

June 12, 1934.

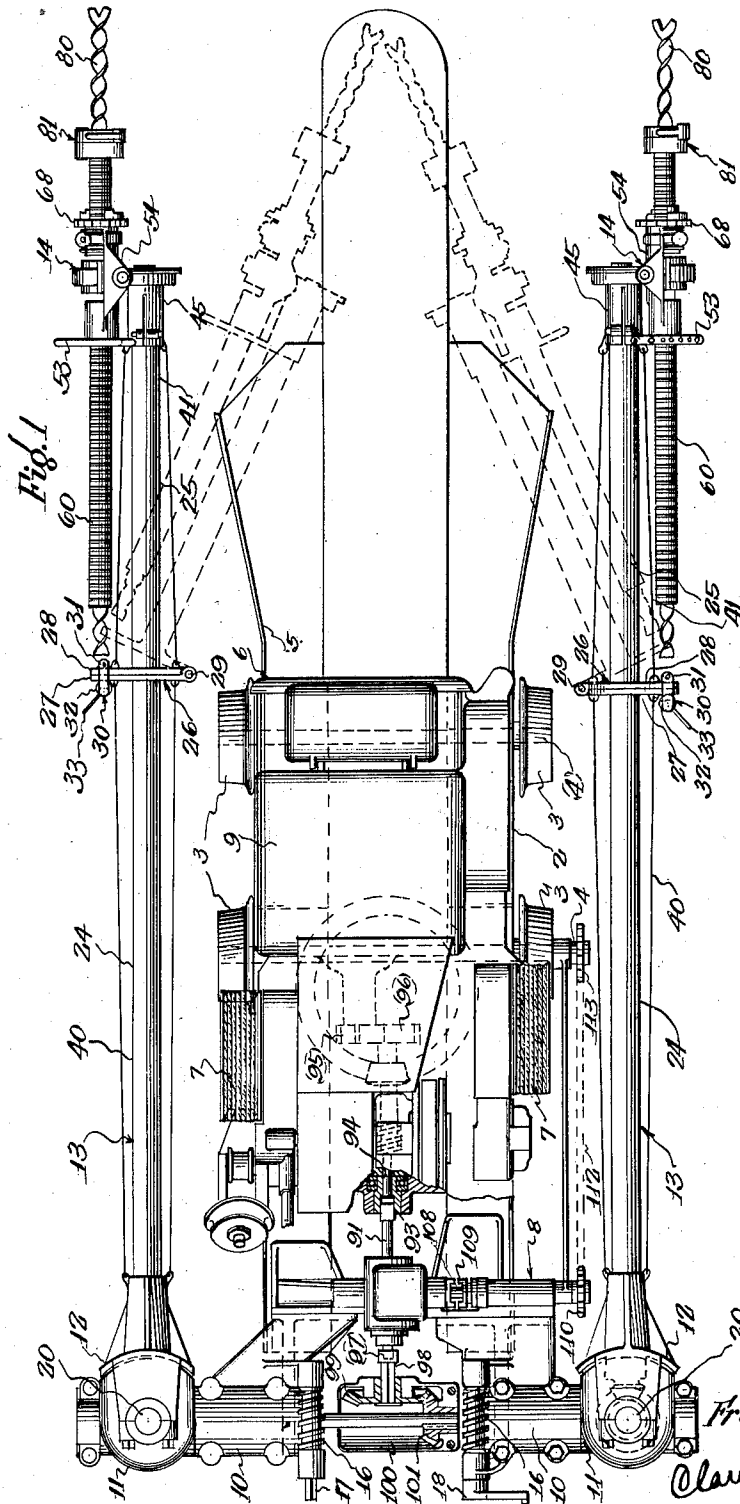
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1,962,334

DRILLING MECHANISM

Original Filed April 9, 1928

4 Sheets-Sheet 1



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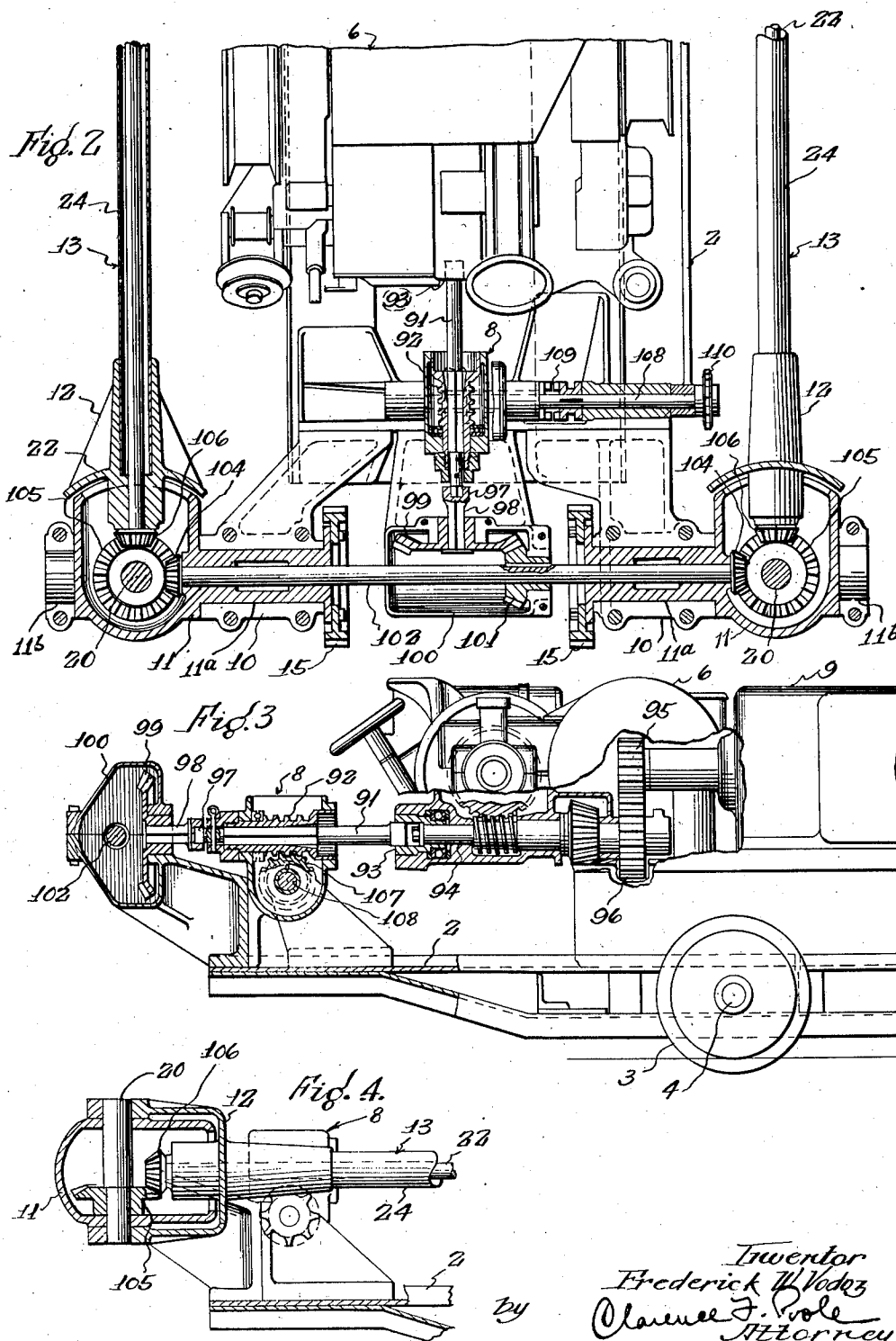
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DRILLING MECHANISM

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4 Sheets-Sheet 2



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DRILLING MECHANISM

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4 Sheets-Sheet 3

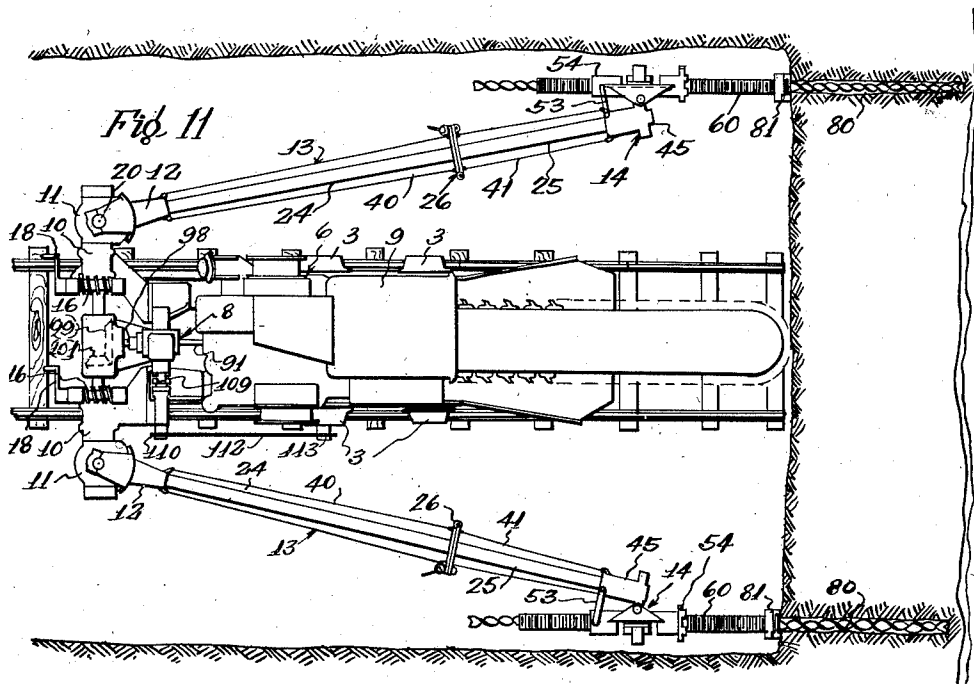
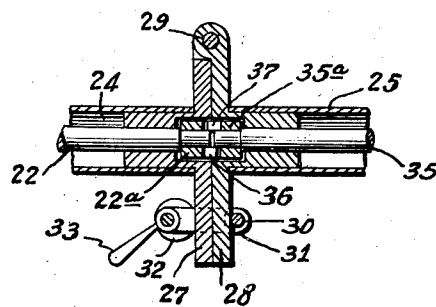


Fig. 5.



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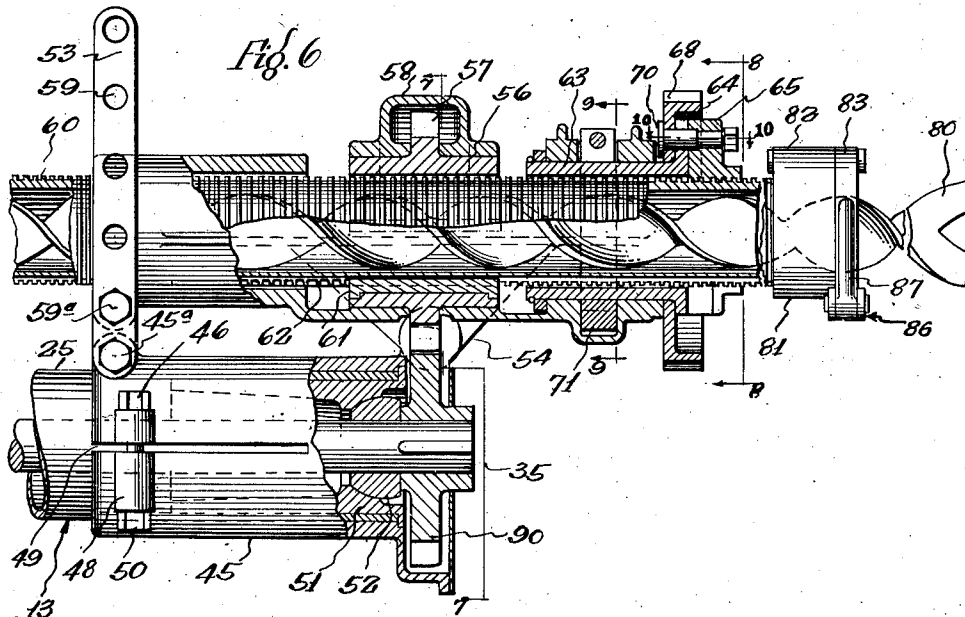
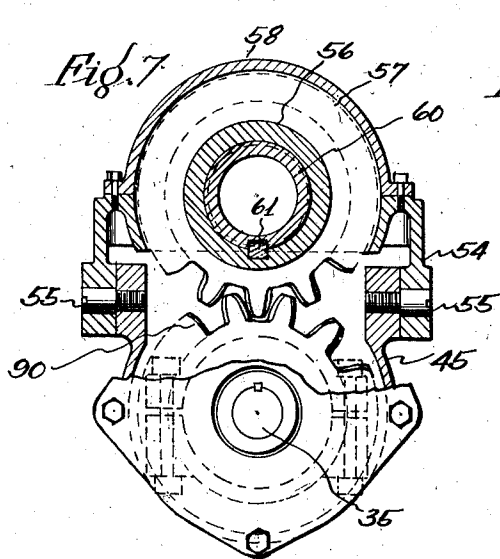
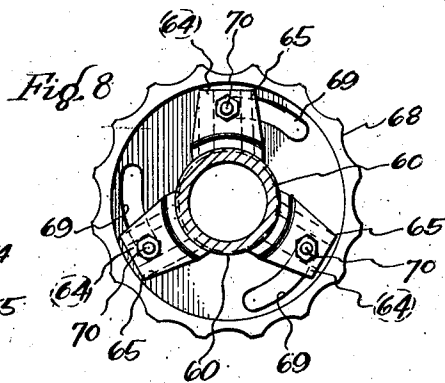
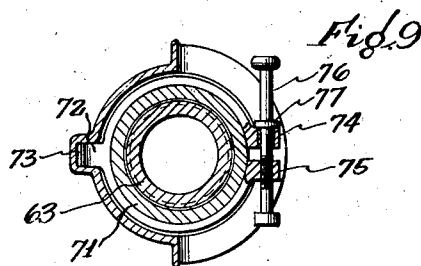
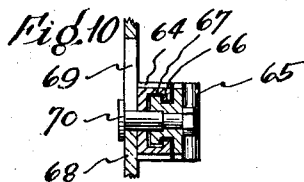
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DRILLING MECHANISM

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

1,962,334

DRILLING MECHANISM

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Application April 9, 1928, Serial No. 268,733
Renewed June 19, 1931

7 Claims. (Cl. 262—5)

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 truck, or similar portable power mechanism.

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 by hand, 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 results.

In carrying out my invention I provide an improved form of drilling mechanism so combined and carried with a mining machine truck as to afford sufficient strength to withstand all strains subjected to it due to drilling and moreover provide a drilling mechanism consisting of two drills operable by one man so that two holes may be drilled at the same time.

A prior application, Serial No. 263,402, filed March 21, 1928, shows an improved form of drilling mechanism in combination with a coal mining machine. My present invention improves on the form of feeding mechanism for the drill and provides two drills in combination with a mining machine truck operable from the same source of power which drives the mining machine and mining machine truck.

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 on a truck having my invention applied thereto;

Figure 2 is an enlarged fragmentary plan view of the rear portion of the mining machine and truck shown in Figure 1, with parts shown in section;

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

Figure 4 is a detail view of the rear portion of the drill arm with the connection of the arm to the support shown in section;

Figure 5 is a detail fragmentary view of one of the drill supporting arms with parts in section;

Figure 6 is an enlarged detail side view of the

drill head with the drill tube and supporting and operating parts therefor shown in section;

Figure 7 is a sectional view taken on line 7—7 of Figure 6;

Figure 8 is a sectional view taken on line 8—8 of Figure 6;

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

Figure 10 is a detail fragmentary sectional view taken on line 10—10 of Figure 6; and

Figure 11 is a top plan view of the device shown in operative position relative to a mine wall.

In the drawings, one embodiment of my invention is illustrated as applied to a mining machine truck of the ordinary type adapted for transporting a mining machine of the continuous cutter or shortwall type about a mine on the mine rails. Said truck comprises a frame 2 supported on wheels 3, 3, and axles 4, which frame has a hinged forward portion 5 adapted to engage the mine bottom so a mining machine 6 may be slidably moved thereon by means of its draft ropes 7 in the usual manner. A power bracket 8 is provided at the rearward end of said truck for propelling the truck about the mine rails through a motor 9 on the mining machine 6 in the well known manner. The power bracket 8 includes a worm and worm gear drive, driven from the mining machine motor 9, which drive has connection with the truck wheels through suitable sprockets and drive chains, which drive will hereinafter be more fully described.

A plurality of drilling devices are supported bodily on said mining machine truck, herein being carried on the rearward end thereof by supports 10, 10, and each comprising in general a knuckle 11 having an inner hub 11^a and an outer hub 11^b mounted for rotatable movement in the supports 10, a forked member 12, mounted for pivotal movement on the knuckle 11 in a plane perpendicular to the plane of rotation of the support 10, and having a tubular arm 13 projecting longitudinally forward therefrom which in turn has a drilling head 14 adjustably mounted on its forward end.

It may here be pointed out that the entire drilling devices are supported by supports 10, 10, at the rearward end of the truck frame 2 and that the drilling heads 14, 14, are vertically adjustable by moving the arms 13, 13, about the horizontal axis of the knuckles 11, 11, and that said drilling heads are horizontally adjustable by moving the arms 13, 13, about the pivotal axis of the forked members 12, 12. Means are pro-

vided for obtaining this vertical adjustment of the drilling heads 14, 14, which herein comprise worm gears 15, 15, fixed to the inner ends of the knuckles 11, 11, by any suitable means such as cap screws. Longitudinally extending, self-locking worms 16, 16, are journaled in the supports 10, 10, and mesh with and drive the worm gears 15, 15. Each of the worms 16, 16 have squared ends 17, 17, projecting rearwardly therefrom adapted to receive crank handles 18, 18, for rotating said worms and worm gears and arcuately moving the arms 13, 13, about the axis of the knuckles 11, 11. The arms 13, 13, are swung horizontally by hand in their several permissible positions relative to the knuckles 11, as will hereinafter more fully appear.

The forked members 12, 12, are pivotally mounted on the ends of shafts 20, 20, which are fixed in the knuckles 11, 11, perpendicular to the axis of rotation of said knuckles. A portion of the forked members 12, 12, project within the knuckles 11, 11, to form a bearing for the rearward end of shafts 22, 22. See Figures 2 and 4. The shafts 22, 22 are rotatable within the tubular supporting arms 13, 13, which tubular supporting arms 13, 13, are preferably secured within the ends of the forked members 12, 12. The tubular supporting arms 13, 13 may be held within the ends of the forked members 12, 12 in any suitable manner but as herein shown the members 12, 12 are shrunk on the tubular supporting arms 13, 13. Means are provided for hinging the arms 13, 13, intermediate their ends so that the drilling heads 14, 14, may be swung inwardly and rest on the mining machine cutter bar in moving from place to place.

Since the drilling mechanisms on both sides of my device are substantially the same, one drilling mechanism only will now be described in detail.

The tubular arm 13 is made up of a lower portion 24 and an upper portion 25 connected together by a hinge 26. Said hinge comprises a member 27 inserted in the portion 24 and a member 28 inserted in the portion 25, which members are connected together at one end by a pin 29 so as to have pivotal movement with respect to each other, and at their other end by a locking means 30 to hold said members stationary with respect to each other when desired. Said locking means is of an ordinary construction consisting of a member 31 pivoted to the member 28 and passing about the member 27 and having an eccentric cam 32 mounted to the end passing about the member 27 to engage the member 27 to lock the members 27 and 28 together. A handle 33 is provided on the cam 32 for operating said cam. The shaft 22 journaled in the portion 24 of the arm 13 has driving connection with a shaft 35 journaled in the portion 25 of the arm 13 through clutch jaws 36 on a member 22a keyed on the shaft 22 which jaws are engageable with clutch jaws 37 on a member 35a keyed on the shaft 35, for driving the shaft 35 from the shaft 22 when the hinge 26 is in a closed position and the shafts 22 and 35 are coaxial.

Auxiliary means are provided for the portions 24 and 25 of the tubular arm 13 to support and strengthen said arm. Said means comprise guy wires 40 extending from the forked member 12 to the member 27, and guy wires 41 extending from the member 28 to a point near the forward portion of the portion 25 of the tubular arm 13.

Referring now in particular to the drilling

head 14 as shown in detail in Figure 6, said head is supported on a sleeve 45 mounted on the forward portion of the tubular arm 13 so said sleeve may be rotatable about said arm. Suitable means are provided to hold the sleeve 45 in any desired position with respect to the supporting arm 13; as, for example, a bolt 46 passing through a lug 48, which lug is intersected by a slit 49 extending longitudinally of the sleeve 45 for a portion of its length, which bolt has a nut 50 on its opposite end so that tightening of the nut 50 on the bolt 46 contracts the sleeve 45 on the tubular arm 13 to hold said sleeve stationary. A member 51 is inserted in the forward end of the tubular supporting arm 13 to provide a reinforcement for the forward portion of said arm and to support a bearing member 52 for the shaft 35.

A supporting member 54 is trunnioned to the sleeve 45 on pins 55, 55, screwed into extensions from the sleeve 45 so the drilling head 14 may be moved angularly with respect to the tubular supporting arm 13. A spacing strip 53 is provided to hold the supporting member 54 in its several angular positions with respect to the sleeve 45. Said strip has a plurality of holes 59 therein and is fastened to the sleeve 45 at one end by means of a bolt 45a having a nut thereon. A bolt 59a is provided to fasten the strip 53 to the member 54. Said bolt has a nut thereon and may be inserted through any of the holes 59 to hold the supporting member 54 in its several positions with respect to the sleeve 45.

The outer periphery of a hub 56 of a gear 57 is journaled in the central portion of the supporting member 54 so that the transverse pivotal axis of the supporting member 54 tangentially intersects the pitch line of the teeth of the gear 57. The upper half of the bearing for the hub 56 of the gear 57 is formed from a cap piece 58. The rearward portion of the supporting member 54 serves as a supporting bearing for a threaded drill holding tube 60, which tube passes through the gear 57 and is driven by said gear by a feather key 61 which is slidable in a keyway 62 extending substantially the length of the threaded drill holding tube 60. The forward portion of the supporting member 54 serves as a support for feeding means to move said drill holding means transversely of the gear 57.

The drill feeding means is so arranged as to be automatically releasable on overload of the drill holding tube 60. A sleeve 63 is journaled on the forward portion of the supporting member 54 and provides an exterior supporting bearing for the threaded drill holding tube 60. Lugs 64 project radially outward from the forward portion of the sleeve 63 and have feeding jaws 65 radially movable therein. The jaws 65 have tongues 66 thereon which ride in grooves 67 in the lugs 64, (see Figure 10) and have a threaded inner face engageable with the threaded tube 60.

A locking wheel 68 abuts the rearward side of the lugs 64 and has a plurality of notches on its outer periphery to serve as a grip whereby said locking wheel may be rotated about the sleeve 63 by hand. Arcuate slots 69 are provided eccentric of the axis of the locking wheel 68. A pin 70 is secured in each of the jaws 65, and extends inwardly through a slot in the lug 64, and thence through one of the arcuate slots 69 in the locking wheel 68, as is best seen in Figures 6 and 8. As the locking wheel 68 is rotated in one direction (the sleeve 63 and lugs 64

being held stationary) the feeding jaws 65 are moved radially in the lugs 64 by means of the pins 70 which ride on the arcuate slots 69, to engage or disengage the threaded face of the jaws 65 with the threaded drill holding tube 60. A friction band 71 is provided to hold the sleeve 63 stationary while the drill holding tube 60 is being fed longitudinally of said sleeve, the arrangement being such that said sleeve may be allowed to rotate by overload due to slippage of the friction band 71 on the sleeve 63. This stops translational movement of the drill holding tube 60 due to the fact that the jaws 65 are allowed to rotate with the drill holding tube 60. The friction band herein shown comprises a flexible steel band having a lug 72 projecting therefrom which fits in an aperture 73 in the supporting member 54 and having lugs 74 and 75 projecting from each end thereof. A pin 76 passes through the lugs 74 and 75. Said pin has a flange 77 thereon abutting the lug 74 and has a threaded lower portion which engages threads in the lug 75 so that turning the pin 76 in one direction contracts the friction band 71 on the sleeve 63 and vice-versa. Means for turning the pin by hand are provided on each end of the pin 76, the means on the lower end being removable so the pin 76 may be removed from the lugs 74 and 75.

The threaded drill holding tube 60 is adapted to receive a drill 80 therein. The drill 80 may be of any type but is herein shown as a twist drill having its blade of the same shape as ordinary drills used in coal mines. A chuck 81 is provided on the forward end of the tube 60 to hold the drill 80 in said tube.

The chuck 81 is similar to that disclosed in my prior application, Serial No. 263,402, and filed March 21, 1928, and is no part of my present invention so will only be described in so far as is necessary to disclose my present invention. A member 82 is threaded on the end of the threaded tube 60 which has clamping means for holding the blades of the drill 80 at the forward end thereof. This clamping means consists of two holding pieces 83 which are pivoted to the member 82 at a common point and engage each side of the drill 80. These holding pieces are clamped on the drill 80 by means of a cam and link arrangement generally indicated at 86 which cam and link arrangement is connected to one holding piece 83 and operated by a handle 87 so that when said handle is in an upright position a cam will bear against the other holding piece 83 to lock the holding pieces 83 together and clamp the drill 80 so as to extend from the end of the tube 60 in any position of adjustment desired.

Referring now to the means for driving the gear 57 and rotating the drill 80 and feeding said drill into the coal from a power source carried on the mining machine 6, it may be seen that the gear 57 meshes with a gear 90 on the shaft 35, and that the gear 90 is adapted to drive the gear 57 when said gear is at various angles with respect to the gear 90. Provision is made for driving the gear 57 from the gear 90 at the several permissible angles of said gears relative to each other, by arranging the pivotal axis of the sleeve 45 and supporting member 54 so it will coincide with the pitch circles of both gears 57 and 90, and providing said gears with relatively deep teeth, chamfered at their edges to prevent binding between said gears.

The mining machine 6 being in position on the truck frame 2, has driving connection with the

drilling heads 14, 14, through a coupling pin 91. Said coupling pin serves as a driving connection for the truck driving means carried in the power bracket 3 and passes through a worm 92, therein. The worm 92 drives a worm wheel 107 which drives a shaft 108 through a suitable clutch 109. The shaft 108 drives a sprocket 110 which drives the rearward truck supporting wheels 3, 3, through a drive chain 112 and sprocket 113. The forward end of the coupling pin 91 is squared and fits in a squared socket 93 on the end of a shaft 94 on the mining machine 6. The shaft 94 is driven from the mining machine motor 9 through a motor pinion 95 and gear 96, keyed to said shaft. The opposite end of the coupling pin 91 is squared and is adapted to fit in a squared socket 97 on the end of a squared shaft 98 for rotating said shaft. The squared shaft 98 in turn rotates a bevel gear 99 journaled in a housing 100 on the truck frame 2. The bevel gear 99 meshes with and drives a bevel pinion 101 keyed on a transverse shaft 102 on the rearward end of the truck frame 2 and journaled in the knuckles 11, 11. Bevel pinions 104, 104, are keyed on each end of the shaft 102 and drive bevel gears 105, 105, loosely mounted on the shafts 20, 20. The bevel gears 105, 105, have driving connection with bevel pinions 106, 106, keyed to the shafts 22, 22, for driving said shafts and for driving the gear 90 through the jaws 36 and 37 and the shaft 35. It may herein be noted that the axis of rotation of the bevel pinions 104, 104, are on the axis of rotation of the knuckles 11, 11, and that the axes of rotation of the bevel gears 105, 105, are on the axes of rotation of the supporting arms 13, 13, so said bevel gears and pinions will have driving connections with each other in all of the several positions of the supporting arms 13, 13.

It may now be seen that I have provided a simple and strong means for supporting mining drills so said drills may be simultaneously 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 drills whereby said drills may be driven from the motor of the mining machine 6 when said mining machine is in place on a truck for transporting it about a mine.

It should also be noted that the gear 57 both rotates the drill 80 and causes said drill to be fed into the mine wall and that said drill is supported inside of the threaded drill holding tube 60 which passes through the hub of the gear 57 and moves longitudinally through the hub of said gear as said gear is rotating said threaded drill holding tube. This is accomplished by journalling the gear 57 on its hub 56 in the supporting member 54 and feathering said gear to the threaded drill holding tube 60, the keyway in said tube extending substantially the length of said tube. When the feeding jaws 65 engage the threaded drill holding tube 60 and the sleeve 63 is held stationary by the friction band 71 said threaded drill holding tube will be moved longitudinally through the hub of said gear, the feather key 61 sliding in the longitudinal keyway 62 in the threaded tube 60. When hard material or other obstructions are encountered in the coal, the friction band 71 will tend to slip, stopping translational movement of the drill 80. The drill 80, however, will continue its rotational movement and will automatically be fed into the coal by means of the friction band 71 as the obstruction is drilled away by the drill 80.

Therefore it may be seen that translational

movement of the drill may be stopped or started by tightening or loosening the friction band 71 on the sleeve 63 and that said band may be so adjusted on the sleeve 63 that translational movement will automatically be stopped upon overload of the drill. When it is desired to move the threaded drill holding tube 60 through the support 54 by hand it is necessary to disengage the jaws 65 from the threaded drill holding tube 60 by turning the locking wheel 68.

Referring now in particular to Figure 11 showing a plan view of a mining machine truck with drills such as are described in my invention drilling a hole in a mine wall, it may be seen that said mining machine truck is on the mine rails close to the face of the coal and has a mining machine thereon. The drilling operation is performed immediately after the cutting operation so when the mining machine 6 has undercut the kerf in the mine wall said mining machine is drawn up on the truck by means of the draft ropes 7. The truck and mining machine are then moved along the mine rails as close to the face of the coal as possible. The drill driving mechanism is connected with the mining machine motor by means of the coupling pin 91. The arms 13, 13, are raised upwardly to the desired height by turning the crank handles 18, 18, which rotate the worms 16, 16, and worm gears 15, 15, to rotate the knuckles 11, 11, and thus raise the arms 13, 13. The drilling heads 14, 14, are then swung into the proper lateral position with respect to the face of the coal for drilling as shown in Figure 11.

The drills 80, 80, as shown in Figure 11 have advanced simultaneously 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 mining machine cutter bar and varies from five and one-half to eight feet in depth. Since the tubular supporting arms 13 are inclined from the rear of the mining machine truck towards the mine wall it may be seen that it is seldom possible to place the drilling heads 14, 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 drills into the coal by stages. Due to the construction of my drilling head this is a distinct advantage 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 of the drills, since the drills may be simply and quickly advanced in their chucks to prepare for each succeeding stage. As the construction of the drilling heads 14, 14, have hereinbefore been explained it may be seen that when the chucks 81, 81, near the face of the coal the rotation of the drills are stopped by turning off the mining machine motor 9; the chucks 81, 81, are then released from the drills 80, 80. The jaws 65, 65, are disengaged from the threaded drill holding tubes 60, 60, by means of the hand locking wheels 63, 68, and the threaded drill holding tubes 60, 60, are moved rearwardly until the chucks 81, 81, near the supports 54, 54. The chucks 81, 81, are then tightened around the drills 80, 80, the jaws 65 are engaged with the threaded drill holding tubes 60, 60, and the motor 9 is started so the drills 80, 80, may complete the drilling operation.

After the holes have been drilled to their full depth, the jaws 65, 65, are released from the threaded drill holding tubes 60, 60, the chucks

81, 81, are released from the drills 80, 80, and the drills are removed from the drill holes. The arms 13, 13, are lowered and folded inwardly so the drilling heads 14, 14, may rest on the mining machine cutter bar as is illustrated by dotted lines in Figure 1. The mining machine and truck are then ready to move to the next cutting place.

Although I have herein shown and described one form in which my invention may be embodied, it will be understood that the construction and arrangement of the various parts may be altered or changed without departing from the spirit and scope thereof. Furthermore, I do not wish to be construed as limiting myself to the particular form illustrated, excepting as it may be limited in the appended claims.

I claim as my invention:

1. In a drilling apparatus, a mining machine truck, a mining machine on said truck, a motor on said mining machine, a plurality of drill supporting arms arcuately movable in both vertical and horizontal planes on said mining machine truck at the rearward end thereof, a hinged connection in said arms whereby the forward end of said arms may be folded onto the forward portion of said mining machine truck, a drilling head on the forward portion of each of said arms for angular movement thereon, and means for driving said drilling heads from said mining machine in all positions of adjustment thereof through driving means carried within said hinged arms.

2. In a drilling apparatus, a mining machine truck, a mining machine on said truck, a motor on said mining machine, a plurality of drill supporting arms arcuately movable in both vertical and horizontal planes on said mining machine truck at the rearward end thereof, rotatable supporting means for supporting said arms on said truck, a hinged connection in each of said arms whereby the forward end of each of said arms may be folded on to the forward portion of said mining machine truck, a drilling head on the forward portion of each of said arms for angular movement thereon, means for driving said drilling heads from said mining machine in all positions of adjustment of each of said arms and drilling heads with respect to said mining machine truck through driving means carried within said hinged arms, and means for vertically adjusting said arms comprising a self-locking worm and worm gear connectible with said rotatable supporting means for each of said arcuately movable arms.

3. In an apparatus of the class described, a mining machine including a motor and a forwardly extending cutter bar, a swinging drill supporting arm, drilling mechanism including a drilling head mounted on the outer end of said arm for movement with respect thereto about a horizontal axis, a hinged connection in said arm whereby said drilling head and the forward end of said arm may be folded onto said mining machine cutter bar when inoperative, and means carried by said drill supporting arm having operative connection with said drilling head and motor for driving said drilling head from said mining machine motor in all positions of adjustment of said drilling head and swinging arm with respect to said motor.

4. In an apparatus of the class described, a support including a motor, a swinging drill supporting arm on said support, drilling mechanism adjustably mounted on said arm, a hinged con-

nection in said arm whereby said drilling mechanism may be folded onto said support, and means carried by said drill supporting arm having operative connection with said drilling mechanism and motor for driving said drilling mechanism from said motor.

to said transverse axis, drilling mechanism supported on the opposite end of said arm for adjustable movement with respect thereto about the longitudinal axis of said arm and about an axis disposed perpendicularly to said longitudinal axis, and means driven by said motor and carried within said arm for driving said drilling mechanism from said motor in all positions of adjustment of said drilling mechanism and arm with respect to said truck.

5. In an apparatus of the class described, a truck, a motor on said truck, a swinging arm supported adjacent one of its ends on said truck for pivotal movement with respect thereto about a transverse axis and an axis disposed perpendicularly to said transverse axis, drilling mechanism supported on the opposite end of said arm for adjustable movement with respect thereto about the longitudinal axis of said arm and about an axis disposed perpendicularly to said longitudinal axis, a hinged connection in said arm whereby said drilling mechanism may be folded onto said truck, and means carried by said drill supporting arm having operative connection with said drilling mechanism and motor for driving said drilling mechanism from said motor.

7. In a drilling apparatus, a mining machine truck, a mining machine adapted to be detachably mounted on said truck, a motor on said mining machine, a swinging arm supported adjacent one of its ends on said truck for pivotal movement with respect thereto about a transverse axis and an axis disposed perpendicularly to said transverse axis, drilling mechanism supported on the opposite end of said arm for adjustable movement with respect thereto about the longitudinal axis of said arm and about an axis disposed perpendicularly to said longitudinal axis, a hinged connection in said arm whereby said drilling mechanism may be folded onto said truck, and means carried by said drill supporting arm having operative connection with said drilling mechanism and motor for driving said drilling mechanism from said motor.

6. In a drilling apparatus, a mining machine truck, a mining machine adapted to be detachably mounted on said truck, a motor on said mining machine, a swinging arm supported adjacent one of its ends on said truck for pivotal movement with respect thereto about a transverse axis and an axis disposed perpendicularly

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