Sept. 4, 1951 J. LIVINGSTONE 2,566,671

ROTARY DRILLED HOLE ENLARGER

Filed Aug. 21, 1948

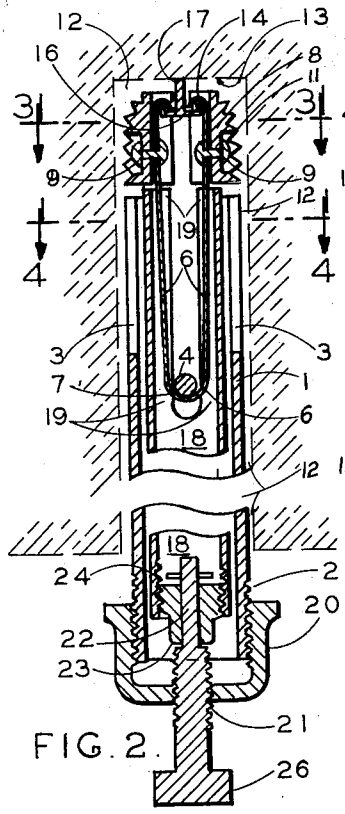


FIG. 2.

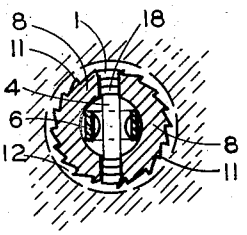


FIG. 3.

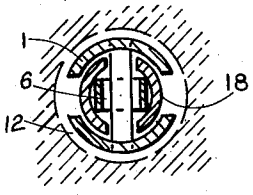


FIG. 4.

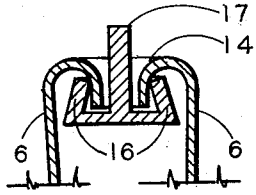


FIG. 5.

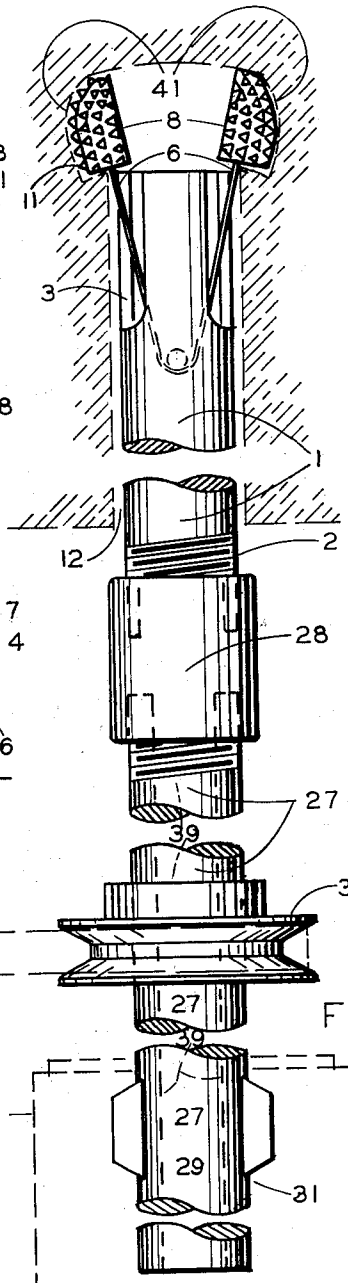
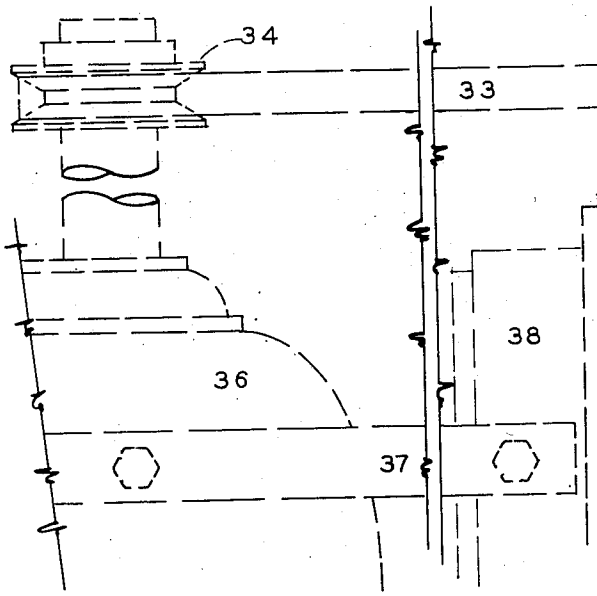


FIG. 1.



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ROTARY DRILLED HOLE ENLARGER

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3 Claims. (Cl. 255—77)

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This invention relates to rotary drilled hole enlarger.

In the present practice it is rather tedious and difficult to enlarge the bottom or inner end of a drilled hole in rock drilling and blasting, for the purpose of forming a pocket into which the explosive charge could be packed for greater effectiveness.

The primary object of my invention is to provide a device which can be readily inserted in a drilled hole and then released for laterally expanding operation and rotated so as to enlarge the bottom of the hole into a pocket; and which device can be easily contracted for withdrawal from the hole after the pocket is completed.

Another object of the invention is to provide a pocket forming tool for the bottoms of drilled holes which tool can be easily attached to the usual usual rock drills for guiding and operation.

I am aware that some changes may be made in the general arrangements and combinations of the several devices and parts, as well as in the details of the construction thereof without departing from the scope of the present invention as set forth in the following specification, and as defined in the following claims; hence I do not limit my invention to the exact arrangements and combinations of the said device and parts as described in the said specification, nor do I confine myself to the exact details of the construction of the said parts as illustrated in the accompanying drawings.

With the foregoing and other objects in view, which will be made manifest in the following detailed description, reference is had to accompanying drawings for the illustrative embodiment of the invention, wherein:

Fig. 1 is a side view of the device shown in the drilled hole after the pocket is formed, the broken lines indicate the connection to an electric motor mounted on the usual rock drills.

Fig. 2 is a section view of the tool showing it in contracted position and also showing the means for contracting the tool for the purpose of withdrawal.

Fig. 3 is a sectional view of the tool the section being taken on the lines 3—3 of Fig. 2

Fig. 4 is a sectional view of the tool the section being taken on the lines 4—4 of Fig. 2, and

Fig. 5 is a fragmental sectional view of the tripping device in the ends of the leafspring of the tool.

In the illustrative embodiment of my invention I make use of a tube 1, one end of which is externally threaded at 2. The other end of the

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tube 1 has parallel diametrically opposite slots 3 extended from the extreme end of the tube 1 longitudinally of the tube and parallel with the axis thereof. A retaining pin 4 is extended through the tube substantially at right angles to the diameter on which the slots 3 are located and at right angles to said slot 3. The pin 4 is beyond the bottom or inner ends of the slots 3. A substantially V-shaped leaf spring 6 has its apex 7 engaged with the underside of the pin 4 and has its legs extended outwardly through the slotted end of the tube 1 so that they extend substantially beyond the said end of said tube 1. On the outer end of each leg of the leaf spring 6 is secured a suitable reamer 8 by any suitable securing element such as screws or rivets 9. Each reamer element 8 is generally semi-cylindrical with the outer end thereof tapering inwardly. The outer surface of each reamer section 8 is roughened or provided with cutting teeth 11 to act against the sides of the holes for enlarging the same when rotated.

A tripping device is provided to hold the semi-cylindrical reamer sections 8 in contracted position for insertion into a drilled hole 12, so that the reamer does not expand for forming a pocket until after it reached near the bottom 13 of said drilled hole 12. In the present form this is accompanied by bending the outer end of the leaf spring 6 inwardly into retaining hooks 14 and engaging said retaining hooks by a transverse clamp 16 well within the space between the reamer sections 8. A tripping finger 17 extends from the clamp 16 outwardly of the tool and slightly beyond the tips of the reamer section 8, so that it will abut the bottom 13 of the drilled hole 12. The pressure exerted in inserting the tool into the hole 12 will cause the finger 17 to be pushed in by the hole bottom 13 thereby pushing the clamp 16 out of the hooks 14 of the leaf springs 6 and allowing the latter to expand. The slots 3 on the tube 1 are such as to allow expansion of the leaf spring 6 outwardly beyond the outer periphery of the tube 1 and of the hole 12.

The reamer sections 8 are contracted for the initial operation of insertion and withdrawal by a tubular rod 18 slidable inside of the tube 1. The inner end of the rod 18 is forked, the prongs 19 of the fork are so spaced that they engage the legs of the leaf spring 6 as the rod 18 is inserted into the tube 1 and compress the same. The leaf spring 6 is necessarily of considerable strength and the compression is accomplished by any suitable device whereby leverage can be exerted upon the rod 18. In the present illustra-

tion a cap 20 is threaded on the threaded end 2 of the tube 1. In the center of the cap 20 is axially threaded a screw 21, the inner end 22 of which is rotatable in a plug 23 which latter is fixed by threading, or otherwise, into the outer end 24 of the rod 18. Thus after the rod 18 is inserted into the tube 1 so far as it can be pushed manually, the cap 20 is screwed upon the threaded end 2 of the tube 1 and thereafter applying a leverage to the head 26 of the screw 21 the latter can be turned so that it moves inwardly of the tube 1 pushing the rod 18 inwardly by sufficient force to compress the leaf spring 6. After the leaf spring 6 is so compressed the tripping clamp 16 is inserted under the hooks 14 and the leaf spring is released by removing the forked rod 18 and the clamp 16 holds the spring against expansion. The width of the clamp 16 is such that it does not allow the expansion of the leaf spring 6 beyond the point where the outer peripheries of the reamer sections 8 are generally within the diameter of the tube 1 and of the hole 12.

The unit with the contracted reamer sections 8 is then inserted in the hole 12 either manually or by any suitable extension rod, and when the tool reaches the bottom 13 of the hole 12 the clamp 16 is tripped in the manner heretofore described and the jaws or reamer sections 8 are allowed to expand from the reaming or pocket forming operation. In some instances it may be necessary to rotate the tool in a tight hole 12 for insertion. In such instances the tool is rotated but the reamer sections 8 are not permitted to form a pocket until the tool is thus reamed into the hole 12 to the bottom 13 where the tripping operation is performed as heretofore described. In this manner it is assured that the pocket forming operation occurs only at the bottom of the hole 12.

In the present illustration an extension rod 27 is secured by a suitable coupling 28 to the threaded end 2 of the tube 1. Both the tube 1 or the extension rod 27 may be of the suitable length to extend into drilled hole 12 of any depth. Rotation is imparted to the tool in any suitable manner, but it is preferable that the usual rock drill mechanism of any suitable type, not herein shown, may be employed. The extension rod 27 is preferably journalled at its rear end 29 in the socket 31 formed in the end of the usual rock drill device wherein the rod for the usual drill bit is otherwise held. On the extension rod 27 is a transmission pulley 32, which by suitable belting 33, indicated in broken lines, is connected to the pulley 34 of an electric motor 36 which latter is mounted on a bracket 37 on one side of the usual rock drill casing 38. The electric motor 36 is connected to a source of electricity in any suitable manner and is controlled by a suitable switch, not shown. It is to be noted that the extension rod 27 and the coupling 28 are both provided with a central water passage 39 which is aligned with the usual water passage of such rock drill device so as to furnish the water for the reaming operation. The operator holds the rock drill for the insertion and operation of the tool similarly to the holding of the same for any drilling operation, then it operates the motor 36 and as the tool rotates it will expand and form a pocket 41 as indicated in Fig. 1.

After the pocket is formed the coupling 28 is disconnected from the threaded end 2 of the tube 1 and the contracting or compressing rod 18 is inserted in the manner heretofore described to compress the leaf spring 6 thereby allowing the

withdrawal of the tool from the pocket and from the hole 12. In the event of a hole deeper than the length of the lowest tube, the compressing rod is of a length, whether single or sectional, to project above the ground level, and the threaded capping is performed on the pipe section at said level.

I claim:

1. In a pocket forming device for the bottom of a drilled hole, a tubular element insertable in the drilled hole, one end of said tubular element having diametrically opposite axial slots at an end thereof, an anchor element in said tubular element adjacent said slots, a bow spring anchored on said anchor element and extended beyond the slotted ends of said tubular element and being expansible through said slots beyond the outer periphery of said tubular element, reaming jaws on the outer ends of said bow spring to be urged apart by said spring, a catch device to hold said spring and said jaws in contracted position said jaws being complemental substantially half cylindrical within the circumferential dimensions of said tubular element and of the hole in said contracted position, cutting teeth on the outer peripheries of said jaws, and a tripping member on said catch device abuttable against the bottom of the hole for releasing said catch device and allowing the expansion of said spring and said jaws against the sides of the hole at said bottom.

2. In a pocket forming device for the bottom of a drilled hole, a tubular element insertable in the drilled hole, one end of said tubular element having diametrically opposite axial slots at an end thereof, an anchor element in said tubular element at about said slots, a bow spring anchored on said anchor element and extended beyond the slotted ends of said tubular element and being expansible through said slots beyond the outer periphery of said tubular element, reaming jaws on the outer ends of said bow spring to be urged apart by said spring, a catch device to hold said spring and said jaws in contracted position said jaws being complemental substantially half cylindrical within the circumferential dimensions of said tubular element and of the hole in said contracted position, cutting teeth on the outer peripheries of said jaws, and a tripping member on said catch device abuttable against the bottom of the hole for releasing said catch device and allowing the expansion of said spring and said jaws against the sides of the hole at said bottom, a contracting device insertable through the other end of said tubular element for engaging said spring and contracting the same to move the jaws together.

3. In a pocket forming device for the bottom of a drilled hole, a tubular element insertable in the drilled hole, one end of said tubular element having diametrically opposite axial slots at an end thereof, an anchor element in said tubular element at about said slots, a bow spring anchored on said anchor element and extended beyond the slotted ends of said tubular element and being expansible through said slots beyond the outer periphery of said tubular element, reaming jaws on the outer ends of said bow spring to be urged apart by said spring, said reaming jaws being substantially semicylindrical and when contracted complemental to a cylinder of substantially the same diameter as the outer diameter of the tubular element, cutting teeth on the outer peripheries of said jaws, a catch device to hold said spring, and said jaws in contracted position within the circumferential di-

mensions of said tubular element and of the hole, and a tripping member on said catch device abuttable against the bottom of the hole for releasing said catch device and allowing the expansion of said spring and said jaws against the sides of the hole at said bottom, the other end of said tubular element being adapted for connection to a rotating device for rotating said tubular element and said jaws in said hole, said anchor device being adapted to transmit rotation from said tubular element to said spring and to said jaws.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
79,400	Salisbury	June 30, 1868
465,103	Wegner	Dec. 15, 1891
729,743	Dunn	June 2, 1903
1,304,167	Dunham	May 20, 1919
1,375,817	Blodgett	Apr. 26, 1921
1,515,780	Lewis	Nov. 18, 1924
1,560,019	Cooper	Nov. 3, 1925
1,608,945	Korts	Nov. 30, 1926
2,244,674	Cady	June 10, 1941
2,466,991	Kammerer	Apr. 12, 1949

FOREIGN PATENTS

Number	Country	Date
6,641	Great Britain	of 1885