

Sept. 20, 1932.

F. W. VODOZ

1,878,036

DRILLING MECHANISM

Filed June 11, 1928

2 Sheets-Sheet 1

Fig. 1

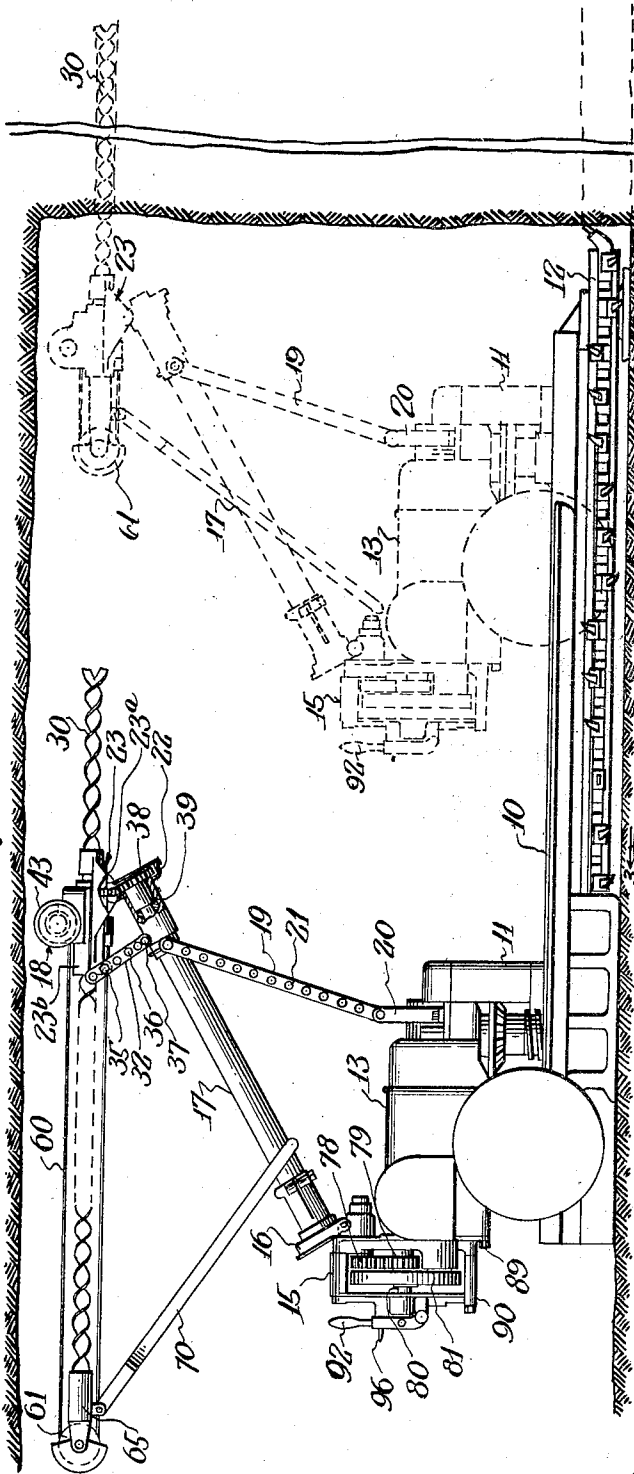
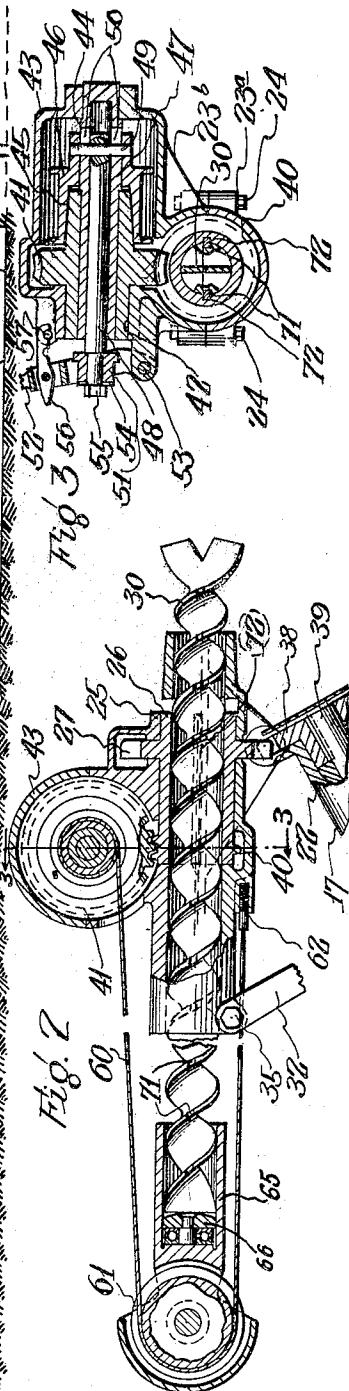


Fig. 2



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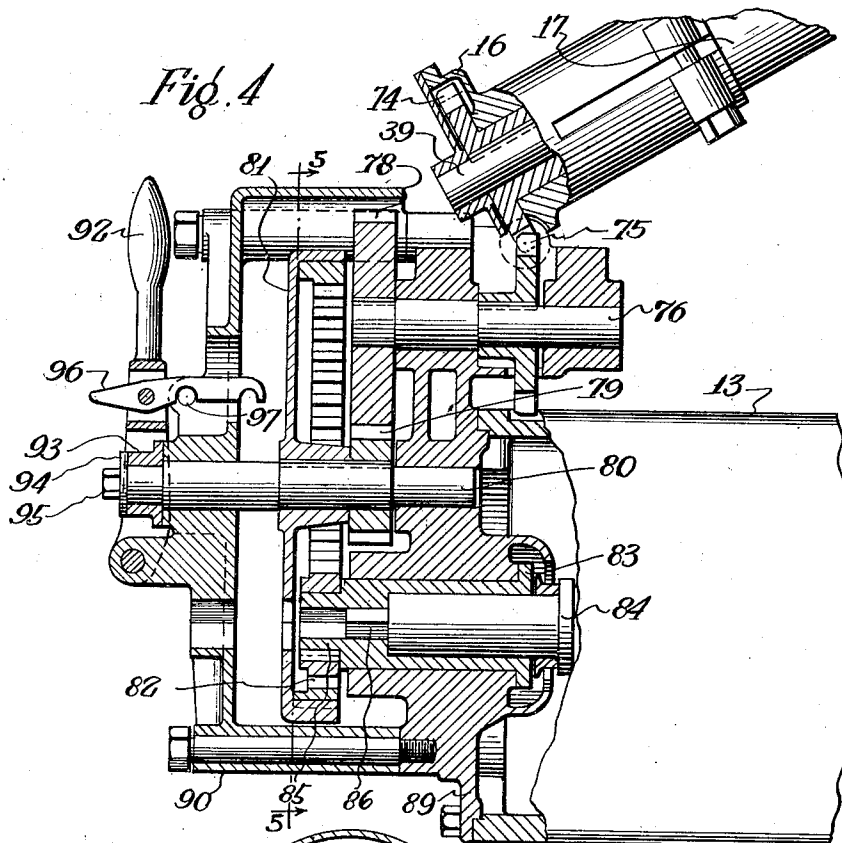
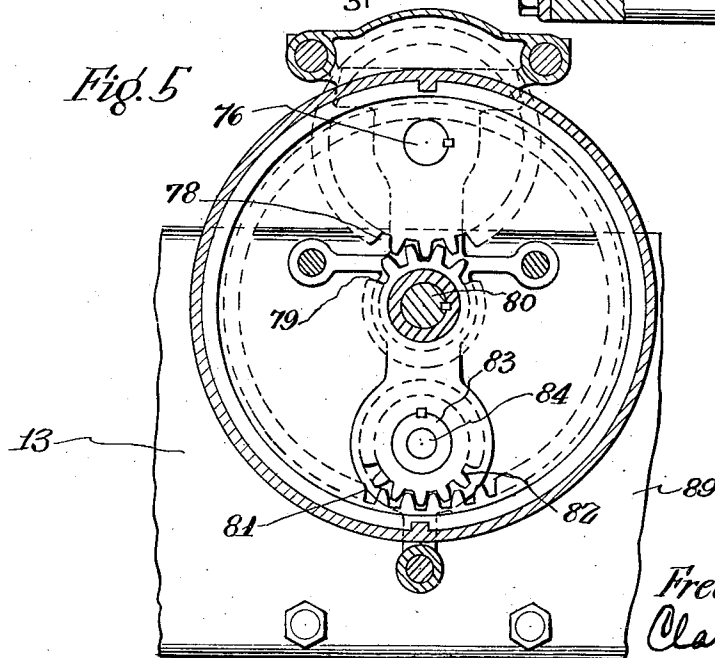
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

FREDERICK W. VODOZ, OF WILMETTE, ILLINOIS, ASSIGNOR TO GOODMAN MANUFACTURING COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS

DRILLING MECHANISM

Application filed June 11, 1928. Serial No. 284,471.

This invention relates to improvements in drilling mechanisms; particularly adapted for use in coal mines, and has for its principal object to provide a new and improved drilling mechanism in combination with a mining machine or similar power mechanism and which may be mounted on and operated from said mining machine.

Other objects of my invention will appear from time to time as this specification proceeds.

A prior application Serial Number 263,402, filed March 21, 1928, shows an improved form of drilling mechanism in combination with a coal mining machine of the shortwall type. My present invention differs from my prior invention in that an improved form of drilling mechanism is shown which eliminates the use of a feeding bar for the drill and provides a new and novel means of feeding said drill into the coal.

The drilling mechanism herein illustrated is shown in combination with a mining machine of the breast type, which is well known to the art. While said drilling mechanism may be mounted on a shortwall machine, or on any type of power device, as well as on a breast machine, it is particularly desirable to mount said drilling mechanism on a breast machine in driving narrow rooms or entries in that the drill is immediately in position to drill a hole in the mine wall when the machine has completed its undercutting operation.

My invention may be more clearly understood with reference to the accompanying drawings, wherein:—

Figure 1 is a side elevation of a mining machine of the breast type having my invention applied thereto;

Figure 2 is an enlarged vertical partial sectional view of the drilling head taken substantially on the longitudinal center line thereof;

Figure 3 is a cross-sectional view taken on line 3—3 of Figure 2;

Figure 4 is an enlarged fragmentary sectional view of the driving mechanism for connecting the drill with the mining machine motor; and

Figure 5 is an end view of the driving mechanism, for connecting the drill with the mining machine motor, with parts removed and in section to more clearly show the details thereof.

In the drawings, one embodiment of my invention is illustrated as applied to a mining machine of the ordinary "breast type" having a stationary frame 10 and a movable frame 11. The movable frame 11 is reciprocably movable on the stationary frame 10 and has a chain carrying cutter bar 12, projecting forwardly therefrom which is fed into the face of the coal to cut a kerf therein by forward movement of said movable frame on the stationary frame 10. The cutting mechanism and means for reciprocally moving the movable frame 11 on the stationary frame 10 are operatively driven from an electric motor 13 through a suitable gear train of the well known type generally used in mining machines of this design which is not herein shown since it is no part of my invention.

A drilling mechanism is supported bodily on said machine, herein being mounted on the rearward end thereof on a reduction gear supporting frame 15 for the driving mechanism for said drilling mechanism which will hereinafter be described, and comprises in general a member 16 trunnioned on the reduction gear supporting frame 15 having a tubular arm 17 projecting longitudinally forwardly therefrom which in turn has a drilling head 18 adjustably mounted on its forward end.

It may here be seen that the entire drilling mechanism is trunnioned on the support 15 which is supported on the rearward end of the motor 13, which in turn is supported on the movable frame 11 and that when the movable frame 11 has finished its forward movement and the cutter bar 12 has undercut the coal to the desired depth, that said drilling mechanism is in position for drilling a hole in the coal as may be seen in dotted lines in Figure 1.

It may also be observed that the drilling head 18 is vertically adjusted for drilling at various heights by movement of the arm 17

about the axis of the member 16. A member 19 is provided to support the drilling head 18 in any desired position of adjustment and extends from said drilling head to a member 20 on the movable frame 11. A plurality of holes 21 are provided in the member 19 for fixing said member to the member 20 at the various positions of vertical adjustment of the drilling head 18 by means of a nut and bolt or any other suitable device.

The drilling head 18 is supported on a member 22 which fits on the forward end of the tubular supporting arm 17. The member 22 may be clamped or held on the forward end of the tubular arm 17 by any suitable means well known to the art (not herein shown) so as to be rotatable about the tubular arm 17 and held in various desired positions of adjustment with respect to said arm. A drill supporting member 23 is trunnioned on the forward portion of the member 22. The drill supporting member 23 is made up of a lower portion 23a and an upper portion 23b. The upper portion 23b and lower portion 23a are held together by suitable nuts and bolts as indicated at 24. A bearing 25 is provided in the drill supporting member 23 for receiving the outer periphery of a hub 26 of a spur gear 27. The extreme forward and rearward portions of the drill supporting member 23 form a guiding support for a drill 30.

A spacing strip 32 is provided to hold the drill supporting member 23 in its several angular positions of adjustment with respect to the member 22. The spacing strip 32 is fastened to the drill supporting member 23 by means of a cap screw 35 or any other suitable holding device and has a plurality of holes 36 therein adapted to register with a hole in the member 22 and to be held to said member by means of a cap screw 37 or any other suitable holding device.

The pivotal axis of the drill supporting member 23 is tangential to the pitch line of the spur gear 27. The spur gear 27 is driven by a spur gear 38 journaled within the member 22 and keyed to a shaft 39 which is driven from the motor 13 by a suitable gear train which will hereinafter more fully be explained. The gears 27 and 38 are provided with relatively deep teeth chamfered at their edges so the gear 38 may drive the gear 27 in all positions of adjustment of the drilling head 18 with respect to the tubular arm 17. A worm 40 is provided on the hub 26 of the gear 27 and is integral therewith. The worm 40 has driving connection with a worm gear 41 having a hub 42 thereon journaled in a housing 43 on the upper portion 23b of the drill supporting member 23. A hub 45 on the opposite end of the worm gear 41 from the hub 42 is in the shape of a frustum of a cone and may be engaged with the inner periphery of a bobbin 46 for driving said bobbin. The

bobbin 46 is mounted on a raised portion 44 of a shaft 47. The shaft 47 is hollow for a portion of its length and is journaled in the housing 43 at one end.

The shaft 47 passes through the hubs 42 and 45 of the worm gear 41 and the shoulders formed by the raised portion 44 about the housing 43 and hub 45 of the worm gear 41 to prevent end movement of said worm gear and shaft. A rod 48 is slidable in the hollow portion of the shaft 47. A pin 49 connects the rod 48 with the bobbin 46 for engaging or disengaging the inner periphery of said bobbin with the hub 45 of the worm gear 41. Suitable slots 50, 50, are provided in the shaft 47 to allow for movement of the pin 49 with respect to said shaft. Suitable lever means are provided to move the rod 48 and bobbin 46 longitudinally with respect to the hub 45 of the worm gear 41. Said means herein comprise a member 51 freely mounted on the outer end of the rod 48 and abutting a shoulder on said rod and having pivotal connection with a forked lever 52 pivoted to the housing 43 at 53. A nut 54 and washer 55 is provided on the outer end of the rod 48 to prevent longitudinal movement of the member 51 with respect to the rod 48. Movement of the forked lever 52 in one direction or the other therefore moves the member 51 and rod 48 to engage or disengage the inner periphery of the bobbin 46 with the hub 45 of the worm gear 41. Locking means are provided for locking the bobbin 46 in an engaged or disengaged position with respect to the hub 45 of the worm gear 41 which herein comprise a lever 56 pivoted to the forked lever 52 engageable with a pin 57 on the housing 43.

Flexible power means of any suitable type which is preferably shown herein as a wire rope 60 is fastened to the bobbin 46 at one end and passes from said bobbin rearwardly around a sheave 61 on the rearward end of the drill 30 and forwardly to the drill supporting member 23 where said wire rope is fixed at its opposite end to said drill supporting member at 62 to move the drill 30 longitudinally with respect to the drill supporting member 23 as said flexible power means is wound on the bobbin 46. The sheave 61 is held in the end of a drill feeding member 65 freely mounted on the rearward end of the drill 30 so said drill may rotate within said member. A thrust member 66 within the drill feeding member 65 abuts the rearward end of the drill 30 to prevent friction between the end of the drill 30 and the drill feeding member 65 as said member is feeding the drill longitudinally with respect to the drill supporting member 23. A forked member 65 is pivoted to the drill feeding member 65 and extends downwardly to the tubular arm 17, a prong of said fork being on each side of said tubular arm and slidable

into the coal whereby I eliminate the use of a thread or feeding bar and support said drill at a point adjacent the face of the coal insuring an accurate drill hole and lessening the possibilities of binding of said drill and still arrange my feeding device so that the drill may be fed into the coal to the entire depth of the hole desired in one continuous operation.

Although I have herein shown and described one form in which my invention may be embodied in combination with a mining machine it will be understood that the construction and arrangement of the parts may be altered and that my invention need not be used in connection with a mining machine of the type shown, but may be used in combination with any other type of mining machine or power device.

I claim as my invention:

1. In a drilling apparatus, a drill, a drilling head comprising a drill supporting member, a drill rotating member on said drill supporting member, winding means on said drill supporting member, a sheave detachably connected with the rearward portion of said drill, a flexible feeding member passing rearwardly from said winding means about said sheave and forwardly to said drill supporting member, and a member pivotally connected to said sheave for holding said sheave in alignment with said winding means.

2. In a drilling apparatus, a drill, a drilling head comprising a drill supporting member, a drill rotating member on said drill supporting member, winding means on said drill supporting member, a drill feeding member having engagement with said drill comprising a sleeve insertable on the end of said drill having a sheave on the rearward end thereof, a flexible feeding member passing rearwardly from said winding means about said sheave and forwardly to said drill supporting member, and a member pivotally connected to said sleeve for holding said sheave in alignment with said winding means.

3. In a drilling apparatus, a drill, a drilling head comprising a drill supporting member, a drill rotating member on said drill supporting member, winding means on said drill supporting member, a drill feeding member having engagement with said drill comprising a sleeve having a sheave on the rearward end thereof, a flexible feeding member passing rearwardly from said winding means about said sheave and forwardly to said drill supporting member, and a member pivotally connected to said drill feeding member for holding said sheave in alignment with said winding means.

4. In an apparatus of the class described, a drilling head including a drill rotating member, a drill, means for supporting said drilling head for drilling in a horizontal plane or various angular planes with respect to the horizontal, means for feeding said

drill including flexible feeding means, a direction changing device on the rearward end of said drill adapted to be engaged by said flexible feeding means and means for holding said direction changing device in alignment with said flexible feeding means comprising a member having connection with said direction changing device and adapted to engage said drilling head supporting means.

5. In an apparatus of the class described, a drilling head including a drill rotating member, a drill, means for supporting said drilling head for drilling in a horizontal plane or various angular planes with respect to the horizontal, means for feeding said drill including flexible feeding means, a direction changing device on the rearward end of said drill adapted to be engaged by said flexible feeding means and means for holding said direction changing device in alignment with said flexible feeding means comprising a depending member having connection with said direction changing device and adapted to slidably engage said drilling head supporting means.

6. In an apparatus of the class described, a drilling head including a drill rotating member, a drill, means for feeding said drill including flexible feeding means, a direction changing device on the rearward end of said drill adapted to be engaged by said flexible feeding means and means for holding said direction changing device in alignment with said flexible feeding means comprising a member having pivotal connection with said direction changing device and adapted to slidably engage extraneous means.

7. In an apparatus of the class described, a drilling head including a drill rotating member, a drill, means for supporting said drilling head for drilling in a horizontal plane or various angular planes with respect to the horizontal, means for feeding said drill including flexible feeding means, a direction changing device detachably connectible with the rearward end of said drill adapted to be engaged by said flexible feeding means and means for holding said direction changing device in alignment with said flexible feeding means comprising a member having connection with said direction changing device and adapted to slidably engage said drilling head supporting means.

8. In an apparatus of the class described, a drilling head including a drill rotating member, a drill, means for feeding said drill including flexible feeding means, a direction changing device detachably connectible with the rearward end of said drill adapted to be engaged by said flexible feeding means and means for holding said direction changing device in alignment with said flexible feeding means comprising a member

thereon to hold the sheave 61 in a vertical position as the drill 30 moves longitudinally with respect to the drill supporting member 23.

5 Keyways 71 are provided in the drill 30 and extend substantially the entire length of said drill. Feather keys 72 are fixed on the inner periphery of the gear 27 to engage the keyways 71 to rotate the drill 30 on rotation
10 of the gear 27, and to allow said drill to be moved through said gear as said drill is being rotated by said gear. The keys 72 are chamfered at their forward and rearward ends to eliminate the possibility of the keys
15 72 fouling in the keyways 71 on the drill 30.

It may now be seen that rotation of the gear 27 will rotate the drill 30 and will also cause rotation of the worm gear 41 which will rotate the bobbin 46 when the inner periphery
20 of said bobbin engages the hub 45 of said worm gear and thus wind in the flexible power device 60 which will move the drill 30 longitudinally through the hub of the gear 27 to feed said drill into the material it is
25 desired to drill. In cases of extreme load or strain on the drill 30 translational movement of said drill will automatically be stopped by slippage of the bobbin 46 on the hub 45 of the worm gear 41.

30 The shaft 39 within the tubular drill supporting arm 17 has a spur gear 74 keyed to its lower end. The gear 74 is journaled on its hub within the member 16 and the pitch circle of said gear is tangential to the pivotal
35 axis of the member 16. The spur gear 74 is driven by a spur gear 75 journaled in the reduction gear supporting frame 15. The pitch circle of the gear 75 is tangential to the pivotal axis of the member 16 and the teeth
40 of the gears 74 and 75 are relatively deep and chamfered at their edges to prevent binding between the teeth of said gears when the gear 75 is driving the gear 74 at the various permissible angles of adjustment of the tubular
45 drill supporting arm 17. The gear 75 is keyed to a shaft 76 which is driven by a gear 78 keyed thereon. The gear 78 is in turn driven by a pinion 79 on a shaft 80 slidable longitudinally with respect to the reduction
50 gear supporting frame 15. An internal gear 81 drives the shaft 80 and pinion 79 and is in turn driven by a pinion 82 keyed to a member 83 journaled in the gear supporting frame 15 and having a socket therein fitting on an
55 end of a motor shaft 84 of the motor 13. A portion 85 of said socket is squared to engage a squared end 86 of the motor shaft 84 so the member 83 may be driven by said motor shaft.

It may be here observed that the reduction
60 gear supporting frame 15 is split in two sections and that one section 89 forms an end plate for the motor 13, supports the drilling mechanism for pivotal movement thereabout, and serves as a support for the reduction gear
65 mechanism, while another section 90 serves

as a support for one end of the longitudinally movable shaft 80.

Means are provided on the section 90 of the reduction gear supporting frame 15 for longitudinally moving the shaft 80, internal
70 gear 81 and pinion 79, for disengaging said internal gear and pinion from the pinion 82 and gear 78 to disconnect the drill driving mechanism from the motor 13. Said means
75 may be of any well known type but herein comprise a forked hand lever 92 pivoted to the section 90 of the reduction gear supporting frame 15 and having pivotal connection
80 with a member 93 freely mounted on the shaft 80. The member 93 abuts a shoulder on the shaft 80 at one end and a washer 94 at its other end held on the shaft 80 by a nut 95 threaded thereon, so that movement of the
85 member 93 will cause movement of the shaft 80. Locking means are provided to lock the forked hand lever 92 in an extreme inward or outward position with respect to the section 90 of the reduction gear supporting frame 15 for engaging or disengaging the
90 drill driving mechanism with the motor 13 which herein comprises a lever 96 pivoted to the forked lever 92 and engageable with a pin 97 on the section 90.

Figure 1 shows the drilling mechanism on a breast machine, when said machine is in
95 position to undercut a kerf in the mine wall and also shows said machine in dotted after said machine has cut said kerf, showing the drill 30 drilling a hole in said mine wall. When the cutter bar 12 has cut a kerf to the
100 desired depth forward movement of the movable frame 11 is stopped, and the drilling mechanism is adjusted to the desired height and position for drilling a hole in the mine wall. The motor pinion 82 is engaged with
105 the internal gear 81 by movement of the hand lever 92 to drive the shaft 39 within the tubular drill supporting arm 17 and to rotate the spur gear 27 and the drill 30. Movement of the hand lever 52 then engages the inner periphery of the bobbin 46 with the hub 45 on
110 the worm gear 41 to rotate said bobbin and wind in the flexible power device 60 to feed the drill 30 into the coal. In case of binding of the drill 30 or in case said drill should encounter hard spots in the coal, feeding of said
115 drill will automatically be stopped by slippage of the inner periphery of the bobbin 46 on the hub 45 of the worm gear 41. When the hole has been drilled to the desired depth, the movable frame 11 is moved rearwardly away from the face of the coal drawing the cutter bar 12 and drill 30 therewith.

It may now be seen that I have provided a
120 drilling mechanism adapted to be mounted on and operable from a power device or mining machine of any well known type, but particularly adapted for use on a mining machine of the breast type, and that I provide a new
125 and improved method of feeding my drill

having pivotal connection with said direction changing device and adapted to engage extraneous means.

9. In an apparatus of the class described, a
drilling head including a drill rotating mem-
ber, a drill, means for feeding said drill
including flexible feeding means, a direction
changing device detachably connectible with
the rearward end of said drill adapted to
be engaged by said flexible feeding means
and means for holding said direction chang-
ing device in alignment with said flexible
feeding means comprising a depending mem-
ber having pivotal connection with said di-
rection changing device and adapted to slid-
ably engaged extraneous means.

10. In an apparatus of the class described, a portable support, an arm having pivotal connection with said portable support, a drilling head having pivotal connection with the opposite end of said arm, a drill supported by said drilling head, means for feeding said drill including flexible feeding means, a direction changing device on the rearward end of said drill adapted to be engaged by said flexible feeding means, and means for holding said direction changing device in alignment with said flexible feeding means comprising a member having connection with said direction changing device and adapted to engage said arm.

11. In an apparatus of the class described, a portable support, an arm having pivotal connection with said portable support, a drilling head having pivotal connection with the opposite end of said arm, a drill supported by said drilling head, means for feeding said drill including flexible feeding means, a direction changing device on the rearward end of said drill adapted to be engaged by said flexible feeding means, and means for holding said direction changing device in alignment with said flexible feeding means comprising a forked member having connection with said direction changing device and adapted to have slidable engagement with said arm.

12. In an apparatus of the class described, a portable support, an arm having pivotal connection with said portable support, a drill-
ing head having pivotal connection with the
opposite end of said arm, a drill supported
on said drilling head, means for feeding said
drill including flexible feeding means, a di-
rection changing device on the rearward end
of said drill adapted to be engaged by said
flexible feeding means, and means for hold-
ing said direction changing device in align-
ment with said flexible feeding means com-
prising a member having pivotal connection
with said direction changing device and
adapted to have slidable engagement with
said arm.

13. In an apparatus of the class described,
65 a portable support, an arm having pivotal

connection with said portable support, a drilling head having pivotal connection with the opposite end of said arm, a drill supported by said drilling head, means for feeding said drill including flexible feeding means, a direction changing device on the rearward end of said drill adapted to be engaged by said flexible feeding means, and means for holding said direction changing device in alignment with said flexible feeding means comprising a depending forked member having pivotal connection with said direction changing device and adapted to have engagement with said arm.

14. In an apparatus of the class described, a portable support, an arm having pivotal connection with said portable support, a drilling head having pivotal connection with the opposite end of said arm, a drill supported by said drilling head, means for feeding said drill including flexible feeding means, a direction changing device detachably connected with the rearward end of said drill adapted to be engaged by said flexible feeding means, and means for holding said direction changing device in alignment with said flexible feeding means comprising a member having connection with said direction changing device and adapted to engage said arm.

15. In an apparatus of the class described, a portable support, an arm having pivotal connection with said portable support, a drilling head having pivotal connection with the opposite end of said arm, a drill supported by said drilling head, means for feeding said drill including flexible feeding means, a direction changing device detachably connected with the rearward end of said drill adapted to be engaged by said flexible feeding means, and means for holding said direction changing device in alignment with said flexible feeding means comprising a forked member having connection with said direction changing device and adapted to have slidable engagement with said arm.

16. In an apparatus of the class described, a portable support, and arm having pivotal connection with said portable support, a drilling head having pivotal connection with the opposite end of said arm, a drill supported by said drilling head, means for feeding said drill including flexible feeding means, a direction changing device detachably connected with the rearward end of said drill adapted to be engaged by said flexible feeding means, and means for holding said direction changing device in alignment with said flexible feeding means comprising a member having pivotal connection with said direction changing device and adapted to have slidable engagement with said arm.

17. In an apparatus of the class described, a portable support, an arm having pivotal connection with said portable support, a drilling head having pivotal connection with the

opposite end of said arm, a drill supported
by said drilling head, means for feeding said
drill including flexible feeding means, a di-
rection changing device detachably connected
with the rearward end of said drill adapted to
5 be engaged by said flexible feeding means,
and means for holding said direction chang-
ing device in alignment with said flexible
feeding means comprising a depending
forked member having pivotal connection
10 with said direction changing device and
adapted to have slidable engagement with
said arm.

Signed at Chicago, in the county of Cook
and State of Illinois, this 6th day of June,
15 A. D. 1928.

FREDERICK W. VODOZ.

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