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C. C. HANSEN

ROTATION DEVICE

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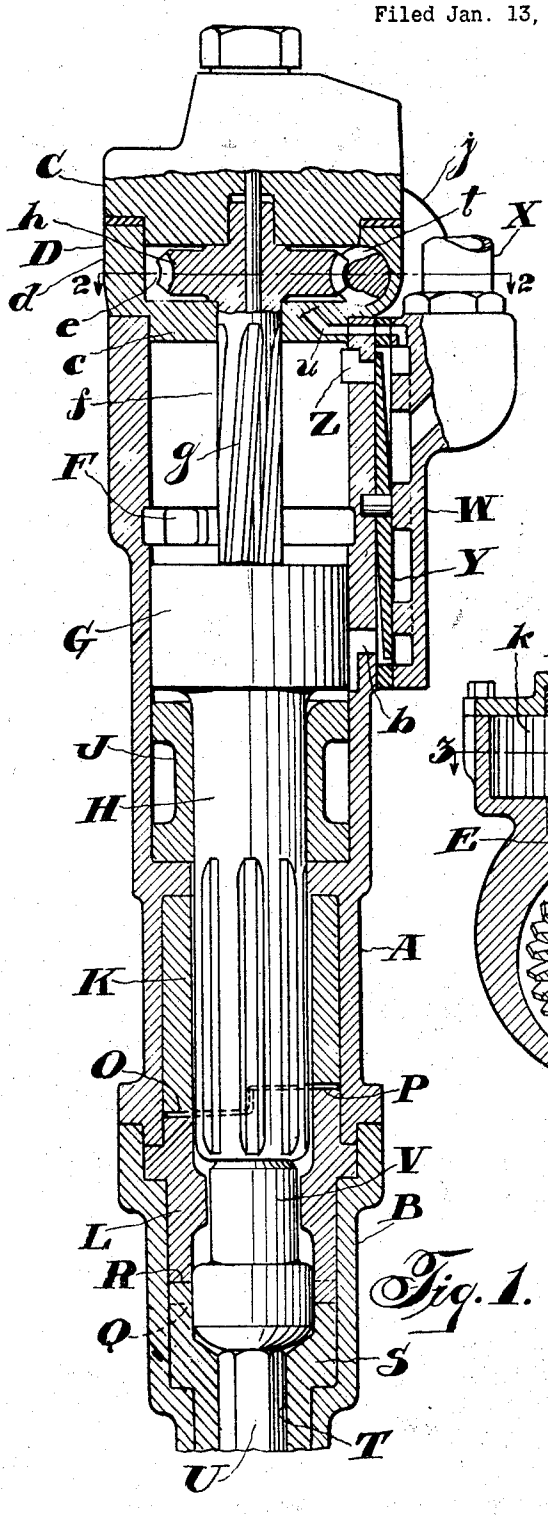


Fig. 1.

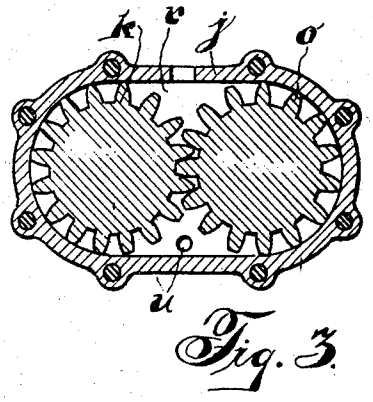


Fig. 3.

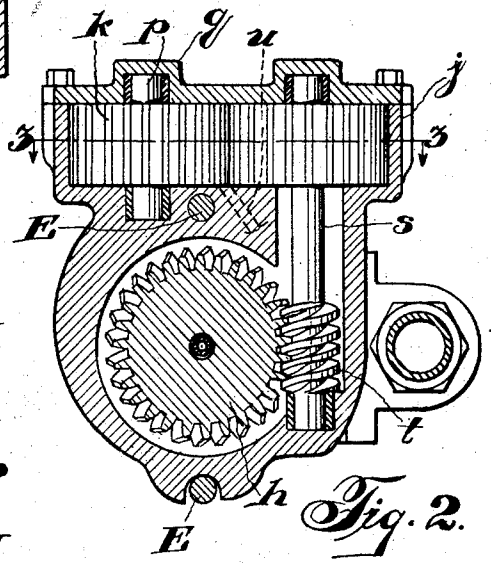


Fig. 2.

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UNITED STATES PATENT OFFICE.

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ROTATION DEVICE.

Application filed January 13, 1926. Serial No. 80,942.

This invention relates to rock drills, but more particularly to a rotation device for fluid actuated rock drills of the hammer type.

An object of the present invention is to rotate the drill steel by means of a gear motor constantly exposed to pressure fluid and connected to transmit rotary movement to the steel through the rifle bar, the piston and the associated chuck parts.

Other objects will be in part obvious and in part pointed out hereinafter.

The invention consists of the combinations of elements and arrangement of parts substantially as hereinafter described and more particularly pointed out in the appended claims and illustrated in the accompanying drawings, in which—

Figure 1 is an elevation partly in section of a rock drill equipped with a rotation device constructed in accordance with the practice of the invention,

Figure 2 is a transverse section taken through Figure 1 on the line 2—2 looking in the direction of the arrows, and

Figure 3 is an elevation in section of the motor taken through Figure 2 on the line 3—3 looking in the direction of the arrows.

Referring to the drawings, the invention is shown embodied in a rock drill in which a cylinder A, a front head B, a back head C and a back cylinder extension D comprise the casing of the rock drill and are held in operative position with respect to each other by side bolts E arranged on opposite sides of the drill. The cylinder A in this instance has a free exhaust port F and is provided with a reciprocatory piston G having a fluted forward extension or nose H. The nose H is guided by a front cylinder bushing J and interlocks slidably with a chuck nut K disposed rotatably in the front end of the cylinder A.

In order to prevent relative rotation between the chuck nut K and an anvil block seat L rotatable in the rearward end of the front head B, cooperating clutch members O and P are formed on the chuck nut and the anvil block seat respectively. In like manner, the front end of the anvil block seat L is provided with clutch members Q which interlock with similar clutch members R carried by a chuck S which is bored to receive a drill steel U. Disposed within the anvil block seat L and adapted to reciprocate into the rearward end of the chuck S is an anvil block V for transmitting the blows of the hammer piston G to the drill steel U.

Secured to the cylinder A is a valve chest W carrying a connection X through which pressure fluid may be conveyed for operating the drill. The pressure fluid admitted into the valve chest W is in this instance distributed to the ends of the cylinder A by a flat oscillatory valve Y adapted to control the inlet ports Z and *b*.

In accordance with the present invention, the back cylinder extension D projects into the cylinder at *c* and forms a closure for the rearward end of the cylinder and is also provided with rearwardly extending wall *d* which forms a seat for the back head C. The back head C projects slightly within the wall *d* and thus forms a closure for one end of the chamber *e* formed within the back cylinder extension.

In order to impart rotary movement to the drill steel U for keeping said drill steel free within the drill hole, a rifle or rotation bar *f* extends through the back cylinder extension D and is provided with spiralled flutes *g* which engage the piston G in the usual manner. The rifle bar *f* in this instance is provided with a worm gear *h* near its rearward end and is arranged to rotate within the chamber *e*.

Suitable means are provided for constantly rotating the rifle bar *f* during the reciprocation of the piston G. To this end a motor casing *j* is preferably formed integrally with the back cylinder extension D and is provided with a pair of intermeshing gears *k* and *o* constituting a rotary motor. In this instance the gear *k* is provided with an integral shaft *p* supported at one end in the back cylinder extension D and at its other end in a cover *q* which forms a closure for a motor chamber *r* within which the gears *k* and *o* are housed. Similarly, the gear *o* is provided with a shaft *s* which may be formed integrally with said gear as indicated, or may be formed separately and secured thereto in any convenient and well known manner. The shaft *s*, like the shaft *p*, is also supported at one end in the cover *q* and at its other end is supported by the back cylinder extension D and carries near its inner end a worm *t* which meshes with the worm wheel *h*. The

worm drive so formed is intended to be of the usual non-reversible type, which can only be rotated in one direction. By this is meant a worm drive which becomes locked and cannot be rotated reversely or backwardly by power applied to the driven member, which in this case is the worm gear *h*.

To the end that a constant supply of pressure fluid may be supplied to the chamber *r*, a passage *u* is formed through the back cylinder extension D and through the valve chest W to be in constant communication at one end with the inlet connection X. Any suitable means may be provided for controlling the supply of pressure fluid to the chamber *r*, but the control of such pressure fluid supply to the motor may be effected by the means which control the supply of pressure fluid to the cylinder A, as for instance, a throttle valve (not shown) preferably of a well known type commonly used for such purposes.

In the operation of the device let it be assumed that pressure fluid is being admitted into the valve chest W for actuating the hammer piston G. A portion of the pressure fluid thus admitted to the valve chest will pass through the passage *u* and acting against the gears *k* and *o* will rotate the rifle bar *f*. Such rotation of the rifle bar is in turn transmitted through the piston G and through the interlocking chuck parts to the drill steel U, thus constantly changing the position of the drill steel with respect to the rock face for each successive blow of the hammer piston. As hereinbefore described the rifle bar, together with the interlocking associated parts, will be constantly rotated and rotation of the drill steel will be checked only momentarily at the instant the blow of the hammer piston is delivered thereon. If, however, undue resistance should occur between the drill steel and the rock, and such resistance should be sufficient to temporarily check rotation of the motor, the pressure fluid admitted in the front end of the cylinder will, during the rearward stroke of the piston, cause said piston to describe a partial revolution on the rifle bar due to the spiral flutes *g* and thus change the position of the drill steel. The worm *t* and worm gear *h* cannot be rotated backwardly, so that the spiralled rifle bar will cause the piston to rotate on the up or rearward stroke, and thus aid in loosening the drill steel.

By means of this invention, the constant rotation of the drill steel will be at all times assured. The parts comprising the rotation mechanism may be of simple and sturdy construction, and breakage which so frequently occurs in mechanisms for rotating the drill steel will be entirely eliminated.

I claim:—

1. In a rotation device for rotating the drill steel of a fluid actuated rock drill, the combination of a cylinder and reciprocating piston, a rotation bar having spiral flutes interlocking slidably with the piston, a rotation motor, and a worm drive comprising driving and driven members incapable of being rotated in reverse direction by power applied to the driven member and operatively connected between the motor and the rotation bar, whereby increased resistance to rotation of the drill steel beyond a predetermined amount sufficient to stop the motor will permit relative rotation between the piston and the rotation bar to continue and thus aid in releasing the drill steel in the drilled hole.

2. In a rotation device for rotating the drill steel of a fluid actuated rock drill, the combination of a cylinder and reciprocating piston, a rotation bar having spiral flutes interlocking slidably with the piston, a rotation motor, a worm gear on the rotation bar, and a worm connected to the motor, said worm drive so constituted being incapable of being rotated backwardly by power applied to the worm gear, whereby the rotation bar and piston are normally constantly rotated in unison but upon increased resistance to rotation of the drill steel beyond a predetermined amount sufficient to stop the motor, relative rotation will continue between the piston and the rotation bar to aid in releasing the drill steel in the drilled hole.

In testimony whereof I have signed this specification.

CHARLES C. HANSEN.