

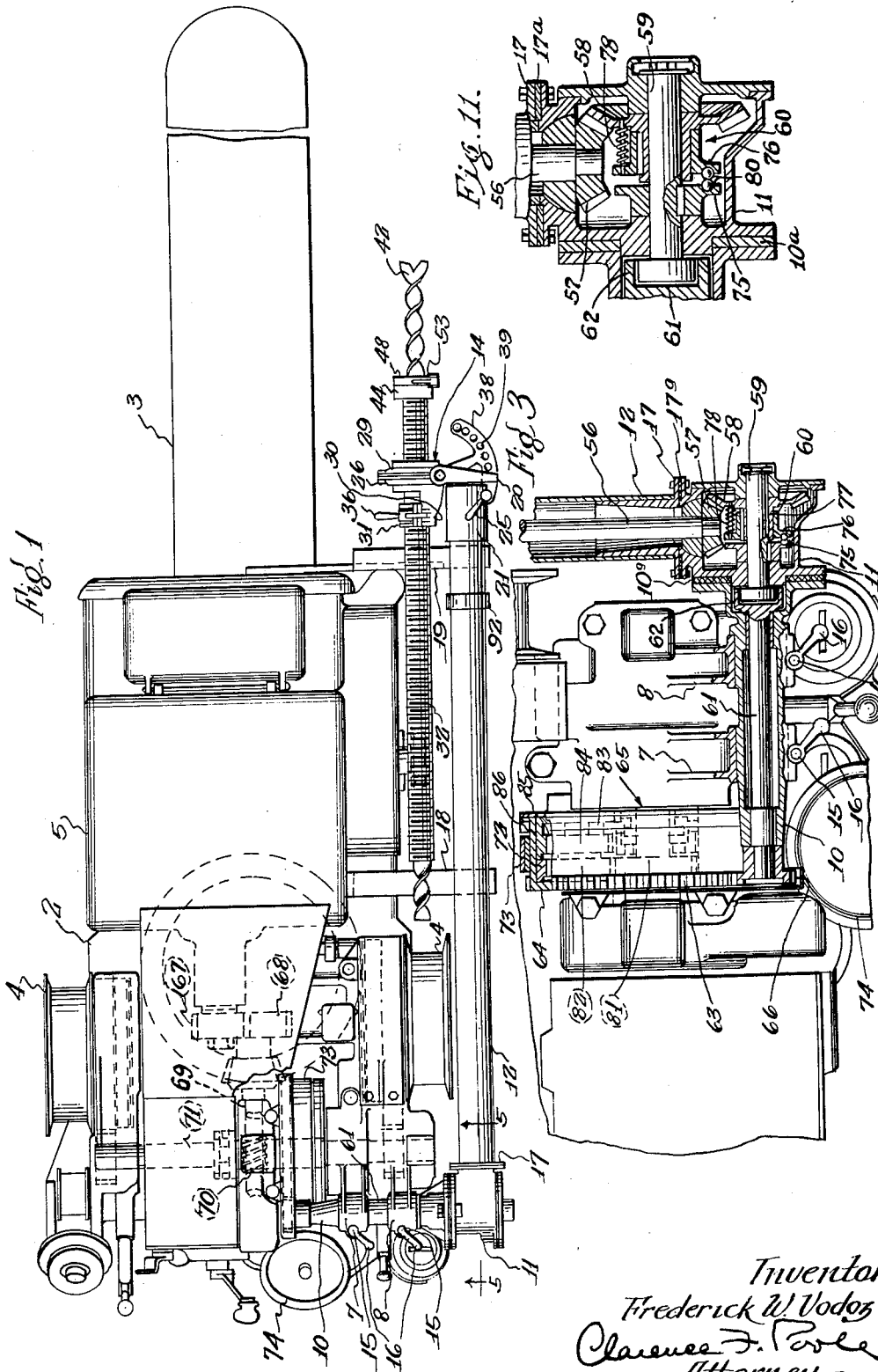
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F. W. VODOZ

1,963,039

DRILLING MECHANISM

Original Filed March 21, 1928 3 Sheets-Sheet 1



Inventor
Frederick W. Vodoz
Clarence F. Poole
Attorney

June 12, 1934.

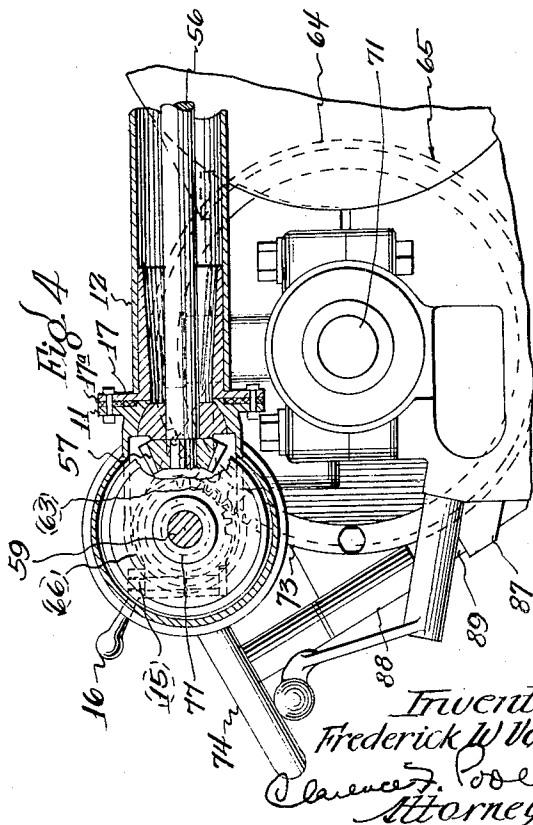
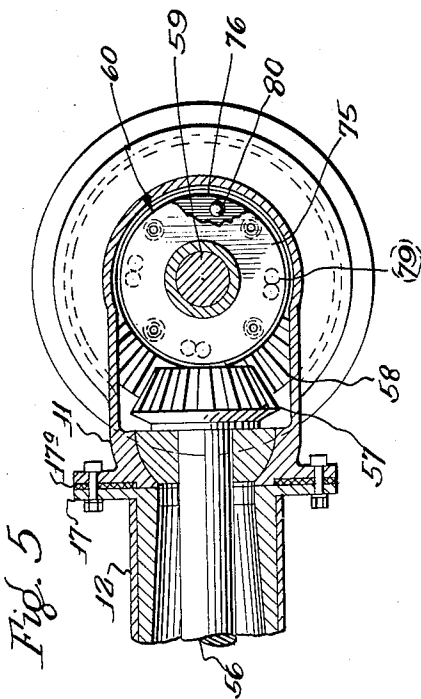
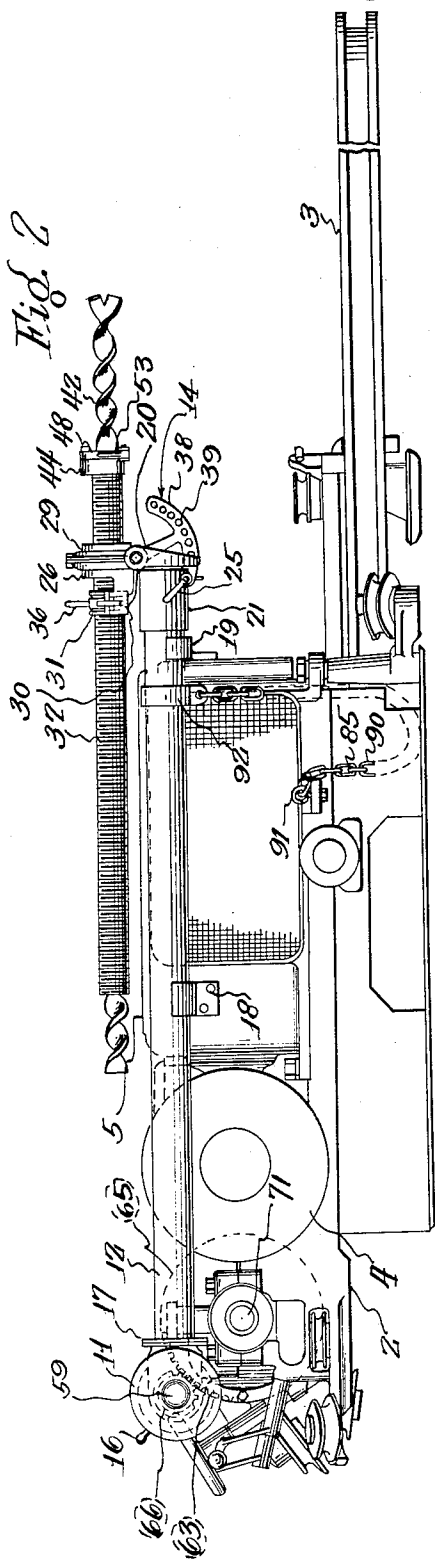
F. W. VODOZ

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DRILLING MECHANISM

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3 Sheets-Sheet 2



Inventor
Frederick W. Vodoz
Clarence F. Poole
Attorney

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F. W. VODOZ

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DRILLING MECHANISM

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3 Sheets-Sheet 3

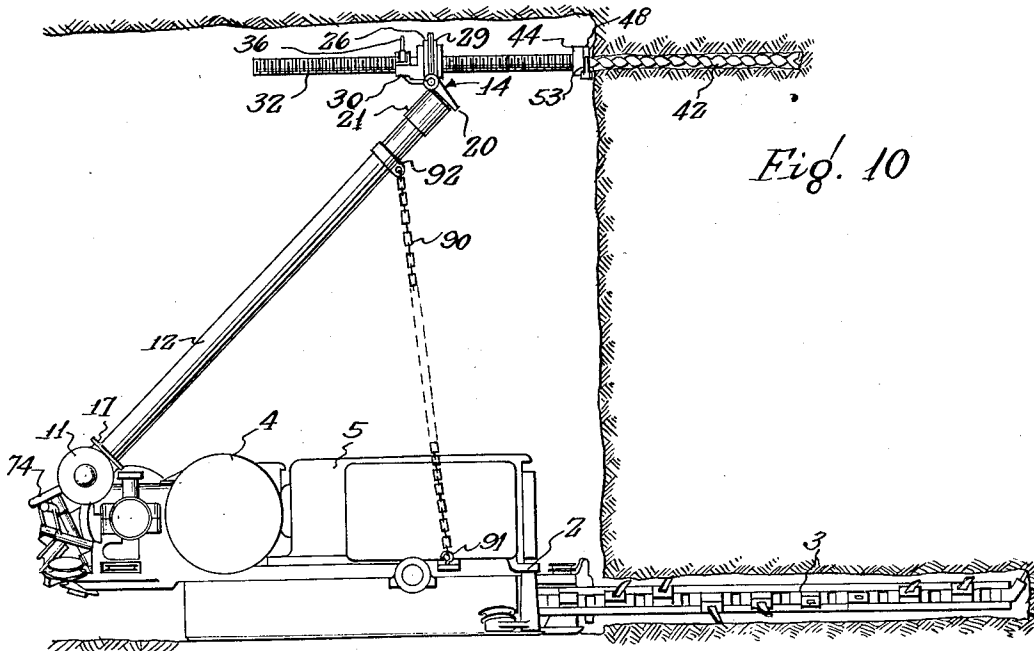


Fig. 10

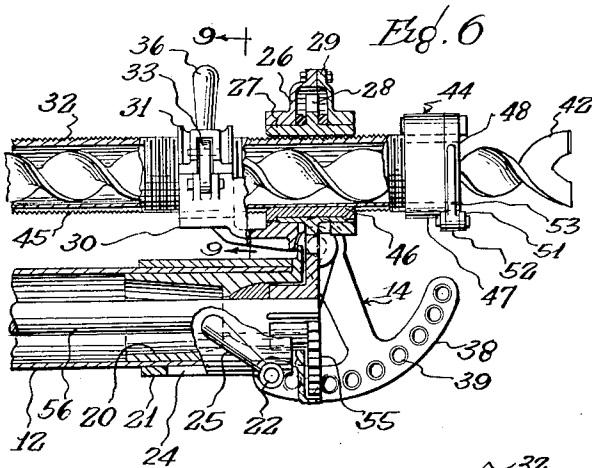


Fig. 6

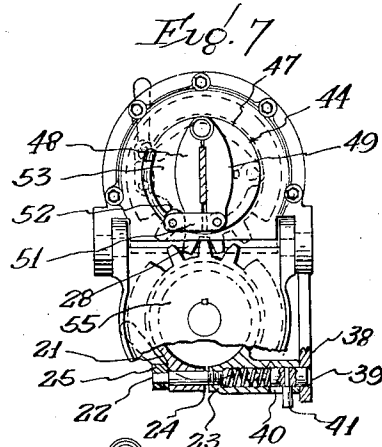


Fig. 7

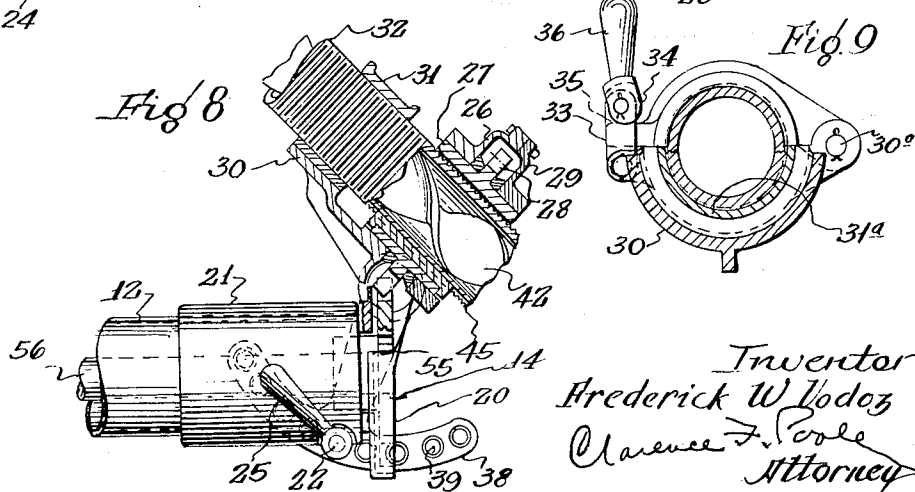


Fig. 8

Fig. 9

Inventor
Frederick W. Vodoz
Clarence F. Cole
Attorney

UNITED STATES PATENT OFFICE

1,963,039

DRILLING MECHANISM

Frederick W. Vodoz, Wilmette, Ill., assignor to
Goodman Manufacturing Company, Chicago,
Ill., a corporation of Illinois

Application March 21, 1928, Serial No. 263,402
Renewed June 11, 1931

16 Claims. (Cl. 255—46)

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 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.

The general practice in coal mining operations is to drill the coal with a hand operated post drill or small portable electric drill after the mining machine has completed its undercutting operation. Drilling by hand usually requires more than one man and has proven to be very slow and expensive. While drilling with a portable electric drill is faster than hand drilling, more than one man is usually required to handle the drilling mechanism, and in order to make said mechanism portable and easy to handle, said mechanism is often made too light to give satisfactory service.

In carrying out my invention I provide an improved form of drilling mechanism so combined and carried with a coal cutting machine as to afford sufficient strength to withstand all strains subjected to it due to drilling, and which moreover provides a drilling mechanism operable by one man whereby the coal may be drilled during the undercutting of the coal and by the same crew that operates the coal cutting machine.

My invention may be more clearly understood by reference to the accompanying drawings wherein:

Figure 1 is a plan view of a mining machine of the continuous cutter type having my invention applied thereto;

Figure 2 is a side elevation of the machine shown in Figure 1 with the drilling mechanism in another position than shown in Figure 1;

Figure 3 is an enlarged fragmentary plan view of the rear portion of the mining machine shown in Figure 1, with parts shown in section;

Figure 4 is an enlarged fragmentary side view of a mining machine, with parts shown in section;

Figure 5 is an enlarged fragmentary sectional view taken on line 5—5 of Figure 1;

Figure 6 is a detail side view of the drill head showing the drill tube in section;

Figure 7 is a front end view of the drill head shown in Figure 6 with the drill shown in section;

Figure 8 is a detail side view of the drill head used in the device embodying my invention with

the drill tube in section, and in a different position from Figure 6;

Figure 9 is a cross-sectional view taken on line 9—9 of Figure 6;

Figure 10 is a side elevation of the device shown in operative position relative to a mine wall; and

Figure 11 is an enlarged detail sectional view showing overload release means for the drilling mechanism.

In the drawings, one embodiment of my invention is illustrated as applied to a mining machine of the ordinary continuous cutter, or "shortwall" type having a frame 2 with a chain carrying cutter bar 3 projecting forwardly therefrom. Two power driven feed drums 4, 4, are provided with cables arranged in the usual and well known manner to maneuver said machine on the mine floor, and feed it across a mine face. The feeding and cutting means for said mining machine are operatively driven from an electric motor 5 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 mining machine, herein being mounted on the rearward end thereof by supports 7 and 8, and comprises in general a member 10 mounted for rotatable movement in supports 7 and 8, and a supporting casing 11 at the outer end thereof having a tubular arm 12 projecting longitudinally forwardly therefrom which in turn has a drilling head 14 adjustably mounted on its forward end.

It may here be seen that the entire drilling mechanism is supported by the member 10 at the rearward end of the mining machine frame 2 and that the drilling head 14 is vertically adjustable by moving the arm 12 about the axis of the member 10 and that said drilling head will be held in a stationary position when the member 10 is held in a stationary position. Clamping means are provided to hold the member 10 from rotation which herein comprises bolts 15, 15, passing through the portion of each support 7 and 8 which encircles the member 10, and each having a handle 16 threaded thereon. The portions of the members 7 and 8 surrounding the member 10 are split in the horizontal plane at the rearward end thereof so tightening of the handles 16 on the bolts 15 contracts the portion of the supports surrounding the members 10 and this clamps the member 10 in a stationary position. Brackets 18 and 19 are provided to support the drilling mechanism in its lowered or inoperative position.

The tubular arm 12 is preferably shrunk on a member 17 which in turn is bolted to the supporting casing 11. A gasket 17a of any suitable resilient material is interposed between the member 17 and the supporting casing 11. Similarly, the supporting casing 11 is bolted to the member 10 and a resilient gasket 10a is interposed between said supporting casing and the member 10. These gaskets are so interposed between the member 10, supporting casing 11 and member 17, as to take up shocks and vibration imparted to said members through the drilling head 14.

Referring now in particular to the drilling head 14 as shown in Figures 1, 2, 6, 7 and 8, said head is supported on a member 20 which is inserted in the tubular arm 12 at the forward end thereof so that said member is rotatable in said tubular arm. Means are provided to hold the member 20 in any desired position, which herein comprises a longitudinally split sleeve 21 surrounding the tubular arm 12 and member 20, having a suitable means for tightening said sleeve on said tubular arm; as, for example, a screw 22 is threaded into a lug 23 on one side of a slit 24 in said sleeve having a handle 25 on its opposite end and bearing against a portion of the same lug 23 on the opposite side of the slit 24 so that turning of the handle 25 in one direction contracts the sleeve 21 about the tubular arm 12 and tightens said arm about the member 20 to hold said member in a stationary position.

A supporting member 26 is trunnioned on the upper portion of the member 20. A bearing 27 is provided at the forward portion of the supporting member 26 for receiving the outer periphery of the hub of a gear 28. A cap piece 29 is bolted to the forward portion thereof to hold the gear 28 in position on the member 26. A feeding and supporting collar 30 is integral with a rear portion of the supporting member 26. Said collar is split in a horizontal plane and has a top portion 31 threaded on its inner periphery to engage a threaded tube 32. Said top portion is hinged on a pin 30a at one side thereof and has a suitable locking means at the opposite side thereof so said threaded portion may readily be disengaged from the threaded tube 32 and said tube may be quickly removed from said collar at will.

A shoe 31a is provided on the lower portion of the collar 30 and provides a supporting surface for the member 32. The locking means herein shown comprises a link 33 pivoted to the lower portion of the collar 30 at one end and having an eccentric cam 34 pivoted to its opposite end. The cam 34 bears against a projection 35 on the top portion of the collar 30 and has a handle 36 thereon to force the cam 34 against the projection 35 and lock the collar 30 in a closed position and thus cause the threaded tube 32 to move longitudinally of said collar on rotation of said tube. To stop longitudinal movement of said tube it is simply necessary to release the cam 34 from the projection 35 and open the collar 30.

The means for holding the supporting member 26 in a stationary position herein comprises a sector 38 which depends from said supporting member and has a plurality of holes 39 therein which are adapted to receive a spring actuated plunger 40 which works in the lug 23 projecting from the split sleeve 21. A pin 41 depending from the plunger 40 is provided to aid in the removal of the plunger 40 from the holes 39.

The threaded tube 32 is adapted to receive a drill 42 therein. The drill 42 may be of any type but is herein shown as a twist drill having its

blade of the same type as is ordinarily used in coal mine drills. A chuck 44 is provided at the forward end of the tube 32 to hold the drill 42 in said tube. The tube 32 passes through the collar 30 and hub of the gear 28 and has a keyway 45 extending longitudinally therewith. A feather key 46 is slidable in said keyway and provides a means to key the gear 28 to said tube to rotate said tube through said gear.

The chuck 44 comprises a member 47 threaded on the end of the threaded tube 32 which has a clamping means for holding the blades of the drill 42 at the forward end thereof. The holding or clamping means for the drill 42 comprise two holding pieces 48 and 49 pivoted to the member 47 at a common point. A link 51 is pivoted at the lower end of the holding piece 49. Said link has an eccentric cam 52 pivoted to its opposite end which is adapted to bear against the clamping member 48. A handle 53 is provided to operate said cam so that when said handle is in an upright position the cam 52 will bear against the member 48 to lock the members 48 and 49 together and clamp the drill 42 so as to extend from the end of the tube 32, in any position of adjustment desired.

Referring now to the means for driving the gear 28 and rotating the drill 42 and feeding said drill into the coal from the mining machine motor 5 it may be seen that the gear 28 meshes with a gear 55 on a shaft 56 journaled in the member 20 at one end and in the member 17 at its opposite end, and that the gear 55 is adapted to drive the gear 28 when said gear is at various angles with respect to the gear 55. Provision is made for driving the gear 28 from the gear 55 at the several permissible angles of said gears relative to each other, by arranging the pivotal axis of the members 20 and 26 so it will coincide with the pitch circles of both gears 55 and 28, and providing said gears with relatively deep teeth chamfered at their edges to prevent binding between said gears.

The shaft 56 is rotatable by a bevel pinion 57 which is driven by a bevel gear 58 having operative connection with a transverse stub shaft 59 through a safety clutch 60. A transverse shaft 61 journaled in the member 10 is coaxial with the stub shaft 59 and abuts the inner end of said stub shaft. The stub shaft 59 is provided with an upturned inner end of an irregular shape which fits in a socket 62 on the end of the transverse shaft 61 for driving the stub shaft 59 from said transverse shaft. Two shafts coupled together are used here instead of one continuous shaft to enable the supporting casing 11 to be quickly removed from the member 10 without removing the entire shaft from said member with the gears thereon and to provide a flexible connection between the member 10 and supporting casing 11 to prevent bending of said shaft which would necessarily occur if said shaft were a continuous shaft, on account of the resilient connection between the member 10 and supporting casing 11. The shaft 61 is in turn driven by a gear 63 on the outer periphery of a casing 64 of a planetary gear device 65 which has driving connection with a gear 66 fixed to said shaft. The planetary gear device 65 is driven by the motor 5 in the usual manner employed in mining machines of this type; viz., through a motor pinion 67, driven pinion 68, shaft 69, worm and worm gear reduction drive generally indicated at 70 which has driving connection with a transverse shaft 71 and the planetary gear device 65.

The planetary gear device 65 is of the type ordinarily used in mining machines; as, for example, that disclosed in a patent issued to Charles E. Davis, No. 1,430,799, issued October 3, 1922.

5 The casing 64 is rotatable through a sun gear 81, planetary pinions 82, cage 83 holding said planetary pinions, and internal gear 72 keyed to the inner periphery of the casing 64. Planetary pinions 84 are also held in the cage 83 and rotate
10 with the planetary pinions 82 to rotate an internal gear 85 integral with a casing 86 rotating within the casing 64, to provide a drive for either rope drum 4 at a reduced speed from the speed of the sun gear 81. A friction band 73 surrounds
15 the casing 86 to prevent rotation thereof when it is desired to transmit power to the rope drums 4 through said casing. When the friction band 73 is loose on the casing 64 said casing will rotate and the gear 66 on the shaft 61 will be rotated
20 by the gear 63 to drive the drilling mechanism and drill 42. When the friction band 73 is tight on the casing 64 said casing and the gear 63 are held stationary to stop the driving of the drilling mechanism and drill 42. The friction band 73 is
25 tightened on the casing 64 by means of a hand wheel 74 in the usual manner; namely, said hand wheel is fixed to a rod which is threaded in a lug 87 on one end of said friction band. A collar 88 is interposed between the hand wheel 74 and
30 a lug 89 on the opposite end of said friction band so that turning of the said hand wheel in one direction brings the ends of the friction band 73 together to tighten said friction band on the casing 64 and vice versa.

35 The safety clutch 60 (see Figures 3 and 5) comprises a plate 75 having a hub thereon keyed to the shaft 59 abutting a plate 76 having a hub integral therewith feathered on a hub 77 of the bevel gear 58 and having a plurality of compression springs 78 interposed between the bevel gear 58 and the plate 76 to cause the plate 76 to bear against the plate 75. Indentations 79 in the shape of spherical segments are provided in the abutting faces of the plates 75 and 76 to receive steel balls 80 to form a driving connection
45 between the plates 75 and 76. The angle of incidence of the indentations 79 in the plate 75 is such that when sudden excess loads are imposed on the drilling mechanism and bevel gear 58 due to the striking of hard spots in the coal such as
50 rock or sulphur balls, by the drill 42, the balls 80 will slip out of said indentations on the plate 76 to allow the plate 75 to rotate while the plate 76 remains stationary. This relieves all strain from the drill 42 and the gearing for said drill and prevents breakage of said parts.

55 It may now be seen that I have provided a simple and strong means for supporting a mining drill so said drill may be operated at various elevations and angles with respect to the face of the coal, and that I have provided strong and simple feeding and driving means for said drill whereby said drill may be driven from the mining machine motor 5 in all of its possible positions
60 of adjustment by simply turning the hand wheel 74 to loosen the tension of the friction band 73 on the casing 64.

65 It should also be noted that the gear 28 both rotates the drill 42 and causes said drill to be fed into the mine wall and that said drill is supported inside of the threaded tube 32 which passes through the central portion of the gear 28 and moves longitudinally through the hub of said gear as said gear is driving said threaded
70 tube in a rotational direction. This is accom-

plished by journalling the gear 28 in the bearing 27 on the support 26 and feathering said gear to the threaded tube 32. When the collar 30 is closed about the threaded tube 32 and the threaded
80 portion of said collar engages the threaded tube 32, and said threaded tube is rotated by the gear 28, said tube will be moved longitudinally through the hub of said gear, the feather key 46 sliding in the longitudinal keyway 45 in the threaded tube 32.

85 Referring now in particular to Figure 10 showing a mining machine with a drill such as is described in my invention drilling a hole in the mine wall, it may be seen that said mining machine may be fed as usual to undercut the coal
90 but its feeding movement is stopped at any point where it is desired to place a drill hole in the mine wall. The drill is carried in lowered position during the undercutting operation, but when the machine is stopped, the arm 12 is swung upwardly to the desired height for drilling, as shown in Figure 10. A chain 90 extends from a hook 91 on the mining machine frame 2 to a bracket 92 on the forward portion of the tubular supporting arm 12. By hooking different links of the chain 90 on the hook 91 said chain provides
100 means for limiting the upward movement of the drill arm, and also is arranged to be taut when the drill is in drilling position, so as to relieve strains from the member 10 and supporting casing 11 as the drill 42 is advanced into the coal.

105 The drill 42 shown in Figure 10 has advanced into the mine wall to a portion of the full depth of the hole desired, which is usually the depth of cut made by the cutter bar 3 and varies from five and one-half to eight feet in depth, according to the length of cutter bar used. Since the tubular supporting arm 12 is inclined from the rear of the mining machine toward the mine wall it may be seen that it is seldom possible to place the drilling head 14 far enough away from the face of the coal to drill the hole to its full depth in one operation but that it is necessary to advance said drill into the coal by stages. Due to the construction of my drilling head this is a distinct advantage in drilling since the drilling head 14 is always close to the face of the coal which insures a more accurate drill hole than could otherwise be obtained and minimizes the danger of binding the drill due to a crooked drill hole, since the drill may be simply and quickly advanced in its chuck to prepare for each succeeding stage. As the construction of the drilling head 14 has been hereinbefore explained it may be seen that when the chuck 44 nears the face of the coal the drill is stopped by tightening the friction band 73 on the casing 64 by means of the hand wheel 74, the chuck 44 is released from the drill, the threaded portion 31 of the collar 30 is released from the threaded tube 32, the threaded tube 32 is moved rearwardly until the chuck 44 nears the support 26, the chuck 44 is tightened about the drill 42, the collar 30 is tightened about the threaded tube 32 and the friction band 73 is released from the casing 64 so the drill may again be fed into the coal to complete the drilling of the hole.

140 Although I have herein shown and described one form in which my invention may be embodied in combination with a mining machine of the continuous cutter type, it will be understood that the construction and arrangement of the parts may be altered and that my invention need not be used in combination with a mining machine of the type shown, but may be used in combina-

tion with any other type of mining machine or portable power device.

I claim as my invention:

1. In a drilling apparatus, a motor, a swing-
ing arm, a drilling head on the free end of said
arm supported for adjustment about axes co-
incident with and perpendicular to the longitu-
dinal axis of said swinging arm, a threaded mem-
ber supported by and movable with respect to
said drilling head, drill holding means on said
threaded member, a drill supported by said
threaded member, means for imparting transla-
tional and rotational movement to said drill
comprising a gear feathered to said threaded
member, and means for driving said gear from
said motor comprising a spur gear supported
by said swinging arm having driving engagement
with said first mentioned gear in all positions
of said drilling head with respect to said swing-
ing arm.
2. In a drilling apparatus, a motor, a swing-
ing arm, a drilling head on the free end of said
arm supported for adjustment about axes co-
incident with and perpendicular to the longitu-
dinal axis of said swinging arm, a threaded
member supported by and movable with respect
to said drilling head, drill holding means on said
threaded member, a drill supported by said
threaded member, means for imparting transla-
tional and rotational movement to said drill
comprising a gear feathered to said threaded
member, and means for driving said gear from
said motor comprising a spur gear supported by
said swinging arm having driving engagement
with said first mentioned gear in all positions
of said drilling head with respect to said swinging
arm, and a shaft within said swinging arm for
driving said last mentioned spur gear.
3. In a drilling apparatus, a motor, a swing-
ing arm, a drilling head on the free end of said
arm supported for adjustment about axes co-
incident with and perpendicular to the longitu-
dinal axis of said swinging arm, a threaded mem-
ber supported by and movable with respect to
said drilling head, drill holding means on said
threaded member, a drill carried within said
threaded member, means for imparting transla-
tional and rotational movement to said drill
comprising a gear feathered to said threaded
member, and means for driving said gear from
said motor comprising a spur gear supported by
said swinging arm having driving engagement
with said first mentioned gear in all positions
of said drilling head with respect to said swinging
arm.
4. In a drilling apparatus, a motor, a swinging
arm, a drilling head on the free end of said arm
supported for adjustment about axes coincident
with and perpendicular to the longitudinal axis
of said swinging arm, a threaded member sup-
ported by and movable with respect to said
drilling head, drill holding means on said thread-
ed member, a drill carried within said threaded
member, means for imparting translational and
rotational movement to said drill comprising a
gear feathered to said threaded member, and
means for driving said gear from said motor
comprising a spur gear supported by said swing-
ing arm having driving engagement with said
first mentioned gear in all positions of said drill-
ing head with respect to said swinging arm,
and a shaft carried within said swinging arm for
driving said last mentioned spur gear.
5. In combination with a mining machine, a
supporting member extending transversely of said

mining machine rearwardly of said motor, a longi-
tudinally extending supporting arm supported by
said supporting member for movement about an
axis extending transversely of said mining ma-
chine, a drilling head on the forward end of said
arm, said drilling head being mounted for ad-
justment about axes coincident with and per-
pendicular to the longitudinal axis of said arm,
drill feeding and rotating means on said drilling
head comprising a threaded member having a
drill supported thereby, a gear feathered to said
threaded member, feeding means engageable with
the threads on said threaded member, and means
for driving said gear in all positions of adjust-
ment of said drilling head with respect to said
supporting arm comprising a spur gear sup-
ported by said supporting arm and a shaft carried
within said supporting arm for driving said gear.

6. In an apparatus of the class described, a
portable support, a motor on said portable sup-
port, an arm supported at one end on said port-
able support for rocking movement with respect
thereto, a drilling head mounted on the free
end of said arm for adjustment about an axis
coincident with the longitudinal axis of said arm
and about an axis perpendicular to the longi-
tudinal axis of said arm, a drill holding and ad-
vancing member carried by said drilling head, a
drill carried by said drill holding and advancing
member, and means for driving said drill from
said motor in the several permissible positions
of adjustment of said drill with respect to said
arm including a spur gear feathered to said drill
holding and advancing member, a drive shaft
carried within said arm and a spur gear on said
shaft for driving said last mentioned spur gear.

7. In a drilling apparatus, a support including
a mining machine, said mining machine includ-
ing a motor, a forwardly extending cutter bar,
flexible feeding mechanism rearwardly of said
cutter bar, means for driving said flexible feeding
mechanism from said motor, a swinging arm sup-
ported on said mining machine, drilling mecha-
nism including a drilling head supported on the
free end of said swinging arm for adjustment
about axes coincident with and perpendicular to
the longitudinal axis of said swinging arm, said
drilling head including a drill holding and ad-
vancing member, a drill supported by said drill
holding and advancing member, and drive mecha-
nism connectible with said means for driving said
flexible feeding mechanism from said motor for
imparting independent or simultaneous transla-
tional and rotational movement to said drill hold-
ing and advancing member including a drive
shaft supported within said swinging arm, a spur
gear journaled in said drilling head and having
driving connection with said drill holding and
advancing member and a spur gear on the outer
end of said drive shaft and meshing with said
first mentioned spur gear for driving said spur
gear in all positions of adjustment of said drilling
head with respect to said swinging arm.

8. In a drilling apparatus, a support including
a mining machine, said mining machine includ-
ing a motor, a forwardly extending cutter bar,
flexible feeding mechanism rearwardly of said
cutter bar, means for driving said flexible feed-
ing mechanism from said motor including a
planetary gear reduction device having an outer
casing, a swinging arm supported on said mining
machine, drilling mechanism including a drilling
head supported on the free end of said swinging
arm for adjustment about axes coincident with
and perpendicular to the longitudinal axis of

said swinging arm, said drilling head including a drill holding and advancing member, a drill supported by said drill holding and advancing member, and drive mechanism connectible with said casing of said planetary gear reduction device for imparting independent or simultaneous translational and rotational movement to said drill holding and advancing member.

9. In a drilling apparatus, a support including a mining machine, said mining machine including a motor, a forwardly extending cutter bar, flexible feeding mechanism rearwardly of said cutter bar, means for driving said flexible feeding mechanism from said motor including a planetary gear reduction device having an outer casing a swinging arm supported on said mining machine, drilling mechanism including a drilling head supported on the free end of said swinging arm for adjustment about axes coincident with and perpendicular to the longitudinal axis of said swinging arm, said drilling head including a drill holding and advancing member, a drill supported by said drill holding and advancing member, and drive mechanism connectible with said casing of said planetary gear reduction device for imparting independent or simultaneous translational and rotational movement to said drill holding and advancing member including a gear integral with the outer casing of said planetary gear reduction device, a drive shaft supported within said swinging arm and a geared connection from said gear integral with the outer casing of said planetary gear reduction device to said drive shaft.

10. In a drilling apparatus, a support including a mining machine, said mining machine including a motor, a forwardly extending cutter bar, flexible feeding mechanism rearwardly of said cutter bar, means for driving said flexible feeding mechanism from said motor including a planetary gear reduction device having an outer casing a swinging arm supported on said mining machine, drilling mechanism including a drilling head supported on the free end of said swinging arm for adjustment about axes coincident with and perpendicular to the longitudinal axis of said swinging arm, said drilling head including a drill holding and advancing member, a drill supported by said drill holding and advancing member, and drive mechanism connectible with said casing of said planetary gear reduction device for imparting independent or simultaneous translational and rotational movement to said drill holding and advancing member including a gear on the outer casing of said planetary gear reduction device, a drive shaft supported within said swinging arm, a geared connection from said gear on the outer casing of said planetary gear reduction device to said drive shaft, a spur gear journaled in said drilling head and having driving connection with said drill holding and advancing member and a spur gear on the outer end of said drive shaft for driving said first mentioned spur gear in all positions of adjustment of said drilling head with respect to said swinging arm.

11. In a drilling apparatus, a motor, a longitudinally extending pivotally movable arm, a drilling head on the forward end of said arm, means for supporting said drilling head on said arm, said supporting means being adjustable with respect to said arm about an axis coincident with the longitudinal axis of said arm, and said drilling head being pivotally mounted on said supporting means to move in a plane perpendicular to the longitudinal axis of said longitudinally

extending arm, a threaded member supported by and movable in said drilling head, adjustable drill clamping means on said threaded member, a drill carried within said threaded member, means for imparting translational and rotational movement to said drill comprising a gear feathered to said threaded member and feeding and supporting means engageable with threads on said threaded member, and means for driving said gear from said motor comprising a spur gear having driving engagement with said first-mentioned gear in all positions of said drilling head with respect to said longitudinally extending arm and a shaft within said supporting arm.

12. In combination with a mining machine, a motor, a supporting member extending transversely of said mining machine rearwardly of said motor, a longitudinally extending supporting arm on the outer end of said supporting member and movable about the axis of said member, a drilling head on the forward portion of said arm mounted for adjustable movement with respect thereto about an axis coincident with the longitudinal axis of said arm and about an axis perpendicular to said longitudinal axis, drill feeding and rotating means on said head comprising a threaded member including a quick releasable clamping means on said threaded member for holding a drill within said threaded member, a gear feathered to said threaded member, feeding and supporting means engaging threads on said threaded member, and means for driving said gear in all positions of said drilling head with respect to said supporting arm comprising a driving gear and a shaft extending the length of said longitudinally extending arm and within said arm.

13. In a drilling apparatus, a mining machine slidable on its bottom on the mine bottom, a motor on said mining machine, a planetary gear reduction device driven by said motor, a swinging arm mounted on said mining machine, a drilling head mounted on said swinging arm for movement about an axis coincident with the longitudinal axis of said arm and for movement about an axis perpendicular to said longitudinal axis of said arm, a drill holding and advancing member on said drilling head, a drill supported by said drill holding and advancing member, and drive mechanism connectible with said planetary gear reduction device for imparting independent or simultaneous translational and rotational movement to said drill holding and advancing member in all positions of said drilling head with respect to said motor.

14. In a drilling apparatus, a mining machine slidable on its own bottom on the mine bottom, a motor on said mining machine, a planetary gear reduction device driven by said motor, a swinging arm, a drive shaft within said swinging arm driven by said planetary gear reduction device, a drilling head mounted on said swinging arm for movement about an axis coincident with the longitudinal axis of said arm and for movement about an axis perpendicular to said longitudinal axis of said arm, a drill holding and advancing member on said drilling head, a drill supported by said drill holding and advancing member, and drive mechanism connectible with said drive shaft for imparting simultaneous translational and rotational movement to said drill holding and advancing member in all positions of said drilling head with respect to said motor.

15. In an apparatus of the class described, a

mining machine slidable on its bottom on the mine bottom, a motor on said mining machine, a planetary gear reduction device driven by said motor including a casing, an arm supported at one end of said mining machine for rocking movement with respect thereto, a drilling head mounted on the free end of said arm for adjustment about an axis coincident with the longitudinal axis of said arm and about an axis perpendicular to the longitudinal axis of said arm, a drill holding and advancing member carried by said drilling head, a drill carried by said drill holding and advancing member, and means for driving said drill from said casing in the several permissible positions of adjustment of said drill with respect to said arm.

16. In an apparatus of the class described, a mining machine slidable on its bottom on the

mine bottom, a motor on said mining machine, a planetary gear reduction device driven by said motor including a casing, an arm supported at one end of said mining machine for rocking movement with respect thereto, a drilling head mounted on the free end of said arm for adjustment about an axis coincident with the longitudinal axis of said arm and about an axis perpendicular to the longitudinal axis of said arm, a drill holding and advancing member carried by said drilling head, a drill carried by said drill holding and advancing member, and means for driving said drill from said casing in the several permissible positions of adjustment of said drill with respect to said arm including a drive shaft carried within said arm.

FREDERICK W. VODOZ.

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30	105
35	110
40	115
45	120
50	125
55	130
60	135
65	140
70	145
75	150