June 1, 1937. E. G. GARTIN 2,081,918

ROCK DRILL

Filed Dec. 22, 1933 2 Sheets-Sheet 1

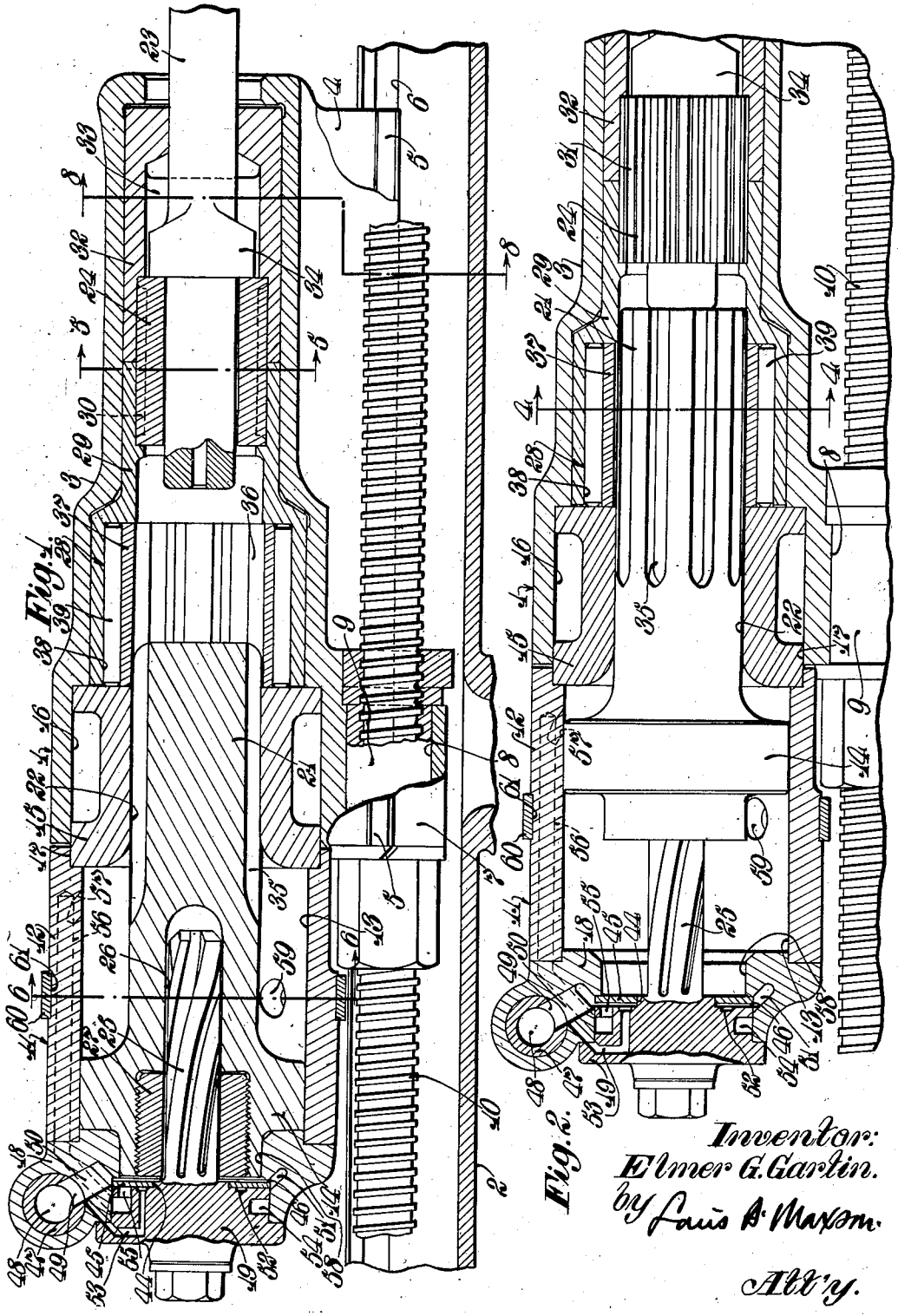


Fig. 1.

Fig. 2.

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Fig. 3.

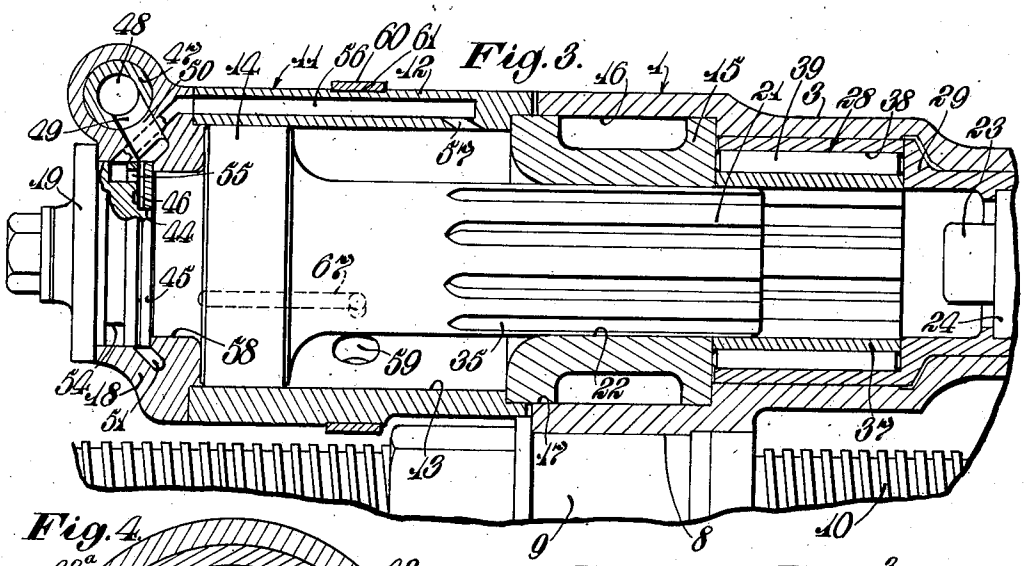


Fig. 4.

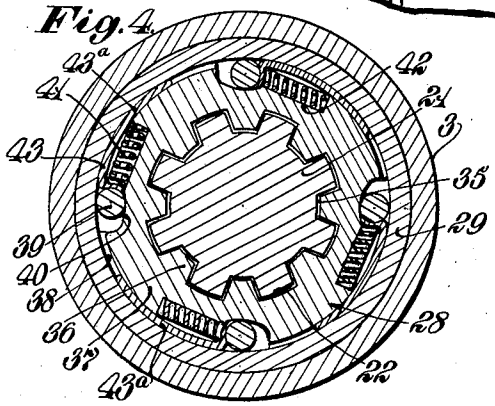


Fig. 5.

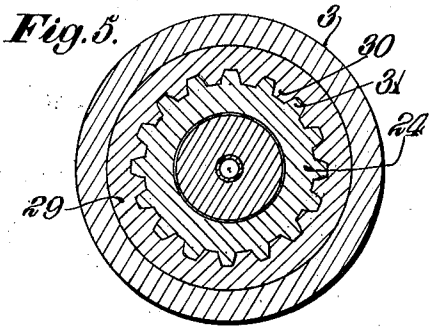


Fig. 7.

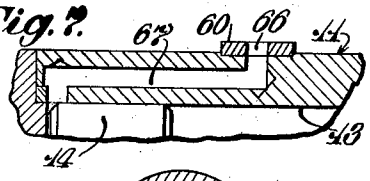


Fig. 6.

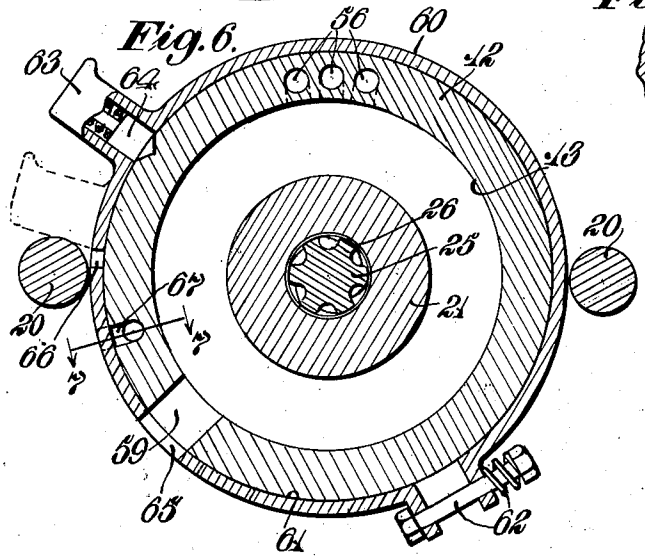
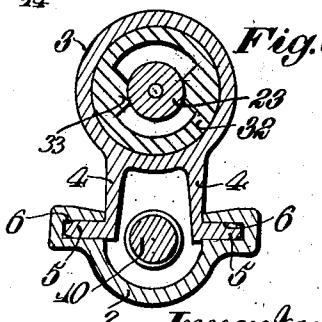


Fig. 8.



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UNITED STATES PATENT OFFICE

2,081,918

ROCK DRILL

Elmer G. Gartin, Claremont, N. H., assignor to Sullivan Machinery Company, a corporation of Massachusetts

Application December 22, 1933, Serial No. 703,580

3 Claims. (Cl. 255—45)

This invention relates to rock drills, and more particularly, but not exclusively, to improvements in rock drills of the mounted drifter type.

An object of this invention is to provide an improved rock drill. Another object is to provide an improved rock drill having an improved pressure fluid actuated hammer motor. A further object is to provide an improved rock drill of the drifter type having improved guiding means. Yet another object is to provide an improved rock drill having improved drill steel rotation means. A further object is to provide a rock drill having an improved pressure fluid actuated hammer motor and improved valve means for controlling the fluid distribution means therefor. These and other objects and advantages of the invention will, however, hereinafter more fully appear.

In the accompanying drawings there is shown, for purposes of illustration, one form which the invention may assume in practice.

In these drawings,—

Fig. 1 is a central, longitudinally extending, vertical sectional view showing the illustrative form of the improved rock drill.

Fig. 2 is a view similar to Fig. 1 showing the fluid distributing valve and hammer piston in a different position.

Fig. 3 is a view similar to Fig. 2 showing the fluid distributing valve and hammer piston in a hole blowing position.

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

Fig. 5 is a cross sectional view taken on line 5—5 of Fig. 1.

Fig. 6 is a cross sectional view taken on line 6—6 of Fig. 1.

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

Fig. 8 is a cross sectional view on a reduced scale, taken on line 8—8 of Fig. 1.

In this illustrative construction there is shown a rock drill of the mounted drifter type, generally comprising a hammer mechanism, generally designated 1, slidably mounted on a guide shell 2. The hammer mechanism comprises a front chuck housing or frame 3 having, as shown in Fig. 8, depending portions 4, 4 provided with lateral projections 5 forming guides slidably mounted for rectilinear movement along the guide shell in guideways 6. The guides 5 are formed solely on the chuck housing throughout the entire length of the latter and constitute the sole supporting and guiding means for the hammer mechanism. Formed integral with the depending portions 4, 4 of the chuck housing 3 at the rear end of the latter and arranged between the guides 5, 5 is a depending boss 7 having a longitudinal bore 8 in which is mounted, in non-rotatable relation, a feed nut 9. As is usual in rock drills of the drifter type, the non-rotatable feed nut 9 threadedly engages a feed screw 10 rotatably mounted in a suitable manner within the guide shell 2, and having at its rear end a manual rotating handle, not shown, so that when the feed screw is rotated relative to the feed nut, the hammer mechanism 1 is fed rectilinearly along the guideways of the guide shell 2.

Arranged at the rear end of the hammer mechanism and supported solely by the chuck housing 3 is a pressure fluid actuated hammer motor 11 comprising a motor cylinder 12 having a bore 13 containing a reciprocable hammer piston 14. The motor cylinder has a front head 15 arranged within a bore 16 formed in the chuck housing or frame 3 and having a rearwardly projecting portion fitting within a counter-bore 17 formed within the forward end of the motor cylinder. The motor cylinder is provided with a rear head block 18 having secured thereto in non-rotatable relation with respect thereto, a rear head member 19; and the elements 12, 15, 18 and 19 are held in assembled relation with respect to the chuck housing in any suitable manner, herein by side bolts 20, 20 shown in Fig. 6. The hammer piston 14 is formed with a forwardly projecting striking bar 21 guided within a bore 22 formed in the front head 15, and this striking bar is adapted to transmit the hammer blows of the piston to the shank of a drill steel 23 arranged within the forward end of the hammer mechanism and supported within a chuck bushing 24 rotatably supported within the chuck housing 3.

The improved drill rotation means operated by the hammer piston comprises a spirally grooved rifle bar 25 fixed to the non-rotatable head member 19 and projecting within a bore 26 formed in the hammer piston, the spiral grooves of this rifle bar engaging the spiral lugs of a rifle nut 27 fixed within the rear end of the hammer piston. This rifle bar, due to its interlocking engagement with the hammer piston, causes the latter to oscillate back and forth as the same reciprocates, and this oscillatory movement of the hammer piston is transformed into an intermittent rotary movement by means of a slip rotation mechanism, generally designated 28. Driven through this slip rotation mechanism 28 is a chuck sleeve 29 rotatably mounted within the chuck housing 3 and having inwardly pro-

jecting teeth **30** interlocked with corresponding teeth **31** formed on the exterior periphery of the chuck bushing **24**. Also having teeth interlocked with the teeth **31** of the chuck bushing, is a driver member **32**, also rotatably mounted within the chuck housing, and having driving lugs **33** engageable with the usual lugs **34** of the drill steel **23**.

Now referring to the improved slip rotation mechanism, it will be noted that formed on the exterior periphery of the striking bar **21** of the hammer piston are longitudinal grooves **35** interlocked with inwardly projecting teeth **36** formed on a combined chuck nut and grip member **37**, herein arranged within an enlarged bore **38** formed within the rear portion of the chuck sleeve **29**. This member **37** carries elongated gripping rollers **39** adapted to engage with a wedging action inclined surfaces **40** formed on the member **37** and the interior periphery of the bore **38**, and these rollers are normally urged toward their gripping or wedging position by means of coil springs **41** arranged within recesses **42** formed in the member **37** and engaging a follower member **43**, in turn engaging the rollers. Each of these follower members is provided with an arcuate guide portion **43a** fitting within the annular space formed between the member **37** and the bore **38**. It will thus be seen that as the hammer piston is oscillated during its reciprocatory movement, the member **37**, due to its interlocking connection with the piston striking bar, is likewise oscillated back and forth, and this oscillatory movement of the member **37** is transformed into an intermittent rotary movement through the gripping rollers **39**, the rollers gripping the interior periphery of the bored portion of the chuck sleeve in one direction and releasing automatically upon rotation of the member **37** in the opposite direction. This intermittent rotary motion is transmitted through the chuck sleeve **29** to the chuck bushing **24**, and thence through the lugs of the driver member **32** to the lugs **34** of the drill steel **23**; and as a result, as the hammer piston reciprocates, the drill steel is intermittently rotated.

Now referring to the improved fluid distribution means for the hammer motor for effecting reciprocation of the piston, it will be noted that guided on a reduced cylindrical portion **44** of the head member **19** and surrounding the rear portion of the rifle bar **25**, is a fluid distributing valve **45**, herein in the shape of an annular disc and arranged in an annular valve chamber **46** formed in the rear head block **18** and the head member **19**. Arranged within the head block **18** is a throttle valve **47** having a central fluid supply passage **48** and controlling, through a radial port **49**, the flow of pressure fluid from the passage **48** to a passage **50** formed in the head block **18** and communicating with the valve chamber **46** through an annular chamber **51**. Formed in the forward face of the member **19** at the rear of the valve **45** is an annular groove **52** connected through a passage **53** with the fluid supply passage **50**. Formed on the head member **19** is an annular groove **54** communicating through passages **55** with the valve chamber at the rear side of the valve, and connected through passages **56** and ports **57** with the forward end of the cylinder bore. The valve chamber at the forward side of the valve communicates with the rear end of the cylinder bore through an axial passage **58** formed in the head block **18** and surrounding the rifle bar **25**. Pressure fluid is exhausted from the opposite ends of the cylinder bore under the control of the hammer piston through a central exhaust passage **59**.

When the parts are in the position shown in Fig. 1, the communication of the groove **51** with the passages **55**, **56** is cut off by the valve **45** and pressure fluid flows through the passage **50**, annular groove **51**, through the valve chamber **46**, past the forward face of the valve and through the axial passage **58** to the rear end of the cylinder bore to act on the rear pressure area of the piston to drive the latter forwardly to effect its working stroke, and as a result, delivering a hammer blow to the shank of the drill steel **23**. When the piston head overruns the exhaust passage **59**, the pressure within the cylinder bore at the rear side of the piston head drops materially, while the pressure trapped within the forward end of the cylinder bore is compressed, and as a result, the valve **45** is thrown from the position shown in Fig. 1 to the position shown in Fig. 2, the valve being thrown by the compression pressure built up within the forward end of the cylinder bore and the constant pressure in groove **52** acting against the opposing reduced pressure within the rear end of the cylinder bore. When the valve is in the position shown in Fig. 2, communication of the passage **58** with the valve chamber is cut off by the valve **45** and pressure fluid flows from passage **50** and annular groove **51** through the valve chamber at the rear side of the valve, through passages **55**, groove **54**, passages **56** and ports **57**, to the forward end of the cylinder bore to act on the forward pressure area of the piston to drive the latter rearwardly to effect its retraction stroke. As the hammer piston moves rearwardly, the exhaust port **59** is overrun by the front edge of the piston head, thereby causing the pressure within the forward end of the cylinder bore to drop materially, while the pressure trapped within the rear end of the cylinder bore is compressed, and as a result, the valve is thrown from the position shown in Fig. 2 back to the position shown in Fig. 1, the valve being thrown by the compression pressure acting on the forward pressure area of the valve against the opposing reduced pressure in the groove **52** acting on the rear pressure area of the valve. These operations are repeated in rapid succession to effect rapid reciprocation of the hammer piston.

The improved means for controlling the hammer motor to effect a hole blowing operation herein comprises an annular split spring valve member **60** arranged within an annular groove **61** surrounding the motor cylinder and having its ends yieldably connected together by a bolt and spring connection **62**. Formed on the member **60** is a handle **63** carrying a spring pressed plunger lock **64** for holding the valve **60** in its released position. When the valve is in this released position, as shown in Fig. 6, a port **65** formed therein registers with the exhaust passage **59**. When the handle **63** is swung downwardly into a position wherein the same engages the adjacent side bolt **20**, the exhaust passage **59** is closed, while a passage **66** formed in the valve **60** is brought into registry with a passage **67** communicating, as shown in Fig. 7, with the rear end of the cylinder bore. It will thus be seen that when the valve **60** is in its position wherein the port **66** registers with the passage **67**, the cylinder exhaust passage **59** is closed, while the cylinder bore at the rear side of the hammer piston is connected to exhaust through passage **67** and port **66**. As a result, pressure fluid flowing from the passage **50** through groove

51 and through the valve chamber past the rear surface of the valve flows through ports 55, groove 54, passages 56 and ports 57, to the forward end of the cylinder bore, thereby moving the hammer piston to its rearmost position in the cylinder bore and holding it there. When the hammer piston is thus disposed, pressure fluid flows from the forward end of the cylinder bore through grooves 35 formed in the striking bar, through the chuck nut 37 and chuck sleeve 29, and thence through the central bore formed in the drill steel 23, to the bottom of the drill hole to blow out the cuttings from the hole. When the valve 60 is again returned to the full-line position shown in Fig. 6, the normal operation of the hammer motor is resumed.

As a result of this invention, it will be noted that an improved rock drill is provided, of the mounted drifter type, having improved means for guiding the hammer mechanism within the guide shell, and improved mechanism for hammering and rotating the drill steel, the improved hammer motor being mounted in an improved manner directly on the chuck housing. It will further be noted that an improved rock drill is provided, having improved drill steel rotation means and improved means associated with the hammer motor for effecting a hole blowing operation. These and other uses and advantages of the improved rock drill will be clearly apparent to those skilled in the art.

While I have in this application specifically described one form which my invention may assume in practice, it will be understood that this form is 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 a rock drill, a support having a longitudinal guideway, a rock drilling motor comprising a cylinder containing a piston and front and rear heads, a chuck housing, a chuck within said chuck housing for supporting the shank of a drill steel, said chuck housing having a bore receiving the forward portion of said front head and said cylinder being attached to and wholly supported by said chuck housing, the latter having elongated integral guides extending throughout substantially its length and slidably engaging in said support guideway, and means for securing the motor parts together embodying means whereby the motor cylinder and back head may be detached from the chuck housing while the guides of the latter remain in said support guideway and said chuck and front head remain in supported position in said chuck housing.

2. In a rock drill, a support having a longitudinal guideway, a rock drilling motor comprising a cylinder containing a reciprocating piston having a striking bar for actuating a drill steel, front and rear heads for said cylinder, a front chuck housing having integral elongated guides for slidably supporting the drilling motor in said support guideway, said chuck housing having a bore, a chuck rotatably mounted in said chuck housing bore for receiving the shank of the drill steel, means arranged in said chuck housing bore and operated by the piston striking bar for rotating said chuck, said front motor head arranged in said chuck housing bore and said chuck, steel rotating means and front head all supported solely within the chuck housing, said motor cylinder being attached to and wholly supported by said chuck housing at the rear end of the latter, and means for securing the motor parts together embodying means whereby said motor cylinder and rear head may be detached from said chuck housing while the guides of the latter remain in said support guideway and said chuck, steel rotating means and front head all remain in supported position in said chuck housing.

3. In a rock drill, a support having a longitudinal guideway, a rock drilling motor comprising a cylinder containing a reciprocating piston having a striking bar for actuating a drill steel, front and rear heads for said cylinder, a front chuck housing having integral elongated guides for slidably supporting the drilling motor in the support guideway, said chuck housing having a bore, a chuck rotatably mounted in the chuck housing bore for receiving the shank of a drill steel, means arranged in said chuck housing bore and operated by the piston striking bar for rotating said chuck including a chuck sleeve rotatably mounted in said chuck housing bore and connected to said chuck and an intermittent grip connection between the piston striking bar and said chuck sleeve, said front motor head arranged in said chuck housing bore and said chuck, chuck sleeve and front head all supported solely within the chuck housing, said motor cylinder being attached to and wholly supported by said chuck housing at the rear end of the latter, and means for securing the motor parts together embodying means whereby said motor cylinder and rear head may be detached from said chuck housing while the guides of the latter remain in said support guideway and said chuck, chuck sleeve, intermittent grip connection and front head all remain in supported position in said housing.

ELMER G. GARTIN.