Nov. 24, 1936. M. C. HUFFMAN 2,061,908

ROCK DRILL

Filed July 25, 1934 2 Sheets-Sheet 1

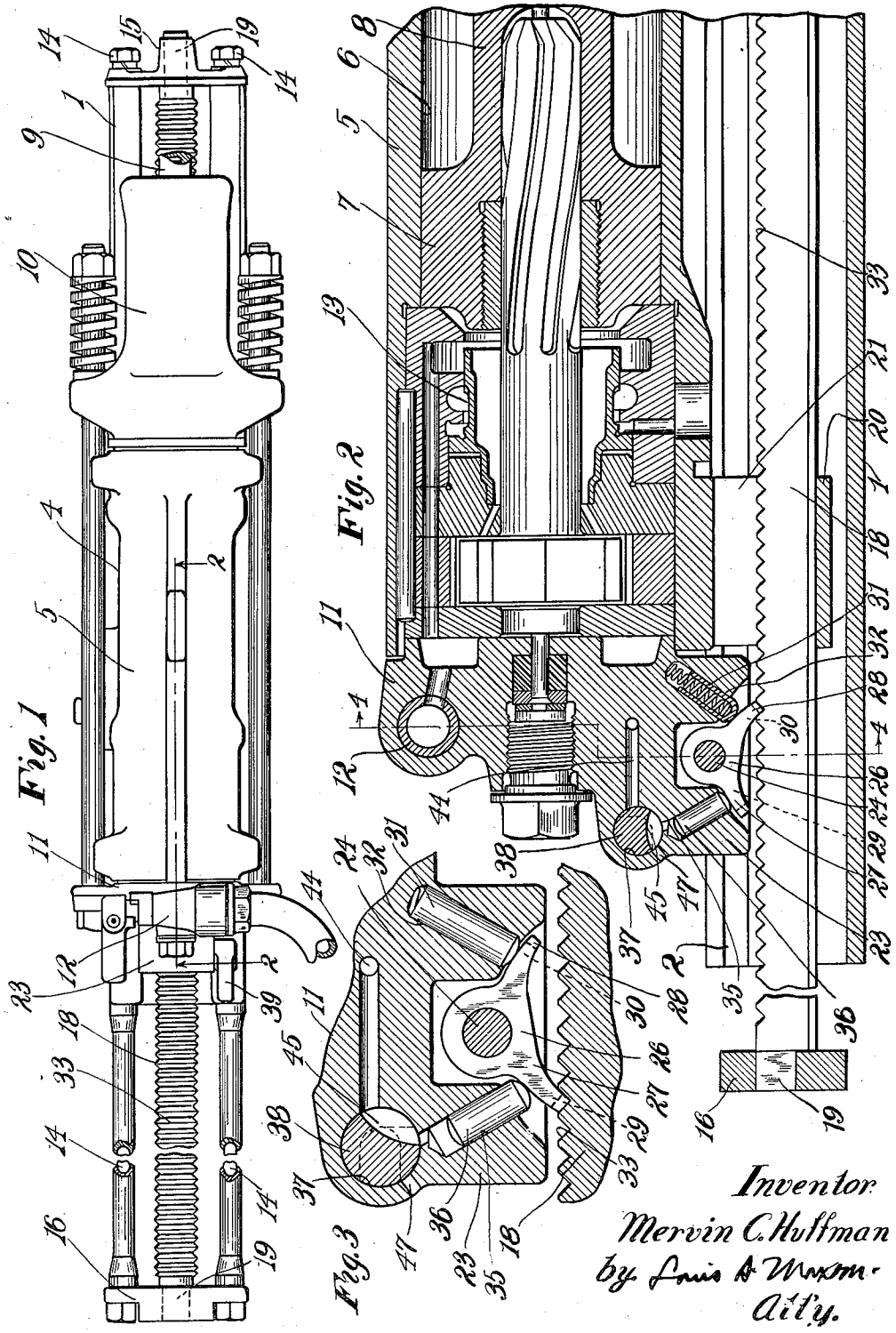

Fig. 1

Fig. 2

Fig. 3

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Fig. 4

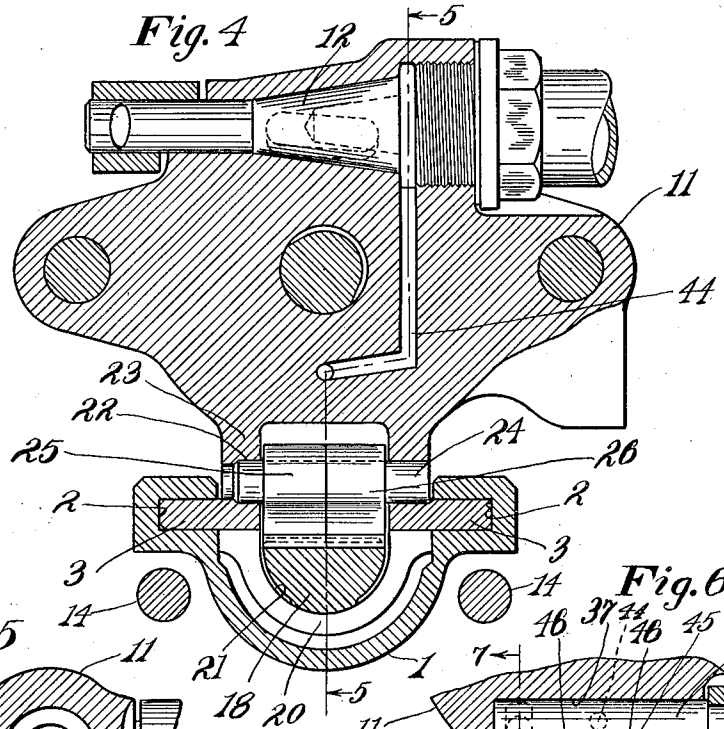


Fig. 5

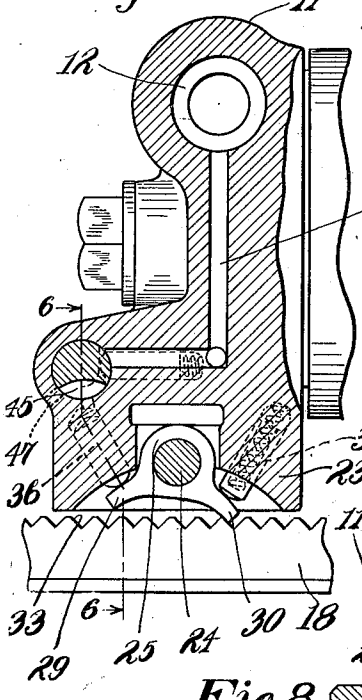


Fig. 6

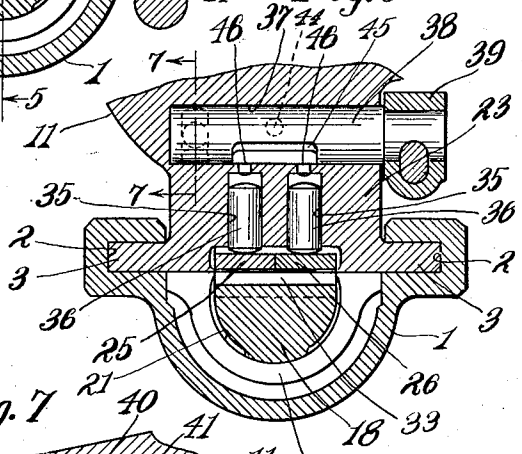
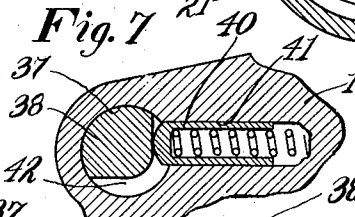


Fig. 7



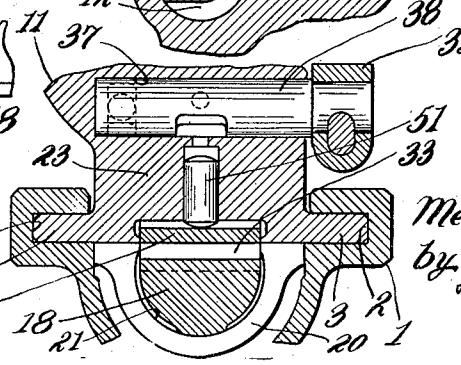


Fig. 8

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UNITED STATES PATENT OFFICE

2,061,908

ROCK DRILL

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Application July 25, 1934, Serial No. 736,917

7 Claims. (Cl. 255—45)

This invention relates to rock drills, and more particularly, but not exclusively, to improved automatic feeding means for a mounted rock drill of the pressure fluid actuated hammer type.

An object of this invention is to provide an improved rock drill feeding means. Another object is to provide an improved feeding means for a rock drill wherein the feed is automatically controlled by the vibrations of the drill hammer motor during the drilling operation. A further object is to provide an improved automatic rock drill feeding means of the vibration-controlled type and including a rack and cooperating reversible pawls and improved means for selectively effecting movement of the pawls into engagement with the rack teeth whereby the drill may be fed automatically in either of opposite directions. Yet another object is to provide in an automatic feeding means of the above character an improved pressure fluid actuated, valve-controlled pawl operating means for controlling the direction of feed. These and other objects will, however, hereinafter more fully appear.

In the accompanying drawings there are shown for purposes of illustration one form and a modification thereof which the invention may assume in practice.

In these drawings,—

Fig. 1 is a plan view of a rock drill having embodied therein one illustrative form of the improved automatic feeding means.

Fig. 2 is an enlarged longitudinally extending vertical sectional view taken substantially on line 2—2 of Fig. 1, omitting the pawl mechanism.

Fig. 3 is an enlarged detail sectional view of the pawl operating means.

Fig. 4 is a cross sectional view taken substantially on line 4—4 of Fig. 2.

Fig. 5 is a longitudinally extending vertical sectional view taken on line 5—5 of Fig. 4.

Fig. 6 is a detail sectional view taken on line 6—6 of Fig. 5.

Fig. 7 is a detail sectional view taken on line 7—7 of Fig. 6.

Fig. 8 is a view similar to Fig. 6 showing a modified form of pawl construction.

In this illustrative construction the improved automatic feeding means is shown embodied in a rock drill of the mounted drifter type comprising a guide shell 1 having parallel longitudinally extending guideways 2 for receiving parallel guides 3 formed by lateral projections on the rock drill hammer motor, generally designated 4. This rock drill hammer motor is of an ordinary construction and comprises a cylinder 5 having a bore 6 receiving a reciprocable hammer piston 7. As is usual in rock drills of the type disclosed, the hammer piston 7 is provided with a forwardly projecting striking bar 8 for delivering impact blows to the shank of a drill steel 9 mounted in a usual manner within a front chuck housing 10 secured to the forward end of the motor cylinder. Secured to the rear end of the motor cylinder is a back head 11 having mounted therein a usual throttle valve 12 for controlling the flow of pressure fluid from any suitable source of pressure fluid supply to an automatic fluid distributing valve mechanism 13 by which the flow of pressure fluid to the motor cylinder to effect reciprocation of the hammer piston is controlled. Secured as by side bolts 14, 14 to the forward end of the guide shell 1 is a transverse yoke plate 15, and these side bolts extend rearwardly in parallel relation to the rear end of the guide shell and support at their rearward ends a transverse yoke plate 16.

Now referring to the improved automatic drill feeding means, it will be noted that there is provided a longitudinally extending rack bar 18 arranged in the guide shell 1 in the space between the guideways 2 in the manner shown in Fig. 4, and this rack bar has projecting end portions 19, 19 of polygonal cross section fitting within correspondingly shaped sockets formed in the yoke plates 15 and 16. The hammer motor cylinder 5 is provided with a depending boss 20 having a longitudinal bore 21 within which the lower, convex surface of the rack bar fits for guiding the intermediate portion of the rack bar. It will thus be seen that the rack bar 18 is rigid with respect to the guide shell and is positively held against rotative movement by the yoke plates. As shown in Fig. 4, mounted in a transverse bore 22 formed in a depending portion 23 of the back motor head 11 is a shaft 24 on which is loosely mounted for oscillatory movement a pair of pawls 25 and 26. The pawl 26 has oppositely or reversely disposed pawl portions 27 and 28, while the pawl 25 has similar pawl portions 29 and 30 of slightly shorter length than the pawl portions 27 and 28, for a purpose to be later described. Engaging the pawl portions 28 and 30 of the pawls 26 and 25, respectively, are spring-pressed plungers 31 mounted within recesses 32 formed in the back motor head 11, and these plungers normally urge the pawl portions 28 and 30 into engagement with the rack teeth 33 formed along the top surface of the rack bar 18. These teeth have opposed pawl engaging surfaces so that when the pawls engage one sur-

face the hammer motor is fed in one direction and in the opposite direction when the pawls engage the opposed surfaces. Arranged in parallel bores 35, 35 in the back motor head 11 is a pair of plungers 36, 36 engaging the pawl portions 27 and 29 of the pawls 26 and 25, respectively. Formed in the depending portion 23 of the back motor head is a bore 37 having mounted therein a rotary control valve 38 having an operating handle 39. The valve 38 is maintained in the bore 37 and is located in its different adjusted positions by a spring pressed retaining and positioning plunger 40 arranged in a bore 41 and engaging a circumferentially extending groove 42 formed in the valve body. Leading from the throttle valve 12 is a passage 44 for conducting pressure fluid from the throttle valve chamber to the bore 37 of the control valve 38, and formed on the valve 37 is a groove 45 for connecting the passage 44 with passages 46, 46 communicating with the bores 35, 35 at the upper ends of the plungers 36, 36. Also communicating with the valve chamber 37 is a vent passage 47.

In the modified form of construction shown in Fig. 8, but a single wide pawl 50 is provided for engaging the rack teeth, and a single pressure fluid actuated plunger 51 is provided for reversing the position of the pawl. Otherwise this form of the invention is the same as that shown in Fig. 6.

The operation of the improved automatic control feeding means is as follows: When it is desired to effect feeding of the drill hammer motor forwardly along the guides of the guide shell, the throttle valve is operated to admit pressure fluid to the automatic fluid distributing valve mechanism 13, thereby to effect rapid reciprocation of the hammer piston 7 within the motor cylinder, to actuate percussively the drill steel 9. The reciprocation of the hammer piston within its cylinder causes, due to the sudden reversal of movement of the piston, vibration in a longitudinal direction of the hammer motor in a manner well known to those skilled in the art. The feed control valve 38 is then adjusted into the position shown in Fig. 3 to supply pressure fluid from the passage 44 through ports 46, 46 to the plunger bores to move the plungers 36, 36 downwardly, thereby swinging the pawls 25, 26 against the action of the spring pressed plungers 31 to the position shown in Fig. 3 with the pawl portions 27 and 29 engaging the rack teeth 33. The action of the hammer piston as the latter rapidly reciprocates, to effect percussive actuation of the drill steel, causes the pawls to be jogged along the rack bar, feeding the drill hammer forwardly along the guide shell toward the work and holding the drill steel at all times in the most effective drilling position with respect to the work. The pawl portion 29, being somewhat shorter in length than the pawl portion 27, engages the rack teeth at a point intermediate the points of engagement of the pawl portion 27 with the rack teeth so that the pawl mechanism jogs along at a half a tooth at a time instead of a full tooth, as in the single pawl form shown in Fig. 8. When the control valve 38 is rotated to the position shown in Fig. 2, the plunger bores 35 are vented to atmosphere through the vent passage 47, thereby causing the spring pressed plungers 31 to move the pawl portions 28 and 30 into engagement with the rack teeth 33 and thereby effect reversal of the direction of feed, the pawl portions 28 and 30 both engaging the rack to effect rearward feed as the hammer piston continues to reciprocate within its cylinder.

As a result of this invention, it will be noted that an improved automatic drill feeding means is provided wherein the feed is effected and controlled by the longitudinal vibrations of the drill hammer motor during the drilling operation. It will further be noted that an improved feed reversing means is provided, regulated by pressure fluid and valve controlled, whereby the direction of feed may be reversed at will. It will still further be evident that the improved automatic feeding means is of an extremely simple and rugged character and composed of a relatively small number of parts of rugged and simple design. These and other uses and advantages of the improved drill feeding means will be clearly apparent to those skilled in the art.

While there are in this application specifically described one form and a modification which the invention may assume in practice, it will be understood that this form and modification of the same are shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In combination, a relatively reciprocably related drilling motor and drilling motor guideway, and means for effecting selectively opposite feeding of said motor relative to said guideway including teeth, pawl means comprising alternatively operative pawl portions for cooperating with said teeth, means for yieldingly pressing one of said pawl portions into tooth engaging position and holding the other in inoperative position, and means rendered operative at will for exerting a force superior to the force exerted by said third mentioned means and transmitting such superior force to press said other of said pawl portions yieldingly into tooth engaging position and to move the first mentioned pawl portion into inoperative position and there maintain it while said first mentioned pawl portion is still subjected to the force which was previously effective to press it into tooth engaging position.

2. In combination, a relatively reciprocably related drilling motor and drilling motor guideway, and means for effecting selectively opposite feeding of said motor relative to said guideway including teeth, alternatively operative pawls cooperating therewith, means for yieldingly pressing one of said pawls into tooth engaging position and holding the other in inoperative position, and means operable at will for exerting a superior force for yieldingly pressing said other of said pawls into tooth engaging position and holding the first in inoperative position, said last mentioned means including a pressure fluid operated plunger cooperating directly with a pawl.

3. In combination, a relatively reciprocably related drilling motor and drilling motor guideway, and means for effecting selectively opposite feeding of said motor relative to said guideway including a toothed rack bar carried by the guideway, alternatively operative pawls cooperating therewith, pivotally mounted for movement about axes fixed relative to said motor, means for yieldingly pressing one of said pawls into tooth engaging position and holding the other in inoperative position, and a pneumatically actuated plunger made effective at will for exerting a superior force for yieldingly pressing said other of

said pawls into tooth engaging position and holding the first in inoperative position.

4. In combination, a relatively reciprocably related drilling motor and drilling motor guideway, a rack bar carried by one of the same, a two-armed pawl pivotable about an axis fixed relative to the other of the same, yielding means constantly acting to press one arm of said pawl into cooperative relation to said rack bar, and means rendered operative at will for exerting a force superior to the force exerted by said first mentioned means and transmitting such superior force to press the other arm of said pawl yieldingly into tooth engaging position and to move the first mentioned pawl arm into inoperative position and there maintain it while said first mentioned pawl arm is still subjected to the force which was previously effective to press it into tooth engaging position.

5. In combination, a relatively reciprocably related drilling motor and drilling motor guideway, a rack bar carried by one of the same, a two-armed pawl pivotable about an axis fixed relative to the other of the same, yielding means coacting with one arm of said pawl constantly acting to press said arm of said pawl into cooperative relation to said rack bar, and means effective at will for exerting a superior, pneumatic force on the other arm of said pawl to overcome said yielding means and yieldingly maintain said other arm of said pawl in cooperative relation to said rack bar.

6. In combination, a guide shell having a rack bar fixed against longitudinal movement with respect thereto, a drilling motor slidably guided by said shell, a two-armed pawl swingably supported by said drilling motor, resilient means for normally maintaining one arm of said pawl in cooperative relation with the rack bar, and means rendered operative at will for exerting a force superior to the force exerted by said first mentioned means and transmitting such superior force to press the other arm of said pawl yieldingly into tooth engaging position and to move the first mentioned pawl arm into inoperative position and there maintain it while said first mentioned pawl arm is still subjected to the force which was previously effective to press it into tooth engaging position.

7. In combination, a guide shell having a rack bar fixed against longitudinal movement with respect thereto, a drilling motor slidably guided by said shell, a two-armed pawl swingably supported by said drilling motor, a spring actuated plunger for normally maintaining one arm of said pawl in cooperative relation with the rack bar, and pneumatically actuated means for overcoming said resilient means and maintaining the other arm of said pawl yieldingly in cooperative relation with the rack bar unit.

MERVIN CHESTER HUFFMAN.