Jan. 3, 1961 R. CORCREHAM ET AL 2,967,044

MINING DRILL EXTRACTOR

Filed June 17, 1957 2 Sheets-Sheet 1

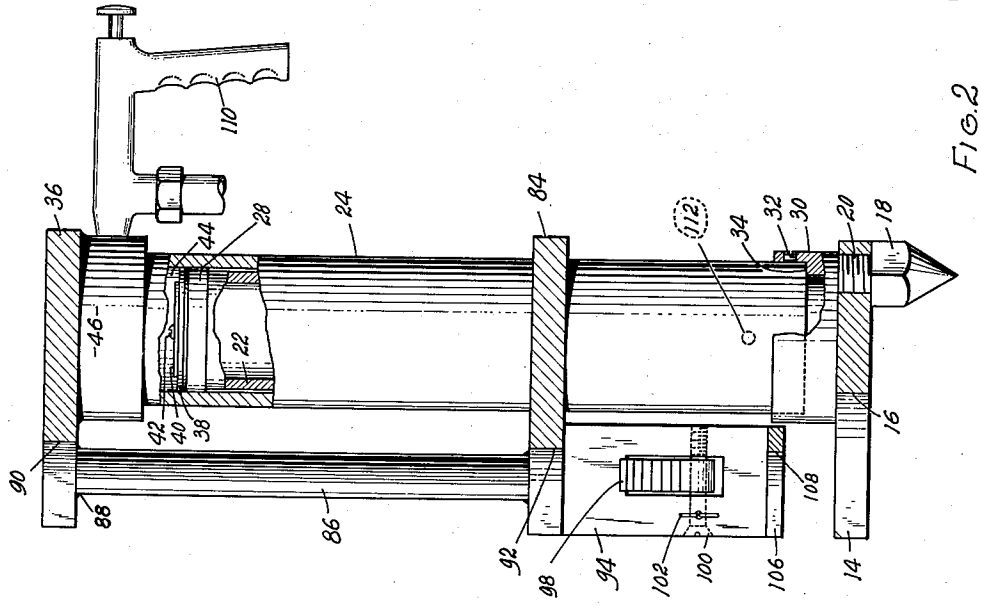


FIG. 2

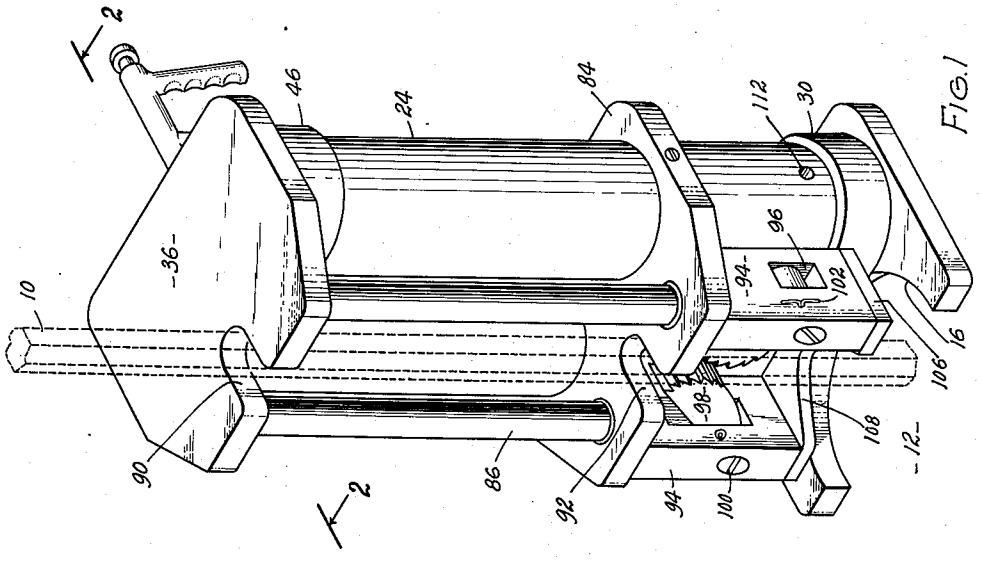


FIG. 1

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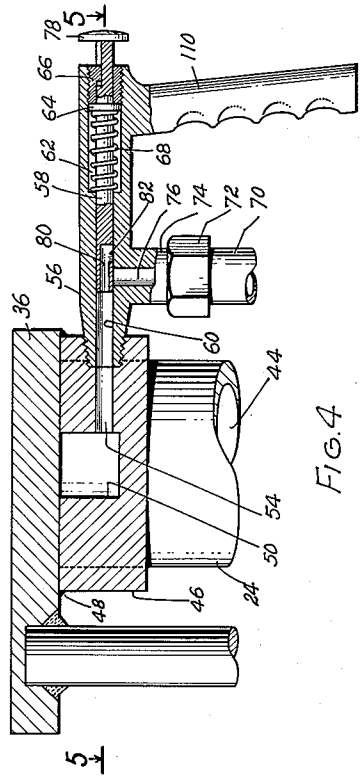


FIG. 4

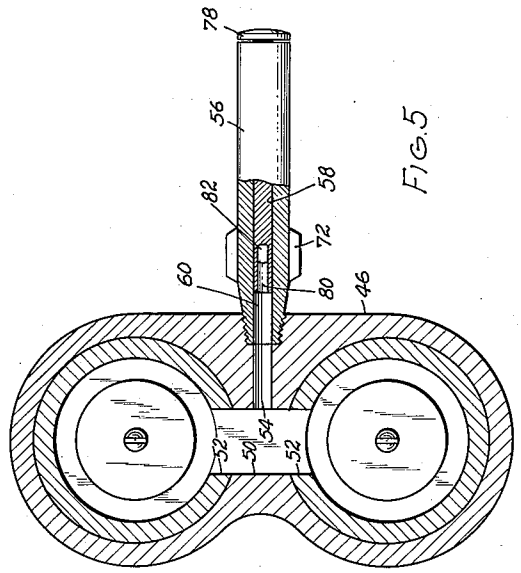


FIG. 5

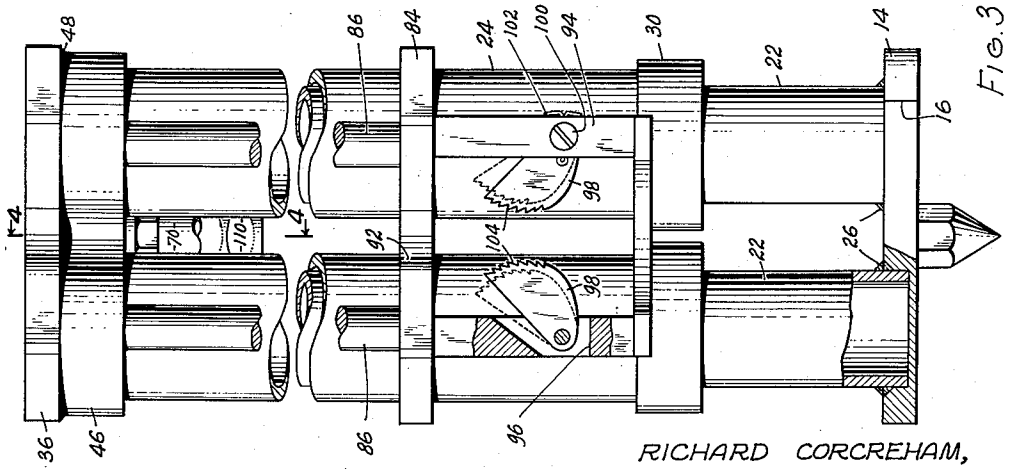


FIG. 3

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MINING DRILL EXTRACTOR

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3 Claims. (Cl. 254—30)

The present invention relates generally to improvements in pulling implements and in particular to a lifting jack for extracting from the earth a mining drill, or the like, that is embedded so tightly as to be impossible to remove manually.

In carrying out earth drilling operations it sometimes happens that the drill rod penetrates a stratum of soil or rock from which it is impossible to remove the drill manually. In that event it has heretofore been the practice to attempt to extract the rod by twisting it out with a wrench or other suitable lever or by pulling on the rod with a chain pulley supported on a tripod. Even if the rod does not break it may be so tightly lodged that it cannot be removed and is left in the ground. Since these rods are expensive and since the present practice of extraction is time-consuming and laborious it is highly desirable to provide a powered pulling implement in the nature of a readily portable tool that will quickly and surely extract embedded rods from the ground.

An object of our invention is to provide a pulling implement with jaw means for gripping a drill rod that is embedded in the ground and power means for extracting said rod after it has been engaged by the jaw means.

Yet another object of the invention is to provide a drill rod extractor that has guide means for quickly aligning the extractor with an embedded rod with the jaw means in operative association with the rod.

A further object of the invention is to provide a device of this character that has means for automatically limiting its pulling stroke as well as a manually actuated valve for halting movement in a pulling direction at any point in the stroke of the device.

These annd other objects and advantages of the invention will be apparent from the following description of a presently preferred embodiment thereof when taken in conjunction with the accompanying drawings in which:

Figure 1 is a perspective view of a mining drill extractor embodying our invention shown in lowered position preparatory to lifting a drill rod out of the ground;

Figure 2 is a vertical sectional view of the extractor in the position shown in Figure 1 taken along the line 2—2 of Figure 1;

Figure 3 is a front elevation, partially in section and with parts thereof broken away, showing the extractor in a partially raised position;

Figure 4 is a partial vertical sectional view, on an enlarged scale, of the top plate of the device taken on the line 4—4 of Figure 3; and

Figure 5 is a horizontal sectional view taken along the line 5—5 of Figure 4 showing the valve means also depicted in Figure 4.

In carrying out our invention we have provided a generally U-shaped base plate which supports the extractor on a ground surface with the drill rod between its legs. The base plate serves to support one or more pneumatic power cylinders in alignment with the drill rod, the upper

ends of the power cylinders being sealed by a top plate. The movable sections of the power cylinders, at their lower ends, carry a jaw assembly which is interconnected with the upper plate by means of suitable brace rods. The jaw assembly and top plate are provided with apertures in alignment with the opening between the legs of the base plate adapted to receive the embedded drill rod.

The jaw assembly includes a pair of oppositely disposed cam face jaws which are adapted to wedgingly engage the drill rod during pulling movement only of the extractor. Thus, when the power cylinders are communicated with a source of air under pressure these jaws wedgingly engage the drill rod and the expansion of the power cylinders causes the extraction of the drill rod by the jaws. It will be appreciated that the force with which the ground embraces the embedded drill rod will vary from one situation to another and accordingly it is desirable to provide a valve for interrupting extracting movement of the drill rod whenever it appears to have become sufficiently free to permit easy manual withdrawal thereof. The impact of the pneumatic power on the drill rod may be rather sharp and this valve means thus provides a method of preventing the drill rod from being suddenly forcefully shot out of its hole.

Very tightly embedded drill rods may require repeated strokes of our extraction apparatus. This may very well occur in a situation where the drill rod is very long, as for example 20 feet, and is embedded in the ground for almost its entire length. In order to limit the extension of the power cylinders when they have reached the extremity of their stroke the invention includes positive stop means and vents in the cylinders to relieve fluid pressure in the cylinders when they are fully expanded.

Referring now to the drawings and particularly to Figure 1, a drill rod **10**, shown in phantom outline, is shown firmly embedded in the ground **12**. In order to support the drill extractor in position for pulling the rod **10** out of the ground, there is provided a base plate **14** having a semi-circular opening **16** in its forward edge defining legs of the base plate **14** between which the drill rod **10** is positioned. Thus the base plate **14** provides bearing support for the extractor in the same plane as rod **10** so as to be stable during pulling of the rod.

Due to the action of the drilling apparatus the mouth of the hole made by the drill rod **10** may be larger in area than the area of the base plate **14**. Therefore, in order to provide a stable platform to support the extractor during the pulling operation it may be desirable to place a plank or the like, across the hole opening and to support the extractor thereon. In order to insure that the extractor will securely be held on such a plank the base plate **14** is provided with a downwardly protruding removable spear **18** having a threaded connection **20** with the base plate.

Rigidly secured to the upper face of the base plate **14** are a pair of parallel inner cylinders **22** which slidably support a pair of outer cylinders **24**. In Figure 1 the extractor is shown in fully lowered position so that the lower ends of the outer cylinders **24** are supported on the upper face of the base plate **14** whereby inner cylinders **22** are hidden from view. In Figure 3 the extractor is shown in partially raised position so that the lower end portions of inner cylinders **22** are visible and it will be observed that the inner cylinders **22** are rigidly affixed to the base plate **14** at their lower ends by welding **26** or the like.

As is shown in Figure 2, the outer diameter of the inner cylinders **22** is less than the inner diameter of the outer cylinders **24** so that a clearance space is provided therebetween. Each of the inner cylinders **22** at its upper end is sealed by a cap **28** having the same diameter as

the internal diameter of the outer cylinder 24 which is slidably supported thereon. Each of the outer cylinders 24 at its lower end is provided with a collar 30 held thereon by a plurality of circularly spaced set screws 32 or other suitable fastening means. The inner diameter of the collar 30 is approximately the same as the outer diameter of the inner cylinder 22. The outer cylinders 24 are thereby telescopically slidably supported upon inner cylinders 22 by the caps 28 and collars 30 whereby the frictional resistance to sliding movement of the parts is greatly reduced.

The collars 30 are provided with internal annular shoulders 34 wider than the wall thickness of the external or outer cylinders 24 and receive the lower ends of the cylinders 24. When the outer cylinders 24 are raised the collar shoulders 34 eventually will come into contact with the lower face of the caps 28 thereby acting as positive stop elements to limit extracting movement of the device.

Both of the outer cylinders 24 are sealed at their upper ends by a top plate 36. As is shown in Figure 2, the cap 28 at the upper end of each inner cylinder 22 is provided with a leather disc 38 in fluid sealing engagement with the inner wall of outer cylinder 24 securely held in place on the cap 28 by means of a washer 40 and screws 42. A fluid sealed expandable chamber 44 is thus defined by the wall of each outer cylinder 24 between the top plate 36 and caps 28.

A member 46 is rigidly affixed as by welding 48 to the underside of the top plate 36 to embrace the upper ends of both outer cylinders 24. As is shown in Figures 4 and 5, a passage 50 is formed in the member 46 to register with openings 52 in the upper ends of the outer cylinders 24 whereby both chambers 44 are intercommunicated to equalize fluid pressure therein.

In order to communicate the chambers 44 with a source of fluid pressure an inlet port 54 extends rearwardly from the passage 50 to terminate in a threaded opening adapted to threadedly receive an end of a valve housing 56. A valve member 58 is slidably mounted in a bore 60 that extends axially through the housing 56, the bore 60 being of enlarged diameter at its outer end to provide a spring pocket 62 which slidably receives a flange 64 on the valve member 58. The outer end of the spring pocket 62 threadedly receives a nut 66 through which the valve member 58 protrudes outwardly of housing 56 and a compression spring 68 disposed in the pocket 62 biases the flange 64 against the inner face of the nut 66 to normally hold the valve in closed position.

In order to communicate the extractor with a source of air under pressure, a hose 70 leading from such source is connected to the housing 56 by means of a coupling 72 which threadedly engages a stub 74 on the housing 56. An orifice 76 extending through the stub 74 is normally closed at its junction with the housing bore 60 by the inner end of the valve member 58. The closed position of the valve is illustrated in Figure 4 wherein it will be noted that the spring 68 holds the flange 64 against the inner end of the nut 66. The outer end of the valve member 58 has a button 78 thereon which is fully depressed as in Figure 5 in order to open the valve. The inner end of the valve 58 is formed with an axial bore 80 which terminates in a port 82 through the valve member 58. Thus when the button 78 is fully depressed as aforesaid the port 82 of valve 58 is moved into registration with the orifice 76, whereby the chambers 44 are communicated with the source of fluid pressure via the passage 50, inlet port 54, housing bore 60 and bore 80.

Mounted on the pair of outer cylinders 24 between the upper and lower ends thereof is a jaw mounting plate 84. As can be seen by reference to Figure 1, the jaw mounting plate 84 has the same outline as the top plate 36 and both of these plates overhang forwardly of the outer cylinders 24, being rigidly interconnected by vertical rods 86 welded thereto as indicated by the numeral 88. The forward edge of the top plate 36 has an opening 90 formed therein which is an alignment with a similar opening 92 formed in the front edge of the jaw mounting plate 84. Both of the openings 90 and 92 are in alignment with the frontal opening 16 of the base plate 14 so that the drill rod 10 will extend through these openings.

In order to support the gripping means in the proper position adjacent the drill rod 10, the jaw mounting plate 84 has rigidly affixed to the underside thereof, on opposite sides of the opening 92, a pair of confronting brackets 94. The brackets 94 are generally rectangular in configuration and are provided with aligned cavities 96 adapted to receive the pivoted inner end of a cam shaped jaw 98. Each of the pair of jaws 98 is pivotally connected to a bracket 94 by a shaft 100 which is locked against loosening in the bracket 94 by a suitable cotter pin 102. As is shown in Figures 1 and 3, the confronting cam faces of the jaws 98 are formed with suitable serrations or teeth 104 whereby to firmly engage a drill rod 10 therebetween, at points higher than the axes of the shafts 100 to wedgingly engage the rod 10 during lifting of jaws 98. In order to prevent spreading apart of the brackets 94 during pulling action of the extractor, the lower ends of brackets 94 are rigidly interconnected by a web 106 which is also provided with a suitable opening 108 in its forward edge to receive the drill rod 10.

The manner of use of our improved drill extractor is as follows. The valve housing 56 is provided with a suitable piston grip 110 so that the device may easily be carried from one site to another as required. When the drill rod is so tightly embedded in the ground as to be impossible to remove manually, the extractor is placed in operative position by disposing the drill rod 10 between the aligned openings 90, 92, 108 and 16. In placing the extractor in operative position around the drill rod 10 the jaws 98 are manually parted so as to permit the drill rod to be placed therebetween. Thereafter, the jaws may be dropped to slide downwardly over rod 10 as the device as a whole is lowered onto the ground surface across the mouth of the hole made by the drill rod 10. As has already been noted if the mouth of the hole has become enlarged the spear 18 may be supported on a plank placed across the enlarged mouth.

The button 78 over the pistol grip 110 is then depressed in the manner shown in Figure 5 whereby the chambers 44 are communicated with the source of fluid pressure. Due to the cam configuration of the confronting faces of the jaws 98, the cam teeth 104 wedgingly engage the embedded drill rod 10 as soon as the chambers 44 commence to expand. The drill rod then being firmly gripped by the jaws 98 is pulled out of the ground 12 as the outer cylinders 24 are caused to rise on the inner cylinders 22.

Extracting movement of the outer cylinders 24 will continue until the shoulders 34 of the collars 30 strike the lower face of the caps 28 on the inner cylinders 22. At this time a relief port 112 which is formed in the wall of each outer cylinder 24 just above the collar 30 will communicate the chambers 44 to the atmosphere to relieve fluid pressure in the chambers 44. If the drill rod 10 should become free of the ground 12 before the outer cylinders 24 reach the limit of their extracting stroke, release of the button 78 will permit the spring 68 to close the chambers 44 to the source of fluid pressure and halt extraction of the rod 10.

While there has been shown herein what is considered to be the preferred embodiment of the present invention, it will be apparent that various modifications and changes may be made with respect to the foregoing description without departing from the spirit of the invention or the scope of the following claims.

We claim:

1. A portable drill rod extractor, comprising: a base plate having a drill hole surrounding portion; dual inner

adjacently disposed telescoping cylinders attached to said plate; dual upper cylinders telescopically engaging said inner cylinders defining a fluid-sealed expandable chamber; drill rod gripping means hung laterally from said cylinders over said drill hole surrounding portion; said gripping means including, a drill notched top plate connected to and extending laterally from said upper cylinders, a drill notched intermediate brace plate attached to and extending laterally from said upper cylinders, spaced brace rods connecting said top and intermediate plates; spaced brackets depending from said intermediate plate to a point adjacent to and over said drill hole surrounding portion; dogs having drill rod engaging teeth pivotally mounted in said brackets and manually separable for instant engagement wtih the end of a drill rod in any lodged position; and manually controlled pneumatic means for expanding said chamber to elevate said upper cylinders and withdraw a drill grasped by said dogs.

2. A portable drill rod extractor, comprising: a base plate having a drill hole surrounding portion, a locating spike on said base; dual inner adjacently disposed telescoping cylinders attached to said base plate; dual upper cylinders telescopically engaging said inner cylinders defining a fluid-sealed expandable chamber; drill rod gripping means hung laterally from said cylinders over said drill hole surrounding base portion, said gripping means including, a drill notched top plate connected to and extending laterally from said upper cylinders, a drill notched intermediate brace plate attached to and extending laterally from said upper cylinders, spaced brace rods connecting said top and intermediate plates, spaced brackets depending from said intermediate plates to a point adjacent to and over said drill hole surrounding portion; a web connecting the lower ends of said brackets and surrounding said drill rod, dogs having drill rod engaging teeth pivotally mounted in said brackets

for instant engagement with the end of a drill rod in any lodged position; manually controlled pneumatic means for expanding said chamber to elevate said upper cylinders and withdraw a drill grasped by said dogs; and vent means associated with said expansion chamber.

3. A portable drill rod extractor, comprising: a base plate having a drill hole surrounding portion; dual inner adjacently disposed telescoping cylinders attached to said base plate; dual upper cylinders telescopically engaging said inner cylinders defining a fluid-sealed expandable chamber; drill rod gripping means hung laterally from said cylinders over said drill hole surrounding portion; said gripping means including, braced drill notched top and intermediate plates connected to and extending laterally from said upper cylinders, spaced brackets depending from said lower plate, and drill rod engaging dogs pivotally mounted in said brackets; pneumatic means attached to said upper cylinders for expanding said chamber and withdrawing a lodged drill end grasped by said dogs; and a gun type valve actuating means connected to and controlling said pneumatic means.

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