Nov. 23, 1926. 1,607,937

L. ALDRIN

BIT FOR WELL BORING TOOLS

Filed April 5, 1923 2 Sheets-Sheet 1

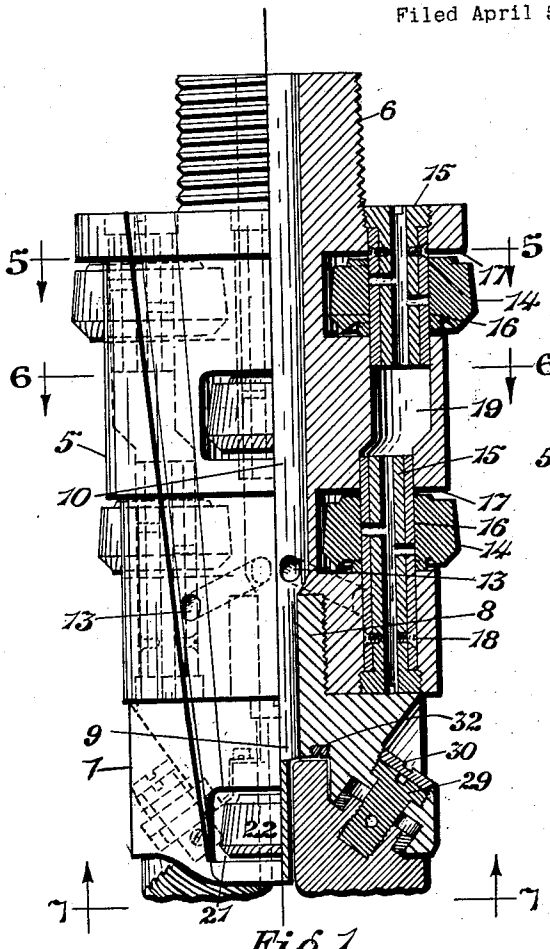


Fig. 1

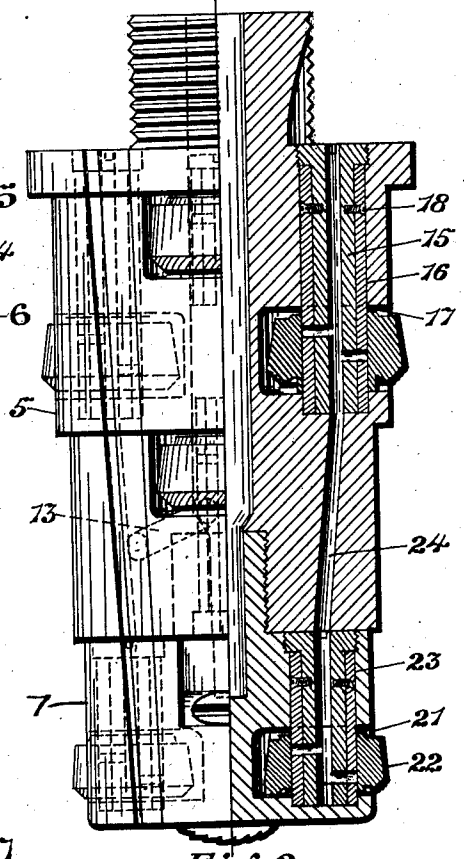


Fig. 2

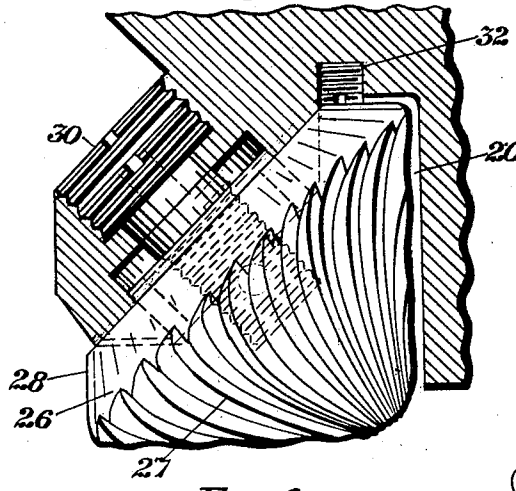


Fig. 3

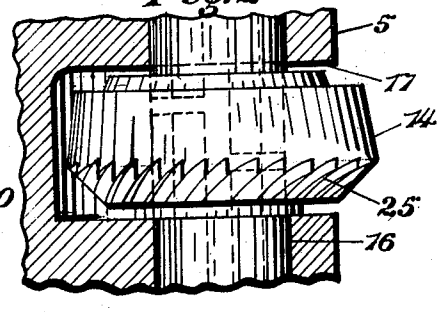


Fig. 4

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BIT FOR WELL BORING TOOLS

Filed April 5, 1923 2 Sheets-Sheet 2

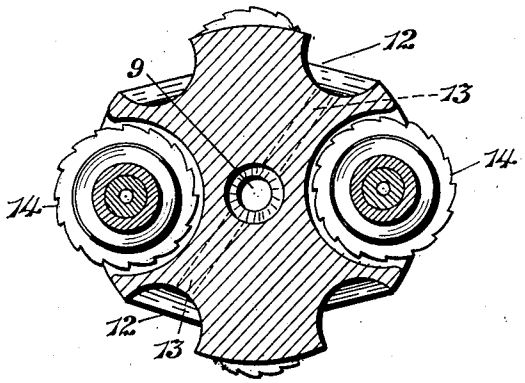


Fig. 5

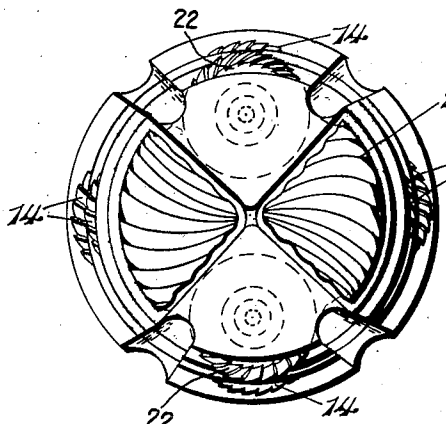


Fig. 7

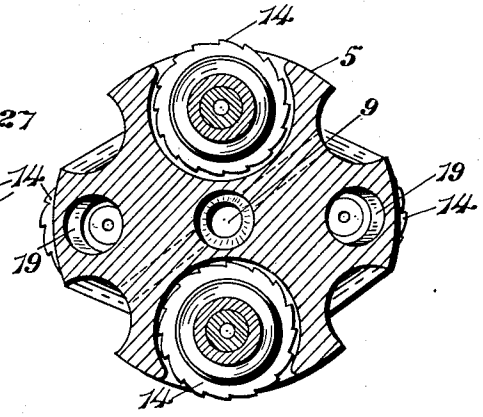


Fig. 6

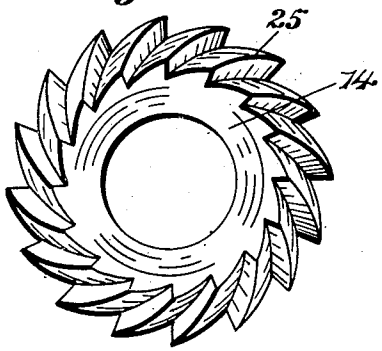


Fig. 8

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Patented Nov. 23, 1926. 1,607,937

# UNITED STATES PATENT OFFICE.

LEONARD ALDRIN, OF DENVER, COLORADO.

## BIT FOR WELL-BORING TOOLS.

Application filed April 5, 1923. Serial No. 630,148.

My invention relates to bits for well boring tools and it is an object of the invention to provide a bit of this type which combines simplicity of construction with great efficiency and practicability in use.

Another object of the invention resides in providing a novel arrangement of cutting members which in the rotary movement of the bit, produce the excavation.

A further object is to provide a bit of the above described character, a cutting member of novel construction which in the operation of a tool to which the bit is attached, gradually engages the surface of the work and thereby spalls or chips the rock with little wear and friction, and still other objects reside in a simple and effective method of lubricating the rotary cutting members of the bit while the tool is in operation, and in other details of construction, all of which will fully appear in the course of the following description.

An embodiment of my invention has been illustrated in the accompanying drawings in the various views of which like parts are similarly designated and in which

Figure 1 represents a composite elevation and longitudinal section of my improved bit;

Figure 2, a similar view taken at right angles to the other;

Figure 3, an enlarged fragmentary section showing one of the removable cutting members at the lower end of the tool;

Figure 4, an enlarged fragmentary section showing one of the cutting members in the body of the bit;

Figure 5, a section taken on the line 5—5, Figure 1;

Figure 6, a section along the line 6—6, Figure 1;

Figure 7, an underneath view of the bit looking in the direction of the arrows drawn across the line 7—7, Figure 1; and

Figure 8, an enlarged bottom view of one of the cutting members shown in detail in Figure 4.

My improved bit as shown in the drawings comprises a body section 5 provided at its upper end with a screw-threaded stem 6 of reduced diameter for its attachment to the drilling tool, and a tip section 7 which is detachably fastened at the lower end of the body by a screw-threaded stem 8 engaging in a correspondingly tapped axial hole thereof.

The two sections of the bit have axial bores 9 and 10 through which a pressure fluid is introduced into the excavation produced by the tool for the removal of the cuttings, the bore 9 in the tip being of smaller diameter than that in the body of the bit.

The sections are furthermore provided with exterior longitudinal channels 12 for the upward passage of the cuttings displaced by the pressure fluid, to the mouth of the excavation, and the bore 10 of the body section is connected with said channels adjacent the points of its connection with the bore 9 of the tip, by laterally extending ducts 13.

It will be seen that by the above described arrangement of passages, a fluid under pressure introduced into the upper end of the bore of the body section of the bit, is at the lower end of the same divided to pass in substantially equal quantities to the exterior channels of the bit and to the lower end of its tip for the purpose of removing the cuttings simultaneously at the different points of the excavation where the cutting members of the tool act upon its surface as will hereinafter be more fully explained.

The body section of the bit is exteriorly recessed as at 17 to receive a plurality of cutting members 14 which are mounted to rotate about axes parallel to the longitudinal axis of the bit and project partially beyond the circumferential surface thereof.

The cutting members are arranged oppositely in pairs and the pairs are arranged one below another at right angles to each other to extend in staggered formation at quadrant points of the cylindrical body. Each cutting member is mounted for rotation upon a shaft composed of a core pin 15 provided with a threaded bead for its attachment to the body and a bushing 16 which is fastened to the core by screws 18.

The core and the bushing are bored axially and laterally to conduct a lubricating fluid introduced into an orifice at the end of the shaft to the surface of the bushing engaged by the cutter.

The shaft fastened as hereinbefore de-

scribed in a threaded opening of the body, is fitted in bores of the same above and below the respective recess, and the bores of correspondingly disposed recesses of alternate pairs are connected as at 19 for the passage of a fluid lubricant from one to the other.

In the construction shown in the drawings, three pairs of cutters are arranged as above described, upon the body section of the bit. The threaded heads of the shafts of the upper and middle pairs of cutters are at the top of the body and those of the shafts of the lower pair at the bottom of the same, and the axes of rotation of each pair of cutters are nearer the axis of the bit than those of the pair immediately above the same, to allow of the cutters gradually engaging the rock in circles of rotation of progressively increasing diameters.

The lower or tip-section of the bit is recessed at 20 and 21 for the reception of four cutting members which co-operate to excavate the rock or soil in advance of those on the body section.

The cutters on the bit are arranged in two pairs which like those of the body section are at right angles to each other. The cutters 22 of the upper pair are similar to those of the body section and similarly mounted and the bores of their shafts 23 connect with the bores of the shafts immediately above the same by means of ducts 24 to conduct the lubricating fluid from one to the other.

The cutting members of the bit, excepting those of the lower pair on the tip, consist of circular bodies axially bored to fit upon the respective shafts and formed peripherally to provide two beveled faces which meet in a mediate plane of greatest diameter.

The lower face which preferably is of lesser depth is serrated to provide a continuous series of spirally arranged cutting edges 25 which terminate in the plane above referred to.

It will be apparent that a cutter thus formed and mounted to rotate about an axis substantially parallel to that of the excavation, first engages the rock at its point of greatest diameter and through the medium of its spiral cutting edges will gradually enter the rock to space or chip the same with little effort and wear, the cuttings produced by the action of the cutters being continuously removed to the mouth of the excavation through the longitudinal channels of the bit by water or other fluid under pressure introduced into the axial bore of the tool.

The pair of cutting members 26 at the lower end of the tip are formed and mounted to engage the bottom of the excavation. They are of conical form and rotate about oblique axes to dispose their peripheral surfaces in tangential relation to a horizontal plane below the end of the bit.

The conical surface of each cutter is grooved to provide a continuous series of spiral cutting edges 27 and the surface is chamfered at its base as shown at 28.

Each cutter 26 is recessed at 31 to fit upon a projection in the recess 20 of the tip of the bit in which it is partially disposed and it is mounted to rotate with a headed stud 29 which is held in a bore of the tip by means of a screw plug 30 engaging in the correspondingly tapped upper end thereof.

Owing to the chamfer 28 on the cutting member and the recess 31 formed in its base, the peripheral cutting face will engage the rock at a distance below the end of the section of the bit on which the cutters are mounted and prevent the section from coming in contact with the bottom of the excavation even after the cutter becomes worn by long and constant use.

A screw plug 32 of steel or other wear-resisting material screwed in a hole in the recess 20 of the section in which the cutter is partially disposed, provides a bearing surface for the chamfer of the cutter and thereby relieves the pressure on the shaft on which the cutter is mounted.

In the operation of a tool of which the bit is a part, the rotary motion imparted to the tool will cause the several cutting members to rotate about their individual axes by contact with the surface of the excavation.

The engagement of the conical cutters with the bottom of the excavation and the action of the other cutting members upon the circumferential wall of the same in gradually increasing circles as hereinbefore described will rapidly spall and cut the formation in which the excavation is made irrespective of its nature and with the minimum of friction and wear.

The peculiar formation of the cutting members and their cutting edges and the manner in which they are arranged on the bit, are the principal factors in producing this most desirable and advantageous result; the cuttings are easily removed from the excavation immediately after they are produced thereby clearing the way for the further progress of the tool; and all the lateral cutting members may be constantly lubricated by a lubricant introduced into the bores of the shafts which are accessible at the top of the body section of the bit.

It will be evident that the manner of mounting the cutters provides for their ready removal for repair; that by adjusting the bushing members of the shafts of the cutters upon their respective cores and producing new apertures to register with the lateral bores of the core and new apertures to receive the screws by which they are fastened to the cores, the life of the bushings in providing a bearing surface for the cutters may be extended; and that the oppositely

beveled surfaces of the cutters greatly facilitate the work of re-sharpening the cutting edges on the smaller face in case of wear.

In order to produce the best results in the operation of the cutting members on the body section of the drill or those of the upper pair on the tip section of the same, it is desirable that the serrated cutting faces of the same be at an agle of 45 degrees to the axis of rotation.

The distance of the axes of rotation of the upper cutting members of the bit from the longitudinal axis of the tool, determines the diameter of the excavation produced in the operation, and it will be understood that by increasing the length of the body portion of the bit and adding other cutting members axially at a greater distance from the axis of the same, wells of proportionately greater diameter may be produced. The same tip may be used under these conditions and by supplying a number of body portions of different lengths having a correspondingly increased number of cutting members at progressively increased distances from the axis of the bit, the tool is readily changed to produce a well of any desired diameter within the limits defined by the proportions of the smallest and largest body portions of the set.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A bit for well boring tools comprising a recessed body, rotary cutting members in recesses at the lower end thereof, adapted to engage the bottom of an excavation, and cutting members in recesses at the circumference of the body, having at the intersection of oppositely beveled faces, toothed cutting-edges projecting outside the recesses to engage the wall of the excavation at a point adjacent its bottom and at different distances above said point, the cutting members at the circumference of the body being mounted to rotate about axes substantially parallel to the axis of the body.

2. A bit for well boring tools comprising a body having a recess at its lower end and a projection in said recess, a cutting member in the recess mounted to move about an oblique axis and having a conical cutting face projecting outside the recess to engage the bottom of an excavation, and a chamfer at an angle to said face, the cutting member being hollowed at its base to admit said projection and thereby cover the lower end of the body, and a wearing plug in the recess engaging the chamfer.

3. A bit for well boring tools comprising a body having recesses at its circumference at different distances from its lower end, and having shaft-openings at opposite ends of said recesses, shafts in said openings, and cutting members in said recesses mounted for rotation on the shafts, the shafts being provided with longitudinal passages and lateral ducts for the conveyance of a lubricant to the bearing surfaces of the respective cutting members, and the shaft holes of upper and lower recesses being connected for the flow of lubricant from the passage of the upper shaft to that of the lower one.

4. A bit for well boring tools comprising a body having recesses at its circumference at different distances from its lower end, and having shaft-openings at opposite ends of said recesses, shafts in said openings, and cutting members in said recesses mounted for rotation on the shafts, the shafts being provided with longitudinal passages and lateral ducts for the conveyance of a lubricant to the bearing surfaces of the respective cutting members, and the shaft holes of upper and lower recesses being connected by an interposed chamber communicating with the passages of the respective shafts.

In testimony whereof I have affixed my signature.

LEONARD ALDRIN.