

Sept. 24, 1946.

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2,407,976

DRILLING APPARATUS

Filed Sept. 28, 1944

2 Sheets-Sheet 1

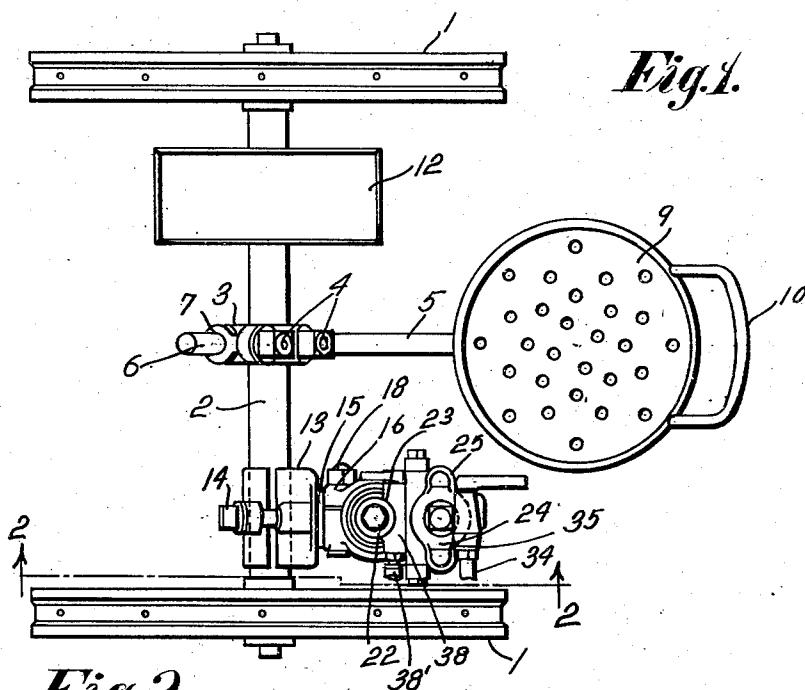


Fig. 1.

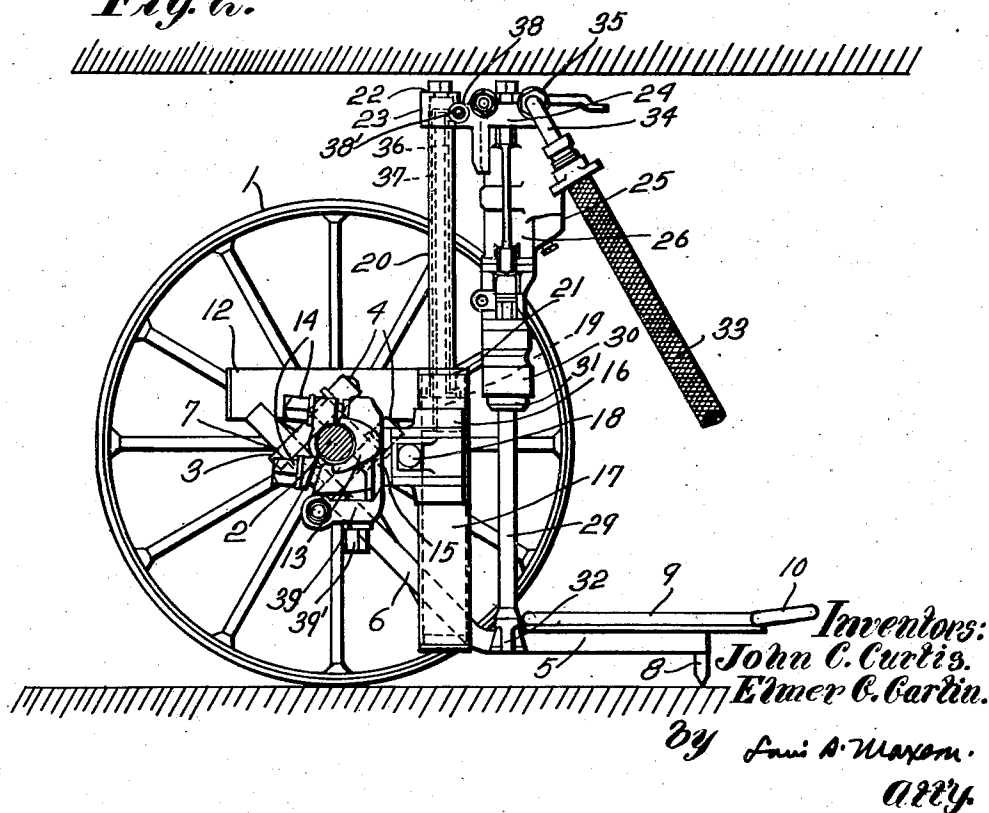


Fig. 2.

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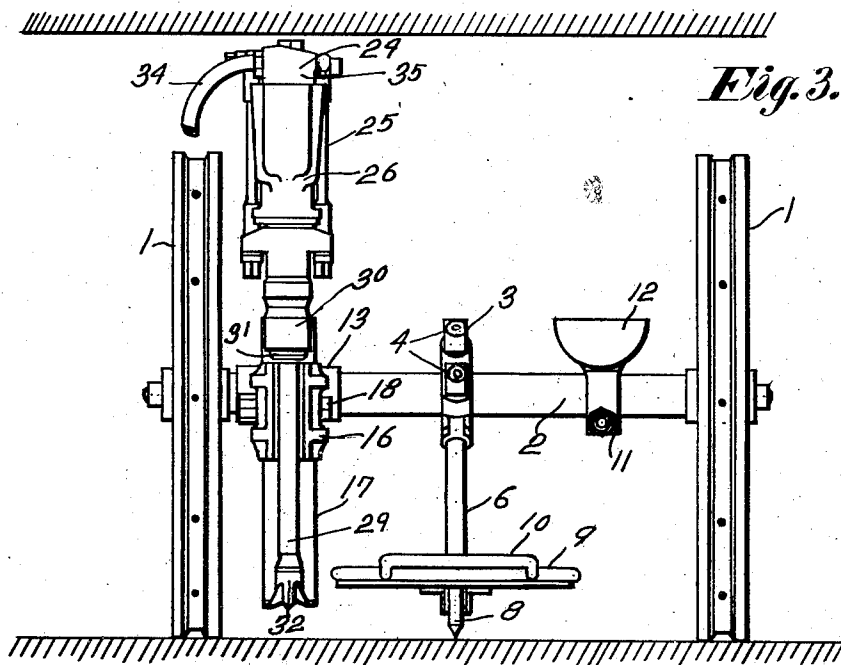


Fig. 3.

Fig. 4.

Fig. 6.

Fig. 7.

Fig. 8.

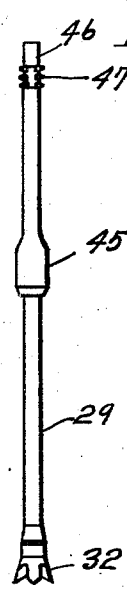
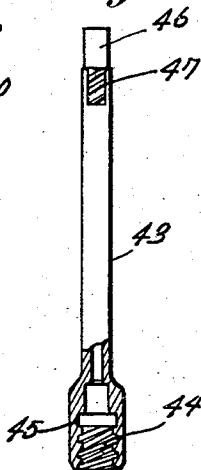
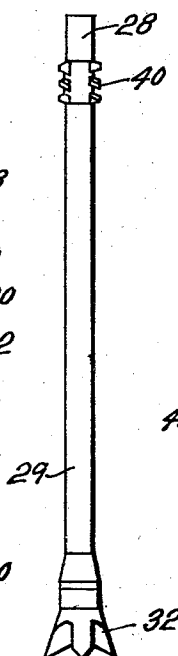
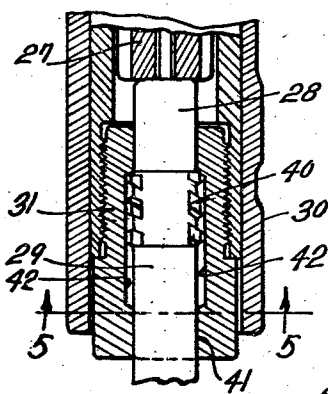
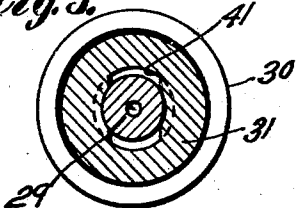


Fig. 5.



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UNITED STATES PATENT OFFICE

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DRILLING APPARATUS

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Application September 28, 1944, Serial No. 556,259

7 Claims. (Cl. 255—51)

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This invention relates to drilling apparatus and more particularly to an improved portable drilling apparatus for drilling substantially vertical bottom holes below the surface on which the apparatus is supported.

In underground mines such as coal mines, the seams are oftentimes very narrow affording low headroom, and, to increase the height of the seam, it is necessary to take up the bottom. Usually handheld drilling tools are employed to drill blast holes in the bottom coal, and, due to the relatively restricted space, the manual supporting and guiding of the drilling tool is a very laborious task. From its broad aspect, the present invention relates to a novel portable drilling tool mounting of an extremely low compact construction especially designed to operate in a narrow coal seam having low headroom, thereby to relieve the operator of the laborious task of manually supporting and guiding the drilling tool during the drilling operation. In a preferred embodiment, the drilling apparatus may comprise a portable base comprising a pair of supporting wheels adapted to run along the bottom of a coal seam and supporting a guide for the drilling tool and a bottom engaging support operatively connected to the drill guide for receiving the weight of the operator to hold the drill guide in operative tool-supporting position. The support for receiving the operator's weight may assume the form of a platform or seat so that the operator, in the cramped space available, may take a comparatively comfortable position during operation of the drilling tool. The drilling tool may be mounted to move in a substantially vertical direction along a guideway on the drilling tool guide, and motor operated feeding means may be employed to feed the drilling tool toward and from the work.

An object of the present invention is to provide an improved portable mounting for a drilling tool. Another object is to provide an improved portable drilling apparatus of an extremely low compact design for drilling substantially vertical holes below the surface on which the apparatus is supported. A further object is to provide an improved portable drilling apparatus especially designed for use in underground mines having low headroom for drilling bottom holes. A still further object is to provide an improved drilling apparatus of the wheel supported type having novel means for holding the drilling tool in operative drilling position by the weight of the operator. Still another object is to provide an improved drilling apparatus having a novel arrangement and combination of parts. These and other objects and advantages of the invention will, however, hereinafter more fully appear.

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

In these drawings:

5 Fig. 1 is a top plan view of a drilling apparatus constructed in accordance with an illustrative embodiment of the invention.

Fig. 2 is a vertical sectional view of the drilling apparatus, taken on line 2—2 of Fig. 1.

10 Fig. 3 is an end elevational view of the improved drilling apparatus.

Fig. 4 is an enlarged view in longitudinal vertical section taken through the forward portion of the drilling apparatus, showing details of the tool chuck.

15 Fig. 5 is a cross sectional view taken on line 5—5 of Fig. 4.

Fig. 6 is a detail view of the drill steel section which carries the drill bit.

20 Fig. 7 is a detail view of an additional steel section.

Fig. 8 is a view on a reduced scale, showing the steel sections of Figs. 6 and 7 coupled together.

25 In this illustrative construction there is shown a portable base comprising a pair of supporting wheels 1, 1 adapted to run along a supporting surface such as the bottom of a coal seam and having a transverse axle 2 which is freely rotatable in the wheel bearings. Attached by a clamp 3 having tightening bolts 4, is a rodlike arm or support 5 having an upwardly bent rearward portion 6 (see Fig. 2). The rearward bent portion 6 of the support 5 is adjustable at 7 within the clamp 3 and is also held in adjusted position 35 with respect to the clamp by the bolts 4. By the provision of the attachments 3 and 7, the rodlike support 5 may be adjusted laterally along the axle 2, and the rearward arm portion may be adjusted in an endwise direction relative to the clamp. The rodlike arm or support 5 has a bottom pointer 8 located near the outer end of the support and engageable with the bottom supporting surface. In lieu of the pointer 8 an auxiliary supporting wheel may be provided, if desired. 45 Carried by the support 5 just above the pointer 8 is a platform or seat 9 adapted to receive the weight of the drill operator to maintain the pointer in firm engagement with the bottom supporting surface, thus to hold the axle 2 against turning about its longitudinal axis in the wheel bearings. Provided at the outer end of the support 5 at the side of the seat remote from the wheels is a grasping handle 10, whereby the operator may readily lift the support 5 and use the same as a handle to 55 move the apparatus from place to place.

In this illustrative construction, attached by a conventional clamp 11 to the axle 2 at one side of the support 5 is a drill steel container 12 in which

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a supply of drill steel sections may be placed. Also attached to the axle 2 by a clamp 13 tightened by bolts 14 is a conventional trunnion support or swivel plate 15 formed as a part of a clamp 16, the latter carrying the feeding means for the drilling tool. The support 5 is angularly disposed with respect to the feeding means so that when the support pointer 8 is in engagement with the ground surface the feeding means is in substantially an upright position. The feeding means may assume various forms and herein includes an upright feed cylinder 17 firmly held in position within the clamp 16 by a tightening bolt 18. Reciprocable in the feed cylinder is a feed piston 19 having its piston rod 20 extending upwardly through the top packed head 21 of the feed cylinder. Secured at 22 to the upper end of the feed piston rod is a bracket 23 herein preferably integral with a rear head block 24 of a hammer drilling tool 25. The drilling tool has a pressure fluid motor 26 of a conventional design including a reciprocable hammer piston 27 (see Fig. 4) for percussively actuating the shank 28 of a drill steel 29. The drilling tool has a usual front chuck housing 30 containing a chuck 31 in which the steel shank is received and supported. Carried by the drill steel is a usual detachable drill bit 32.

In this illustrative embodiment, pressure fluid may be supplied to the hammer motor through a supply hose 33 connected by a swivelled pipe 34 to the back head 24 of the drilling tool, and the latter has a usual throttle valve 35 for controlling the fluid supply to the motor. Passages 36 and 37 lead from a feed control valve 28 through the piston rod 20 into communication with the opposite ends of the feed cylinder 17 above and below the feed piston 19. Pressure fluid may be supplied to the feed control valve through a supply hose 38. Accordingly, under the control of the control valve 38, pressure fluid may be supplied to the feed cylinder selectively above and below the feed piston to feed the drilling tool either toward or from the work. The clamp 13 carries a clamp 39 tightened by a bolt 39' which may be loosened to enable swivelling of the trunnion support or swivel plate 15 of the feed cylinder clamp 16 with respect thereto to enable lateral inclination of the drilling tool with respect to the vertical. Also the clamp 13, 14 may be loosened or completely released to enable positioning of the drilling tool longitudinally of the axle 2 or to enable transposition of the drilling tool to the other end of the axle at the opposite side of the clamp 3, 4 for the support 5. The support 5, by adjustment of the clamp 3, 4 may likewise be moved and secured into different positions with respect to the axle 2. Instead of the cylinder and piston type feeding means, it will be evident that other well known types of feeds may be employed such as a motor driven feed screw carried by the drill support and engaging a feed nut movable with the drilling tool.

Since the drilling apparatus is designed to operate in coal seams having low headroom, the drill steel must be made up in sections so that when the hole is deepened, additional steel sections may be added. The drill steel section 29 has formed thereon near its shank 28 mutilated screw threads 40 receivable in the usual key opening 41 in the forward end of the chuck 31 so that the screw threads at this time act as lugs for locking the steel shank within the chuck. The threads, when in locking position, move in longitudinal recesses 42 in the chuck so that the

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steel, when locked in position, may freely reciprocate. The steel shank 28 may be readily released from the chuck simply by turning the thread portions 40 into registry with the key opening and moving the steel shank longitudinally outwardly from the chuck. When the drill steel has been fed downwardly to its extreme forward limit and the feed piston 19 is at the forward end of its travel in the feed cylinder, the steel shank may be detached from the chuck and the drilling tool may then be fed upwardly into the raised position shown in Fig. 2. An additional drill steel section 43 may then be attached by the mutilated threads 40 to the shank 28 of the steel section 29, and the threads 40 may be turned into engagement with internal threads 44 within a socket 45, tightly to couple the sections 29 and 43 together. Thus the thread portions at this time act as screw threads instead of locking lugs. The shank 46 of the additional steel section 43 has mutilated threads 47 and may then be inserted through the key opening in the chuck and turned into locked position. Drilling to an increased depth may then be resumed. As the hole deepens, a number of additional sections may be added as desired. In our application Serial No. 584,846, filed March 26, 1945, which is a continuation-in-part of this present application, we are presenting claims to the sectional drill steel subject matter just described.

The operator may grasp the handle 10 and raise the support 5 to swing the latter together with the drill support with the axle 2 in its bearings in the wheels and may then use the handle support 5 to move the apparatus from place to place. When it is desired to drill a vertical hole in the bottom of the coal seam, the operator may swing the handle support 5 downwardly to bring the pointer 8 into contact with the bottom surface and moving the drill support to bring the drilling tool into its upright drilling position. The operator may then seat himself on the platform or seat 9 so that his weight may serve to hold the drill support against swinging movement with the axle 2 to maintain the drilling tool in its upright drilling position. The operator may then start the hammer motor 26 simply by turning the throttle valve 35 to admit pressure fluid to the motor cylinder, thereby to effect reciprocation of the motor piston 27 to actuate percussively the drill steel. The control valve 38 may then be manipulated to supply pressure fluid through passage 36 to the upper end of the feed cylinder 17 to act on the upper side of the feed piston 19, thereby to move the latter downwardly to feed the drilling tool toward the work. The drilling tool may be retracted from the work simply by turning the control valve 38 to supply pressure fluid to the passage 37 leading to the lower end of the feed cylinder beneath the feed piston. By loosening or releasing the several clamps for the drill support and armlike support 5, the supports may be adjusted or transposed into different positions with respect to the axle 2.

As a result of this invention, an improved portable drilling apparatus is provided especially designed for use in underground coal mines having low headroom for drilling substantially vertical holes in the bottom of the coal seam, thereby to facilitate taking up of the bottom. The drilling apparatus is simple and rugged in construction and is readily portable, and by utilizing the weight of the operator to hold the drilling tool in operative position during drilling, it is possible to steady the apparatus in an extremely simple

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manner. Other uses and advantages of the invention will be clearly apparent to those skilled in the art.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form of the same 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 we claim as new and desire to secure by Letters Patent is:

1. In a drilling apparatus, a pair of wheels adapted to run along a supporting surface and having a transverse axle on which said wheels are journaled, a support secured to said axle and adapted to support a drilling tool, and an additional support secured to said axle and engaging the supporting surface at its outer end remote from said wheels, said additional support near its point of engagement with the supporting surface being disposed in a relatively low horizontal position close to the supporting surface and having thereon means to receive the weight of the drill operator at a point between the point of engagement of said additional support with the supporting surface and the points of contact of said wheels with the supporting surface to hold the drill support against turning with said axle relative to said wheels or lifting of said wheels.

2. In a drilling apparatus, a pair of wheels adapted to run along a supporting surface and having a transverse axle on which said wheels are journaled, a support secured to said axle and adapted to support a drilling tool, said drilling tool including a drilling motor and a feed cylinder and piston, said feed cylinder secured at its upper end to said axle and said drilling tool being collapsible to bring the top of said drilling motor below the tops of said wheels, and an additional support secured to said axle and engaging the supporting surface at its outer end remote from said wheels, said additional support near its point of engagement with the supporting surface being disposed in a relatively low horizontal position and having thereon means to receive the weight of the drill operator to hold the drill support against turning with said axle relative to said wheels.

3. In a drilling apparatus, a pair of wheels adapted to run along a supporting surface and having a transverse axle on which said wheels are journaled, a support secured to said axle and adapted to support a drilling tool disposable in one position thereof substantially vertical and including drilling and feeding motors and when so disposed, and with the feeding motor collapsed, wholly below a horizontal plane tangent to said wheels at the tops thereof, and an additional support secured to said axle and at its outer end remote from said wheels engaging the supporting surface, said additional support having a horizontal portion close to the supporting surface and having thereon means for receiving the weight of the drill operator to hold said drilling tool support against turning with said axle relative to said wheels.

4. In a drilling apparatus, a pair of wheels adapted to run along a supporting surface and having a transverse axle on which said wheels are journaled, a support secured to said axle and adapted to support a drilling tool, a relatively

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adjustable handle support secured to said axle and having generally at the opposite side of said axle from said tool support securing means for a handle, a handle having a support secured by said securing means to said handle support and provided with a supporting-surface-engaging point at its outer end remote from said wheels, said handle having a grasping portion adapted to be grasped by the operator for moving the apparatus from place to place, and a support on said handle in a relatively low position near said supporting-surface-engaging point a substantial distance below a horizontal plane including the wheel axes for receiving the weight of the operator to hold said tool support against turning with said axle relative to said wheels.

5. In a drilling apparatus, a pair of wheels adapted to run along a supporting surface and having a transverse axle on which said wheels are journaled, a support secured to said axle and adapted to support a drilling tool disposable in one position thereof substantially vertical and including a drilling motor and feeding means therefor adjustable to position the top of said drilling motor wholly below a horizontal plane tangent to said wheels at the tops thereof, and an additional support secured to said axle and at its outer end remote from said wheels engaging the supporting surface, said additional support having a horizontal portion disposed in a relatively low position close to the supporting surface and having thereon means for receiving the weight of the drill operator to hold the drilling tool support against turning with said axle relative to said wheels.

6. In a drilling apparatus, a pair of wheels adapted to run along a supporting surface and having a transverse axle on which said wheels are journaled, a support secured to said axle and adapted to support a drilling tool, and an additional support secured to said axle and engaging the supporting surface at its outer end at a point remote from the points of contact of said wheels with the supporting surface, said additional support having thereon in a relatively low position close to the supporting surface a horizontal platform for the operator so that the operator's weight holds said tool support against turning with said axle relative to said wheels, said points of contact of said wheels and of said additional support engaging point with the supporting surface arranged at corners of a triangle within which the projections of the center of said operator supporting platform and also the point at which said tool operates lie.

7. In a drilling apparatus, a pair of wheels adapted to run along a supporting surface and having a transverse axle on which said wheels are journaled, a support for supporting a drilling tool disposable substantially upright in one drilling position, a second support projecting laterally and extending downwardly from said axle and engageable with the supporting surface at its outer end remote from said wheels, a seat on said second support near its outer end for receiving the weight of the operator for holding said drill support against swinging movement about the wheel axes during the drilling operation, and adjustable securing means for securing said supports to said axle in different adjusted positions angularly and axially with respect to said axle.

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