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A. E. BLOUNT ET AL.

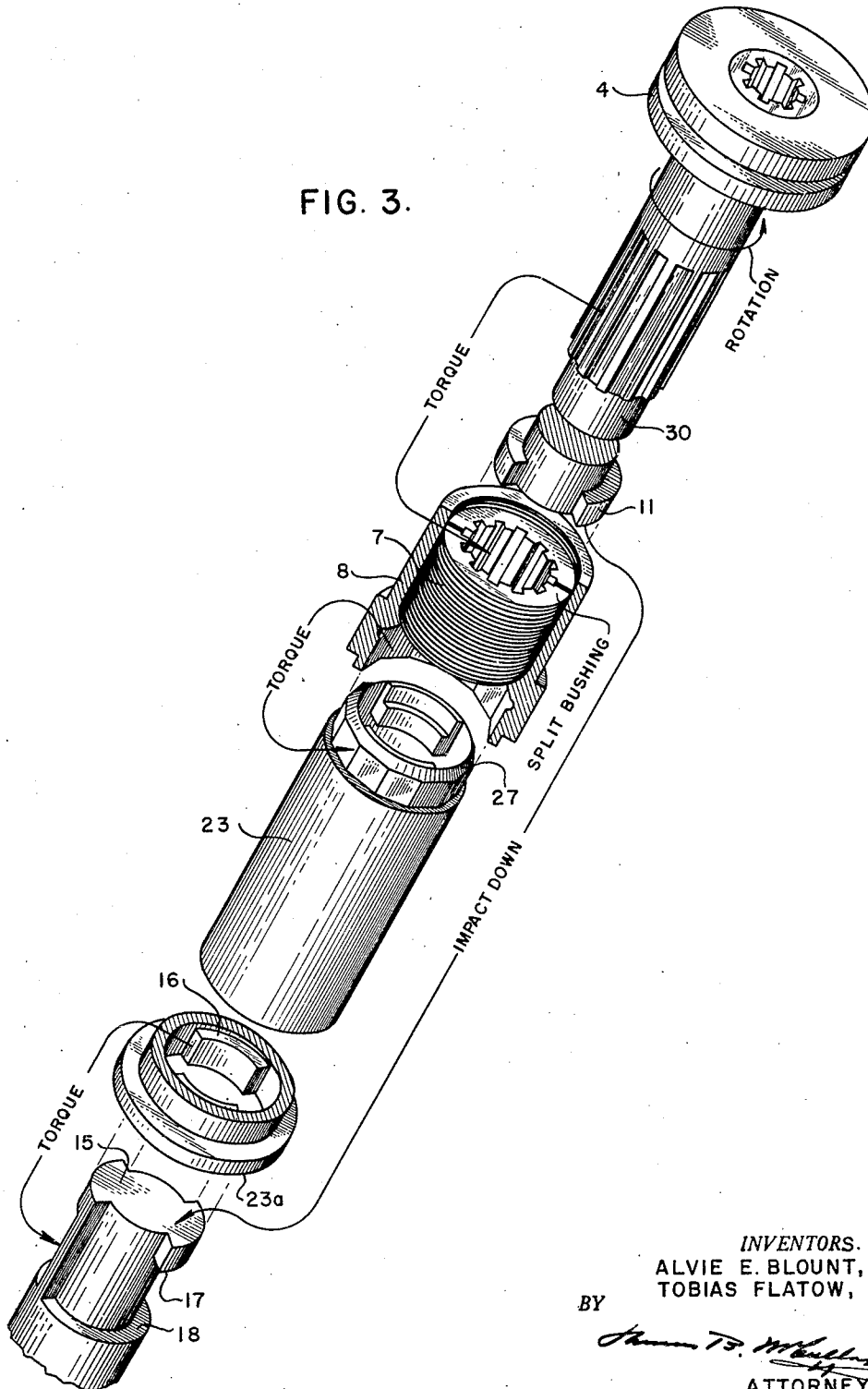
2,812,922

DOUBLE ACTION DRIFTER DRILL

Filed June 26, 1956

2 Sheets-Sheet 1

FIG. 3.



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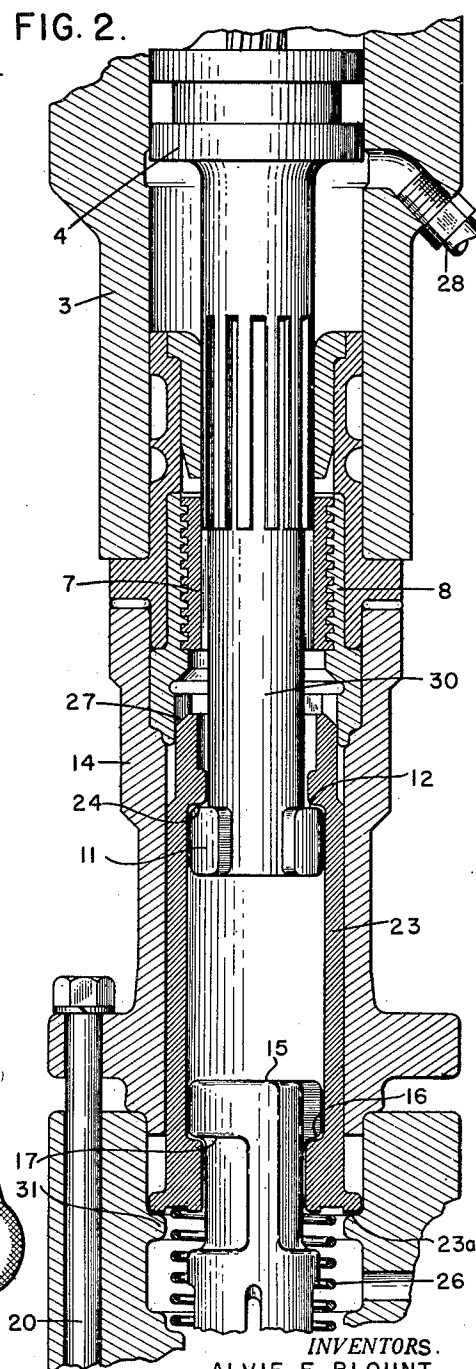
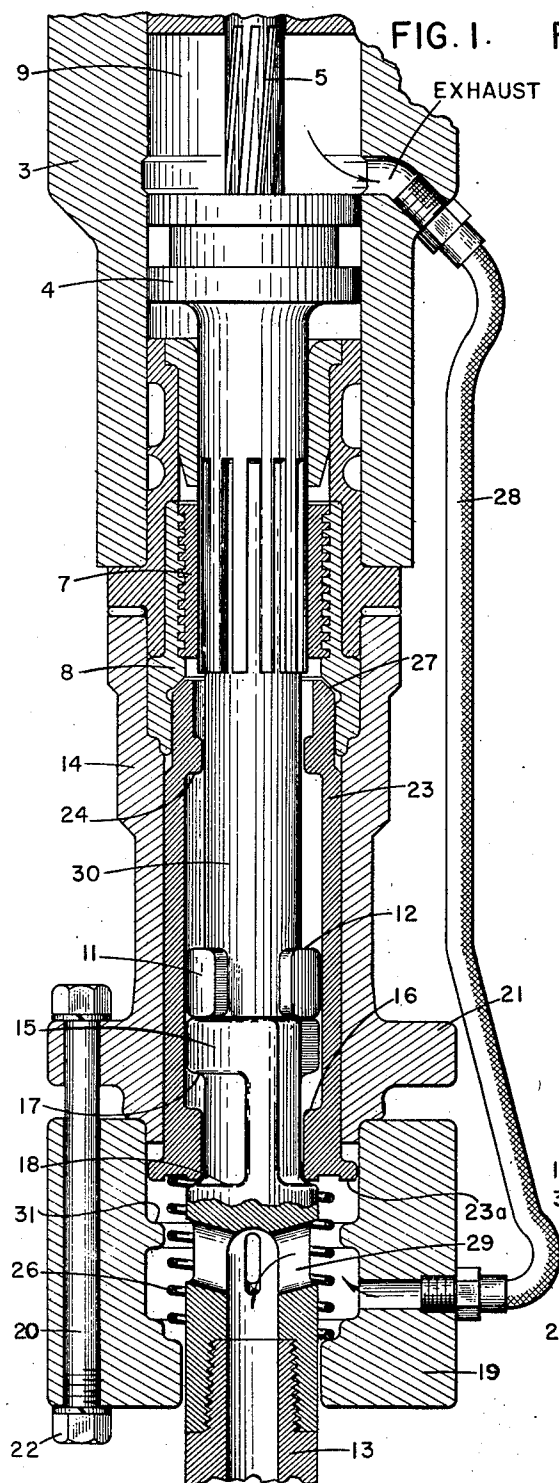
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DOUBLE ACTION DRIFTER DRILL

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Application June 26, 1956, Serial No. 593,920

4 Claims. (Cl. 255—42)

This invention relates to pneumatic hammers and relates particularly to an apparatus for tapping out the drill stem of a pneumatic hammer in the event said drill stem should become stuck during drilling operations and a means for using the exhaust air to blow out cuttings from the hole dug by the drill.

This application is a continuation-in-part of Serial No. 389,762, now abandoned, filed November 2, 1953, for Alvie E. Blount and Tobias Flatow entitled "Double Action Drifter Drill."

In drilling certain holes with conventional pneumatic hammers, it was found that while removing the drill certain earth formations would hold the drill stem fast making it extremely difficult to remove the drill stem from the hole. Certain holes, as for example, shot holes to be used in seismic geophysical exploration must be drilled to a depth of as much as 18 to 20 feet and therefore the pneumatic hammer must have a total drill stem length of 18 to 20 feet. A hammer possessing such a long drill stem is necessarily bulky and ponderous. Hence the removal of such a cumbersome instrument from a drill hole presents quite a problem if the instrument should become stuck during drilling operations. Formerly no efficient means had been developed for loosening a stuck drill stem.

It is the main object, therefore, of this invention to provide a pneumatic hammer having means for quickly and easily tapping out a stuck drill stem from a drill hole.

It is a further object of this invention to provide a pneumatic hammer having means whereby the exhaust air therefrom may be utilized in removing cuttings from a drill hole.

The foregoing objects are carried out by the provision within a pneumatic hammer of a means for permitting the piston within the hammer to pound the drill stem into the ground during drilling operations, by the further provision of a means for permitting the piston to oscillate without striking the head of the drill stem when drilling operations cease and the provision of a means for permitting the reciprocating piston to tap out the drill stem when the drill stem becomes stuck or frozen within the drill hole. More particularly, a sleeve having an upper shoulder and a lower shoulder is provided within the pneumatic hammer casing the shoulders being so positioned within said casing and about the reciprocating piston and anvil of the drill stem to permit a shoulder of the anvil of said drill stem to rest upon the lower shoulder of said sleeve outside the reciprocating limits of the piston thereby stopping the pounding of the drill stem into the drill hole when drilling operations are ceased, the piston then oscillating within the casing, and to permit the upper shoulder to be struck during the upward stroke of the reciprocating piston when the drill stem becomes stuck. The force of the engagements of the reciprocating piston against the upper shoulder of the sleeve is transmitted by means of the sleeve to the drill stem thereby tapping out said drill stem.

In the accompanying drawing forming a part of this

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specification and in which similar reference numerals refer to similar parts,

Fig. 1 is an elevational view partly in section of enough of the pneumatic hammer to illustrate our invention;

Fig. 2 is an elevational view partly in section showing the tap out position of the parts of our new pneumatic hammer; and

Fig. 3 is a perspective broken away view of parts of the apparatus showing the assembly thereof.

Referring more particularly to the drawing, numeral 3 indicates the casing of a conventional pneumatic drill such as marketed by the Chicago Pneumatic Tool Company and shown in Catalog 600-4, page 16. Coaxially arranged within the casing 3 for reciprocating and rotational movement is a piston 4 having a stem 30. The rotational movement of the member 4 is accomplished by the provision of a rifle bar 5 which interlockingly engages the piston 4. The provision of the rifle bar 5 causes the piston 4 to describe a partial revolution during its upward stroke for rotating the stem 30. The piston 4 is provided with longitudinal splines that mesh with a split grooved bushing 7 that is disposed within sleeve member 8. Compressed air is admitted into chamber 9 through an inlet (not shown). The manner in which the rotational and reciprocating movement of the piston is accomplished is clearly explained in Patent No. 2,125,133 and does not form a part of this invention.

At the lowermost extremity of the stem 30 is a hammer head 11. The hammer head 11 has an upwardly facing shoulder 12. In order to drill the hole a drilling member such as a drill stem 13 is locked within the lower portion 14 of casing 3. The drill stem is hammered into the ground during drilling operation by the reciprocating piston 4. The drill stem is provided with a downwardly facing shoulder 17 and an upwardly facing shoulder 18. Also arranged about the drill stem is a jacket member 19, having a protrusion 31, secured to the casing 3 by bolts 20 set through the jacket and flange 21 and nuts 22. Hence the jacket will move longitudinally whenever the casing 3 is moved longitudinally and by the same amount as the movement of the casing. In order to provide for the tapping out of the drill stem if it should become stuck during removal, a sleeve 23 having a downwardly facing shoulder 24 and an upwardly facing shoulder 16 is provided. Sleeve 23 is of substantially cylindrical configuration and has an upper portion of reduced diameter ending in a taper such as shown at 27. The shoulder 18 engages with the lower end 23a of sleeve 23 during drilling operations. A resilient member 26 such as a coil spring is confined within the jacket 19. A circular groove is provided in the lower extremity of sleeve 23 into which the upper coil of coil spring 26 is positioned. The coil spring serves to maintain the upper portion 27 of the sleeve 23 against the sleeve 8 during drilling operations. The hammer head 11 and the anvil 15 can be assembled within the sleeve 23 by any method of assembling well known in the art. For example, hammer head 11 and anvil 15 may be fluted in a manner so as to permit their entrance into the similarly fluted upper and lower extremities, respectively, of sleeve 23.

A particular method of assembling the apparatus will now be described with respect to Fig. 3 and Fig. 1. In assembling the section of the drill containing the hammer, anvil sleeve and related elements, the first step is to place the two halves of the split grooved bushing 7 on the piston 4 so that the grooves in the bushing mesh with the splines on the piston. The cylindrically-shaped sleeve member 8 is then brought over the hammer 11 and the near portion of the piston. It is then screwed upwardly onto bushing 7; hence elements 7 and 8 become rotatably fixed to the piston. Next the hammer 11 is placed through

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the upper opening in the sleeve 23 as will be seen from Fig. 3. The piston assembly, with elements 7 and 8 affixed to the piston 4, is rotated approximately 90° and then the skirt bottom of element 8 is positioned over the nut which forms the upper portion of sleeve 23. The lugs on the hammer will then oppose the lugs on the upper part of the sleeve and consequently the hammer 11 cannot disengage itself from the sleeve. The lower portion 14 and the other structural members are then bolted into place.

The anvil 15 and the lower termination of sleeve 23 are similarly fluted and locked. When the anvil is placed through the lower opening of the sleeve and is rotated approximately 90°, the lugs on the anvil and on the sleeve oppose each other as do the lugs previously described and prevent these elements from becoming disengaged. Torque applied during drilling to rotate the drill keeps the lugs opposing each other. Torque is thus transmitted through bushing 7, sleeve member 8 and sleeve 23 to drill stem 13. Thus the sleeve member 8 acts as both a stop member and a means for transmitting torque.

In order to utilize the exhaust from the cylinder 9 within the casing a flexible hose 28 is connected to the exhaust. This flexible hose 28 is connected at its other end to an inlet in the jacket 19 and thence into a plurality of holes 29 provided within the drill stem 13. It can be seen that by the foregoing arrangement the exhaust may be used to blow out cuttings from the drill hole.

In normal drilling operations, the movement of the anvil 15 places said anvil within the limits of the longitudinal movement of the hammer head 11. Hence as the piston 4 reciprocates, the hammer head 11 hammers the drill stem 13 into the ground. When drilling operations are ceased, the upward movement of the casing draws the shoulder 16 into engagement with the anvil shoulder 17. Further upward movement of the casing permits the drill stem 13 to become disengaged from the bottom of the drill hole and the drill stem then rests upon the shoulder 16 compressing the coil spring 26 until the force exerted by the coil spring upwardly offsets the weight of the drill stem and casing. If the drill stem should become stuck or frozen within the drill hole during removal from the drill hole, the position of the parts are as shown in Fig. 2. A further pull on the casing 3, since the jacket member 19 is connected to the casing, causes the coil spring 26 to be compressed and the entire casing moves upwardly with respect to the sleeve 23. The piston 4 also is thereby moved upwardly by the same amount as the movement of the casing. Hence the upwardly facing shoulder 12 of the hammer head 11 of the stem 30 will upon further reciprocation of the piston member 4 strike downwardly facing shoulder 24 of the sleeve member 23. The force thereby exerted against the shoulder 24 is transmitted through the sleeve 23 to the upwardly facing shoulder 16. Since the shoulder 16 is in engagement with the shoulder 17 of the anvil 15 of the drill stem 13 the drill stem will be tapped out of the drill hole.

It will be understood that alterations may be made in the relative sizes, shapes and positions of the parts of the apparatus of the present invention without departing from the spirit and scope thereof.

We claim:

1. In a pneumatic hammer, a housing having a piston chamber, a sleeve loosely disposed within said housing, reciprocating means disposed within said housing including a reciprocating piston located within said piston chamber and having a piston stem and a hammer head at the lowermost extremity of said piston stem, said piston stem and hammer head extending into said sleeve, the longitudinal movement of said reciprocating means being less in distance than the length of said sleeve, a drill stem loosely disposed within the lower portion of said sleeve thus permitting longitudinal movement of said drill stem to a point permitting the hammering of said drill stem, said drill stem having an anvil which is disposed within

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said sleeve and below said hammer head, said sleeve having an upwardly facing shoulder below said anvil to retain said anvil within said sleeve, yieldable biasing means disposed within said housing so as to yieldably bias said sleeve upwardly relative to the lower part of said housing, means within said housing and above said sleeve for limiting the upward movement of said sleeve, said sleeve also having a downwardly facing shoulder above said hammer head, said downwardly facing shoulder being yieldably biased outside of the longitudinal movement of said reciprocating hammer head by said yieldable biasing means whereby when a holding force is exerted upon said drill stem an upward pull on said housing will effect the sequential contacting of the anvil with the upwardly facing shoulder of said sleeve, and the slidable movement of said housing and reciprocating means with respect to said sleeve to a position permitting said hammer head to impinge upon said downwardly facing shoulder upon each of the upward strokes of said hammer head thereby exerting a force upon said drill stem.

2. In a pneumatic hammer, a casing, a reciprocating piston having a stem coaxially disposed within said casing, said stem having at its lowermost extremity a hammer head, said hammer head having an upwardly facing shoulder, a drill stem, said drill stem having its upper end arranged within the casing and being provided with an anvil on its upper end, said anvil having a downwardly facing shoulder, a jacket rigidly connected to the lower end of said casing enclosing the upper end of the drill stem below the anvil, a sleeve arranged within the casing and projecting into the jacket, and biasing means arranged within said jacket and in contact with the lower end of the sleeve for yieldably biasing said sleeve upwardly relative to the jacket, means within said casing and above said sleeve for limiting upward movement of the sleeve, said sleeve having an internal upwardly facing shoulder adapted to engage said anvil shoulder upon an upward pull on said casing to cause a slidable movement of said casing, jacket, piston and hammer head with respect to the sleeve, and said sleeve also having an internal downwardly facing shoulder adapted to be engaged by said hammer head shoulder as a result of said continued pull on said casing, jacket, piston and hammer head relative to the sleeve in the event said drill stem becomes stuck thereby transmitting the force of engagement through said upwardly facing sleeve shoulder to said anvil shoulder on reciprocation of said piston and hammer head within said casing, movement of said hammer head being such that said hammer head shoulder and said downwardly facing sleeve shoulder do not engage during normal drilling operations of said pneumatic hammer.

3. In a pneumatic hammer, a casing, a reciprocating piston disposed within said casing, a piston stem integral with said piston, a hammer head integral with said piston stem, a drill stem having an anvil at the uppermost extremity thereof coaxially disposed within said casing below said piston stem and adapted to be hammered by said hammer head during drilling operations, a first sleeve rigidly disposed within said casing coaxial with said piston stem, a second sleeve disposed below said first sleeve having an internal upper shoulder and an internal lower shoulder within which said hammer head reciprocates, said hammer head reciprocating in said second sleeve between the shoulders therein, the lower shoulder of said second sleeve being disposed below said anvil, a jacket disposed about the upper section of said drill stem, said casing and said jacket being so connected as to be movable as one unit, a biasing means disposed about said upper section of said drill stem and within said jacket, said biasing means serving to yieldably urge said second sleeve upward relative to said jacket and maintain said second sleeve in contact with said first sleeve, an upward pull on said casing causing engagement of the lower shoulder of the second sleeve with the anvil and engagement of the upper shoulder

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der of the sleeve with the hammer head by relative movement of said jacket, casing, piston and hammer head with respect to said second sleeve against the bias of said biasing means whereby on sticking of said drill stem it is freed by contact of said lower shoulder of said second sleeve with said anvil and impact of said hammer head against said upper sleeve shoulder on reciprocation of said piston and hammer head within said casing.

4. In a pneumatic hammer, a casing, a reciprocating piston disposed within said casing, a piston stem integral with said piston, a hammer head integral with said piston stem, a drill stem having an anvil at the uppermost extremity thereof coaxially disposed within said casing below said piston stem and adapted to be hammered by said hammer head during drilling operations, a first sleeve rigidly disposed within said casing coaxial with said piston stem, a second sleeve disposed below said first sleeve having an internal upper shoulder and an internal lower shoulder within which said hammer head reciprocates, said hammer head reciprocating in said second sleeve between the shoulders therein, the lower shoulder of said second sleeve being disposed below said anvil, said drill stem hav-

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ing a shoulder adapted to engage the lower extremity of said second sleeve during drilling operations, a jacket disposed about the upper section of said drill stem, said casing and said jacket being connected to be movable as one unit, a biasing means disposed about said upper section of said drill stem and within said jacket, said biasing means serving to yieldably urge said second sleeve upward relative to said jacket and maintain said second sleeve in contact with said first sleeve, an upward pull on said casing causing engagement of the lower shoulder of the second sleeve with the anvil and engagement of the upper shoulder of the sleeve with the hammer head by relative movement of said jacket, casing, piston and hammer head with respect to said second sleeve against the bias of said biasing means whereby on sticking of the drill stem it is freed by contact of said lower shoulder of said second sleeve with said anvil and impact of said hammer head against said upper sleeve shoulder on reciprocation of said piston and hammer head within said casing.

No references cited.