W. K. RILEY.

DRILL ACTUATING MECHANISM.

APPLICATION FILED NOV. 10, 1910. RENEWED DEC. 19, 1911.

1,030,832.

Patented June 25, 1912.

2 SHEETS—SHEET 1.

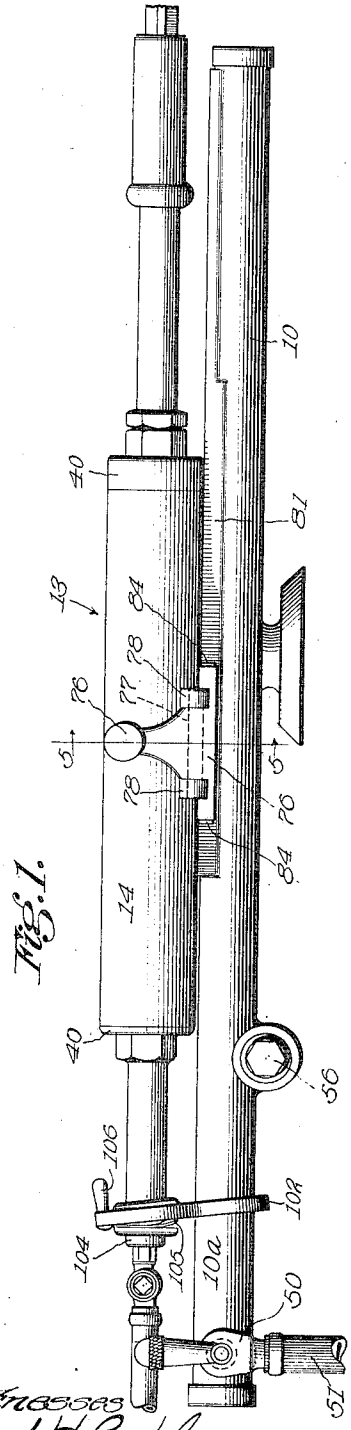

Fig. 1.

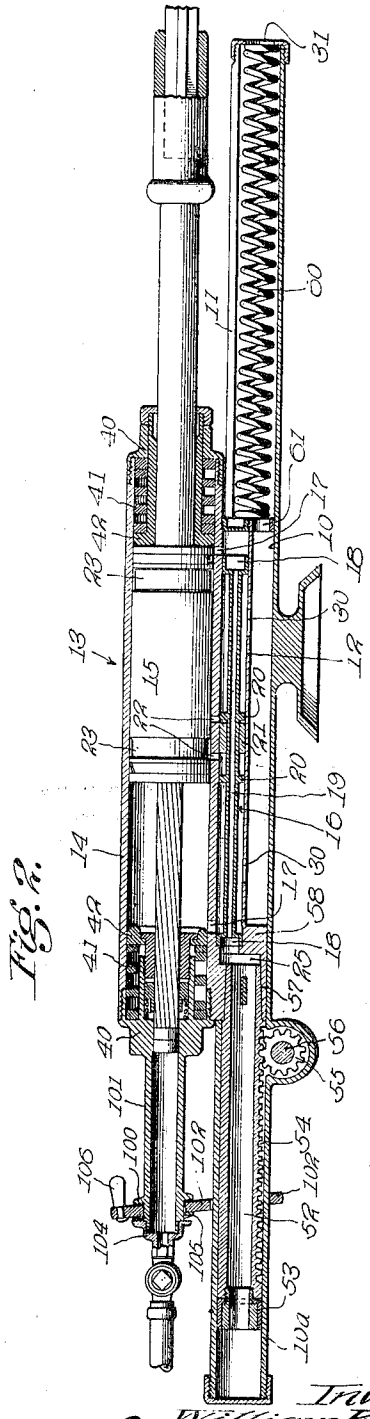

Fig. 2.

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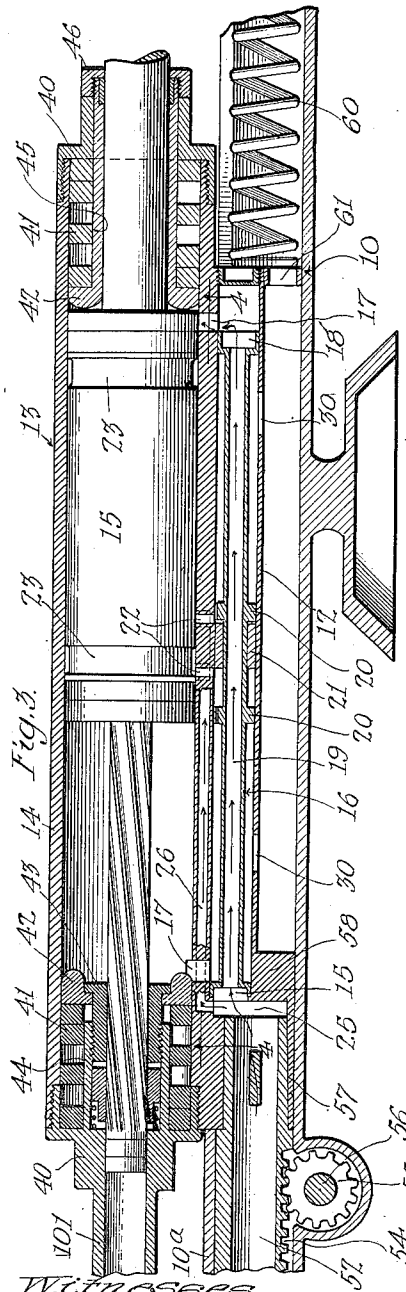

Fig. 3.

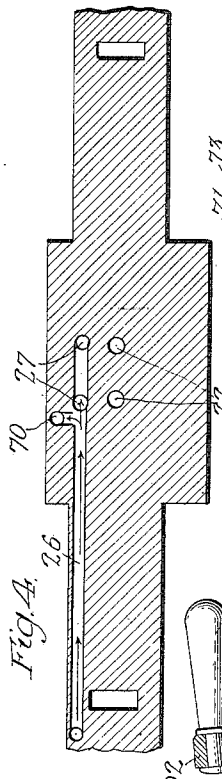

Fig. 4.

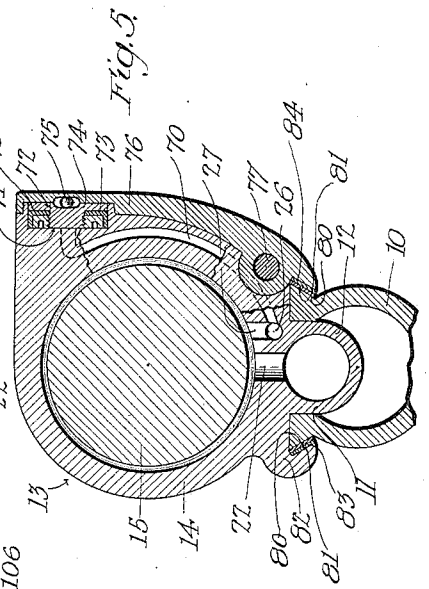

Fig. 5.

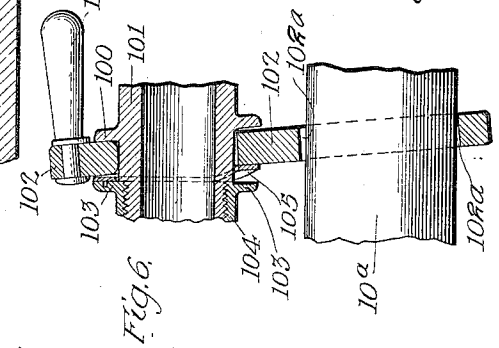

Fig. 6.

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UNITED STATES PATENT OFFICE.

WILLIAM K. RILEY, OF LOS ANGELES, CALIFORNIA, ASSIGNOR OF ONE-HALF TO PHIL MARX, OF TEHACHAPI, CALIFORNIA.

DRILL-ACTUATING MECHANISM.

1,030,832. Specification of Letters Patent. Patented June 25, 1912.

Application filed November 10, 1910, Serial No. 591,659. Renewed December 19, 1911. Serial No. 666,843.

To all whom it may concern:

Be it known that I, WILLIAM K. RILEY, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Drill-Actuating Mechanisms, of which the following is a specification.

This invention relates to actuating mechanisms for rock drills and the like or for any other device where it is necessary or desirable to impart a striking motion; and it refers particularly to an automatic feed means for the drill which obviates all hand action in feeding the drill.

I am aware that certain devices have heretofore been used for the purpose of feeding a rock drill forwardly as fast as the cutting is done, but in devices of this character a manual means has been employed to control the movement. In my application filed June 8th, 1909, bearing Serial No. 500,954, I have described such a mechanism as above outlined. In this device the drill is moved forwardly by air pressure acting upon a suitable plunger, a spring being used to move the drill rearwardly when the air pressure is relieved. A hand controlled friction device is provided for holding the drill in any desired position and for preventing the fluid pressure from forcing the drill forwardly at too great a speed. The chief disadvantage of this construction resides in the necessity for manual adjustment. In the present device I have entirely done away with this difficulty by substituting for the manually operated friction mechanism a mechanism which is operated directly by the same fluid pressure which forces the drill forwardly. In this manner an increase in the forward pressure will be immediately accompanied by an increase in the retarding friction. The different parts of the machine are so proportioned that the back pressure of the spring and the frictional retarding force is always greater than the forwardly exerted force due to the air pressure. The excess pressure required to move the drill forwardly is supplied in a jolting motion by the momentum of moving parts, the drill being fed forwardly at every stroke when the bit is not striking the bottom of the hole. Backward feeding in the same manner is prevented by the fact that the air pressure and frictional retard are very much in excess of the spring pressure and by the provision of a ratchet mechanism, so that a very large excessive pressure is needed to force the drill backwardly.

To keep the frictional retard at a point where the drill will be fed forwardly in desired amounts and under fluctuating air pressures, is an operation which is difficult to perform by manual means alone. The present invention does this work automatically and better than it could be done by hand, allowing the drill to feed forwardly at a uniform rate or adapting the feed to the different substances through which a hole is being drilled.

In the accompanying drawings I have illustrated a drill of my own design equipped with my invention in its preferred form. It will be understood that there are numerous features of structure which have to do with the drill in general rather than with the present invention and these features will vary with different drills. Also, the minor features of the embodiment of the invention shown may be changed and modified to suit adaptation to drills of various characters, the prime features being those which accomplish the general broad action above outlined and about to be described.

In the accompanying drawings: Figure 1 is a side elevation of a drill equipped with my invention. Fig. 2 is a longitudinal central section of the same. Fig. 3 is an enlarged section of the essential operating portions of the drill. Fig. 4 is a section taken on line 4—4 of Fig. 3 and showing the air ducts. Fig. 5 is an enlarged cross section taken on lines 5—5 of Fig. 1. Fig. 6 is an enlarged cross section of the ratchet device for preventing the rearward motion of the drill.

In the drawings 10 designates a tubular longitudinal frame which is slotted as illustrated in Fig. 5 at 11 for the reception of valve casing 12 of the drill proper 13. The drill is comprised in a cylinder 14 having a piston 15 therein and a valve 16 operated with the piston for the purpose of admitting fluid pressure to the opposite ends of the cylinder through ports 17. Valve 16 is of the piston type and carries heads 18 on its ends, these heads controlling ports 17. Air under pressure is fed to the spaces at the ends of the valve and through its hollow interior 19, a balance being thus assured.

The valve carries pistons 20 near its center which are separated by a block 21 which acts as a stationary head. At each side of block 21 a port 22 is cut through the walls of the cylinder so that air may enter the spaces between pistons 20 and block 21 from annular spaces 23 provided in piston 15. At one end of valve 16 a chamber 25 is formed in the structure into which air under pressure is primarily fed. A duct 26 leads from chamber 25 to points opposite ports 22 where ports 27 lead into the cylinder. At one end of the piston stroke, one of annular spaces 23 comes over ports 22 and 27 as illustrated. Air immediately flows from port 27 to port 22 and into the space between piston 20 and block 21. The valve is consequently forced in the direction opposite to that in which the piston 15 has been moving, piston 18 being moved outside of port 17 and the air from behind piston 15 allowed to pass through port 17 and port 30 to the interior of frame 10 whence it escapes to the atmosphere through perforated cap 31. At the other end of the valve, piston 18 is moved inside port 17 and air under pressure is allowed to enter behind piston 15 to force it in the direction opposite to that in which it has just been traveling. This mechanism is described to this extent to show that the piston 15 has a reciprocating movement in cylinder 14. The structure of the valve constitutes no feature of the present invention, but it is essential to the operation of the device that the piston have a reciprocating motion and any mechanism which will accomplish this end will answer the purpose.

At each end of cylinder 14 a cylinder head 40 is provided against which a buffer spring 41 rests. Buffer heads 42 cover the outer ends of the springs and are adapted for engagement with the piston 15. On the rear end of the cylinder the buffer head is held in place by means of a nut 43 engaging with a sleeve 44 forming a part of head 40. At the forward end of the cylinder buffer head 42 is provided with a sleeve 45 which projects through head 40 and is held by nut 46 from inward movement. It is designed that the striking of the piston upon these buffer heads shall stop the piston at definite points in its travel, or at least within reasonable limits. When the piston strikes either of the buffer heads and especially the front one, it imparts a portion of its momentum to the cylinder 14 and tends to thereby move the cylinder along frame 10 in a forward direction. If the bit is not striking the end of the hole, the full impact of the piston and its attached parts will come upon the buffer head and will tend to move the cylinder forwardly. It is this motion which I make use of and control so as to form a uniform and efficient feed for the drill.

The rear end of frame 10 is formed into a cylinder 10^a to which air under pressure is fed through a valve 50 and hose 51. A hollow plunger 52 is mounted in cylinder 10^a, being provided with a leather packing 53 on its end so as to prevent the escape of air around it. The lower edge of plunger 52 is provided with teeth 54 which mesh with the teeth of a pinion 55 having a projecting shaft 56. By means of this arrangement the drill may be moved manually on the frame when such movement is desired. The air pressure in cylinder 10^a forces plunger 52 forwardly. Plunger 52 is joined at 57 to extension 58 of cylinder walls 14, so that the cylinder and its attached mechanism is forced forwardly with the plunger. In the forward end of tubular frame 10 a spring 60 is provided to press rearwardly against the forward end of valve casing 12 and against a guide 61 surrounding the forward end of the valve casing and fitting within tubular frame 10. Spring 60 presses rearwardly with a force somewhat less than the forward pressure exerted by the air on plunger 52, within the variations of pressure used for rock drilling work in various localities. When the air is admitted to the drill the cylinder mechanism is immediately forced forward against the pressure of spring 60 were it not for the intervention of the device now to be explained. When the air pressure is relieved, spring 60 immediately forces the drill mechanism rearwardly, pulling the bit out of the hole being drilled.

The same air pressure which is supplied to the rear end of plunger 52 passes through the plunger to chamber 25 and thence to the various portions of valve 16 and also through duct 26. Connected with duct 26 is a duct 70 which leads around the side of the cylinder to a point near its top where it discharges into a shallow cylinder 71 having a piston 72 therein. Piston 72 is relatively short and of large diameter, having a leather packing 73 and a metallic end disk 74. Through the medium of a ball 75 the piston presses on the interior of a lever 76 pivoted at 77 to lugs 78 extending from the walls of cylinder 14. On the opposite upper sides of frame 10 are formed ways 80 which are provided with stationary gibs or liners 81. Cylinder 14 is provided on one side with a lug 82 extending over way 80 carrying a gib 83 running on gib 81. The lower end of lever 76 below pivot 77 carries a gib 84 which is adapted to be pressed against gib 81 on way 80. This provision of two gibs on each wearing surface makes it possible to provide entirely new wearing surfaces for old worn ones and for keeping the machine in perfect alinement. In the old practice where a single gib is used, the base surface itself is

worn away and the provision of a new gib would not properly center or aline the mechanism.

It will be seen that the admission of air under pressure to the mechanism will cause lever 76 to press its gib 84 against gib 81 with a pressure depending upon the air pressure supplied. As the force tending to move. the mechanism forwardly also depends upon the air pressure, it will be seen that the forwardly moving force and the frictional retardation to that force will vary directly as each other. Thus a relation once established between the forwardly moving force and the frictional retard will always be kept, and the retard will always prevent the forward movement of the piston by just the right amount to insure proper and uniform forward feeding of the drill by the jolting action of the moving parts.

As before explained, the rearward force of the spring, the forward pressure on the plunger and the frictional retard are so proportioned that the spring and retard acting together will hold the mechanism ordinarily from forward movement, while it will allow the mechanism to be moved forwardly by the blow of the moving parts when the bit is not striking the end of the hole and transferring the energy of the machine to the drilling operations. A fluctuation of the air pressure will not change the operation, the drill being still fed forward uniformly and keeping the bit at work at its highest efficiency. The rearward movement of the drill is prevented by a ratchet mechanism shown in detail in Fig. 6. A collar 100 is formed on pump barrel 101 which projects from the rear cylinder head 40, collar 100 being placed angularly so as to allow the movement of ratchet member 102 as shown. A collar 103 on cap 104 on the rear end of the pump barrel confines member 102. A flat spring 105 keeps member 102 in the diagonal position shown. Member 102 has an aperture 102^a surrounding cylinder 10^a and is adapted to bind on the cylinder and prevent the rearward movement of the pump barrel unless member 102 is pressed back against spring 105. A small handle 106 mounted on the upper end of member 102 serves for the manipulation of the ratchet when it is desired to release it and allow the drill mechanism to move rearwardly.

Having described my invention, I claim:

1. A mechanism of the character described, comprising a supporting frame having ways thereon, a cylinder and piston mechanism slidably mounted on the ways, resilient means opposing the movement of the cylinder and piston mechanism in one direction, fluid pressure actuated means for moving the cylinder and piston mechanism in that direction, and fluid pressure operated means for frictionally holding the cylinder and piston mechanism against movement on the ways.

2. A mechanism of the character described, comprising a supporting frame having ways thereon, a cylinder and piston mechanism slidably mounted in the ways, resilient means opposing the movement of the cylinder and piston mechanism in one direction, fluid pressure actuated means for moving the cylinder and piston mechanism in that direction, frictional holding means between the supporting frame and the cylinder and piston mechanism, and means for actuating the frictional holding means from the same source of fluid pressure which operates the cylinder and piston moving mechanism.

3. A mechanism of the character described, comprising a supporting frame having ways thereon, a cylinder and piston mechanism slidably mounted in the ways, yielding means for moving the cylinder and piston mechanism in one direction, a mechanism for moving the cylinder and piston mechanism in the opposite direction, a mechanism for frictionally holding the cylinder and piston mechanism from movement on the ways, and coöperating means whereby the moving and frictional holding mechanism are operated simultaneously from the same source of power.

4. A mechanism of the character described, comprising a supporting frame of tubular section and having ways thereon, a cylinder and piston mechanism slidably mounted in the ways, a spring mounted in the frame and pressing against the cylinder and piston mechanism, fluid pressure actuated means for moving the cylinder and piston mechanism against the spring, a mechanism for frictionally holding the cylinder and piston mechanism from movement on the ways, and means for operating the friction mechanism from the source of fluid pressure which moves the cylinder and piston mechanism,

5. A mechanism of the character described, comprising a supporting frame having ways thereon, a cylinder and piston mechanism slidably mounted on the ways, a spring adapted to move the cylinder and piston mechanism rearwardly, a cylinder and plunger means for moving the cylinder and piston mechanism forwardly, the plunger being hollow and leading the fluid pressure to an air chamber in the cylinder and piston mechanism, air pressure actuated means on the cylinder and piston mechanism and frictionally engaging with the ways on the frame, the frictional mechanism being connected to the air chamber to be operated by the same air pressure which operates the cylinder and plunger mechanism.

6. A mechanism of the class described, comprising a supporting frame of tubular cross section and having ways on its forward end, a hollow plunger in its rear end, a cylinder and piston mechanism slidably mounted on the ways and mechanically connected to the plunger, a spring in the forward end of the frame and pressing rearwardly upon the cylinder and piston mechanisms, and fluid pressure actuated means for frictionally holding the cylinder and piston mechanism in place on the frame, the said means being connected by a duct to the interior of the hollow plunger.

7. A mechanism of the character described, comprising a supporting frame of tubular cross section and having ways on its forward end, a hollow plunger in the rear end of the frame, the rear end of the frame forming a cylinder for the plunger, a cylinder and piston mechanism mounted on the ways, a spring in the frame and pressing rearwardly on the cylinder and piston mechanism, a lever pivoted to the cylinder and piston mechanism and having a surface adapted to frictionally engage with one of the ways on the frame, and fluid pressure actuated means for moving the lever about its pivot to force its frictional surface into engagement with the way.

8. A mechanism of the class described, comprising a supporting frame of tubular cross section and having ways on its forward end, a hollow plunger in the rear end of the frame, the rear of the frame forming a cylinder for the plunger, a cylinder slidably mounted on the ways, a piston in the cylinder, a valve mechanism mounted on the piston and adapted to control the admission of fluid pressure to the cylinder for the movement of the piston, the valve mechanism having ducts connecting to the interior of the hollow plunger, spring supported buffers in each end of the cylinder, a spring mounted on the forward end of the frame and pressing rearwardly on the cylinder, a small cylinder formed in the walls of the first named cylinder, a piston in said small cylinder, a lever pivoted to the first named cylinder walls and having its end engaging with the piston in the said small cylinder, a surface on the lever adapted to be forced into frictional engagement with one of the ways on the frame by the movement of the piston in said small cylinder, means for admitting fluid pressure to the end of the frame forming a cylinder for the hollow plunger, there being ducts leading from the plunger interior to the small cylinder behind its piston.

9. A mechanism of the character described, comprising a supporting frame having ways thereon, a cylinder and piston mechanism slidably mounted on the ways, yielding means opposing the movement of the cylinder and piston mechanism in one direction, fluid pressure actuated means for moving the cylinder and piston mechanism in that direction, and means for frictionally holding the mechanism against movement on the ways.

In witness that I claim the foregoing I have hereunto subscribed my name this 5th day of November 1910.

WM. K. RILEY.

Witnesses:
JAMES T. BARKELEW,
F. A. CARTER.