

Jan. 8, 1952

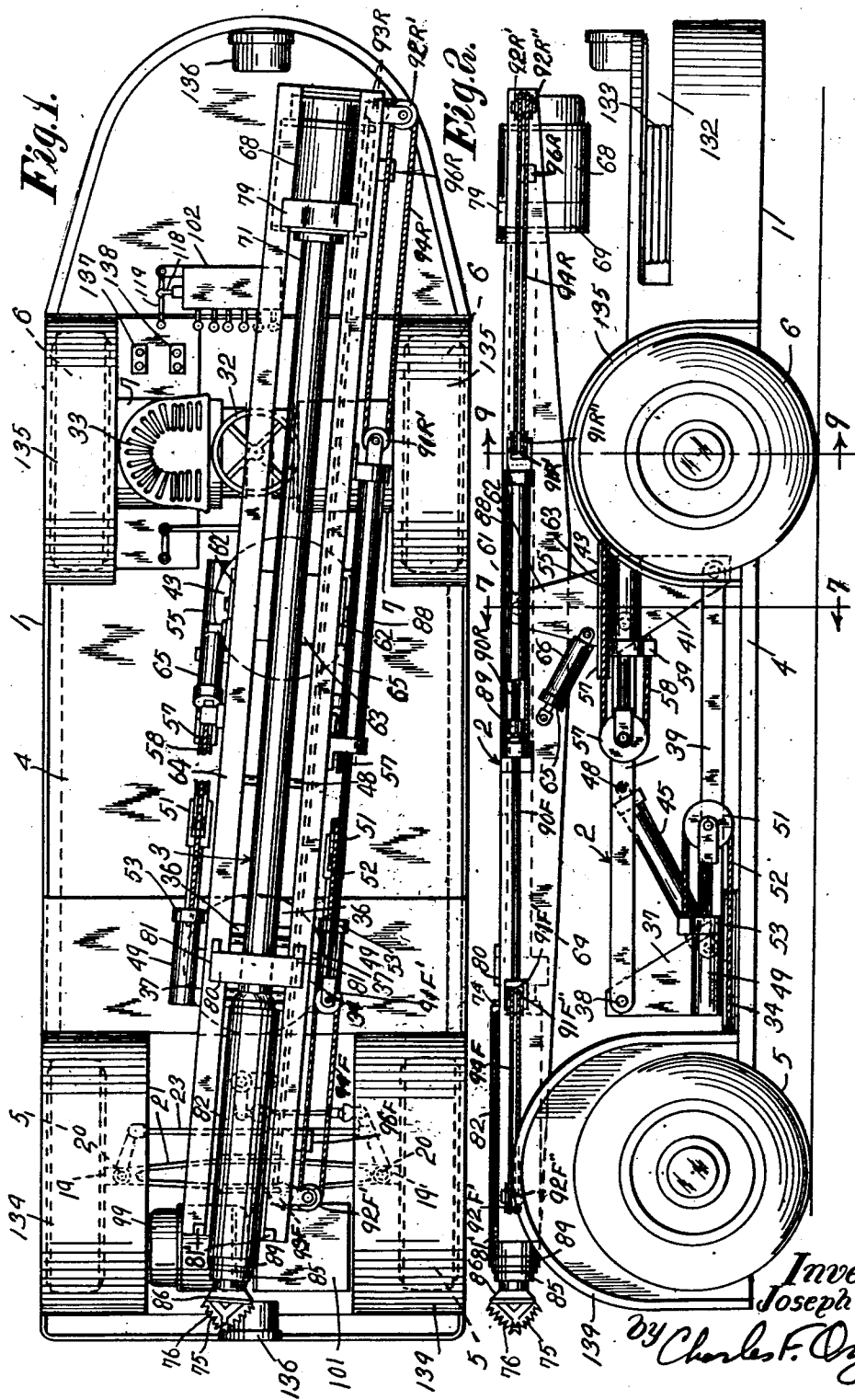
J. F. JOY

2,581,667

MINING APPARATUS

Filed Sept. 4, 1946

6 Sheets-Sheet 1



Inventor:
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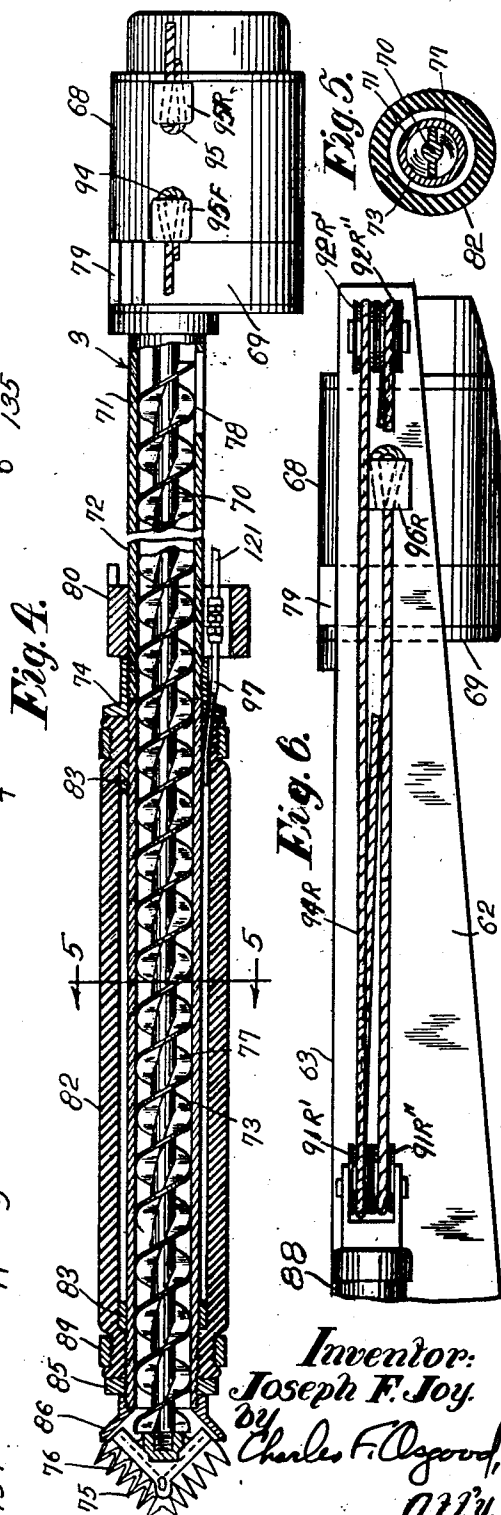
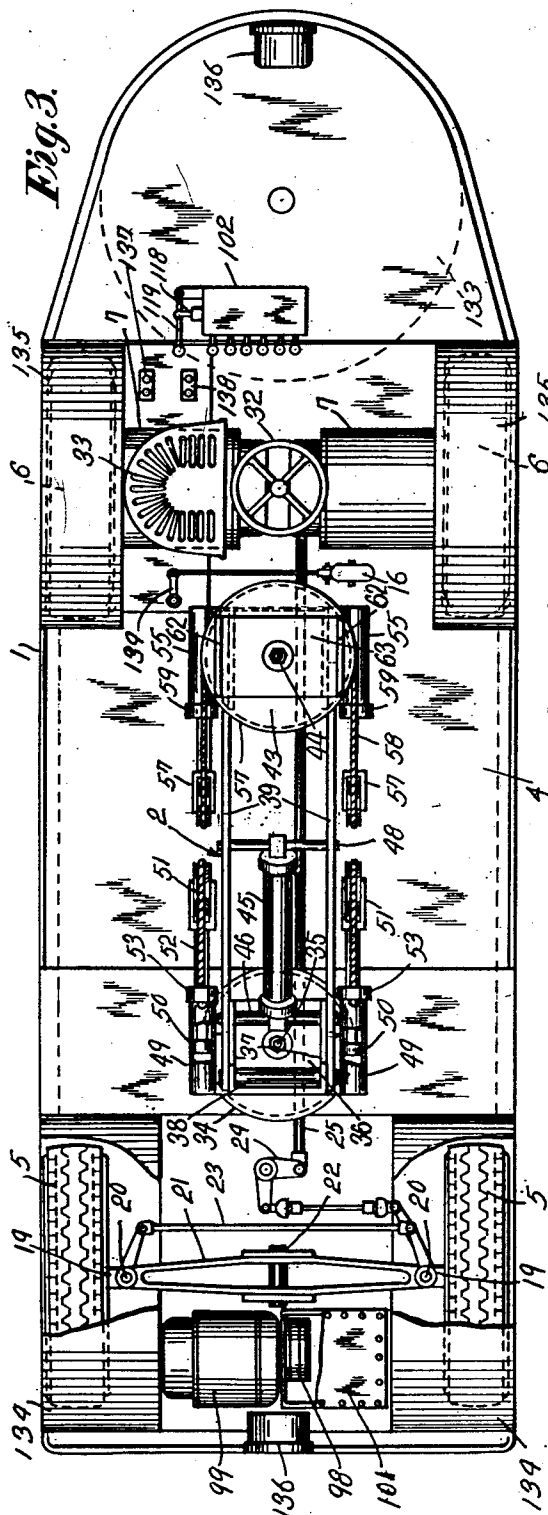
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6 Sheets-Sheet 2



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6 Sheets-Sheet 3

Fig. 7.

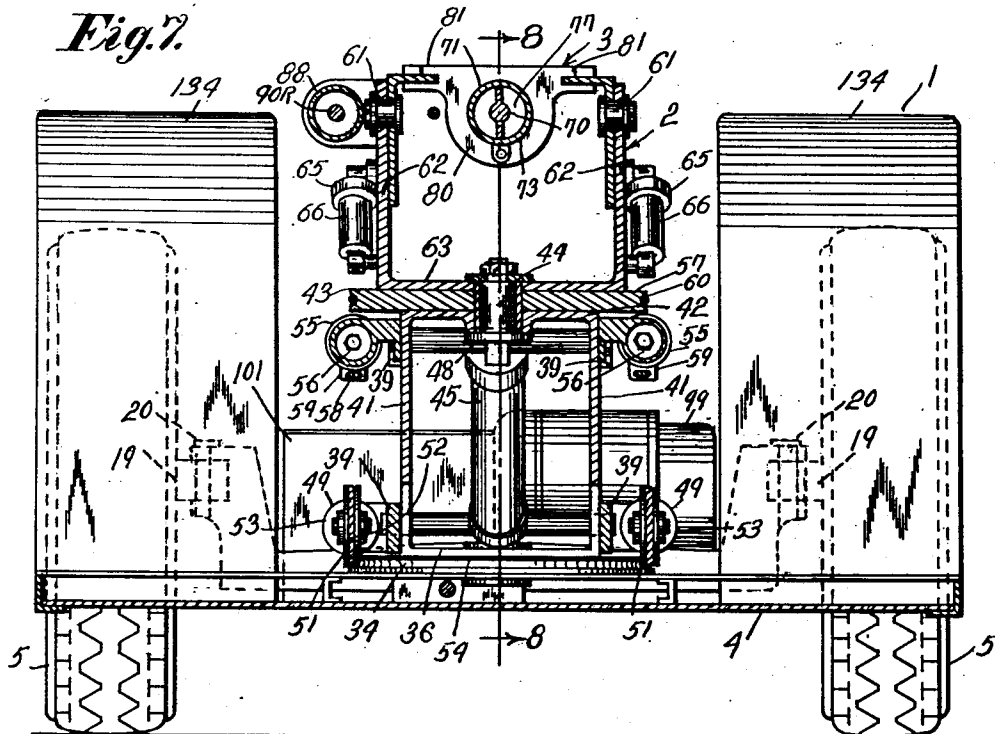
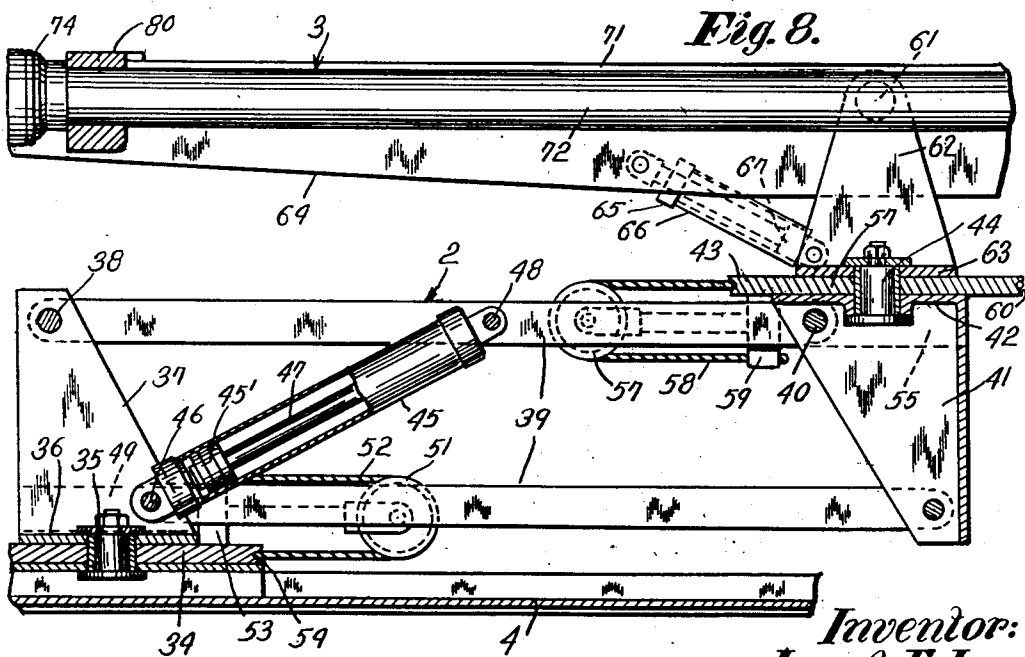


Fig. 8.



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6 Sheets-Sheet 4

Fig. 9.

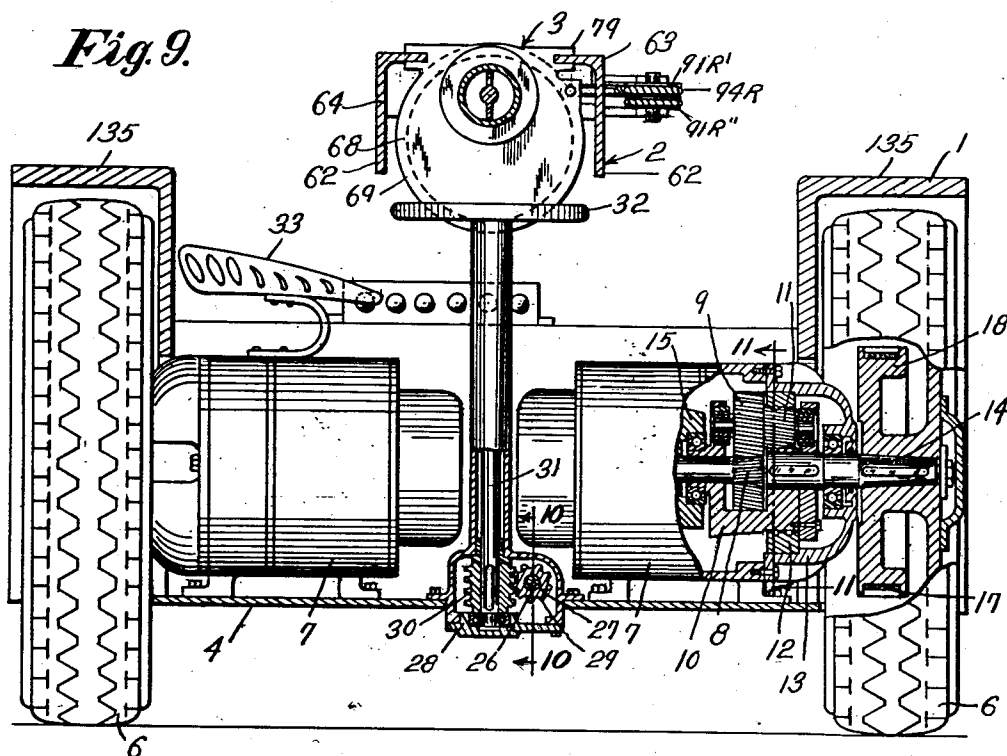


Fig. 10.

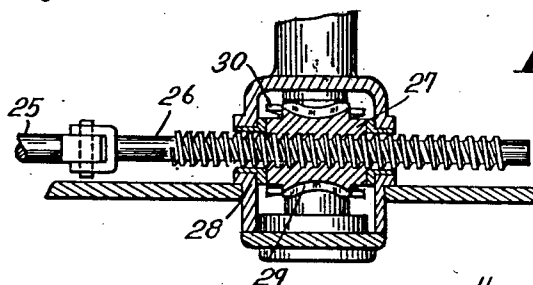
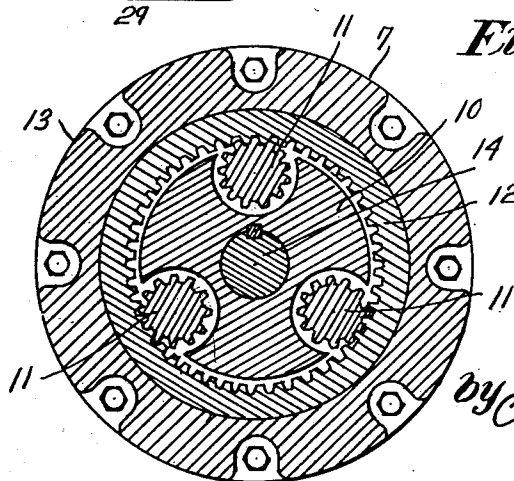


Fig. 11.



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Filed Sept. 4, 1946

6 Sheets-Sheet 5

Fig. 12.

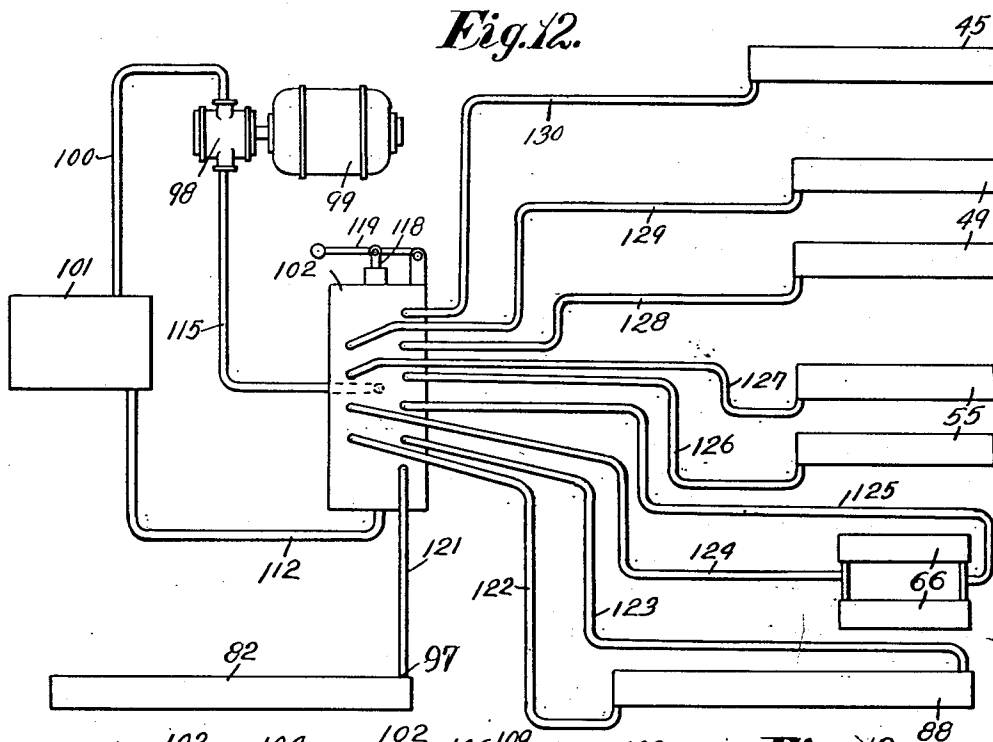


Fig. 13.

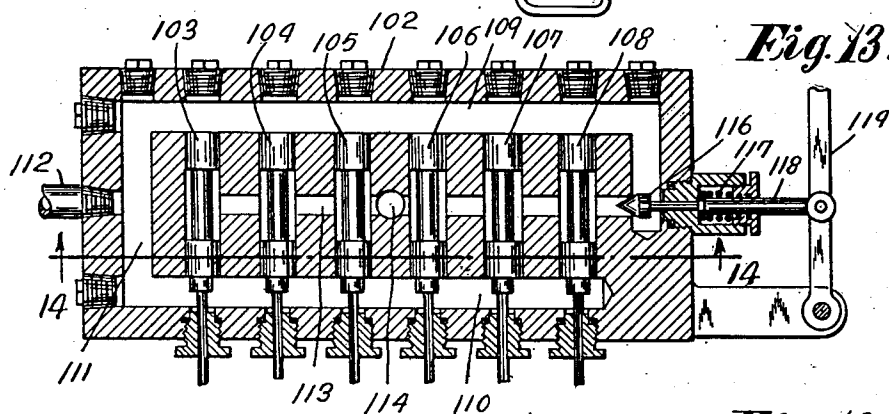
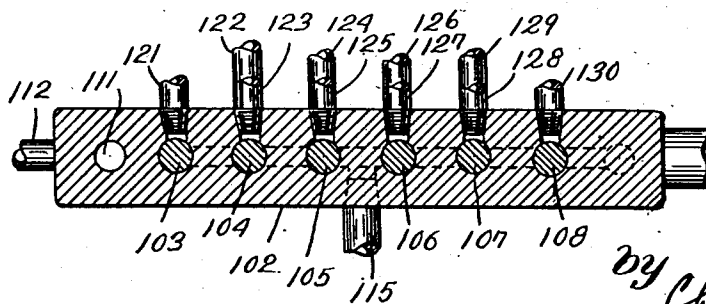


Fig. 14.



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UNITED STATES PATENT OFFICE

2,581,667

MINING APPARATUS

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Application September 4, 1946, Serial No. 694,779

13 Claims. (Cl. 255—51)

1

This invention relates to mining apparatus and more particularly to improved mining apparatus for drilling and breaking down material, such as coal in underground coal mines, thereby to dislodge the coal without the use of explosives.

In accordance with the present day practice of mining coal in underground coal mines, the coal is usually cut by a coal cutting machine and the coal face is drilled by a coal drill to provide a series of blast holes for receiving explosive charges so that the cut coal may be dislodged from the coal seam. The present invention contemplates improvements over previous mining practice in that the use of explosives and the attendant objections and dangers are avoided. In accordance with the present invention, the cut coal is drilled and broken down from the coal seam by a self-contained mobile apparatus embodying means for drilling the coal face and for breaking down the coal, thereby eliminating the objections and dangers encountered in blasting with explosives.

An object of the present invention is to provide an improved mining apparatus. Another object is to provide an improved adjustable supporting structure for a mining instrument. Yet another object is to provide an improved self-contained mobile apparatus for drilling and breaking down the material to be dislodged in an improved manner. A further object is to provide an improved combined drilling and breaking down mechanism whereby the coal may be drilled and thereafter, without removing the drill from the bore hole, a powerful breaking down pressure may be imparted to the coal to dislodge the coal. A still further object is to provide an improved drilling and breaking down apparatus embodying improved means for supporting and adjusting the drilling and breaking down mechanism with respect to the work. Yet another object is to provide an improved drilling and breaking down mechanism embodying a rotary drill and an expansible breaker device encircling the drill spindle rearwardly of the drill head and having improved conveying means associated with the drill head for conveying the cuttings created by the drill head rearwardly through the breaker device along the drill spindle. A further object is to provide an improved adjustable supporting structure for a drilling tool whereby blast holes may be drilled in the coal face at any desired location. Still another object is to provide an improved drilling and breaking down apparatus of the rubber-tired, mobile type especially designed for use in trackless mining without the aid of a guid-

2

ing trackway. Yet another object is to provide an improved mining apparatus having improved arrangements and combinations of parts. These and other objects and advantages of the invention will, however, hereinafter more fully appear.

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

In these drawings:

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

Fig. 2 is a side elevational view of the mining apparatus shown in Fig. 1, showing the drilling and breaking down mechanism in its lowered position on the base.

Fig. 3 is a plan view similar to Fig. 1, with parts of the drilling and breaking down mechanism removed to facilitate illustration.

Fig. 4 is an enlarged view in central longitudinal vertical section through the drilling and breaking down mechanism, illustrating details of construction.

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

Fig. 6 is a fragmentary enlarged view showing details of the feeding mechanism.

Fig. 7 is an enlarged cross-sectional view taken substantially on line 7—7 of Fig. 2.

Fig. 8 is a longitudinal vertical sectional view taken substantially on line 8—8 of Fig. 7, showing parts of the adjustable supporting structure for the drilling and breaking down mechanism.

Fig. 9 is an enlarged cross-sectional view taken substantially on line 9—9 of Fig. 2.

Fig. 10 is an enlarged detail vertical sectional view taken on line 10—10 of Fig. 9, showing a portion of the steering gear.

Fig. 11 is an enlarged detail vertical sectional view taken on line 11—11 of Fig. 9, showing a portion of the traction wheel drive.

Fig. 12 is a diagrammatic view showing the hydraulic system of the machine.

Fig. 13 is a horizontal section through the valve box, the controlling valve assembly of the hydraulic system.

Fig. 14 is a vertical section on the plane of the line 14—14 of Fig. 13.

Fig. 15 is a diagrammatic view in plan, showing the mining apparatus in operating position in a mine.

Fig. 16 is a diagrammatic side view showing the mining apparatus in a mine with the drilling and breaking down mechanism in elevated position.

Fig. 17 is a diagrammatic side view showing

3

the drilling and breaking down mechanism in coal breaking position in a coal seam.

In the illustrative embodiment of the invention, there is shown a mining apparatus of the self-contained mobile type supported on rubber-tired wheels and designed for use in trackless coal mines and embodying improved drilling and breaking down mechanism for dislodging the cut coal from a coal seam without the use of explosives.

The mining apparatus generally comprises a mobile base or chassis 1, an adjustable supporting structure generally designated 2 mounted on the base and a mining instrument, herein a combined drilling and breaking down mechanism, generally designated 3 carried by the adjustable supporting structure. The mobile base comprises a base frame 4 mounted on rubber-tired wheels 5, 5 and 6, 6, adapted to travel over the floor of a mine without the aid of a guiding trackway. The front wheels 5, 5 are steering wheels, and the rear wheels, 6, 6 are traction wheels. The traction wheels may be driven in unison by separate motors 7, 7 supported on the base with their axes arranged in alignment and in a transverse vertical plane in which the wheel axes also lie, and these motors are preferably of the variable speed, reversible, electric type. The speed reducing transmission connections between the motors and the traction wheels may assume various forms and herein comprise, as shown in Figs. 9 and 11, a helical pinion 8 fixed to each of the motor power shafts and meshing with helical planet gears 9 fixed to shafts journaled on a rotatable planet carrier 10. Fixed to the planet gear shafts are helical planet gears 11 of smaller size meshing with an internal helical reaction gear 12 secured to a gear housing 13 attached to the motor casing. Keyed to the planet gear carrier 10 is a drive shaft 14 in turn keyed to the hub of a traction wheel. The planet carrier 10 is journaled in bearings supported within the motor head 15 and the housing 13, as shown in Fig. 9. Electrical control means 16 is provided for effecting operation of the motors 7, 7 in unison and the motors are preferably started in series to provide a relatively high starting torque and are thereafter connected in parallel to give an increased driving speed in a well known manner. Under the regulation of the control means 16, the motors may be operated at variable speeds and the planetary gearings provide a substantial speed reduction between the motors and the wheels. Suitable brake bands 17 cooperating with brake drums 18 on the wheels are provided for braking the wheels in the desired manner.

The front steering wheels 5, 5 have their axles 19 swivelled at 20 at the opposite ends of a transverse front axle 21, which is pivotally mounted at 22 centrally on the base frame to rock about a longitudinal axis. Any suitable means may be employed to swing the steering wheels on their pivotal mountings, and herein the swivelled axles 19 are interconnected by conventional linkage 23 to a crank 24 pivoted on an upright axis at the bottom of the base frame. This crank is pivotally connected to an operating rod 25 extending longitudinally of the base frame and pivotally connected at its rear end to an operating screw 26 (see Fig. 10). This screw threadedly engages a nut 27 mounted in a housing 28 secured to the bottom of the base frame. Formed on this nut is a worm wheel 29 engaged by a worm 30 keyed to a vertical operating shaft 31 to the upper end of which is secured a steering wheel 32. Mounted

4

on the top of one of the wheel-driving motors 7 is a seat 33 for the operator, so arranged that the operator may sit in a convenient position with respect to the steering wheel 32 and the several control elements of the apparatus. Thus, by operating the steering wheel 32, the operator may readily turn the steering wheels 5, 5 in one direction or the other, as desired, through the worm gearing and linkage.

The improved adjustable supporting structure 2 comprises a lower horizontal circular frame 34 (see Fig. 8) fixed to the base frame rearwardly of the front wheels, and swivelled at 35 on the frame 34 is a lower horizontal turntable element 36 having projecting upwardly therefrom spaced vertical side plates 37. Pivotally mounted at their forward ends on these side plates at 38 are pairs of parallel motion arms or links 39, 39 in turn pivotally connected at 40 at their rearward ends to vertical side plates 41 on a frame 42. An upper horizontal turntable 43 is swivelled at 44 on the frame 42. A hydraulic jack cylinder 45 is pivoted at 46 on the side plates 37 in alignment with the front pivots of the lower arms 39, 39 and contains a reciprocable piston 45' having its piston rod 47 pivotally connected at 48 to the upper arms or links 39, 39. When fluid under pressure is supplied to the jack cylinder, the piston is moved to swing the arms upwardly to vary the elevation of the upper turntable while the turntable axis always remains vertical. By trapping the fluid in the cylinder 45, the arms may be locked in adjusted position, and when fluid is discharged from the jack cylinder, the arms may be lowered. A pair of parallel horizontal hydraulic cylinders 49, 49 are attached to the side plates 37 on the lower turntable 36 and contain reciprocable pistons 50 having their piston rods projecting rearwardly and carrying sheaves or pulleys 51. A cable 52 is attached at its ends to the rear cylinder heads 53 and passes around the sheaves 51 with its intermediate portion lying in an arcuate groove 54 extending about the peripheral edge on the stationary bottom frame 34 and centrally fixed to the latter. Similar parallel horizontal hydraulic cylinders 55, 55 are attached to the side plates 41 beneath the upper turntable 43, and reciprocable in these cylinders are pistons 56 having their piston rods projecting forwardly and carrying sheaves or pulleys 57. A cable 58 is attached at its ends to the front cylinder heads 59 and passes around the sheaves 57 and has its intermediate portion lying in an arcuate groove 60 extending about the peripheral edge of the upper turntable 43 and centrally fixed to the turntable. The drilling and breaking down mechanism 3 is mounted on the upper turntable. It is accordingly evident that when fluid under pressure is supplied to one of the lower cylinders 49 and discharged from the other, the lower turntable element 36 may be turned about its swivel 35 in one direction or the other to swing the parallel arm structure 39 horizontally toward one side of the base. By supplying fluid under pressure to one of the cylinders 55 and discharging fluid from the other, the upper turntable 43 may be turned in one direction or the other about its swivel 44 to swing the drilling and breaking down mechanism 3 horizontally into different angular positions with respect to the base. By trapping the fluid in the cylinders, the arm structure and drilling and breaking mechanism may be locked in adjusted position. The means for controlling the fluid supply to the several cylinders above described will be later explained.

Now referring more specifically to the drilling and breaking down mechanism 3, it will be noted that pivotally mounted at 61 on a transverse axis on upstanding side plates 62 of a frame 63 secured to the upper turntable 43 is an elongated, open-centered guide frame 64 which overlies the base frame. This elongated guide frame is swingable in a vertical direction about its pivotal mounting on the upper turntable by means of hydraulic double-acting jacks 65 having their cylinders 66 pivotally connected to the side plates 62 and containing reciprocable pistons 67 having their piston rods pivotally connected to the guide frame 64. By means of these jacks, the guide frame 64 may be tilted upwardly or downwardly as desired, and by trapping fluid in the cylinders, the guide frame may be locked in adjusted position. The combined drill and breaker is slidably mounted on the guide frame and includes a rearwardly located motor 68 having its power shaft connected through a conventional speed reducing unit 69 to a drill rotating shaft or spindle 70 extending longitudinally centrally within a stationary outer tube or tubular housing 71 secured at its rear end to the motor casing. This tubular housing is made up of aligned tubular sections 72 and 73, and a collar 74 welded to the rear end of the front section is threadedly secured to the front end of the rear section for rigidly uniting the sections. Attached to the front end of the drill spindle 70 is a rotary drill head or drill bit 75 having cutting teeth 76. The drill shaft or spindle 70 has spiral conveyor vanes or flights 77 secured thereto to provide a conveyor for conveying the cuttings created by the drill bit rearwardly through the tube 71 to discharge through a rearwardly located bottom discharge opening 78. The motor casing has lateral guides 79 engaging the longitudinal guideways of the guide frame 64 and the tube 71 is slidably guided in a front guide 80 which also has lateral guides 81 slidably engaging the guide-frame guideways. Suitable stop lugs 81' are arranged at the front end of the guide frame 80 for limiting forward movement of the drill and breaker. Surrounding the front tube section 72 of the tubular housing is an expansible tubular breaker in the form of a rubber bag 82 secured at its ends to the tubular housing by means of inner and outer collars 83 and 84, the former welded to the ends of the front tubular section and the latter surrounding and embedded in the ends of the rubber bag. Thus fluid tight joints are provided between the rubber bag and the tubular housing at the ends of the bag. Threaded on the forward end of the front housing section is a collar 85 arranged between the front end of the bag and the rear side of the drill bit, as shown in Fig. 4. Threaded on the front end of the front housing section in advance of the collar 85 is a bell-mouthed member 86 which serves to direct the cuttings created by the drill bit into the tubular housing toward the receiving end of the spiral conveyor. The drill bit is of such size as to form a bore hole of a diameter sufficient to receive the expansible breaker as the drill bit forms a bore hole in the material to be broken. The drill and breaker unit per se is being claimed in a divisional application, Ser. No. 14,057, filed March 10, 1948.

Various means may be employed for feeding the associated drill and breaker longitudinally along the guideways of the guide frame 64. The means shown in the drawings for accomplishing this purpose comprises a hydraulic cylinder

88 arranged longitudinally at one side of the guide frame 64 and containing a reciprocable piston 89 having its piston rods 90F and 90R extending forwardly and rearwardly through the opposite heads of the cylinder. The opposite piston rods each carry at their free ends a pair of sheaves or pulleys, those at the rear of rod 90R being numbered 91R' and 91R'', and those at the front end of rod 90F being numbered 91F' and 91F''. At the rear end of guide frame 64 there are arranged two coaxial pulleys 92R' and 92R'', and another pulley 93R inwardly of the pulley 92R'. Corresponding pulleys 92F', 92F'' and 93F are arranged adjacent the front end of the guide frame. Multiple reeve cables 94F, 94R pass around these pulleys or sheaves as will shortly be described, and these cables at their respective opposite ends are each connected to a lateral lug 95F or 95R, as the case may be, integral with the motor casing, and to a lateral lug 95F' or 96R, as the case may be, secured to the guide frame 64. A desirable reeve for the cables is, using as an example the cable 94R, from a point of attachment on the lug 95R on the motor casing, around the sheave 93R, outwardly and around the sheave 92R', forwardly and around the sheave 91R', then rearwardly and around the sheave 92R'', then forwardly and around the sheave 91R'', and then rearwardly to the connection to the stationary lug 96R. Accordingly, when fluid under pressure is supplied to one or the other end of the feed cylinder, the drilling and breaking means may be fed at a speed substantially higher than the speed of the feed piston, either forwardly or rearwardly along the guide frame, as desired. The valve mechanism for controlling fluid flow to the feed cylinder will later be described, and when the fluid is trapped in the feed cylinder, the drilling and breaking means may be locked in adjusted position. A conduit 97 is connected to the interior of the breaker bag 82 and leads rearwardly along the exterior of the tubular housing to a suitable supply of liquid under pressure so that the rubber bag may be expanded to effect its breaking down function when desired.

The hydraulic system, shown diagrammatically in Fig. 12, comprises a liquid pump 98 driven by a motor 99 arranged at the front end of the base frame and having its intake connected by a conduit 100 to a liquid tank 101. Mounted on the base frame rearwardly of the rear traction wheels is a horizontal valve box 102 having parallel bores containing reciprocable control valves 103, 104, 105, 106, 107 and 108, preferably of the balanced spool type. The valve box has parallel discharge passages 109 and 110 connected together by an end passage 111 which is in turn connected by a discharge conduit 112 back to the tank 101. Arranged longitudinally between the discharge passages in the valve box is a supply passage 113 communicating with the passage 114 connected by a pressure conduit 115 to the discharge of the pump 98. The supply passage 113 of the valve box is communicable, under the control of a valve 116, with one of the discharge passages 109 so that the pressure in the system may be manually controlled as desired. This valve 116 is of the conical type and is urged toward its seated position by a spring 117. Connected to the valve stem is an operating rod 118, in turn pivotally connected to a hand lever 119, conveniently located near the operator's station, whereby the pressure control valve may be readily operated. The pressure in the system may be

7

regulated by varying the amount of communication of the supply passage 113 with the discharge passage and is automatically limited by the presence of the spring 117. The bore in the valve box containing the valve 103 is connected by a circuit 121 to the conduit 97 leading to the interior of the breaker bag 82, and the valve may be controlled to connect the conduit 97 with either the supply passage 113 or with the discharge passage 110. The valve box bore containing the valve 104 is connected by conduits 122 and 123 to the opposite ends of the feed cylinder 88 so that either end of the feed cylinder may be connected to the supply passage while the other end is connected to a discharge passage to effect either forward or rearward feed. The valve box bore containing the valve 105 is connected by conduits 124 and 125 to the opposite ends of the tilt cylinders 66 so that fluid under pressure may be supplied to either end of the cylinders to effect tilting of the guide frame 64 either upwardly or downwardly. The valve box bore containing the valve 106 is connected at its opposite ends by conduits 126 and 127 respectively to one end of each of the cylinders 55 to effect rotation of the upper turntable 43 in one direction or the other. The valve box bore containing the valve 107 is connected by conduits 128 and 129 to one end of the cylinders 49 so that the lower turntable 36 may be turned in one direction or the other. The valve box bore containing the valve 108 is connected by a conduit 130 to the lower end of the lift cylinder 45 so that the parallel arm structure 39 may be swung upwardly as desired. As previously stated, the several valves may be positioned to trap the liquid in the several cylinders to lock the parts adjusted thereby in their adjusted positions.

Arranged in a horizontal chamber 132 within the rearward portion of the base frame is a horizontal cable reel 133 for winding in and permitting paying out of an electrical conductor cable for the electric motors 7, 68 and 99 in a manner well known to those skilled in the art. The front and rear wheels of the mobile base are provided with suitable guards 134 and 135 to protect the operator, and headlights 136 are arranged at the opposite ends of the base. Control switches 137 and 138 are provided for starting the pump motor 99 and the drill motor 68, and these control switches are also conveniently located with respect to the operator's station. The electrical control means 16 for the traction motors 7 also has a conveniently located control lever 139.

The general mode of operation of the improved mining apparatus is as follows. The apparatus may be moved about the mine when practicable at a relatively high speed under the propulsion of the traction wheels 6 driven by the motors 7, and steering of the apparatus may be effected by the front steering wheels 5 under the control of the steering wheel 32. When the apparatus is travelling through relatively sharply curved mine passageways, the traction motors 7 may be operated to effect propulsion of the apparatus at a relatively slow speed under the control of the electrical control means 16. When the coal face is reached and the apparatus is located in the position shown in Figs. 15 and 16, the wheel brakes 17, 18 may be applied to hold the apparatus in a stationary position. It will be understood that the coal face has been previously undercut, as at 140, as shown in Fig. 16, by a conventional coal cutting machine in a well known

8

manner. When the apparatus is positioned as shown with respect to the coal face, the lifting jack 45 may be operated under the control of the valve 108 to swing the parallel motion arms 39 upwardly to elevate the drilling and breaking down mechanism 3 as desired. The swing cylinders 49 and 55 may then be operated under the control of the valves 107 and 106 to swing the arm structure laterally on the base to locate the upper turntable 43 in the desired position at either side of the base and to swing the drilling and breaking down mechanism horizontally into the desired angular position, as indicated in dotted lines in Fig. 15. The tilting jacks 66 may then be operated under the control of the valve 105 to tilt the drilling and breaking down mechanism upwardly as indicated in dotted lines in Fig. 16. When the drill bit is located in the desired position with respect to the coal face, the switch 138 may be operated to start the drilling motor 68, thereby rapidly to rotate the drill bit; and fluid under pressure may be supplied to the feed cylinder 88 under the control of the valve 104 to feed the drill bit into the coal. As the bore hole is formed in the coal by the drill bit, the expansible breaker member 82 enters the bore hole, so that when the bore hole is completed, the breaker assumes the position shown in Fig. 16. Fluid under pressure may then be conducted through the conduit 97 under the control of the valve 103 to the interior of the breaker bag 82 to expand the latter, thereby to apply a powerful breaking down force to the coal to dislodge the coal in the manner shown in Fig. 17. Prior to the coal breaking operation, the fluid in the cylinders 49, 55, 66 and 88 may, if desired, be discharged so that as the coal is broken down, the drill and breaker may move freely, thereby to prevent bending of the drill spindle and possible damage to the associated parts. After the breaking down operation, the feed may be reversed to retract the drill bit and breaker from the coal face. By suitably adjusting the parallel supporting arms and upper and lower turntables and by tilting the guide frame, the drill and breaker may be moved laterally and vertically relative to the base to locate the same in various positions with respect to the face of the coal; and the drilling and breaking down operations may be repeated in each position of the drill and breaker completely to dislodge the coal from the coal face above the undercut. Upon completion of the drilling and breaking down operations, the wheel brakes may be released and the apparatus may be propelled rearwardly away from the coal face.

As a result of this invention, an improved mining apparatus is provided for drilling and breaking down the coal in an underground mine, thereby to dislodge the coal from the solid without the use of explosives. By mounting the drill and breaking down mechanism on a mobile base and by the provision of the improved adjustable supporting structure for the drilling and breaking down mechanism, the apparatus may be readily moved about the mine and quickly adjusted into the desired drilling and breaking down position. By associating the breaking down mechanism with the drill, the expansible breaking down member may enter the bore hole formed by the drill, and upon completion of the drilling operation, the breaking down member may be expanded to dislodge the coal in an extremely expeditious manner. The apparatus is not only readily mobile and flexible in adjustment, but is

also relatively simple and rugged in design, well adapted to meet the severe demands of service in a coal mine. Other uses and advantages of the improved mining apparatus will be clearly apparent to those skilled in the art.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a mining apparatus, an adjustable supporting structure for a mining instrument comprising, in combination, a mobile base having pairs of front and rear wheels and a frame carried by said wheels, a horizontal turntable mounted on said base frame rearwardly of said front wheels and located nearer to the front end of said base than to the rear end thereof, a parallel motion arm structure carried by said turntable and extending rearwardly above said base frame, a horizontal turntable carried by said arm structure and disposed nearer to the rear end of the base than to the front end thereof, an elongated guide frame for guiding the mining instrument toward and from the work and pivotally mounted on said second mentioned turntable to tilt in vertical planes with respect thereto, said guide frame extending longitudinally above said base frame and tiltable on its pivotal mounting relative to said second mentioned turntable into a position wherein its forward portion is located intermediate said front wheels, and a motor driven mining instrument mounted on said guide frame and movable longitudinally back and forth therealong.

2. In a mining apparatus, an adjustable supporting structure for a mining instrument comprising, in combination, a mobile base having front and rear wheels and a frame carried by said wheels, an arm structure pivotally mounted on said base frame rearwardly of said front wheels to swing horizontally and in vertical planes with respect to said frame, said arm structure extending rearwardly above said base frame, a support swiveled on the rearward extremity of said arm structure to turn relative thereto about an upright axis, an elongated guide frame for the mining instrument pivotally mounted on said swiveled support to tilt in vertical planes with respect thereto, said guide frame extending forwardly from said swiveled support above said base frame and tiltable into a position wherein its forward portion lies intermediate said front wheels, and a motor driven mining instrument mounted on said guide frame for movement longitudinally back and forth therealong.

3. In a mining apparatus, an adjustable supporting structure for a mining instrument comprising, in combination, a mobile base having front and rear wheels and a frame carried by said wheels, an arm structure pivotally mounted on said base to swing horizontally and in vertical planes with respect to said frame, said arm structure extending rearwardly above said base frame, a support swiveled on the rearward extremity of said arm structure to turn relative thereto about an upright axis, an elongated guide frame for the mining instrument pivotally mounted on said swiveled support to tilt in vertical planes with respect thereto, said guide frame extending forwardly from said swiveled support above said base frame and tiltable into

a position wherein its forward portion is located intermediate said front wheels, a motor driven mining instrument mounted on said guide frame for movement longitudinally back and forth therealong, and feeding means for said instrument carried by said guide frame for feeding said instrument therealong toward and from the work.

4. In a mining apparatus, an adjustable supporting structure for a mining instrument comprising, in combination, a mobile base having front and rear wheels and a frame carried by said wheels, an arm structure pivotally mounted on said base frame rearwardly of said front wheels to swing horizontally and in vertical planes with respect to said frame, said arm structure extending rearwardly above said base, a support swiveled on the rearward extremity of said arm structure to turn relative thereto about an upright axis, an elongated guide frame for the mining instrument pivotally mounted on said swiveled support to tilt in vertical planes with respect thereto, said guide frame extending forwardly from said swiveled support above said base frame and tiltable into a position wherein its forward portion is located intermediate said front wheels, and a driving motor for the instrument guided on said frame for movement back and forth therealong.

5. In a mining apparatus, an adjustable supporting structure for a mining instrument comprising, in combination, a mobile base having front and rear wheels and a frame carried by said wheels, an arm structure pivotally mounted on said base frame rearwardly of said front wheels to swing horizontally and in vertical planes with respect thereto, said arm structure extending rearwardly above said base, a support swiveled on the rearward extremity of said arm structure to turn relative thereto about an upright axis, an elongated guide frame for the mining instrument pivotally mounted on said swiveled support to tilt in vertical planes with respect thereto, said guide frame extending forwardly from said swiveled support above said base frame and tiltable about its pivot into a position wherein its forward portion is located intermediate said front wheels, a driving motor for the instrument guided on said frame for movement back and forth therealong, and means for feeding said motor and the instrument back and forth along said guide frame.

6. In a mining apparatus, an adjustable supporting structure for a mining instrument comprising, in combination, a mobile base having front and rear wheels and a frame carried by said wheels, a frame swiveled on said base frame rearwardly of said front wheels to turn about an upright axis, a parallel motion elevating structure carried by said swiveled frame, a third frame swiveled on said elevating structure to turn about a parallel axis, said elevating structure always maintaining said axes in parallelism irrespective of the elevated position of said second frame, an elongated guide frame for the mining instrument pivotally mounted on said second frame to tilt in vertical planes with respect to said first frame, said guide frame being tiltable about its pivot into a position wherein its forward portion is located intermediate said front wheels, and a motor driven mining instrument mounted on said guide frame for movement longitudinally back and forth relative thereto.

7. In a mining apparatus, an adjustable supporting structure for a mining instrument com-

prising, in combination, a mobile base having front and rear wheels and a frame carried by said wheels, an adjustable frame structure pivotally mounted on said base frame rearwardly of said front wheels to swing horizontally and in vertical planes with respect thereto, an elongated guide frame for the mining instrument, means for pivotally mounting said guide frame on said adjustable frame structure to swing horizontally and in vertical planes with respect thereto, said guide frame being tiltable about its pivot into a position wherein its forward portion is located down between said front wheels, and a motor driven mining instrument mounted on said guide frame for longitudinal movement back and forth therealong.

8. In a mining apparatus, an adjustable supporting structure for a mining instrument comprising, in combination, a mobile base having front and rear wheels and a frame carried by said wheels, an adjustable frame structure pivotally mounted on said base frame rearwardly of said front wheels to swing horizontally and in vertical planes with respect to said frame, an elongated guide frame for the mining instrument, means for pivotally mounting said guide frame on said adjustable frame structure to swing horizontally and in vertical planes with respect thereto, said guide frame being tiltable about its pivot into a forwardly and downwardly inclined position wherein its forward portion is located down between said front wheels, a motor driven mining instrument mounted on said guide frame for movement longitudinally back and forth therealong, a source of fluid under pressure embodied in the apparatus, fluid operated devices for swinging said frame structure, fluid operated devices for feeding said mining instrument back and forth along the guide frame, and control means on said base for controlling the flow of fluid under pressure from said source to said several fluid operated devices.

9. In a mining apparatus, the combination comprising a mobile base having pairs of front steering wheels and rear traction wheels, said base including a frame supported by said wheels, a support swivelly mounted on said base frame rearwardly of said front steering wheels, an arm structure pivotally mounted on said swivelled support to swing relative thereto and extending rearwardly above said frame, a second support swivelly mounted on the rear extremity of said arm structure, an elongated guide frame pivotally mounted on said second support and extending longitudinally above said base frame and having its forward portion disposable when said guide frame is tilted downwardly intermediate said front steering wheels, and a drilling tool mounted on said guide frame and movable back and forth longitudinally therealong.

10. In a mining apparatus, the combination comprising a mobile base having pairs of front steering wheels and rear traction wheels, said base including a frame supported by said wheels, a support swivelly mounted on said base frame rearwardly of said front steering wheels, an arm structure pivotally mounted on said swivelled support and extending rearwardly above said frame, a second support swivelly mounted on the rear extremity of said arm structure, an elongated guide frame pivotally mounted on said second support and extending longitudinally above said base frame and having its forward portion disposable when tilted downwardly inter-

mediate said front steering wheels, a drilling tool mounted on said guide frame and movable back and forth longitudinally therealong, fluid operated means for independently turning said supports respectively about their swivel mountings, fluid operated means for tilting said guide frame relative to said second support and for holding the same in tilted position, fluid operated feeding means for moving said tool along said guide frame, a motor operated pump on said base frame, and control valve means for individually controlling fluid flow from said pump to said several fluid operated means.

11. In a mining apparatus, the combination comprising a mobile base having pairs of front steering wheels and rear traction wheels, said base including a frame supported by said wheels, a support swivelly mounted on said base frame rearwardly of said front steering wheels, an arm structure pivotally mounted on said swivelled support to swing relative thereto and extending rearwardly above said frame, a second support swivelly mounted on the rear extremity of said arm structure, an elongated guide frame pivotally mounted on said second support and extending longitudinally above said base frame and having its forward portion disposable when said guide frame is tilted downwardly intermediate said front steering wheels, a drilling tool mounted on said guide frame and movable back and forth longitudinally therealong, said swivelled supports being turnable on their respective swivelled mountings and said arm structure being tiltable to vary the angular position of said guide frame both laterally and in vertical planes with respect to said base frame.

12. In a mining apparatus, the combination comprising a mobile base having pairs of front steering wheels and rear traction wheels, said base including a frame supported by said wheels, a support swivelly mounted on said base frame rearwardly of said front steering wheels, an arm structure pivotally mounted on said swivelled support to swing relative thereto and extending rearwardly above said frame, a second support swivelly mounted on the rear extremity of said arm structure, an elongated guide frame pivotally mounted on said second support and extending longitudinally above said base frame and having its forward portion disposable when said guide frame is tilted downwardly intermediate said front steering wheels, a drilling tool mounted on said guide frame and movable back and forth longitudinally therealong, and mechanism for feeding said drilling tool longitudinally along said guide frame including a fluid cylinder arranged longitudinally along one side of said guide frame and containing a reciprocable piston having oppositely extending piston rods, and multiple reeve, cable and pulley, speed multiplying connections between said piston rods and the opposite ends of said guide frame respectively.

13. In a mining apparatus, the combination comprising a mobile base having pairs of front steering wheels and rear traction wheels, said base including a frame supported by said wheels, a support swivelly mounted on said base frame rearwardly of said front steering wheels, an arm structure pivotally mounted on said swivelled support to swing relative thereto and extending rearwardly above said frame, a second support swivelly mounted on the rear extremity of said arm structure, an elongated guide frame pivotally mounted on said second support and extending longitudinally above said base frame and

13

having its forward portion disposable when said guide frame is tilted downwardly intermediate said front steering wheels, and a drilling tool mounted on said guide frame and movable back and forth longitudinally therealong, said arm 5 structure comprising parallel motion arms, and a fluid cylinder connected between said first swivelled support and the upper one of said parallel arms for swinging said arms in vertical planes about their pivots and for holding said 10 arms rigidly in adjusted position.

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14

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