Oct. 25, 1949. P. J. HARINCK 2,485,826

WELL DRILLING MEANS

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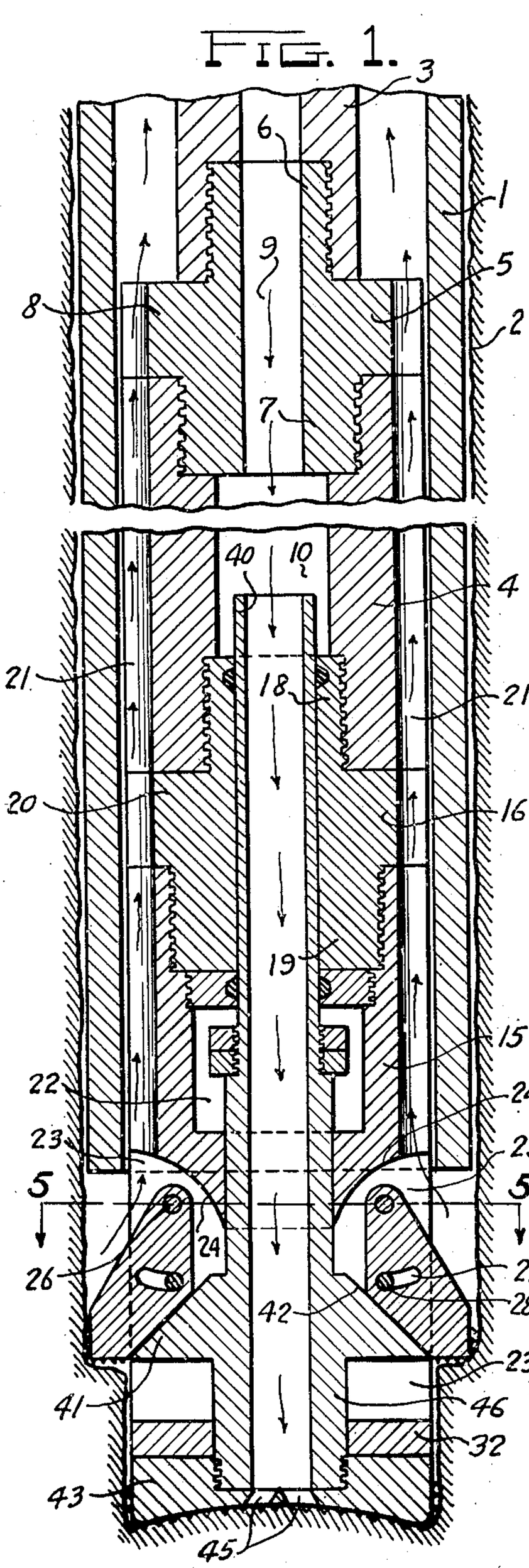
FIG. 1.



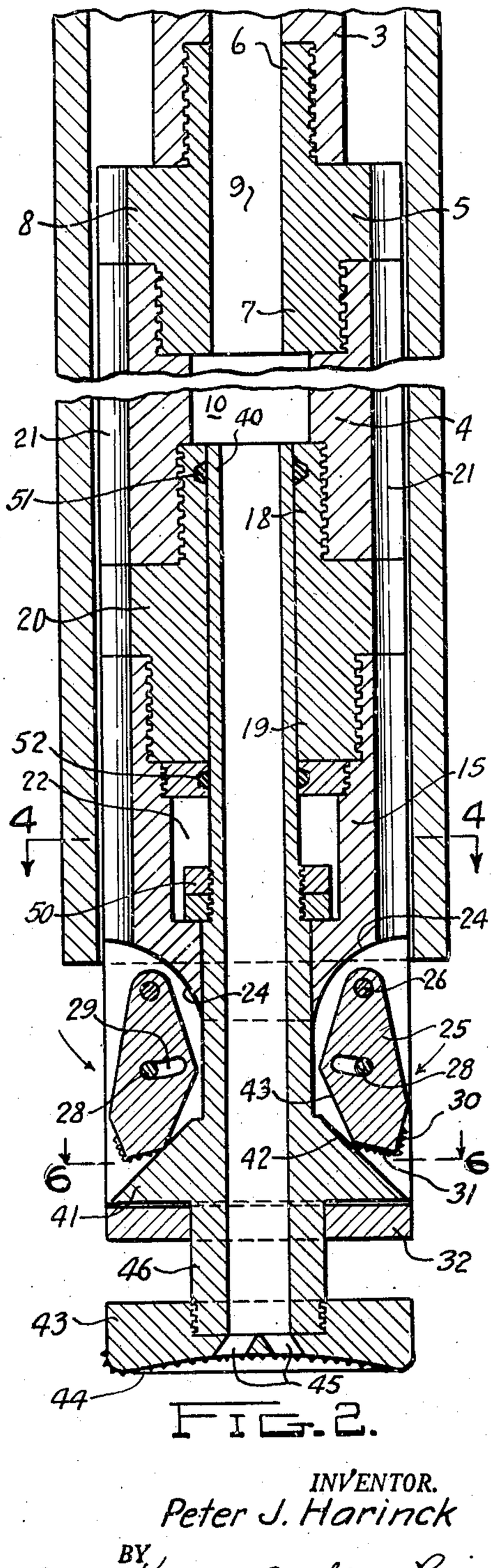


FIG. 2.

INVENTOR.
Peter J. Harinck

BY
Barnes, Kisselle, Laughlin & Raisch

ATTORNEYS

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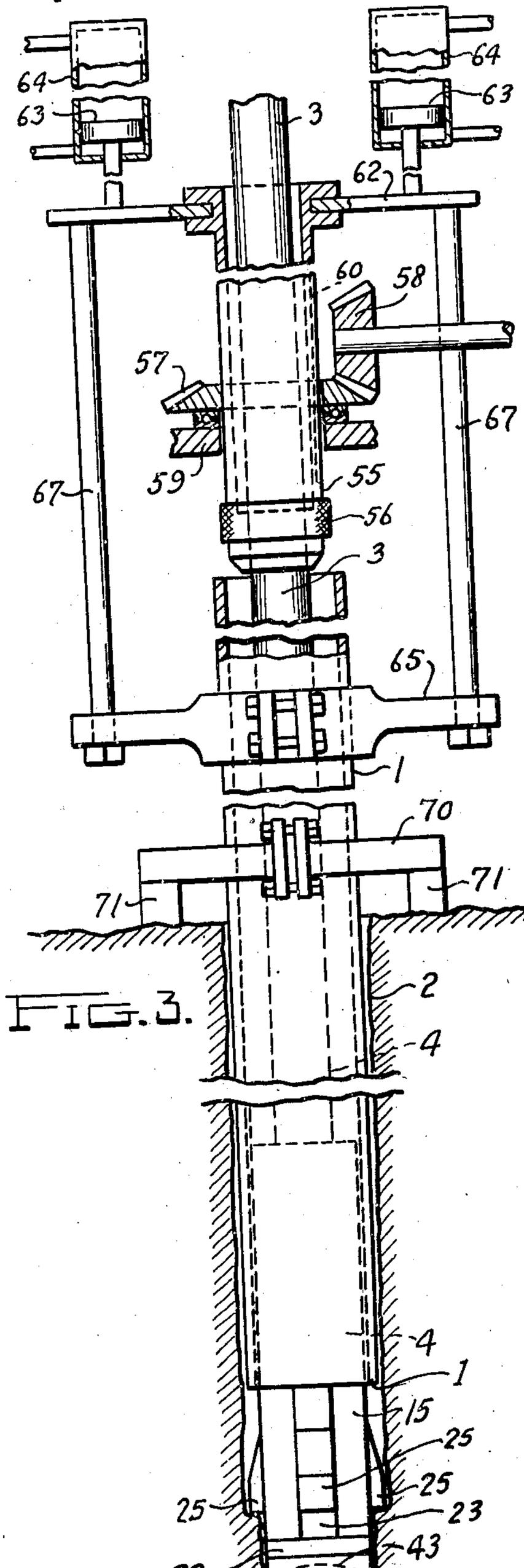

FIG. 3.

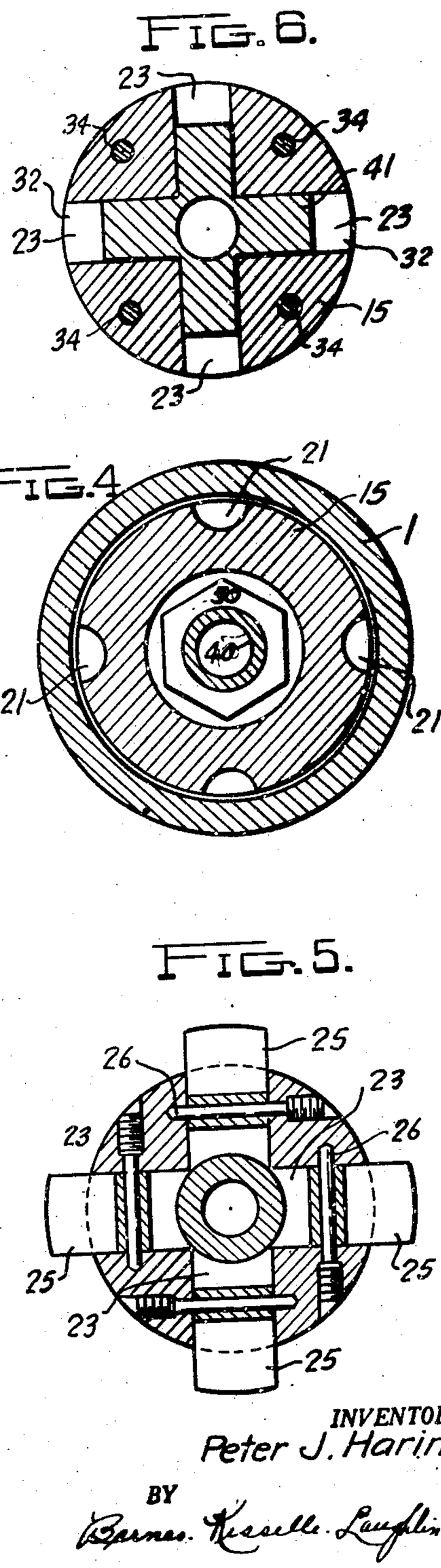

FIG. 6.

FIG. 4

FIG. 5.

INVENTOR.
Peter J. Harinck

BY
Barnes, Kisselle, Laughlin & Raisch
ATTORNEYS

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WELL DRILLING MEANS

Peter J. Harinck, Ferndale, Mich.

Application April 19, 1948, Serial No. 22,000

1 Claim. (Cl. 255—76)

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This invention relates to an apparatus for drilling into the earth and it has to do particularly with an apparatus for drilling wells, such as oil wells or the like.

While the apparatus is suitable for drilling oil wells it, of course, may be used for drilling into the earth for any mining operation or for other purposes. An object of the invention is to provide an improved rotary drilling mechanism and particularly a rotary drilling head so constructed and arranged that a casing may be fed into the drilled hole and which may be caused to progress as the drilling progresses. To this end, the drill head has cutter elements arranged to expand so that a hole is drilled large enough to receive the casing and the cutter elements are retractable to permit of insertion of the drill head through the casing and the retraction of the drill head through the casing.

A structure made in accordance with the invention is shown in the accompanying drawings:

Fig. 1 is a cross sectional view taken through the drill head and casing showing the same in operating position.

Fig. 2 shows the drill head in the condition with the cutter elements retracted.

Fig. 3 is a schematic view illustrating how the drill head may be used.

Fig. 4 is a cross sectional view taken substantially on line 4—4 of Fig. 2 showing some of the structure of the head.

Fig. 5 is a cross sectional view taken substanially on line 5—5 of Fig. 1 showing the mounting for the retractable cutter elements.

Fig. 6 is a sectional view taken substantially on line 6—6 of Fig. 2 showing structure of the drill head.

In Figs. 1 and 2, a casing which ordinarily is of suitable pipe is illustrated at 1 located in a drilled hole 2. Within the casing is a rotary drill pipe or drive pipe 3 which is to be rotated by suitable means on the surface. There is an element which may be termed a guide post indicated at 4 drivingly connected to the drill pipe as by means of a coupling 5. This coupling has a part 6 screw threaded into the end of the drill pipe and a part 7 screw threaded into the guide post and an intermediate part 8 adapted to seat on top of the post 4. The coupling has a passageway 9 therethrough and the guide post is hollow to provide a passage 10. Preferably, square threads are used for the coupling as indicated.

There is a chuck member 15 connected to the guide post 4 by a coupling 16 having a part 18 screw threaded into the guide post, a part 19 threaded into the chuck and an intermediate head part 20 fitting between the post and the chuck.

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The peripheral portions of the chuck, the intermediate portion 20 of the coupling 16, the post 4 and the intermediate part 8 of the coupling 15 are provided with grooves to provide passageways 21 (Fig. 4). The coupling 16 and the chuck are hollow and the chuck has a hollow portion providing a chamber 22.

The lower end of the chuck is cut away to provide slots 23 which extend from their upper portions, indicated at 24, through the lower end of the chuck. As shown in Fig. 6, there are four of such slots and in each slot is a cutter element 25 each pivotally mounted on a pin 26 (Fig. 5). The pivotal movement of each cutter element is preferably limited as by means of a pin 28 operating in a slot 29 of each cutter element. The cutter elements have cutting faces 30 and 31 which are preferably set with diamonds. Attached to the lower end of the chuck is a plate 32 connected thereto by suitable screws 34 for closing the lower ends of the slots 23.

Slidably mounted in the chuck and in the coupling 16 is a tubular member 40 having a cam-like or inclined plane projection extending into each slot 23. These projections are shown at 41 and each has an inclined face 42 for cooperation with the cutter elements 25 and particularly with the faces 43 thereof. The member 40 has an extension 46 which passes through the plate or washer 32 and attached to the end thereof is a cutting tool 43. This tool preferably has a concaved bottom surface set with diamonds 44 and it has one or more passages 45 communicating with the interior of the tubular member.

It will be appreciated how the tool holder 40 may be assembled and held assembled by the attachment of the plate 32 after the cam projections are located in the slots 23. Situated preferably in the chamber 22 is stop means which may be provided by two washers as indicated at 50 and engagable with the bottom of the chuck to limit the sliding movement of the tool holder and suitable gaskets or seal structures 51 and 52 are preferably used to prevent flow of water over the outside surface of the tubular tool holder.

When the parts are in operating position, as shown in Fig. 1, the drill rod 3 may be rotated. The pressure on the cutting tool 43 causes the tool to shift upwardly as shown in Fig. 1 to abut against the washer 32. In this position, the cam projections 41 engage respectively the cutting

elements 25 and hold them out in cutting position as shown in Fig. 1. As the instrument is rotated, the cutting head 43 cuts a hole according to its diameter and the expanded cutter elements 25 cut the earth to enlarge the hole for the casing 1. During this operation, water is pumped down into the well through the hollow drill pipe through the hollow tool holder 40 and out through the passages 45 to thereby wet the substance operated upon. This water, together with the particles of earth which have been cut by the tools, flows back through the passages 21 and thence into the space between the casing and the drill pipe and up to the surface. The sludge carrying water enters the passages 21 through the upper ends of the slots 23.

The position of the parts in Fig. 2 illustrates how the cutter elements 25 may be retracted so that the drill head may be removed through the casing. If the drill rod be pulled upwardly from the position shown in Fig. 1, the lower end of the casing engages the cutting elements 25 to swing them inwardly to the Fig. 2 position. This forces the tool holder 40 downwardly with cam action, as shown in Fig. 2. On the other hand, if the parts are adequately free, the mere weight of the tool holder may cause it to gravitate to the Fig. 2 position. Thus, the drill head may be removed at any time and for any purpose. The drill head or another drill head or a repaired drill head may be inserted through the pipe while the parts are in the position shown in Fig. 2, and when the cutting tool 43 strikes the bottom of the well, it is pushed upwardly and the cutter elements 25 are urged outwardly to their operative position, as shown in Fig. 1.

Thus, as the well is drilled, the casing may be fed into the position. The casing may be lowered from time to time with step by step movement, or it may be so coupled to controlling mechanism on the surface that it follows the drilling head downwardly.

The diagrammatic illustration in Fig. 3 indicates how the apparatus may be employed. The drill pipe 3 may pass through a tubular driving member 55 provided with a chuck 56 for engaging the drill pipe with the member 55 suitably rotated as by means of a bevel gear 57 operable by a gear 58 with the gear 57 suitably supported as at 59 and slidably keyed to the member 55 as at 60. The driving member 55, as shown is provided with a cross head 62 which may be urged downwardly hydraulically, as by means of pistons 63, in cylinders 64 to which hydraulic medium under pressure is supplied. From this it will be seen that the drill pipe may be rotated and urged downwardly under pressure to cause the cutting tool and the cutting elements to engage and cut the earth.

In order to feed the casing downwardly with movement of the drill head, a clamp 65 may be applied to the casing and connected to the cross head 62 by rods 67. At the limit of the downward

stroke of the pistons in their cylinders, the chuck is to be released and the cross head and the structure carried thereby elevated in order to apply the chuck to the drill pipe at another location in order to again apply downward pressure thereto. When this is done the clamp 65 on the casing may be released and the casing may be temporarily supported at this time by applying a clamp 70 thereto which may rest upon suitable supports 71.

I claim:

An apparatus for drilling a well into the earth while a casing for the drilled hole may be advanced thereinto as the drilling operation proceeds comprising, a hollow chuck attachable to a hollow drill pipe, a tool holder, said tool holder having an elongated hollow body, means slidably mounting the tool holder in the chuck, so that the lower end thereof depends below the chuck, the hollows of the drill pipe and the tool holder being in communication with each other for the passage of water, means at the depending end of the tool holder for receiving a cutting head, the chuck being adapted to have the casing passed thereover and the chuck having grooves in its outer surface for the passage of water, said chuck having a plurality of slots therein which open outwardly, a cutter element in each slot, means pivotally mounting each cutter element in its slot so that each cutter element may retract into its slot and may shift to project outwardly from its slot, so that the cutter elements, upon rotation of the chuck, enlarge the hole formed by the said cutting head to a diameter for receiving the casing, the tool holder having a plurality of cam shaped projections, one lying in each slot of the chuck for non-rotatably connecting the tool holder and chuck, each cam shaped projection having an angular surface for engaging a cutter element to shift the same to its outward projecting position as the tool holder is shifted axially relative to the chuck incident to the cutting head engaging the earth at the bottom of the formed well.

PETER J. HARINCK.

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