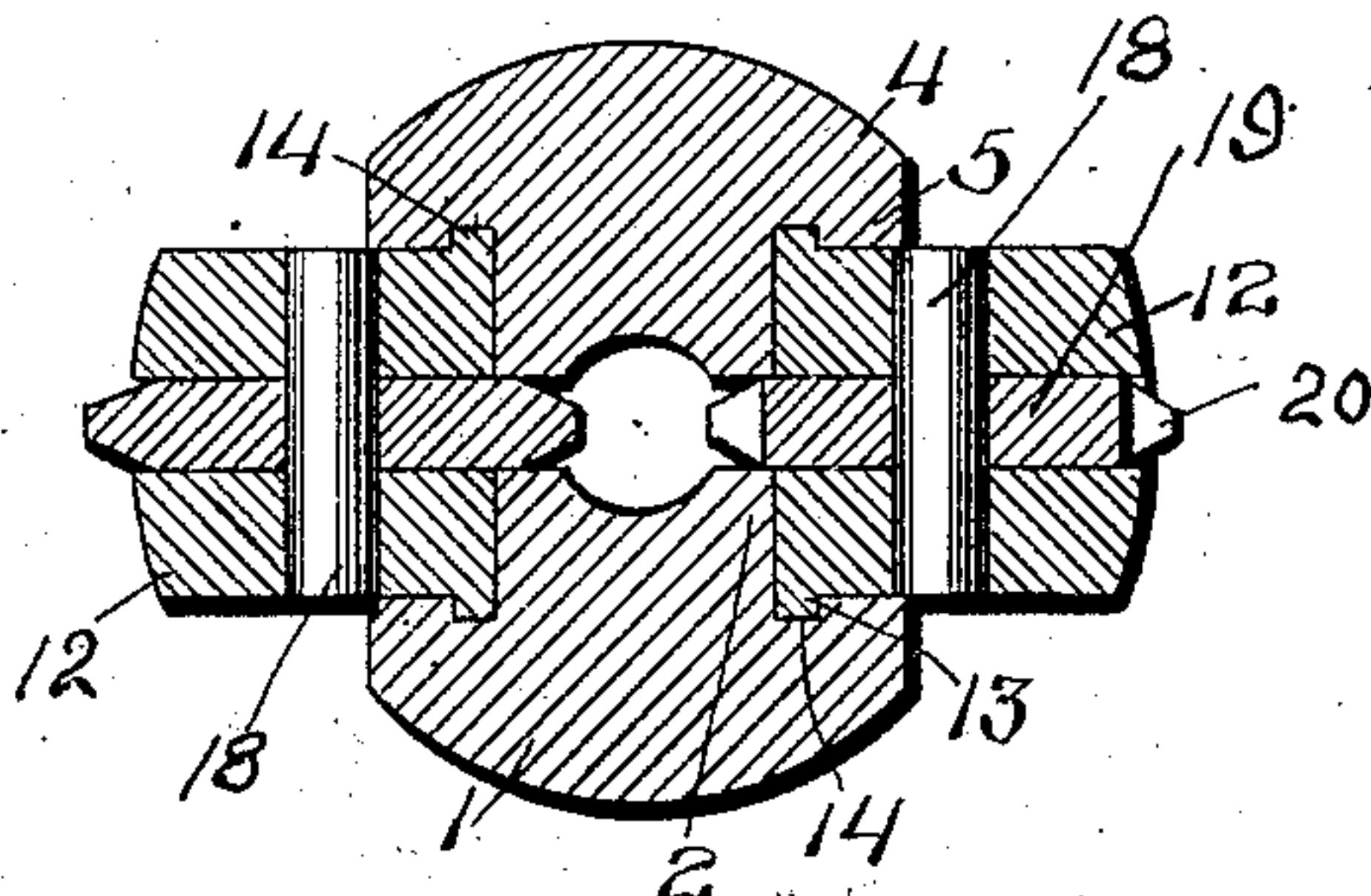


FIG. 8. FIG. 7.

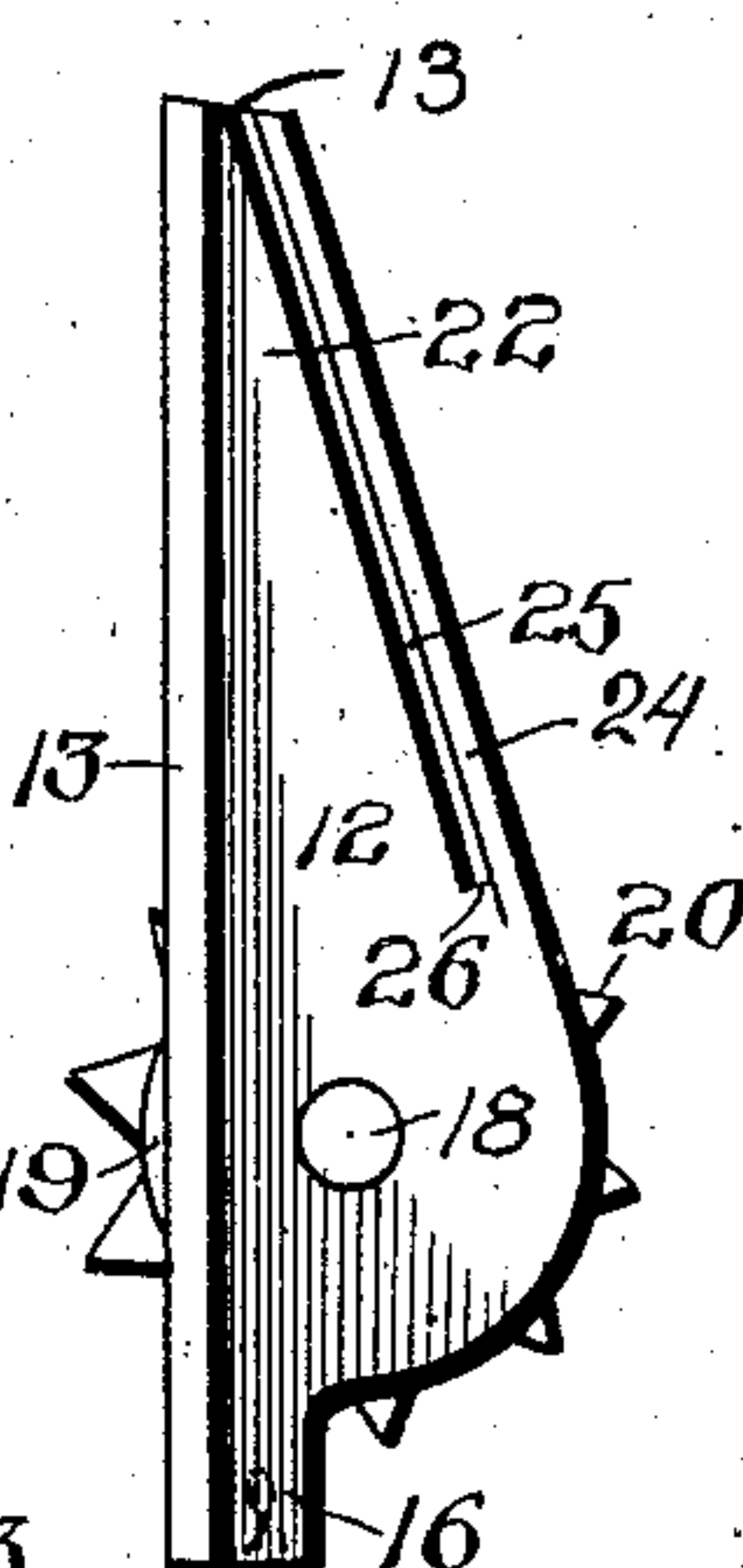
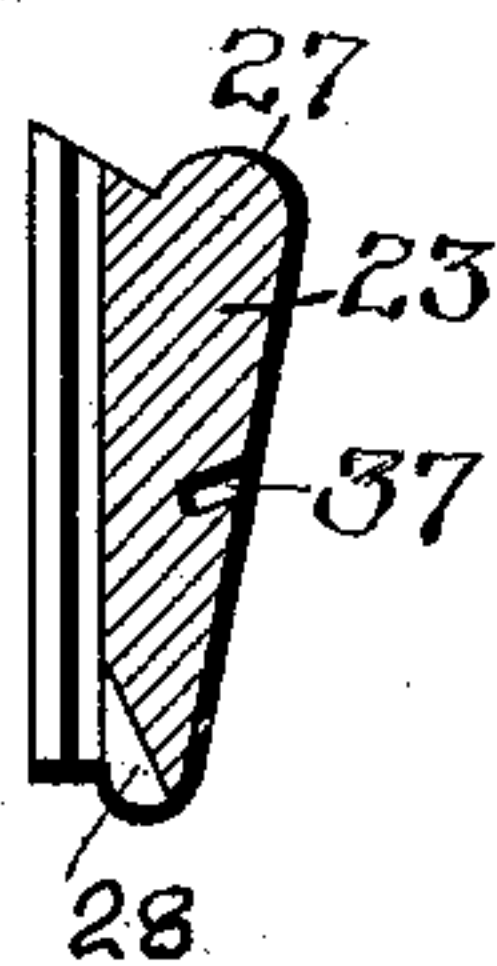
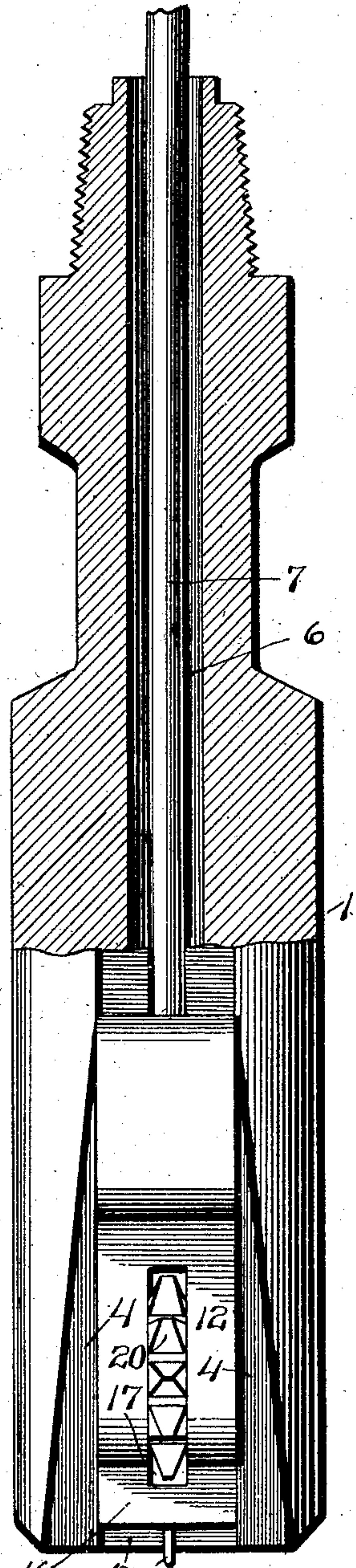


FIG. 9.



FIG. 2.



INVENTOR

*John C. Swan*

BY

*A. L. Smith*

Attorney



J. C. SWAN.  
CASING PERFORATOR.  
APPLICATION FILED OCT. 20, 1909.

973,994.

Patented Oct. 25, 1910.

2 SHEETS-SHEET 2.

FIG. 3.

FIG. 4.

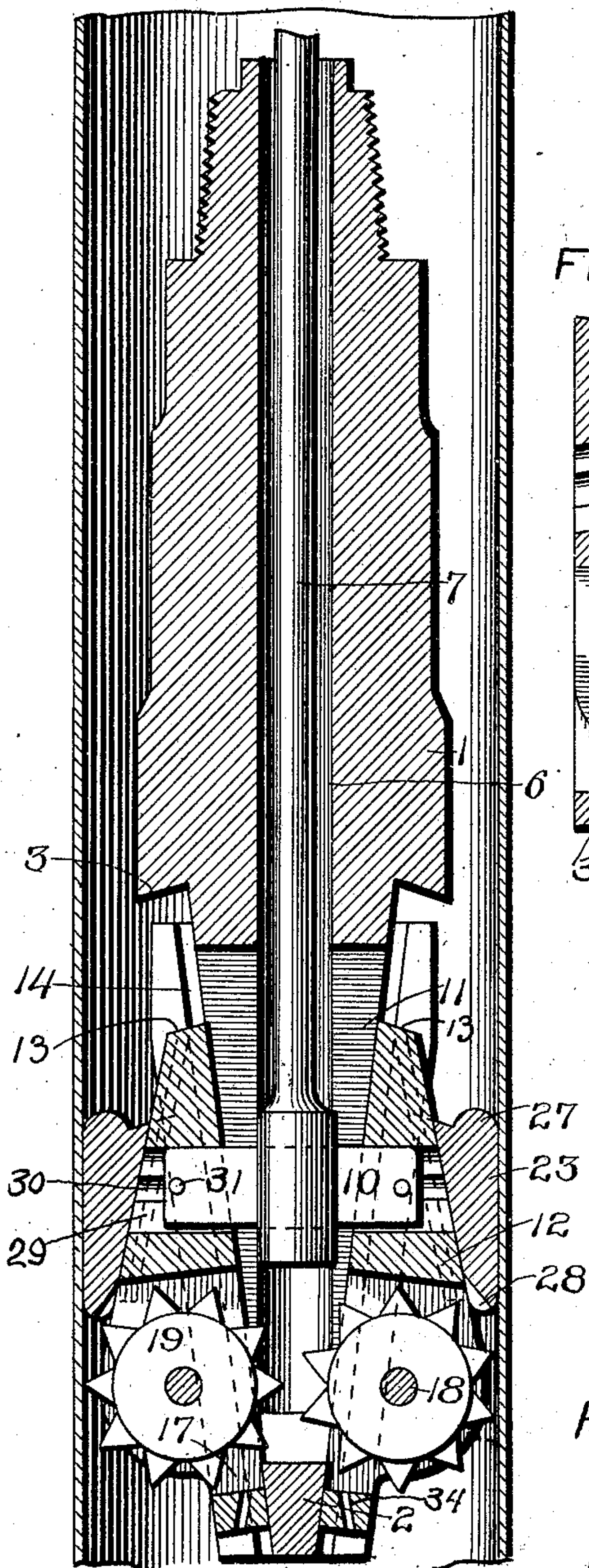


FIG. 10.

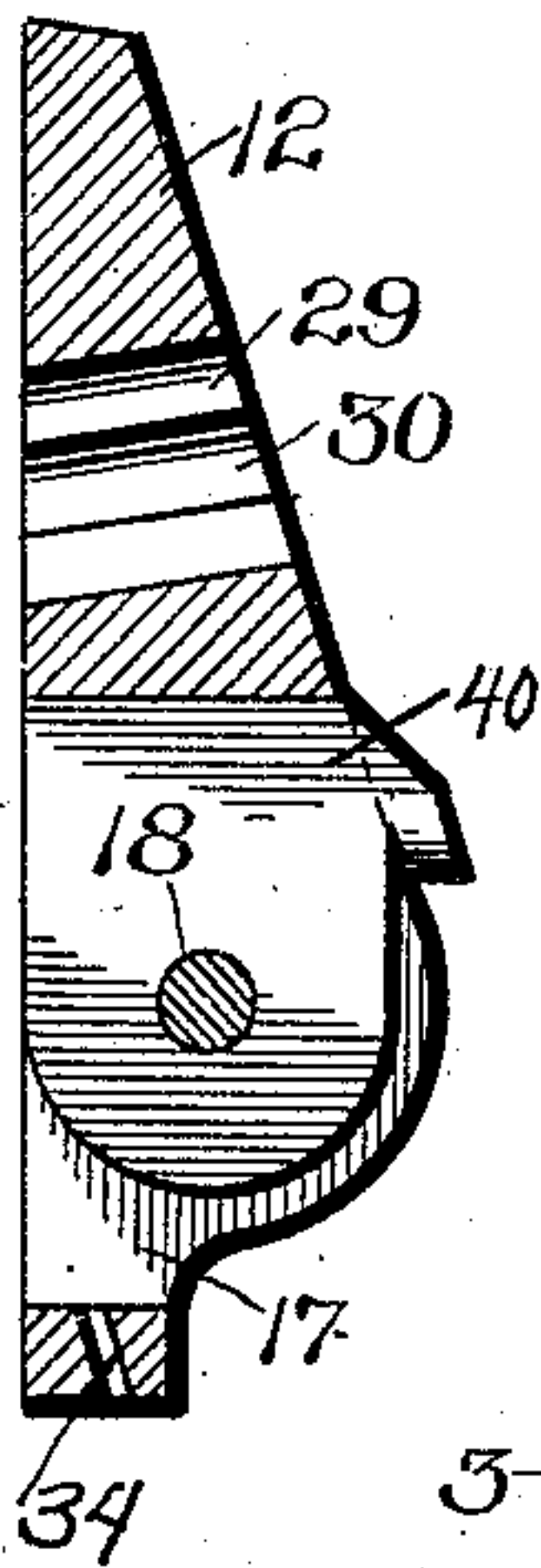
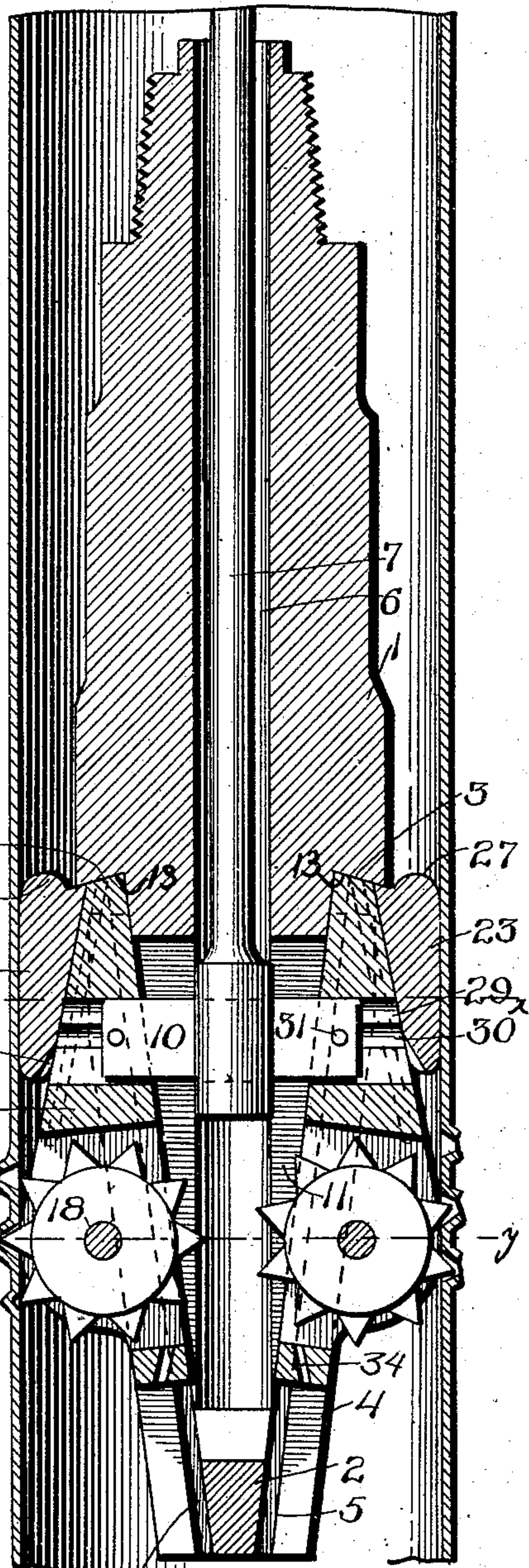
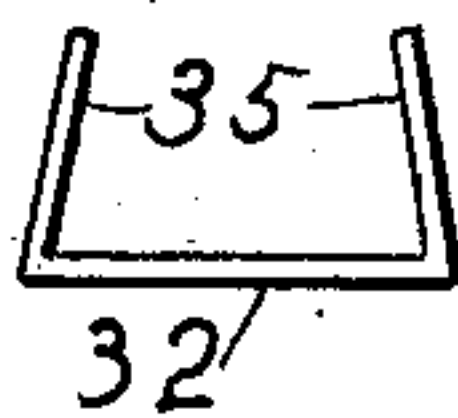


FIG. 11.



WITNESSES:

*H. F. Hoyer*  
*R. H. Whit*

BY

*John C. Swan*

*A. P. Sweeney*

Attorney



# UNITED STATES PATENT OFFICE.

JOHN C. SWAN, OF MARIETTA, OHIO.

## CASING-PERFORATOR.

973,994.

Specification of Letters Patent.

Patented Oct. 25, 1910.

Application filed October 20, 1909. Serial No. 523,706.

*To all whom it may concern:*

Be it known that I, JOHN C. SWAN, a citizen of the United States, residing at Marietta, in the county of Washington, State of Ohio, have invented certain new and useful Improvements in Casing-Perforators, of which the following is a description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to the construction of that class of tools, commonly known as "casing-perforators," which are employed for perforating, cutting and slotting casing and well tubing generally, such as is used in oil and other Artesian wells.

In Artesian and oil-well drilling and operating it frequently becomes necessary to perforate, cut, or slot the casing at points at variable distances below the top of the well—as, for instance opposite the oil-bearing strata in oil wells when for any reason it has been found necessary to case the well at that point, or opposite the water-bearing strata or water-veins in Artesian wells, or to permit the escape of closely packed sand and silt which binds the casing where the tubing or casing is to be withdrawn from the well.

For the purpose of perforating, cutting or slotting casing it is necessary to provide a tool which may be readily introduced into the casing and lowered through it without injury to the casing, may be caused to effect the perforation or slotting of the casing throughout such length of it as may be desired and may thereafter be pulled up through the casing.

It is the purpose of my present invention to provide a perforator and slotter which will be capable of effecting these several operations with certainty and rapidity and with the least expense possible.

With these and other objects hereinafter explained in view, my invention consists in the construction and combination of elements hereinafter described.

In the drawings: Figure 1 is an elevation of a complete perforating device embodying my invention the device being shown with the parts in position for entering the upper end of the casing. Fig. 2 is a side view of the lower part of the body of the tool partly in section showing the parts in the same positions as in Fig. 1 but on a larger scale. Fig. 3 is a longitudinal section of the lower

part of the body of the tool showing the operating parts in the position which they assume when the tool is being pulled up through casing. Fig. 4 is a view similar to Fig. 3 but showing the operating parts in position to perforate the casing. Fig. 5 is a cross-section on line  $x-x$  of Fig. 4. Fig. 6 is a cross-section on line  $y-y$  of Fig. 4. Fig. 7 is a side view of the main slip carrying the perforating wheels, the auxiliary or guard slip being removed. Figs. 8 and 9 are detail views of the auxiliary or guard slip. Fig. 10 is a longitudinal section of the main slip provided with a slitting knife in place of the perforating wheel. Fig. 11 is a detail view of the clip or staple.

In the drawings, 1 is the tool body having at its lower end the wedge 2 with abutments 3, preferably having oblique faces, and the housings 4 with guide ribs 5 formed in them. The tool body is centrally bored at 6 to receive the spring rod 7 which extends upward into spring case 8 and is drawn upward by spring 9. Near its lower end the spring rod carries cross-bar 10 which extends outward on each side through slots 11 formed in the faces of the wedge 2. The tool body as thus far described is essentially the same in construction with the reamer body shown and described in U. S. Letters Patent No. 683,352 issued to me September 24, 1901.

On the faces of the wedge 2 are carried in the same manner as the reaming heads of my patent referred to, main slips 12. These main slips have their upper ends 13 formed to fit the abutments 3 being shown as oblique faces to fit the oblique faces of the abutments. The main slips have guide ribs 13 on their sides to engage the guide ribs 5 and to move freely in the ways 14 formed between these guide ribs and the faces of the wedge. The main slips are tapered or wedge-shaped, the base of this wedge being near their lower ends. Below the base of this wedge the slip is provided with an extension or tail piece 16. Near the lower end of the slip in the thickest part of it is formed a slot 17 in which is journaled, on a pin 18, a toothed perforating wheel 19 which is of such diameter and so mounted that its teeth project outward beyond the outer face of the slip and project inward beyond its inner face.

On the upper portions 22 of the outer faces of the main slips 12 are slidingly



mounted auxiliary or guard slips 23 these guard slips being preferably about one half the length of the upper portions 22 of the main slip and being mounted to slide freely  
 5 on them. The guard slips are held to the upper portions of the main slips by means of guide ribs 24 formed on the guard slips engaging guide grooves 25 formed in the sides of the main slips parallel with the faces of  
 10 the upper portions 22, the lower end 26 of the guide groove 25 forming a stop to limit the downward movement of the guide slip (see Fig. 7). The guide slips are wedge-shaped with the base of the wedge upward.  
 15 the upper portions 22, the lower end 26 of off as shown at 27 and at its lower end the guard slip is provided in its inner face with a recess 28 of a width suitable to receive a tooth 20 of the perforating wheel 19.

20 Through the upper portions 22 of the main slips are formed openings 29 to receive the ends of the cross bar 10 and in the outer ends of these openings are formed recesses 30 to receive retaining pins or rivets 31  
 25 which are carried in the ends of the cross bar.

In assembling the parts of the tool, the spring rod 7 is first drawn down so that its lower end is near the lower end of the slot  
 30 11 and is secured in this position by any convenient means such as a pin or drift 35 extending through a slot 36 in the spring case, and bearing against the upper end of the spring rod. The guard slips 23 are then  
 35 slipped onto the upper portions 22 of the main slips with their guide ribs 24 engaging the guide grooves 25. The main slips are then slipped onto the faces of the wedge 2 with their guide ribs 13 in the spaces 14  
 40 between the guide ribs 5 and the faces of the wedge 2. The openings 29 of the main slips are then brought in line with the slot in the lower end of the spring rod and the cross bar 10 is thrust through into the position  
 45 shown in Figs. 3 and 4 and secured by pins or rivets 31. In order to uncover the openings 29 it will be necessary to slide the guard slips 23 upward on the upper portions 22 of the main slip which may readily be  
 50 done without, however, detaching the guard slips from the main slip this being prevented by the upper end of the guard slip striking the face of the wedge 2 before its lower end leaves the upper end of the main  
 55 slip, the angle of the inner and outer faces of the upper portion of the main slip being such that whatever position the main slips may be in on the faces of the wedge 2 the guard slips will be prevented from removal  
 60 in one direction by the stop 26 and in the other direction by the face of the wedge. The perforating wheels 19 may then be inserted in the slots 17 and their pivot pins 18 inserted, the teeth 20 of the perforating  
 65 wheels extending inward into the slot 11.

The main slips, being at the lower end of the wedge 2, are then secured by tying or preferably by means of a clip or staple 32 having slightly converging legs 33 which  
 70 extend into holes 34 formed in the lower ends of the main slips. The guard slips are then slid upward until by their inward movement on the tapered upper portions 22 of the main slips they are retracted sufficiently to enter the casing. As soon as the  
 75 tool has entered the casing the pin or drift 35 is removed. The tool may then be lowered through the casing without injury to its walls the perforating wheels being held in their inward or retracted position so that  
 80 their teeth will not come in contact with the walls. The tool is lowered until its lower end reaches the bottom of the well hole when the main slips may be released by dropping the tool so that the tying wire or cord is broken  
 85 or, if the clip or staple 32 is used, so that one or the other of the main slips will be forced upward to detach it from the clip or staple 32 which will of course release the clip or staple from the other main slip.  
 90 The main slips will then be drawn upward on the wedge 2 by the spring 9 but as this upward movement of the main slips forces the guard slips outward and as this outward movement of the guard slips is limited by  
 95 the casing, the parts will assume the positions in which they are shown in Fig. 3, the outer faces of the guard slips extending outward in line with or slightly beyond the teeth of the perforating wheel. The tool  
 100 may then be drawn upward through the casing the outer faces of the guard slips bearing against the walls of the casing and their upward movement being resisted by frictional contact with the casing. The guard  
 105 slips being thus retarded in their upward movement will retard the upward movement of the main slips with the result that the wedge 2 will be drawn upward between the main slips until the parts are in the posi-  
 110 tions in which they are shown in Fig. 3, the main slips being at the lower end of the wedge 2 with the perforating wheels 19 in retracted position so that their teeth cannot injure the casing. When in this position  
 115 the guard slips extend over the upper portions of the respective perforating wheels and serve to shield or guard the casing. The recesses 28 permit the free rotation of the perforating wheels in case their teeth are  
 120 caught by a joint or other obstacle in the casing, so that injury to the casing will be avoided.

When the tool has been drawn upward to the point at which it is desired to begin the  
 125 perforating the movement of the tool is reversed. It will of course be understood that where, as is usually desired, a series of perforations are to be made in the casing, the tool should be drawn up to the upper end  
 130



of the desired row or series of perforations as the tool effects the perforation of the casing by its downward and not by its upward movement.

5 As the tool begins its downward movement the guard slips will be retarded in the downward movement by friction on their outer faces with the walls of the casing and will no longer prevent the main slips from  
10 being drawn against the abutments 3 by the spring 9 and the main slips will at once assume the position relative to the wedge 2 in which they are shown in Fig. 3, the upward pull of the spring being aided by the  
15 retardation of the downward movement of the main slips by contact of the teeth of the perforating wheels with the casing walls while the body of the tool continues to descend carrying the wedge 2 between the main  
20 slips to force them outward and to cause one or more of the teeth 20 to be pushed through the casing. By reason of the weight of the perforating tool and the string of tools of which it forms a part, the tool  
25 will drop quickly producing the effect upon the perforating wheels of a sharp outward impulse or blow. This effect will be increased by the use of a set of jars as a part of the string of tools, and cannot fail to  
30 punch one or more of the teeth of both perforating wheels through the casing. A tooth being once punched through the further lowering of the tool will cause the perforating wheel to rotate to force successive  
35 teeth through the casing forming in the casing two diametrically opposite rows of successive perforations from the point at which the first hole is punched downward as far as the tool is lowered.

40 When the casing has been perforated to the depth desired the downward movement of the tool is stopped and it is pulled up. As it begins its upward movement the guard slips will come in frictional engagement  
45 with the walls of the casing and their upward movement will be checked and will in turn check the upward movement of the main slips. As the body of the tool continues to rise the thicker portion of the  
50 wedge 2 will be withdrawn from between the main slips so that they will assume the position in which they are shown in Fig. 3, the guard slips moving downward relative to the main slips to the position shown in  
55 Fig. 3, the lower ends of the guard slips extending over the upper portions of the perforating wheels the recess 28 fitting over any tooth that would otherwise be struck by the lower end of the guard slip. So long as  
60 the tool continues to be drawn upward the perforating wheels will thus be held out of position to injure the walls of the casing.

In case it is desired to perforate the casing at a place above the perforations made  
65 as above described it is only necessary to

stop the upward movement of the tool at the point at which it is desired the second perforating should begin and lower the tool as above described in connection with the first row of perforations. This operation  
70 may be repeated to perforate the casing at as many different depths as may be desired it being necessary only that the lower rows of perforations should be made first, each row  
75 however being made from above downward. Of course if it is desired to perforate at a depth below that to which the tool has been raised it is only necessary to raise the tool  
80 out of the casing, insert the wedge or drift to force the main slips downward into contracted position, secure them in contracted position and lower the tool as above described past the perforations already made until it reaches the required depth.

Instead of the perforating wheel above  
85 described a slitting knife 40 shown in Fig. 10 may be used. The base of this knife is formed to fit at its upper end against the upper end of the slot 17 and the knife is retained in position by the pin 18.  
90

Having thus described my invention and explained the mode of operation thereof, I claim as new and desire to secure by Letters Patent:—

1. In a casing perforator the combination  
95 of a tool body provided with a wedge shaped portion having the thin end of the wedge downward, main slips movable on the faces of the wedge shaped portion having portions thereof wedge shaped with the thin  
100 end of the wedge upward, means adapted to contact with the casing mounted to be freely movable on the wedge shaped portions of the main slips, yielding means for forcing the main slips upward on the faces of the  
105 wedge shaped portion of the tool body, and perforating means carried by the main slips.

2. In a casing perforator the combination of a tool body provided with a wedge shaped  
110 portion having the thin end of the wedge downward, main slips movable on the faces of said wedge shaped portion having portions thereof wedge shaped with the thin end of the wedge upward, guard slips movable on the wedge shaped portions of the  
115 main slips and adapted to contact with the walls of the casing, perforating means carried by the main slips, and yielding means for forcing the main slips upward on the faces of the wedge shaped portion of the  
120 tool body.

3. In a casing perforator the combination of a tool body having in its lower portion a wedge having its thin end downward, and having a longitudinal slot formed in it, main  
125 slips movable on the faces of the wedge having their upper portions wedge shaped with the thin end of the wedge upward, perforating wheels carried by the lower portions of the main slips extending into the slot  
130



of the wedge, and yielding means for forcing the main slips upward on the faces of the wedge.

4. In a casing perforator the combination  
5 of a tool body having in its lower portion a wedge having its thin end downward, and having a longitudinal slot formed in it, main slips movable on the faces of the wedge  
10 having their upper portions wedge shaped with the thin end of the wedge upward, perforating wheels carried by the lower portions of the main slips extending into the slot of the wedge, guard slips movable on the upper portions of the main slips, and  
15 yielding means for forcing the main slips upward on the faces of the wedge.

5. In a casing perforator the combination  
20 of a tool body having in its lower portion a wedge having its thin end downward, main slips movable on the faces of the wedge having their upper portions wedge shaped with the thin end of the wedge upward, perforating means carried by the lower portions of the main slips, guard slips movable  
25 on the upper portions of the main slips having their lower ends adapted to extend outward beyond the outer edge of the perforating means, and yielding means for forcing the main slips upward on the faces of  
30 the wedge.

6. In a casing perforator the combination  
35 of a tool body provided with a wedge shaped portion having the thin end of the wedge downward, main slips movable on the faces of the wedge shaped portion having portions thereof wedge shaped with the thin end of the wedge upward, means adapted to contact with the casing mounted to be freely movable on the wedge shaped portions of  
40 the main slips, yielding means for forcing the main slips upward on the faces of the wedge shaped portion of the tool body, and perforating wheels carried by the main slips and freely rotatable therein.

45 7. In a casing perforator the combination of a tool body provided with a wedge shaped portion having the thin end of the wedge downward, main slips movable on the faces of the wedge shaped portion having  
50 portions thereof wedge shaped with the thin end of the wedge upward, means adapted to contact with the casing mounted to be freely movable on the wedge shaped portions of the main slips, yielding means for forcing  
55 the main slips upward on the faces of the wedge shaped portion of the tool body, and

removable means for holding the main slips at the lower end of the wedge.

8. In a casing perforator the combination  
60 of a tool body provided with a wedge shaped portion having the thin end of the wedge downward, main slips movable on the faces of said wedge shaped portion having portions thereof wedge shaped with the thin end of the wedge upward, guard slips movable  
65 on the wedge shaped portions of the main slips and adapted to contact with the walls of the casing, stops limiting the downward movement of the guard slips on the main slips, perforating means carried by  
70 the main slips, and yielding means for forcing the main slips upward on the faces of the wedge shaped portion of the tool body.

9. In a casing perforator the combination  
75 of a tool body provided with a wedge shaped portion having the thin end of the wedge downward, main slips movable on the faces of said wedge shaped portion having portions thereof wedge shaped with the thin end of the wedge upward, guard slips movable  
80 on the wedge shaped portions of the main slips and adapted to contact with the walls of the casing, perforating means carried by the main slips, and yielding means for forcing the main slips upward on the  
85 faces of the wedge shaped portion of the tool body, the guard slips being adapted to extend over a portion of the perforating means when in expanded position.

10. In a casing perforator the combina-  
90 tion of a tool body provided with a wedge shaped portion having the thin end of the wedge downward, main slips movable on the faces of said wedge shaped portion having portions thereof wedge shaped with the  
95 thin end of the wedge upward, guard slips movable on the wedge shaped portions of the main slips and adapted to contact with the walls of the casing, perforating wheels journaled in the main slips, and yielding  
100 means for forcing the main slips upward on the faces of the wedge shaped portion of the tool body, the guard slips being adapted to extend over a portion of the perforating wheels, when in expanded position.  
105

This specification signed and witnessed this 19th day of October A. D. 1909.

JOHN C. SWAN.

In the presence of—

CHAS. E. RIORDAN,

A. P. GREELEY.