

April 23, 1940.

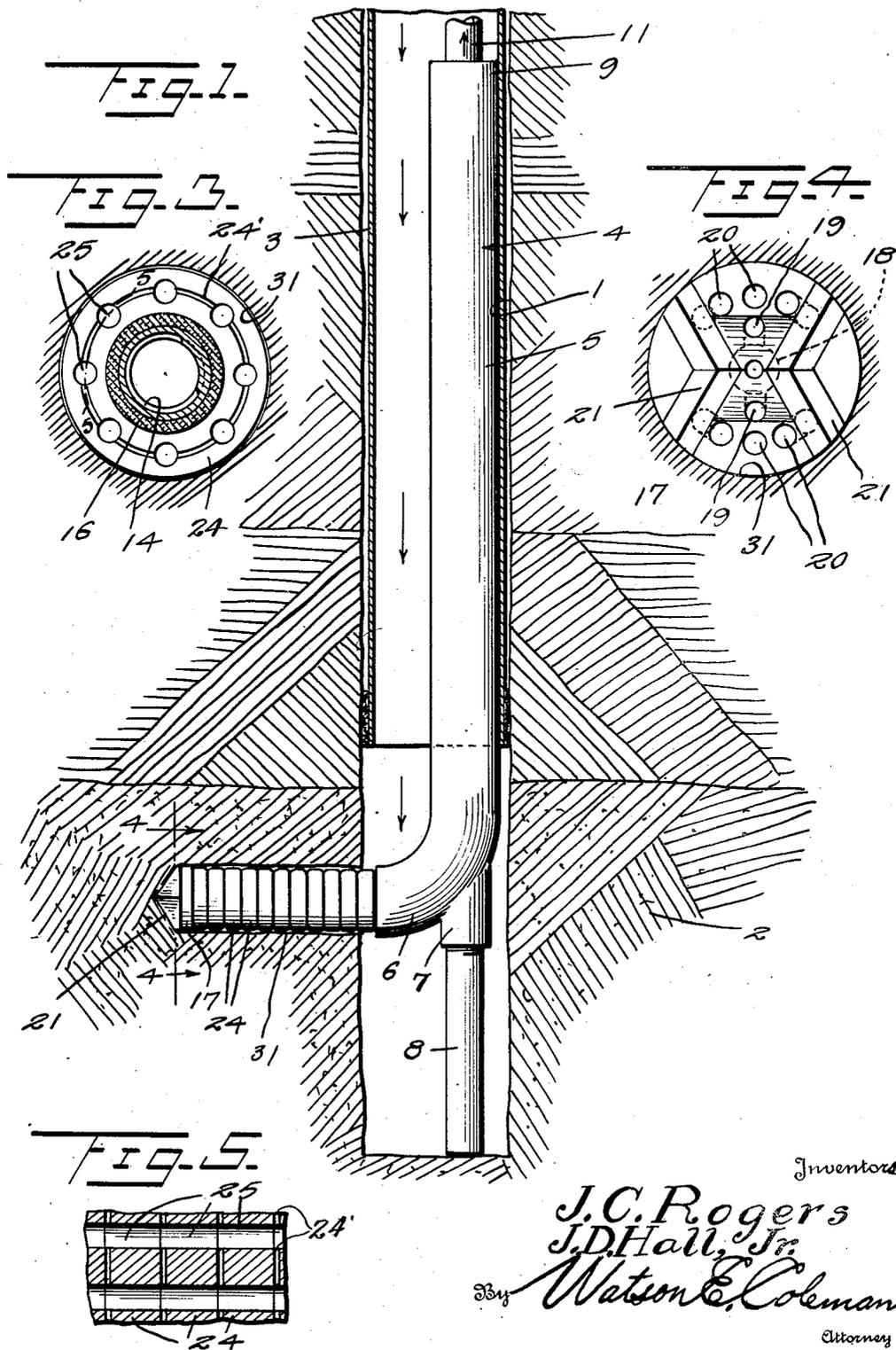
J. C. ROGERS ET AL

2,198,016

LATERAL DRILL MECHANISM

Original Filed Aug. 18, 1938

2 Sheets-Sheet 1



Inventors

J. C. Rogers
J. D. Hall, Jr.

334

Watson E. Coleman

Attorney

April 23, 1940.

J. C. ROGERS ET AL

2,198,016

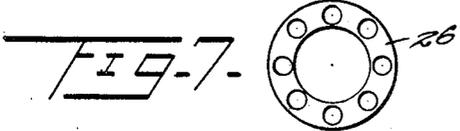
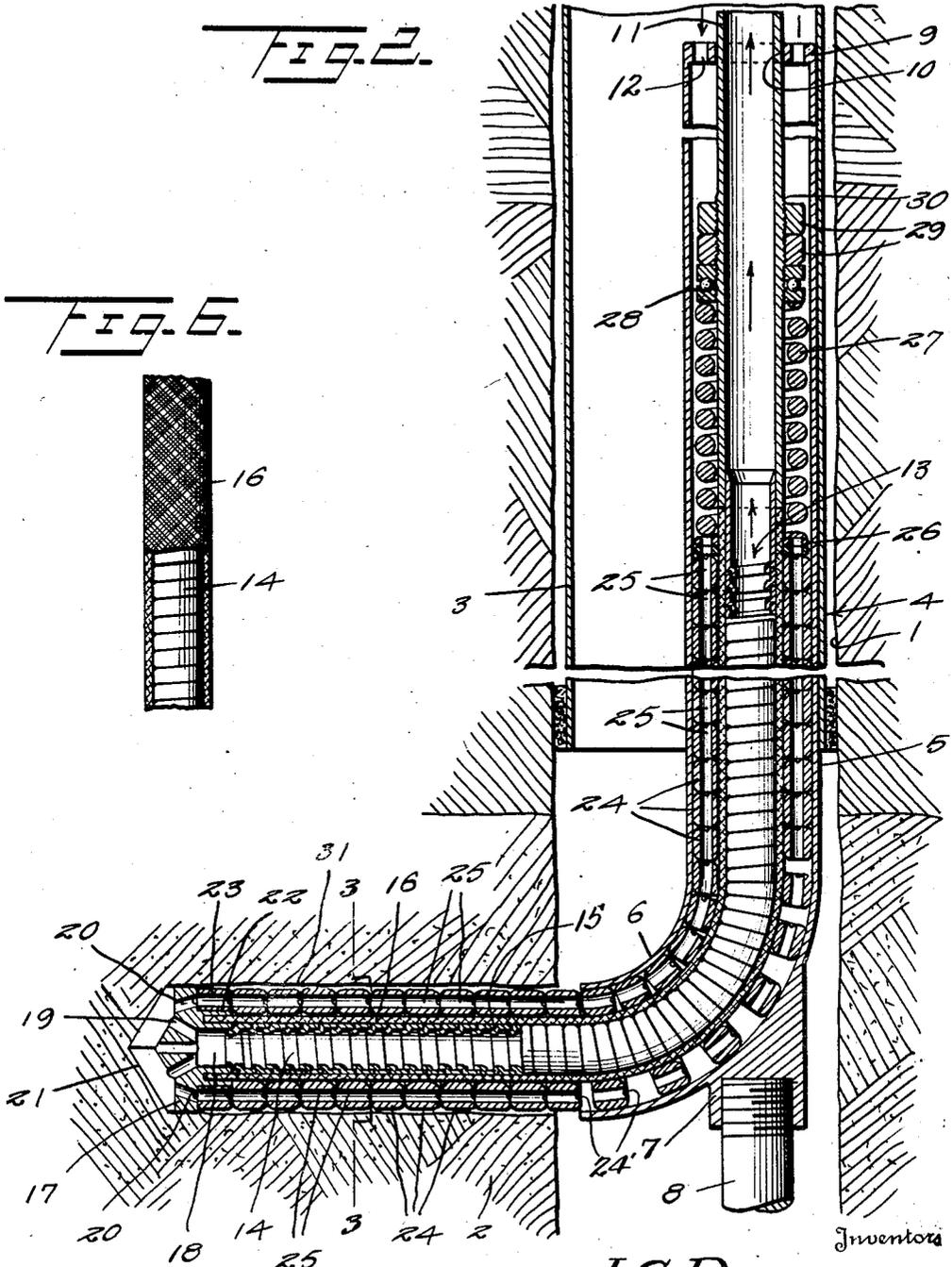
LATERAL DRILL MECHANISM

Original Filed Aug. 18, 1938

2 Sheets-Sheet 2

FIG. 2.

FIG. 5.



Inventors
J.C. Rogers
J.D. Hall, Jr.
By *Watson E. Coleman*
Attorney

UNITED STATES PATENT OFFICE

2,198,016

LATERAL DRILL MECHANISM

James C. Rogers, Big Spring, and James D. Hall, Jr., Kilgore, Tex.

Application August 18, 1938, Serial No. 225,640
Renewed September 26, 1939

6 Claims. (Cl. 255-1)

This invention relates to improvements in drilling devices or machines designed for use primarily in connection with the sinking of oil wells.

In well drilling, the situation is frequently encountered where the oil producing formation is of such a character that it seriously retards the flow of oil from the earth surrounding a drill hole, into the hole and thus the production of the well is seriously interfered with. The general practice for overcoming a situation of this kind is to dynamite the well so as to break away and loosen up the oil flow retarding formation so as to permit the oil to flow more freely into the well hole. This procedure is attended by obvious dangers and in connection with some formations fails to bring about the desired flow of oil. In the case of wells producing oil from limestone, as in the Permian Basin area, the limestone formation is opened up by dissolving it away with the use of acids, which procedure is costly and is also attended by danger from the handling of the acids which must be introduced into the well hole.

The present invention has for its principal object to provide an improved form of drill which is designed, after being inserted into the lower end of the well hole, to drill or bore passages laterally from the well hole into the surrounding formation and further is of such a character that these drillings may be made in any direction.

Another object of the invention is to provide a lateral drill of novel construction wherein the cuttings are carried up through the center of the drill and a pipe employed as a means for turning the drill which is of a flexible character and adapted to be guided in the desired direction through a rigid guide tube.

Still another object of the invention is to provide a lateral drill having a flexible drill carrying portion with novel means associated with the flexible drill carrying portion for stiffening such portion sufficiently to permit application of longitudinal force thereto without causing the flexible portion to buckle, while at the same time allowing sufficient bending of the flexible portion to permit it to be guided around a bend in a guide tube.

The invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings forming part of this specification, with the understanding, however, that the invention is not to be confined to any strict conformity with the showing of the drawings but may be changed or modified so long as such changes or modifica-

tions mark no material departure from the salient features of the invention as expressed in the appended claims.

In the drawings:

Fig. 1 is a view in side elevation of the device embodying the present invention showing the same in working position.

Fig. 2 is a vertical sectional view through the drill.

Fig. 3 is a section on the line 3-3 of Fig. 2

Fig. 4 is a section on the line 4-4 of Fig. 1.

Fig. 5 is a section on the line 5-5 of Fig. 3.

Fig. 6 is a view in detail of a portion of the flexible conduit, a part of the same being in longitudinal section.

Fig. 7 is a plan view of a washer.

Referring now more particularly to the drawings, the numeral 1 generally designates a well hole drilled in the earth into an oil producing formation which is indicated by the numeral 2, which well hole 1 is sheathed or reinforced by the usual well casing 3 which extends substantially to the upper part of the oil producing formation 2.

The lateral drill embodying the present invention is indicated generally by the numeral 4 and is inserted through the well casing 3 into the lower part of the hole into the area surrounded by the formation 2, and this drill comprises a tube 5 having at its lower end the right angular bend or neck 6, the end of which is spaced a distance from the remote side of the tube of which it forms a part, not greater than the inside diameter of the casing 3. Thus it will be seen that the tube 5 may be extended longitudinally downwardly through the casing and that the open lower end of the laterally turned portion 6 will be directed toward and perpendicular to the wall of the lower part of the hole when the tube has been lowered to the desired extent.

Formed integrally with the convex face of the laterally curved portion 6 of the tube is a downwardly opening sleeve 7 which is interiorly threaded to have threaded connection with the upper end of a foot post 8 which is designed to rest upon the bottom of the hole so as to support the end of the portion 6 at the desired elevation therein. This post 8 may be removed to have substituted for it a post of greater or lesser length so that the drill may be positioned at different heights in the hole.

At its upper end the tube 5 is reduced in diameter by the inside collar 9, the central opening 10 of which is of a diameter to permit the ex-

tension therethrough of the drill driving pipe 11. The collar 9 is provided with apertures 12 which permit the forcing of oil downwardly through the tube 5 for discharge into the end of the laterally drilled bore, as hereinafter described.

The pipe 11 which constitutes the driving means for the drill and the flexible extension attached to the pipe has connected to its lower end one end of a flexible conduit which is indicated generally by the numeral 13 and which comprises a tubular center portion 14 formed of helically wound convolutions of metal having their edges in overlapping joined relation, as indicated at 15, whereby flexing of the tube 14 is permitted while at the same time the continuous wall formation is maintained so that a fluid or other substance may be passed through the flexible conduit or tube without any material portion of it escaping from the same between the convolutions. The central tubular portion 14 of the conduit is encased in a woven wire sheath 16. The sheath and conduit are joined at one end to the pipe 11 as previously stated, and the other end thereof is connected with a drill head 17 which is of an overall diameter greater than the outside diameter of the conduit 13 and has the central passageway 18 which communicates with the divergently related outer end passages 19, and a group of outside passages 20 which extend therethrough parallel to the axial center for the passage of fluid as hereinafter described. The drill head 17 is provided with suitable blades 21 and the several passages 19 and 20 open between these blades so that as the drill is forced into the earth, there will be no obstruction of the passages and fluid will be permitted to flow freely through the same.

The rear of the drill 17 is circumferentially recessed as indicated at 22, to receive a stabilizing ring 23 which forms one end of a group of similar rings 24 which encircle the flexible conduit 13 between the drill 17 and the opposite end of the conduit. These stabilizing rings 23 and 24 are provided with the annular series of apertures 25 and the apertures of the rings are alined to form continuous passages from one end of the flexible conduit to the other, the ends of such passages at the drill head end of the conduit communicating with the passages 20. In order that the passages may not be interrupted by rotation of the rings, one face of each ring may have an annular groove 24' connecting the apertures as shown in Figs. 2 and 3. The possible interruption of the passages may also be avoided by making the apertures 25 closer together so that any turning of the rings would still keep some of the apertures in communication with those of adjacent rings.

At the end of the series of stabilizing rings adjacent the lower end of the pipe 11, there are placed one or more washers 26 which support an end of an expansion spring 27 which surrounds the lower end of the pipe 11, as shown. At the upper end of this spring an anti-friction unit 28 encircles the pipe and bears against the adjacent end of the spring and this unit is maintained firmly compressed against the adjacent end of the spring by the adjusting nuts 29 which are connected with the pipe 11 by the screw threads 30. Sufficient clearance is permitted between the tube 4 and the nuts and between the bearing unit 28 and the tube to permit fluid to pass downwardly through the area occupied by the nuts, the anti-friction or bearing unit and

the spring 27 to the upper end of the series of stabilizing rings 24.

In the operation of the drill, the tube is set at the proper height within the well hole by coupling with the collar 7 a foot post 8 of the proper length to position the laterally turned end 6 of the tube at the height desired in the hole and in relation to the oil producing formation. The pipe 11 will be so positioned in the tube 4 that the adjusting nuts 29 will be in the upper end of the latter tube and the nose or point of the drill 17 will be just inside the open end of the lower portion 62. The drill may then be extended into the oil bearing formation by forcing the pipe 11 downwardly while at the same time rotating it to produce the desired drilling action of the head 17. Simultaneously with this operation oil is forced down through the well casing 3 and this will work its way in through the lateral bore 31 formed by the drill to the inner end of this bore and at the same time some of the oil will pass through the openings 12 and by way of the apertures 25 in the stabilizing rings to and through the passages 20 of the drill head and the oil reaching the drill head along these two paths will return through the passages 18 and 19 and the center of the flexible conduit 14 to the surface carrying with it the cuttings produced by the drill.

From the foregoing, it will be readily apparent that the stabilizing rings serve the two-fold purpose of preventing any tendency of the flexible conduit to buckle and at the same time permitting it to be bent to pass through the curved lower end portion 6 of the drill tube 4 and they also provide, by reason of the apertures 25 therein, a means for conducting cuttings removing fluid to the drill head 17 so that a continuous flow of fluid around the drill head can be maintained. By this action, the cuttings will be constantly removed and the drilling operation of the device will be of maximum efficiency.

The extent to which the lateral passages 21 may be cut into the oil producing formation is limited only by the length of the flexible portion of the drilling unit and thus it will be seen that by employing a sufficiently long casing tube for the drilling unit, a flexible conduit of any desired length may be made use of.

After one lateral bore 31 has been formed, the drill can be withdrawn, the tube rotated on the foot 8 and a new bore formed by again extending the drill, and this procedure can be repeated any desired number of times so that the oil bearing formation can be filled with perforations or bores extending radially from the main hole of the well. It will thus be seen that the advantages of this tool over the use of explosives to open the oil formation are that the maximum of space may be obtained in the lower part of the well as all of the material cut away is removed whereas in the use of explosives, such material is only broken up but remains in the well hole or the costly job of cleaning out the hole after using the explosive must be carried out whereas with the present tool, the cleaning out of the hole is simultaneous with the formation of the lateral bores.

What is claimed is:

1. A drilling mechanism for wells, comprising a tubular body adapted to be inserted into the lower end of a well hole and having a laterally turned lower end, a rigid pipe extending downwardly into the upper end of said body, a flexible conduit connected at one end with the lower end

of said pipe and forming an unbroken fluid passageway communicating with the pipe, a drill head secured to the other end of the flexible conduit and rotatable therewith, said drill head having axially extending openings therethrough certain of which are in communication with the conduit, and means forming fluid passageways extending longitudinally of the flexible conduit and communicating at one end with the well hole and having communication at the other ends with the other fluid passages of the drill head.

2. A drilling mechanism for wells, comprising a tubular body adapted to be inserted into the lower end of a well hole and having a laterally turned lower end, a rigid pipe extending downwardly into the upper end of said body, a flexible conduit connected at one end with the lower end of said pipe and forming an unbroken fluid passageway communicating with the pipe, a drill head secured to the other end of the flexible conduit and rotatable therewith, said drill head having axially extending openings therethrough certain of which are in communication with the conduit, and a plurality of concentrically arranged annular members encircling the flexible conduit and forming a casing thereabout, the annular members at one end of the group abutting said drill head, means at the other end of the group of annular members for maintaining the members in yieldable contacting relation, and means for passing fluid from within the drill hole through the other passages of the drill head.

3. A drill mechanism of the character described, comprising a tube designed to be disposed vertically in a well hole and having its lower end open and turned laterally to be directed toward the wall of the hole, a pipe having one end extending into and longitudinally of the upper end of the tube, an armored conduit formed of continuous joined convolutions of material and secured at one end to the lower end of said pipe to form a tubular continuation thereof, a drill head secured to the other end of said conduit and having a central passage communicating with the interior of the conduit and axially extending passages outside the diameter of the conduit, and means for conducting fluid longitudinally along the conduit to and through the last-mentioned passages of said drill head for return through the first-mentioned passage and through the conduit and pipe connected therewith.

4. A drill mechanism of the character described, comprising a tube designed to be disposed vertically in a well hole and having its lower end open and turned laterally to be directed toward the wall of the hole, a pipe having one end extending into and longitudinally of the upper end of the tube, an armored conduit formed of continuous joined convolutions of material and secured at one end to the lower end of said pipe to form a tubular continuation thereof, a drill head secured to the other end of said conduit and having a central passage communicating with the interior of the conduit and axially extending passages outside the diameter of the conduit, a series of annular members encircling said conduit between said drill head and the lower end of said pipe, said annular members being provided with axially extending apertures, the apertures of the annular members being aligned to form fluid passages communicating at the lower end of the series with the last-mentioned passages of said head, means for com-

pressing the series of annular members to maintain the members in firmly contacting relation, and means for introducing fluid into the upper end of said tube for passage through the passages formed by the aligned apertures of the annular members.

5. A drill mechanism of the character described, comprising a tube designed to be disposed vertically in a well hole and having its lower end open and turned laterally to be directed toward the wall of the hole, a pipe having one end extending into and longitudinally of the upper end of the tube, an armored conduit formed of continuous joined convolutions of material and secured at one end to the lower end of said pipe to form a tubular continuation thereof, a drill head secured to the other end of said conduit and having a central passage communicating with the interior of the conduit and axially extending passages outside the diameter of the conduit, a series of annular members encircling the flexible conduit and having a diameter substantially the same as the interior diameter of said tube through which the members are moved with the flexible conduit, said series of members bearing at one end against said drill head and having apertures therethrough which are arranged to form continuous passages extending longitudinally of the flexible conduit for communication at their lower ends with the second-mentioned passages of the drill head, said tube at its upper end being formed to admit fluid from the well hole, resilient means in the tube in encircling relation with the pipe and flexible conduit, and securing means for said resilient means whereby the latter means constantly maintains longitudinal pressure against the series of annular members.

6. A drill mechanism of the character described, comprising a tube designed to be disposed vertically in a well hole and having its lower end open and turned laterally to be directed toward the wall of the hole, a pipe having one end extending into and longitudinally of the upper end of the tube, an armored conduit formed of continuous joined convolutions of material and secured at one end to the lower end of said pipe to form a tubular continuation thereof, a drill head secured to the other end of said conduit and having a central passage communicating with the interior of the conduit and axially extending passages outside of the diameter of the conduit, a series of annular members encircling the flexible conduit and having a diameter substantially the same as the interior diameter of said tube through which the members are moved with the flexible conduit, said series of members bearing at one end against said drill head and having apertures therethrough which are arranged to form continuous passages extending longitudinally of the flexible conduit for communication at their lower ends with the second-mentioned passages of the drill head, said tube at its upper end being formed to admit fluid from the well hole, an expansion spring within the tubular member in concentric relation with the pipe and flexible conduit and bearing at one end against the upper end of the series of annular members, means secured to said pipe for maintaining the spring under compression, and an anti-friction bearing between said last means and the upper end of the spring.

JAMES C. ROGERS.
JAMES D. HALL, Jr.