Nov. 30, 1937. J. F. JOY 2,100,336

MINING APPARATUS

Filed Nov. 14, 1935 7 Sheets-Sheet 1

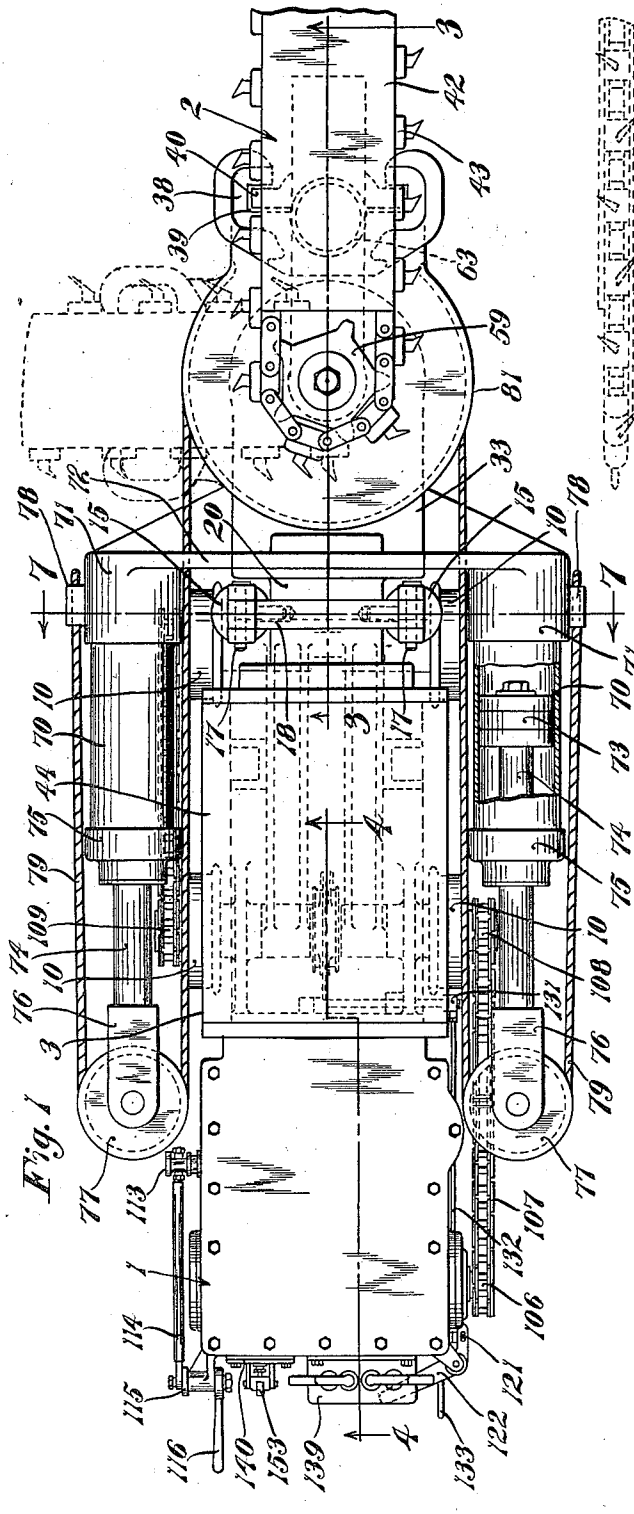


Fig. 1

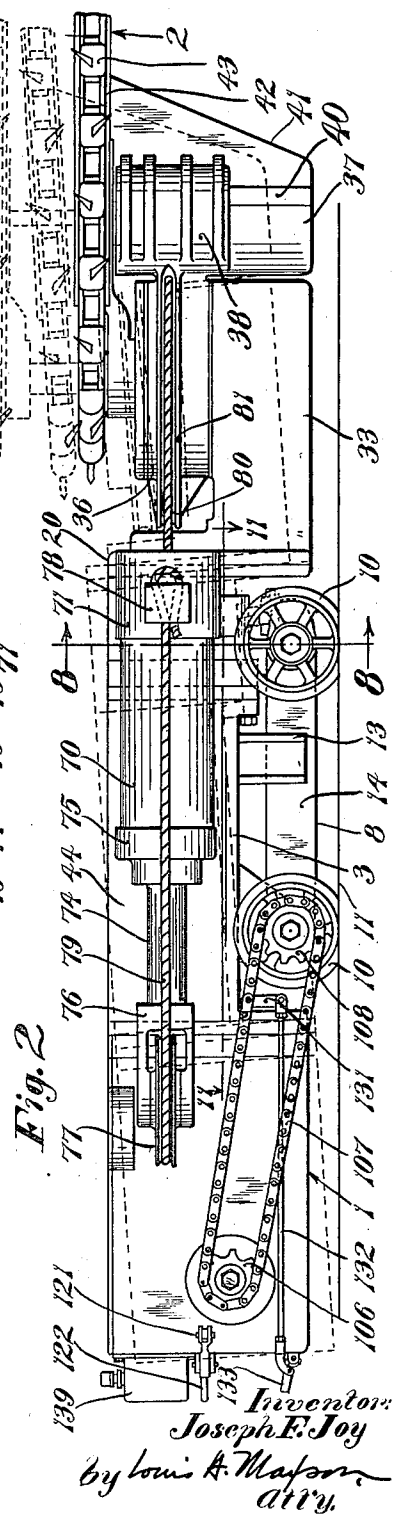


Fig. 2

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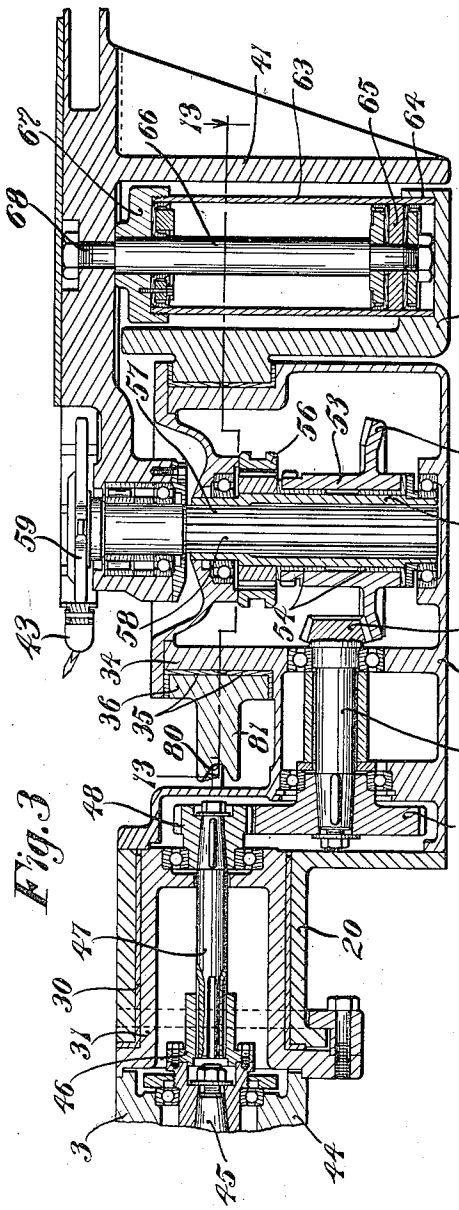


Fig. 3

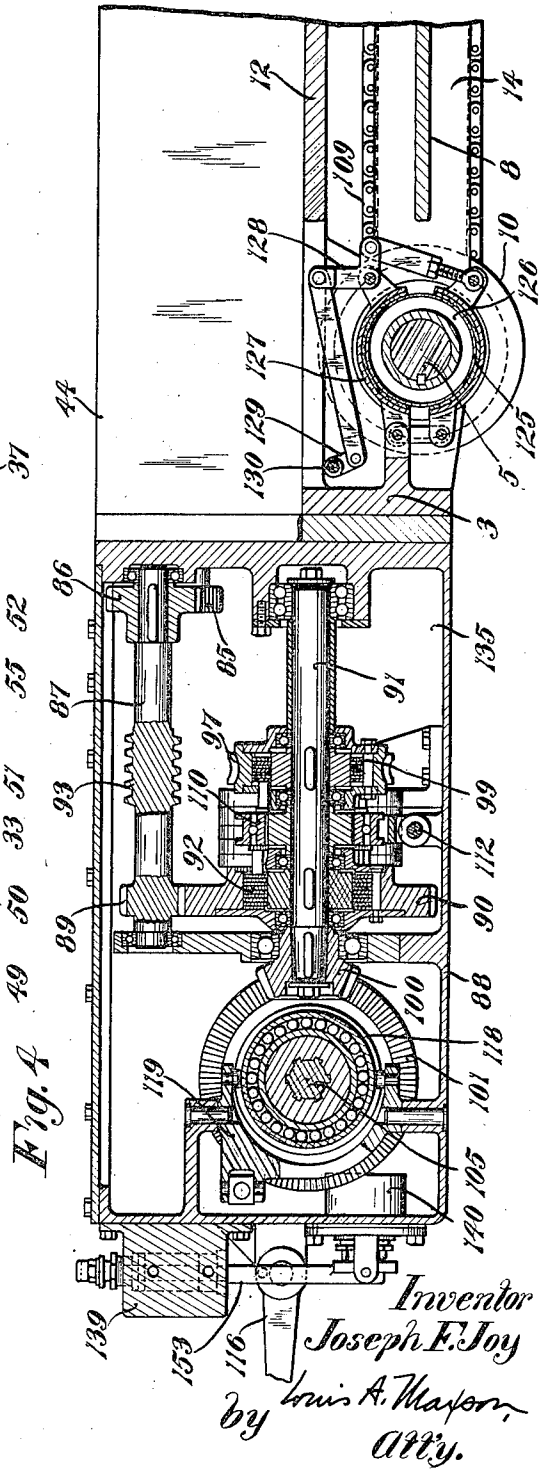


Fig. 4

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MINING APPARATUS

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Fig. 5

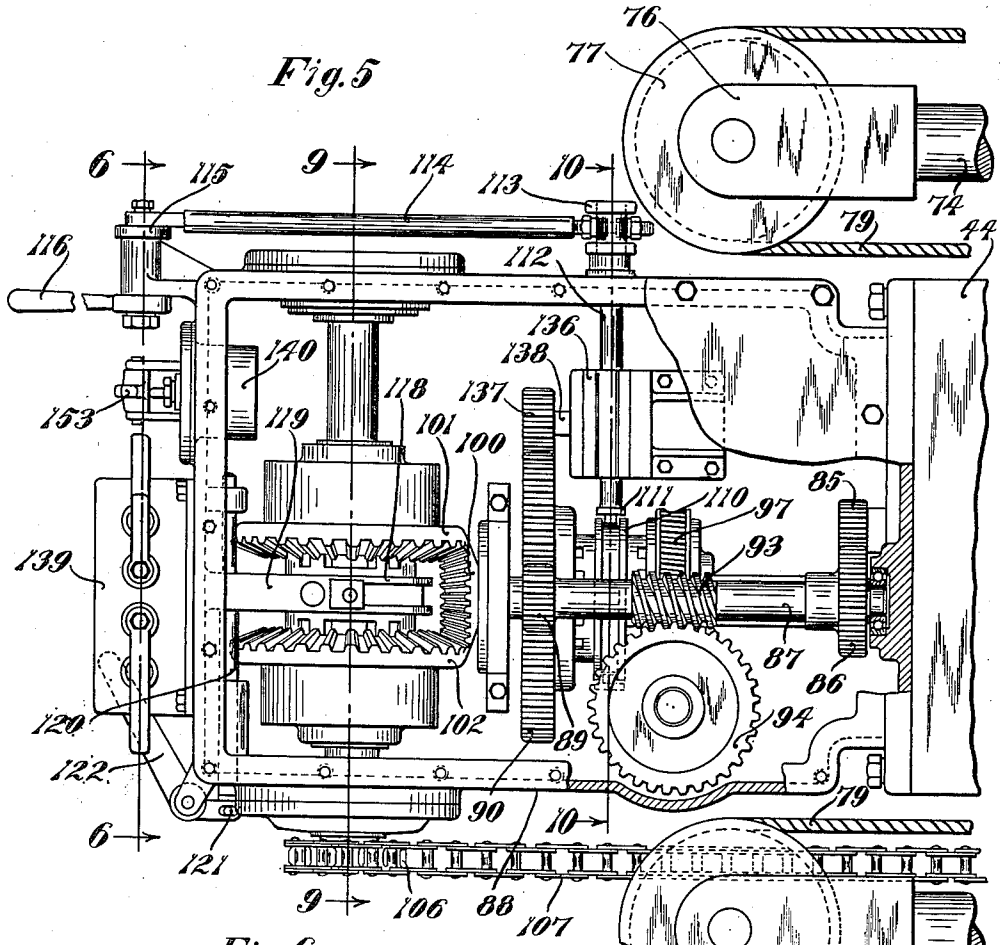
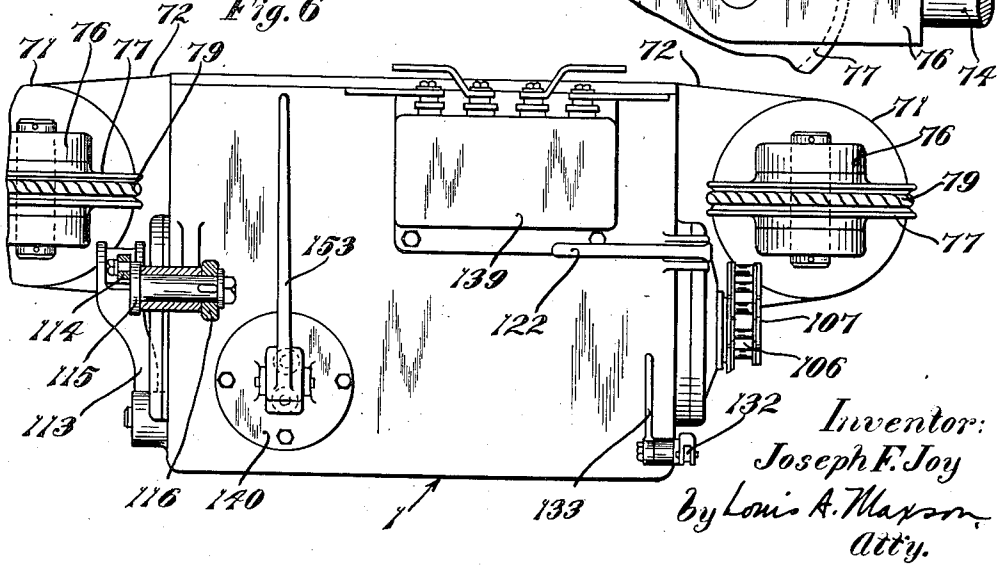


Fig. 6



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Fig. 7

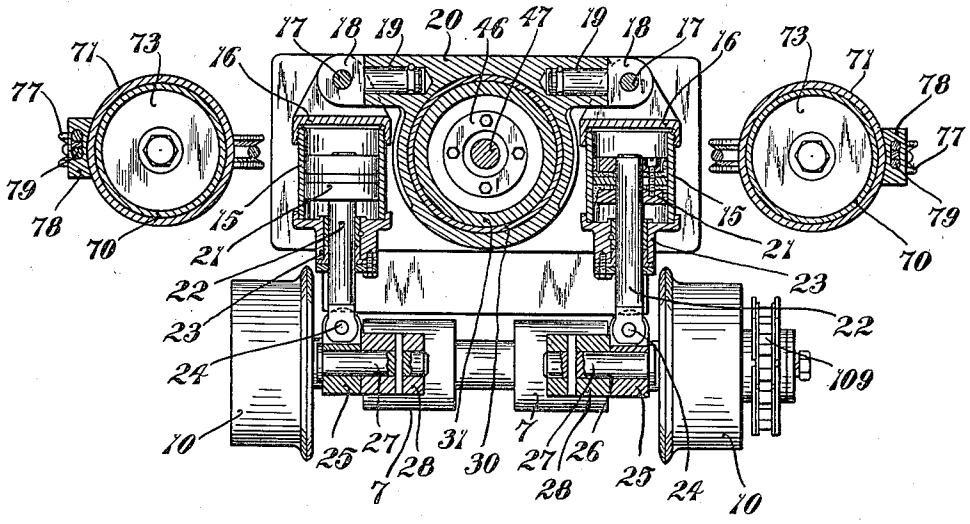
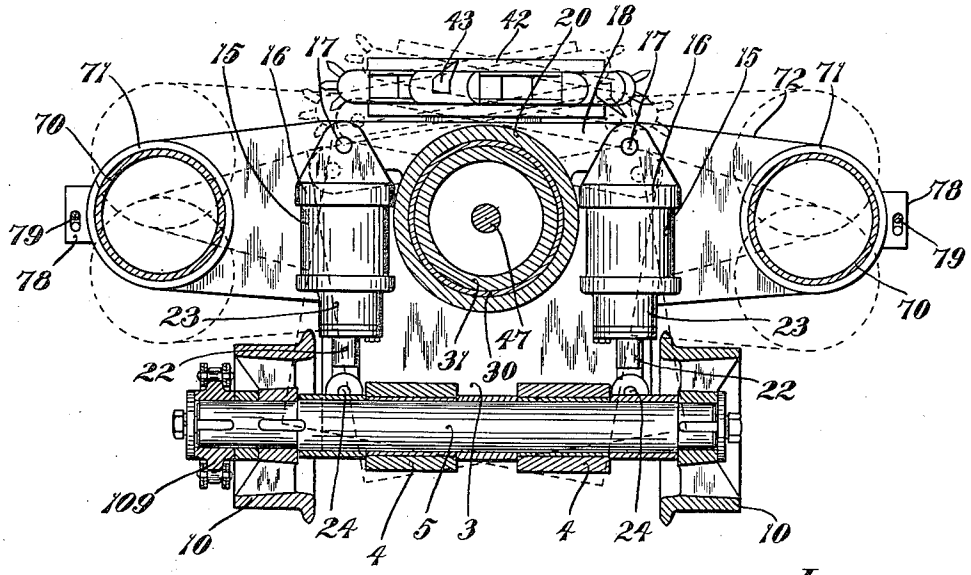


Fig. 8



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MINING APPARATUS

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Fig. 9

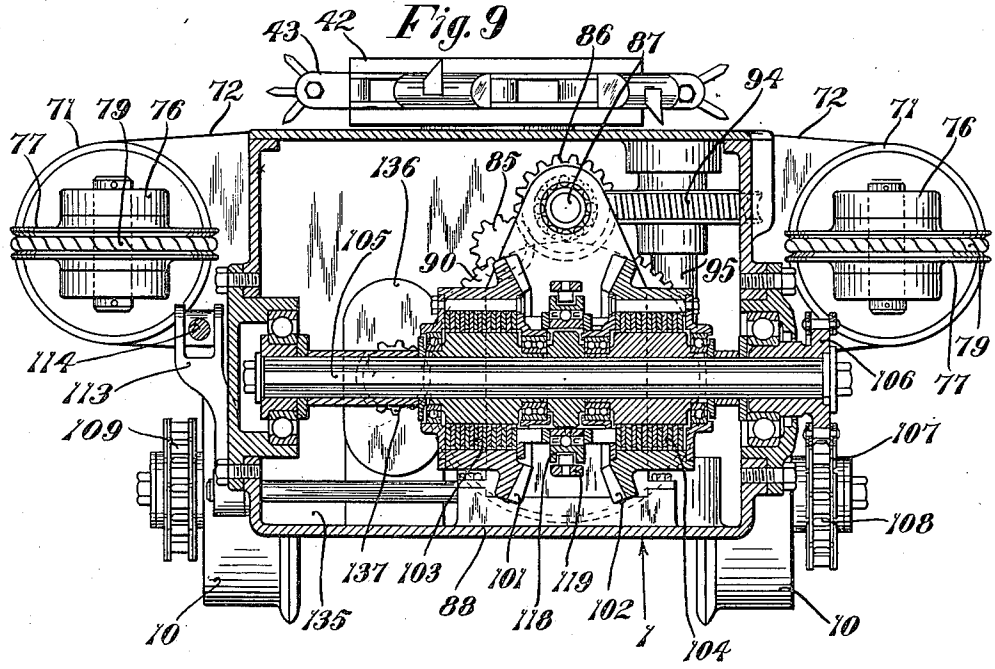
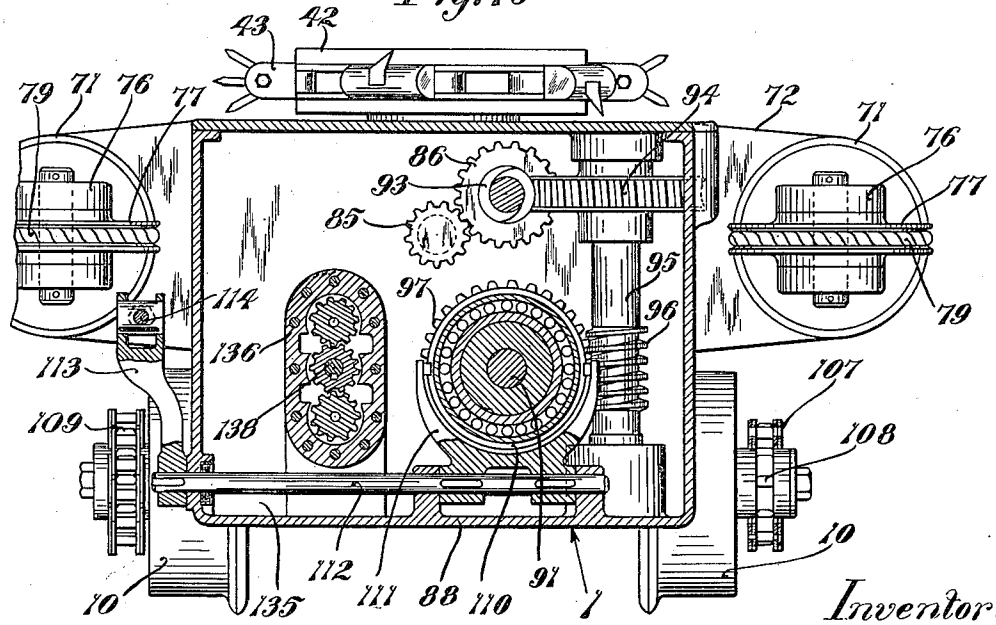


Fig. 10



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Fig. 11

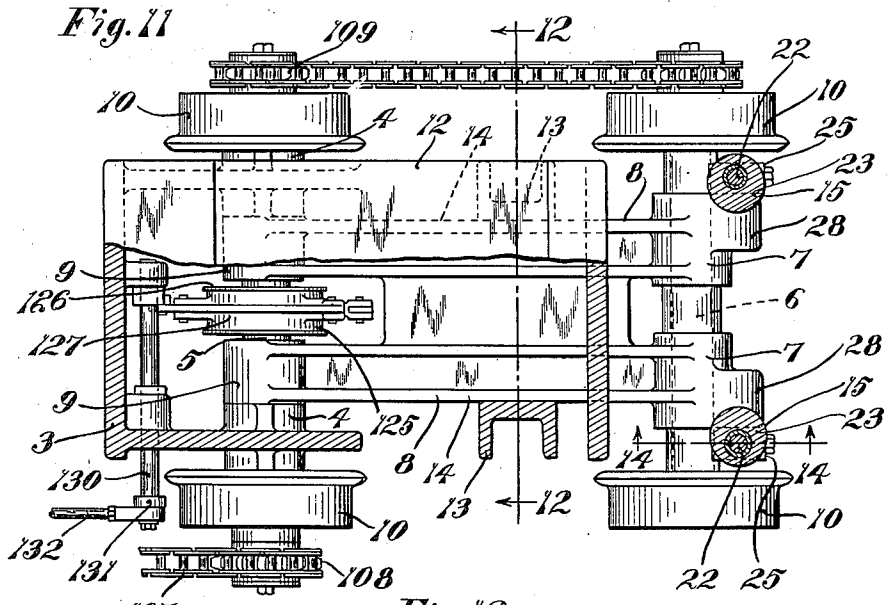


Fig. 12

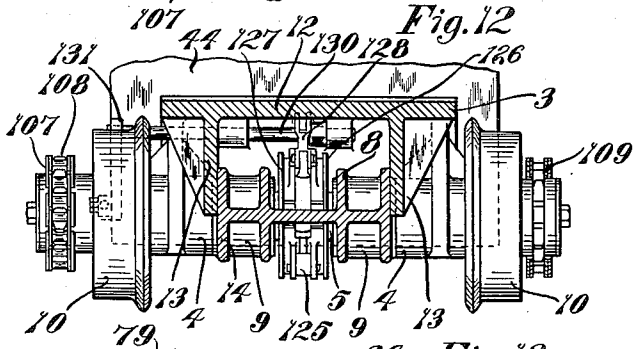


Fig. 14

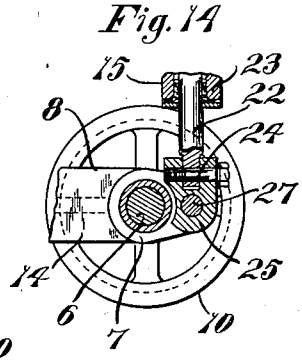
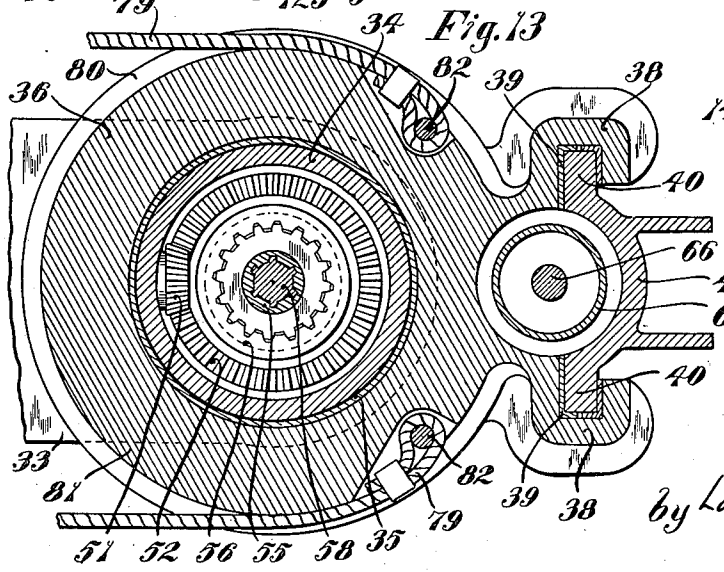


Fig. 13



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MINING APPARATUS

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Fig. 15

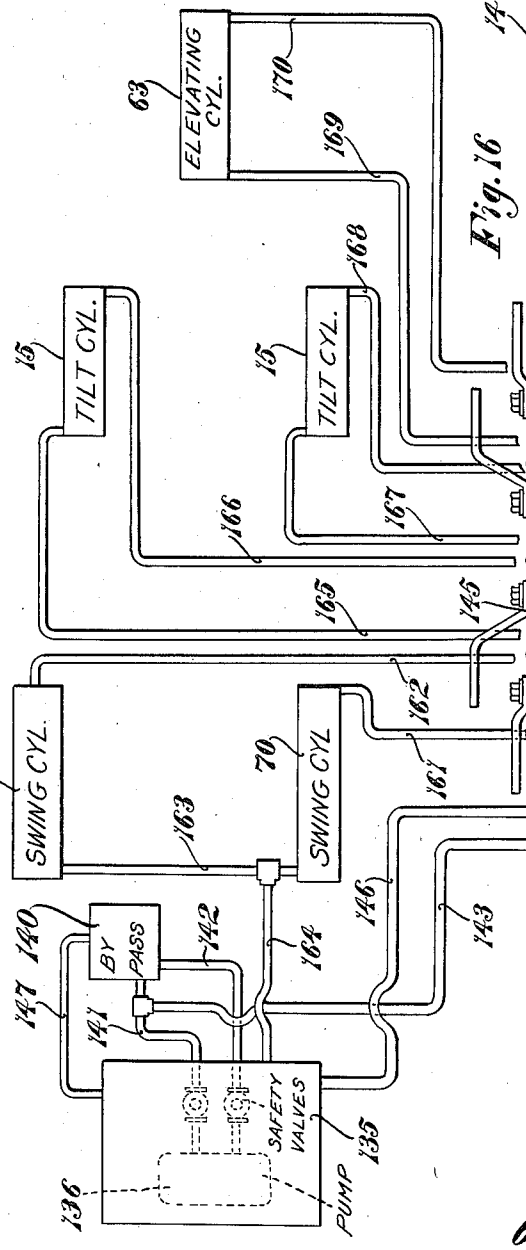
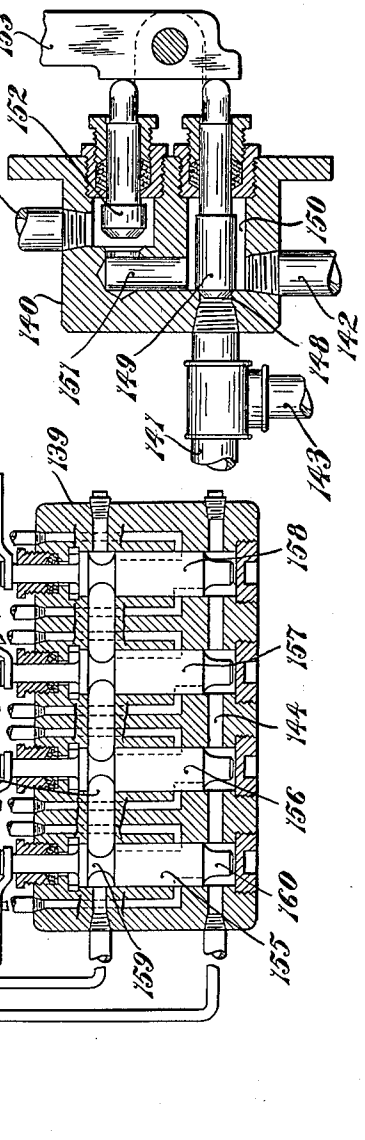


Fig. 16



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Patented Nov. 30, 1937

2,100,336

UNITED STATES PATENT OFFICE

2,100,336

MINING APPARATUS

Joseph F. Joy, Claremont, N. H., assignor to Sullivan Machinery Company, a corporation of Massachusetts

Application November 14, 1935, Serial No. 49,781

35 Claims. (Cl. 262—28)

This invention relates to mining apparatus, and more particularly to improvements in a coal mining apparatus of the wheel supported and track guided type, commonly known as a track cutter.

An object of this invention is to provide an improved coal mining apparatus of the mounted track cutter type. Another object is to provide an improved adjustable supporting structure for the kerf cutting means of such an apparatus. Yet another object is to provide improved means for elevating, swinging and tilting the kerf cutter and for propelling the apparatus. A further object is to provide improved hydraulically operated cylinder and piston devices for elevating, swinging and tilting the kerf cutter. A still further object is to provide an improved track cutter of an extremely compact, and relatively inexpensive and simple design. Other objects will 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 plan view of the illustrative embodiment of the improved mining apparatus.

Fig. 2 is a side elevational view of the mining apparatus shown in Fig. 1, elevated and tilted positions of the kerf cutter being shown in dotted lines.

Fig. 3 is an enlarged view in longitudinal section taken substantially on line 3—3 of Fig. 1.

Fig. 4 is an enlarged view in longitudinal section taken substantially on line 4—4 of Fig. 1.

Fig. 5 is an enlarged fragmentary plan view showing the transmission mechanism, the top cover plate being broken away to show the interior construction.

Fig. 6 is a cross sectional view taken substantially on line 6—6 of Fig. 5.

Fig. 7 is a cross sectional view taken substantially on line 7—7 of Fig. 1.

Fig. 8 is a cross sectional view taken substantially on line 8—8 of Fig. 2.

Fig. 9 is a cross sectional view taken substantially on line 9—9 of Fig. 5.

Fig. 10 is a cross sectional view taken substantially on line 10—10 of Fig. 5.

Fig. 11 is a horizontal sectional view taken substantially on line 11—11 of Fig. 2.

Fig. 12 is a cross sectional view taken substantially on line 12—12 of Fig. 11.

Fig. 13 is a horizontal sectional view taken substantially on line 13—13 of Fig. 3.

Fig. 14 is a detail sectional view taken on line 14—14 of Fig. 11.

Fig. 15 is a diagrammatic view showing the hydraulic system for the various hydraulic devices.

Fig. 16 is a detail sectional view showing the by-pass valve.

In this illustrative embodiment of the invention there is shown a coal mining apparatus of the wheel supported and track guided type, commonly known as a track cutter, generally comprising a self-propelled, portable base 1 having mounted thereon the improved adjustable kerf cutting means generally designated 2. The base 1 is in the form of a truck frame 3 having depending rear axle boxes 4 supporting bearings in which is journaled the rear axle 5, while the front axle 6 is journaled in bearings supported within axle boxes 7 formed on a connecting frame 8 extending longitudinally of the frame 3 below the latter as shown in Fig. 11, and in turn having at its rear end bearing bosses 9 journaled on the rear axle 5. Secured to the front and rear axles are truck wheels 10 adapted to run along a mine trackway 11 laid on the mine floor. The rear truck wheel axle provides a horizontal pivot for the frame 3, and secured to the bottom of the frame 3 is a plate 12 having depending guides 13, 13 engaging the vertical plane sides 14 of the connecting frame 8 for guiding the frame 3 during its vertical tilting movement about the rear truck wheel axle 5, as will later be described. The forward portion of the vertically tiltable frame 3 is supported on the axle boxes 7, 7 of the connecting frame 8 by means of a pair of reciprocable hydraulic cylinders 15, 15 having their upper heads 16 pivotally mounted at 17 on a bearing bracket 18 in turn pivotally mounted at 19 on a transverse axis in the frame 3 on the opposite sides of a tiltable frame 20 as shown in Fig. 7. The axes of pivotal connection of the cylinders 15 with the brackets 18 and the bracket axes are arranged at right angles, thereby to form universal pivotal mountings for the upper ends of the cylinders. Contained in the cylinders 15 are pistons 21 having piston rods 22 extending downwardly through the packed lower heads 23 of the cylinders and pivotally connected at 24 at their lower extremities within brackets 25 pivotally mounted at 26 on transverse pivot pins 27. These pivot pins are arranged with their axes in alinement and extending horizontally in parallel relation with the truck wheel axles, and are fixed within bosses 28 formed integral with the front axle boxes 7 of the connecting frame 8. It is

accordingly evident that when hydraulic pressure is supplied to one end or the other of the cylinders 15 the frame 3 may be tilted in a vertical direction about the rear truck wheel axle as a pivot. The tiltable frame 20, to which the hydraulic cylinders 15 are pivotally connected as shown in Fig. 3, is journaled for rocking movement about a longitudinal axis relative to the frame 3 in a bearing sleeve 30 supported on a cylindrical bearing support 31 fixed to the frame 3. It will thus further be evident that by supplying fluid under pressure selectively to the cylinders 15, the frame 20 may be rocked on its bearing about an axis extending longitudinally of the frame 3 relative to the latter. By trapping the fluid in the cylinders 15 the frames 3 and 20 may be locked in their adjusted position. Secured as by bolts to the tiltable frame 20 is a head frame 33 provided with an upstanding cylindric bearing boss 34 supporting bearing sleeves 35 on which is rotatably mounted an annular bearing member 36 with which a bracket 37 is integrally formed, and this frame 36 has lateral portions 38, 38 providing vertical guideways 39 in which are slidably guided vertical guides 40 formed integrally with a hanger frame 41. Carried by this hanger frame is an elongated horizontal plane cutter bar 42 comprising the kerf cutting element of the kerf cutting means 2. Mounted on the margin of the cutter bar 42 for circulation orbitally thereabout is an endless cutter chain 43 carrying usual cutter bits.

Now referring to the driving means for the kerf cutting means 2, it will be noted that mounted within the frame 3 is a motor 44 having its power shaft 45 horizontally disposed and extending longitudinally of the frame 3. The forward end of the motor power shaft is connected by a self-alining coupling 46 to a longitudinal transmission shaft 47 suitably journaled within the frame 3 and arranged with its axis coincident with the tilt axis of the tiltable frame 20. Fixed to the forward end of the shaft 47 is a spur gear 48 meshing with a large spur gear 49 keyed to a longitudinal transmission shaft 50 suitably journaled in the head frame 33. Secured to the forward end of the shaft 50 is a bevel gear 51 meshing with a large bevel gear 52 having its hub 53 journaled on bearing sleeves 54 supported on a vertical tubular shaft 55, and the gear hub is connectible to this shaft by a usual sliding clutch 56. The shaft 55 is suitably journaled within bearings supported by the head frame 33 and has splined thereto at 57 and telescopically arranged therein a coaxial shaft 58, the shafts 55, 58 alined with the cutter bar pivot and cooperating to provide a telescopic torque shaft connection between the bevel gear 52 and a chain sprocket 59 keyed to the upper end of the shaft 58. The upper end of the shaft 58 is journaled in bearings supported by the hanger frame 41, and the chain sprocket 59 engages and drives the cutter chain 43.

Hydraulically operated means is provided for elevating the hanger frame 41 vertically along its guideways relative to the head frame 33 to vary the elevation of the cutter bar comprising a hydraulic cylinder 63 having its lower end secured at 64 within the bracket 37 and containing a reciprocatory piston 65. The piston has a piston rod 66 projecting upwardly through the packed top head 67 of the cylinder and is secured at 68 at its upper extremity to the hanger frame 41. It will thus be seen that when hydraulic pressure is supplied to one end or the other of the cylinder 63 the piston 65 may be moved either upwardly or downwardly to move the hanger frame relative to the head frame to vary the elevation of the cutter bar. During such adjustment of the cutter bar, the splined telescopically arranged shafts 55, 58 afford a driving connection between the bevel gear 52 and the cutter chain drive sprocket 59, so that irrespective of the elevated position of the cutter bar the cutter chain may at all times be driven by the motor through the spur gearing 48, 49 and bevel gearing 51, 52. By trapping the fluid within the cylinder 63 the cutter bar may be locked in its adjusted position.

The means for swinging the hanger frame 41 about its bearings on the head frame 33 thereby to swing the cutter bar in its plane about the axis of the shaft 58 comprises a pair of hydraulic cylinders 70, 70 arranged at opposite sides of the frame 3 and secured at their forward ends within heads 71 supported by brackets 72 secured to the tiltable frame 20. These cylinders extend longitudinally in parallel relation, and each contains a reciprocatory piston 73 having a piston rod 74 extending rearwardly through the packed rear head 75 of the cylinder and supporting at its rearward extremity a bracket 76. Journaled in the brackets 76 are sheaves 77, and secured to the heads 71 at 78 are cables 79, these cables extending around the sheaves 77 forwardly longitudinally along the sides of the frame 3 and guided within an arcuate guiding groove 80 formed on a flange 81 integral with the annular bearing support 36. The opposite ends of these cables 79 are secured at 82 to the rotatable frame 36. It is accordingly evident that when hydraulic pressure is supplied to the forward end of one or the other of the hydraulic cylinders 70, one or the other of the pistons may be moved to deflect its cooperating cable thereby to swing the cutter hanger in its bearings relative to the head frame, swinging therewith the cutter bar. When the fluid is trapped in the cylinders the cutter bar may be locked in its adjusted position about its pivot.

Now referring to the improved propulsion means for the apparatus, it will be noted that fixed to the rear end of the motor power shaft 45 is a spur pinion 85 meshing with a spur gear 86 keyed to the forward end of a longitudinal transmission shaft 87. This shaft is suitably journaled within a transmission housing 88 secured to the rear end of the tiltable frame 3 and has secured to its rear end a spur pinion 89 meshing with a large spur gear 90 herein journaled on a longitudinal transmission shaft 91 arranged parallel with the shaft 87 and likewise journaled within the housing 88. The spur gear 90 constitutes a low speed terminal driving element and is connectible to the shaft 91 by means of a multiple disc clutch 92. Formed integral with the shaft 87 is a worm wheel 93 meshing, as shown in Fig. 10, with a worm wheel 94 fixed to a vertical shaft 95 suitably journaled on the transmission housing. Secured to the shaft 95 is a worm 96 meshing with a worm wheel 97 herein arranged coaxially with the spur gear 90 and likewise journaled on the shaft 91. The worm wheel 97 constitutes the low speed terminal driving element and is connectible by a multiple disc clutch 99 to the shaft 91. Keyed to the rear end of the shaft 91 is a bevel gear 100 meshing, as shown in Fig. 9, with reverse bevels 101 and 102 selectively connectible by multiple disc clutches 103 and 104 to a transverse shaft 105. The gears 101, 102 are journaled on the shaft 105 and the latter is, in

turn, journaled within the transmission housing. Keyed to the shaft 105 is a chain sprocket 106 connected by an endless chain connection 107 to a sprocket 108 fixed to the rear truck wheel axle 5. The front and rear truck wheel axles are connected in driving relation by a chain and sprocket connection 109. It will thus be seen that depending on which one of the speed controlling clutches 92, 99 is applied, the shaft 91 may be driven at either a low or a high speed, and as a result the truck wheels may be driven at either a high or a low speed, and in either direction at either speed under the control of the reverse frictions 103 and 104. The operating means for the speed controlling clutches 92, 99 comprises a clutch shipper member 110 with which engages a shipper yoke 111 fixed to a transverse operating rod 112. Keyed to the rod 112 is a lever 113 connected through a link 114 and eccentric 115 to an operating lever 116. The operating means for the reverse frictions 103, 104 comprises a shipper member 118 with which engages a shipper yoke 119 secured to a reciprocable actuating rod 120. The outer extremity of the rod 120 is connected through a pin and slot connection 121 to an operating lever 122.

A truck wheel brake 125 is provided for controlling movement of the apparatus along the mine trackway and comprises a brake drum 126 keyed to the rear truck wheel axle 5 and with which a brake band 127 cooperates. This brake band is connected through suitable linkage 128 to a crank 129 fixed to a transverse operating rod 130. Secured to the outer end of the rod 130 is a link 131 to which is pivotally connected a pull rod 132 having an operating lever 133.

Now referring to the improved hydraulic fluid system for supplying hydraulic pressure to the various cylinder and piston devices, it will be noted that the transmission housing 88 forms a reservoir 135 for containing a liquid, preferably oil, and arranged in this reservoir, submerged in the liquid, is a hydraulic gear pump 136 of a conventional design. This pump is driven by a gear 137 secured to the pump drive shaft 138 and meshing with the low speed terminal driving gear 90 of the transmission mechanism. The pump 136 is adapted to pump oil under high pressure from the reservoir to the various hydraulic devices, and arranged at the rear end of the transmission housing is a valve box 139 containing control valves for controlling the hydraulic cutter swing cylinders 70, 70, the elevating cylinder 63 and the head frame tilting and rocking cylinders 15, 15. Located near the valve box 139 within the transmission housing is a valve box 140 containing by-pass valves for regulating the hydraulic pressure in the system. As shown diagrammatically in Fig. 15, leading from the discharge side of the oil pump 136 to the by-pass valve box 140 are supply conduits 141 and 142, and the conduit 141 is connected by a conduit 143 to the intake passage 144 of the control valve box 139. The discharge passage 145 of the control valve box 139 is connected by a conduit 146 to the reservoir. The conduit 141 is communicable through a passage 148 under the control of an end seating valve 149 with a chamber 150 in the by-pass valve box 140, while the chamber 150 is connected by a passage 151 under the control of an end seating valve 152 with the return conduit 147. The end seating valves 149, 152 are controlled by an operating lever 153, and when this lever is swung into the position shown in Fig. 16, oil under pressure flows through the conduits 141, 143 to the supply passage of the control valve box 139, while the conduit 142 is connected through the chamber 150, passage 151, past the valve 152, with the return conduit 147. When the lever 153 is swung into its opposite position communication of the passage 151 with the return conduit 147 is cut off by the valve 152 and at that time both of the supply conduits 141, 142 communicate with the supply conduit 143. The casing of the control valve box 139 is formed with a plurality of vertical bores, herein four in number, respectively, having arranged therein control valves 155, 156, 157 and 158, each provided with an operating handle. These valves are formed with upper annular channels 159, all communicating with the exhaust passage 145, and their lower ends are formed with reduced portions 160, and the valve bores at the lower ends of the valves all communicate past these reduced portions with the supply passage 144. The bore for the valve 155, which is herein the cutter swing control valve, is connected by conduits 161 and 162 with the forward ends of the cutter swing cylinders 70, while the rear ends of the cylinders 70 are connected through a conduit 163 with a return conduit 164 leading back to the reservoir. The bore for the valve 156, which is herein a tilt cylinder control valve, is connected by conduits 165 and 166 with the opposite ends of one of the tilt cylinders 15, while the bore for the valve 157, which is also a tilt cylinder control valve, is connected by conduits 167 and 168 with the opposite ends of the other tilt cylinder 15. The bore for the valve 158, which is the elevating cylinder control valve, is connected by conduits 169 and 170 with the opposite ends of the elevating cylinder 63. Each of the valves 155, 156, 157 and 158 has formed on its periphery a pair of longitudinal grooves, one groove for connecting its return conduit with the exhaust and the other groove for connecting the supply conduit with the pressure supply passage. It will thus be seen that the control valves 155, 156, 157 and 158 may be operated to supply oil under pressure to the cutter swing cylinders 70, the tilt cylinders 15 and the elevating cylinder 63. When the valve 155 is moved into the position to connect the conduit 161 with the supply passage 144 and the conduit 162 with the exhaust passage 145, oil under pressure is supplied to one of the cutter swing cylinders 70 to swing the kerf cutter in one direction about its pivot relative to the head frame, and when the position of the valve is reversed the conduit 161 is connected to the exhaust passage 145 while the conduit 162 is connected to the supply passage 144, and as a result oil under pressure is supplied to the other cutter swing cylinder 70 to swing the kerf cutter about its pivot relative to the head frame in the opposite direction. When the valves 156 and 157 are in the position shown in Fig. 15, oil under pressure may flow from the supply passage 144 through the conduits 165 and 167 simultaneously to the lower ends of the cylinders 15 thereby to move the latter downwardly relative to the stationary pistons 21 to swing the frame 3, together with the kerf cutter, about the rear truck wheel axle as a pivot, thereby to tilt the kerf cutter downwardly wih respect to the horizontal. When the position of the valves 156, 157 is reversed, oil under pressure may flow from the supply passage 144 through the conduits 166 and 168 to the upper ends of the cylinders 15 thereby to tilt the frame 3 upwardly about its pivotal connection with the rear truck wheel axle to tilt the kerf cutter up-

wardly with respect to the horizontal. By independently controlling the valves 156, 157 the supply of oil under pressure to the cylinders 15 may be regulated to tilt the head frame 33 about its axis relative to the frame 3, thereby to tilt the kerf cutter sidewise about a longitudinal axis. When the valve 158 is in the position shown in Fig. 15, oil under pressure may flow from the supply passage 144 through the conduit 169 to the lower end of the elevating cylinder 63, thereby to move the piston 65 upwardly to elevate the kerf cutter relative to the head frame. When the position of the valve 158 is reversed, oil under pressure may flow from the supply passage 144 through the conduit 170 to the upper end of the cylinder 63, thereby to depress the piston 65 to lower the kerf cutter.

The general mode of operation of the improved mining apparatus is as follows: The apparatus may be propelled along the mine trackway at a relatively high transport speed under the control of the high speed disc clutch 92 and one of the reverse frictions 103, 104. When the working place is reached, oil under pressure is supplied to one of the cutter swing cylinders 70 thereby to effect swinging of the kerf cutter about its pivot until its tip end reaches the right hand rib, the kerf cutter thereafter being locked in position by the oil trapped in the swing cylinder. The operator then applies the slow speed disc clutch 99 and the proper reverse friction 103, 104, and as a result the apparatus is propelled forwardly along the mine trackway to sump the kerf cutter within the coal. Upon completion of the sumping cut the slow speed friction 99 is released and the truck wheel brake 125 set to hold the truck frame stationary on the mine trackway. Oil under pressure is then supplied to the other of the cutter swing cylinders 70 to effect swinging of the kerf cutter from right to left to form an arcuate kerf within the coal, and upon completion of the swinging cut the kerf cutter is locked in position by the oil trapped in the swing cylinder and the brake released. The slow speed clutch 99 is then again applied, and upon application of the other reverse friction 103, 104 the apparatus is propelled rearwardly along the mine trackway, to effect withdrawal of the kerf cutter from the coal, thereby to complete the cut. During the cutting operation the kerf cutter may be tilted in a vertical direction and rocked about a longitudinal axis by regulating the flow of oil under pressure to the tilt cylinders 15. The elevation of the kerf cutter may be varied by suitably supplying oil under pressure to the elevating cylinder 63.

As a result of this invention, it will be noted that an improved coal mining apparatus is provided having improved means for tilting the kerf cutter whereby the kerf cutter may be controlled during the cutting operation to follow an uneven mine floor or a pitching coal seam. It will further be noted that by the provision of the hydraulic kerf cutter swinging cylinders, the tilting and rocking cylinders and the elevating cylinders, the kerf cutter may be readily adjusted into different cutting positions to meet varying mining conditions. It will further be noted that the improved mining apparatus is of an exteremely simple and rugged design, is extremely low in overall height and compact both laterally and longitudinally. Other uses and advantages of the improved coal mining apparatus will be clearly apparent to those skilled in the art.

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

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

1. In a mining apparatus, a portable base embodying a vertically tiltable frame, a tiltable support mounted on the forward end of said frame at the forward end of said base to rock with respect thereto, a kerf cutter carried by said support and having orbitally movable cutting elements, said kerf cutter swingable about its pivot to cut a plane kerf in a mine wall, and power operated devices connected to said tiltable support for rocking the latter relative to said frame and for vertically tilting said frame, said power operated devices common both to support rocking and frame tilting.

2. In a mining apparatus, a portable base embodying a vertically tiltable frame a tiltable support mounted on the forward end of said frame at the forward end of said base to rock with respect thereto about an axis extending longitudinally of said frame, a kerf cutter carried by said support and having orbitally movable cutting elements, said kerf cutter swingable about its pivot to cut a plane kerf in a mine wall, and power operated devices connected to said tiltable support for rocking the latter about said longitudinal axis relative to said frame and for vertically tilting said frame, said power operated devices common both to support rocking and frame tilting.

3. In a mining apparatus, a portable base embodying a vertically tiltable frame, a tiltable support mounted on the forward end of said frame at the forward end of said base to rock with respect thereto, a kerf cutter carried by said support and having orbitally movable cutting elements, said kerf cutter swingable about its pivot to cut a plane kerf in a mine wall, a pair of power operated devices extending between said base and said tiltable support and common both to support rocking and frame tilting, and means for effecting simultaneous operation of said devices for tilting said frame and selective operation of said devices for rocking said support relative to said frame.

4. In a mining apparatus, a portable base embodying a vertically tiltable frame, a tiltable support mounted on said frame to rock with respect thereto about an axis extending longitudinally of said frame, a kerf cutter carried by said support and having orbitally movable cutting elements, said kerf cutter swingable about its pivot to cut a plane kerf in a mine wall, a pair of vertically disposed, power operated devices extending between said base and said tiltable support and common both to support rocking and tilting of said frame, and means for effecting simultaneous operation of said devices for tilting said frame and selective operation of said devices for rocking said support about its longitudinal axis relative to said frame.

5. In a mining apparatus, a portable base embodying a vertically tiltable frame, a tiltable support mounted on the forward end of said frame at the forward end of said base to rock with respect thereto, a frame mounted on said support for adjustment vertically relative thereto,

a kerf cutter carried by said vertically adjustable frame, power operated devices connected to said tiltable support for rocking the latter and for vertically tilting said frame, said power operated devices common both to rocking said support and tilting said frame, and a power operated device for vertically adjusting said second mentioned frame relative to said support.

6. In a mining apparatus, a portable base embodying a vertically tiltable frame, a tiltable support mounted on the forward end of said frame at the forward end of said base to rock with respect thereto, a frame mounted on said support for rotation relative thereto, a kerf cutter carried by said rotatable frame, power operated devices connected to said tiltable support for rocking the latter and for vertically tilting said frame, said power operated devices common both to rocking said support and tilting said frame, and power operated devices on said support for rotating said second mentioned frame relative to said support.

7. In a mining apparatus, a portable base embodying a vertically tiltable frame, a tiltable support mounted on the forward end of said frame at the forward end of said base to rock with respect thereto, a frame rotatably mounted on said support, a second support mounted on said second mentioned frame for vertical adjustment with respect thereto, a kerf cutter carried by said vertically adjustable support, power operated devices connected to said tiltable support for rocking the latter and for vertically tilting said first mentioned frame, power operated devices on said first mentioned support for rotating said second mentioned frame, and a power operated device on said second mentioned frame for vertically adjusting said second mentioned support.

8. In a mining apparatus, a portable base embodying a vertically tiltable frame, a tiltable support mounted on said frame to rock with respect thereto, a kerf cutter carried by said support, and a pair of vertically disposed, hydraulic cylinder and piston devices extending between said base and said tiltable support for rocking said support relative to said frame and for vertically tilting said frame.

9. In a mining apparatus, a portable base embodying a vertically tiltable frame, a tiltable support mounted on said frame to rock with respect thereto about an axis extending longitudinally of said frame, a kerf cutter carried by said tiltable support, and a pair of vertically disposed, hydraulic cylinder and piston devices extending between said base and said tiltable support for rocking the latter relative to said frame and for vertically tilting said frame.

10. In a mining apparatus, a wheeled support adapted to run along a mine trackway and having front and rear axles, a frame for connecting said axles in spaced relation, a second frame pivotally mounted on said rear axle to swing vertically relative thereto, a support mounted on said second frame to rock with respect thereto, adjustable devices extending between said connecting frame and said tiltable support for tilting the latter relative to said second frame and for vertically tilting said second frame about said rear axle, and a kerf cutter carried by said tiltable support.

11. In a mining apparatus, a wheeled support adapted to run along a mine trackway and embodying front and rear axles and a spacing frame connecting said axles, a frame pivotally mounted on the rear axle to swing in a vertical direction relative to said spacing frame, a support mounted on said second frame to rock with respect thereto, a kerf cutter carried by said tiltable support, and extensible adjusting devices extending between said spacing frame and said tiltable support for rocking the latter with respect to said second frame and for vertically tilting said second frame about the rear truck wheel axle.

12. In a mining apparatus, a portable base embodying a vertically tiltable frame, a tiltable support mounted on said frame to rock with respect thereto, a kerf cutter carried by said tiltable support, power operated devices connected to said tiltable support for rocking the latter with respect to said frame and for vertically tilting said frame, and a motor carried by said tiltable frame and relative to which said support is tiltable for operating said power operated devices.

13. In a mining apparatus, a portable base embodying a vertically tiltable frame, a tiltable support mounted on said frame to rock with respect thereto, a kerf cutter carried by said tiltable support, power operated devices connected to said tiltable support for rocking the latter with respect to said frame and for vertically tilting said frame, and a motor carried by said tiltable frame and relative to which said support is tiltable for operating said power operated devices and for driving said kerf cutter.

14. In a mining apparatus, a portable base embodying a vertically tiltable frame, a tiltable support mounted on said frame to rock with respect thereto, a rotatable frame mounted on said support, a kerf cutter carried by said rotatable frame, power operated devices connected to said tiltable support for rocking the latter relative to said frame and for vertically tilting said frame, power operated devices for rotating said rotatable frame relative to said support, and a motor carried by said tiltable frame and relative to which said support is tiltable for operating said power operated devices.

15. In a mining apparatus, a portable base embodying a vertically tiltable frame, a tiltable support mounted on said frame to rock with respect thereto, a rotatable frame mounted on said tiltable support, a support mounted on said rotatable frame for adjustment vertically with respect thereto, a kerf cutter carried by said vertically adjustable support, power operated devices connected to said tiltable support for rocking the latter relative to said tiltable frame and for vertically tilting said tiltable frame, power operated devices for rotating said rotatable frame relative to said tiltable support, a power operated device for adjusting said vertically adjustable support relative to said rotatable frame, and a motor carried by said tiltable frame and relative to which said support is tiltable for operating said power devices.

16. In a mining apparatus, a portable base embodying a vertically tiltable frame, a support mounted on said frame to rock with respect thereto about an axis extending longitudinally of said frame, a kerf cutter pivotally mounted on said tiltable support to swing relative thereto, a pair of vertically disposed, hydraulic cylinder and piston devices extending between said base and tiltable support for rocking the latter relative to said frame and for vertically tilting said frame, and a pair of hydraulic cylinder and piston devices carried by said tiltable support and extending longitudinally of said frame at the opposite sides thereof for swinging said kerf cutter about its pivot.

17. In a mining apparatus, a portable base embodying a vertically tiltable frame, a support mounted on said tiltable frame to rock with respect thereto about an axis extending longitudinally of said frame, a rotatable frame carried by said tiltable support, a vertically adjustable support carried by said rotatable frame, a kerf cutter carried by said vertically adjustable support, a pair of vertically disposed, hydraulic cylinder and piston devices extending between said base and said tiltable support for tilting the latter relative to said tiltable frame and for vertically tilting said tiltable frame, a pair of hydraulic cylinder and piston devices carried by said tiltable support and extending longitudinally of said frame at the opposite sides thereof for rotating said rotatable frame relative to said tiltable support, and a vertically disposed, hydraulic cylinder and piston device for vertically adjusting said vertically adjustable support relative to said rotatable frame.

18. In a mining apparatus, a portable base embodying a vertically tiltable frame, a tiltable support mounted on said frame to rock with respect thereto, a rotatable frame mounted on said tiltable support, a support mounted on said rotatable frame for adjustment vertically with respect thereto, a kerf cutter carried by said vertically adjustable support, fluid operated devices connected to said tiltable support for rocking the latter relative to said tiltable frame and for tilting said tiltable frame, fluid operated devices for rotating said rotatable frame relative to said tiltable support, a fluid operated device for adjusting said vertically adjustable support relative to said rotatable frame, and a motor driven pump carried by said tiltable frame and relative to which said support is tiltable for supplying fluid under pressure to said fluid operated devices.

19. In a mining apparatus, a portable base embodying a vertically tiltable frame, a tiltable support mounted on said frame to rock with respect thereto about an axis extending longitudinally of said frame, a kerf cutter pivotally mounted on said tiltable support to swing relative thereto, a pair of hydraulic cylinder and piston devices extending between said base and tiltable support for rocking the latter relative to said frame and for tilting said frame, a pair of hydraulic cylinder and piston devices carried by said tiltable support for swinging said kerf cutter about its pivot, and a motor driven pump carried by said tiltable frame and relative to which said support is tiltable for supplying fluid under pressure to said hydraulic cylinder and piston devices.

20. In a mining apparatus, a portable base embodying a vertically tiltable frame, a tiltable support mounted on said tiltable frame to rock with respect thereto about an axis extending longitudinally of said frame, a rotatable frame carried by said tiltable support, a vertically adjustable support carried by said rotatable frame, a kerf cutter carried by said vertically adjustable support, a pair of hydraulic cylinder and piston devices extending between said base and said tiltable support for tilting the latter relative to said tiltable frame and for tilting said tiltable frame, a pair of hydraulic cylinder and piston devices carried by said tiltable support for rotating said rotatable frame relative to said tiltable support, a hydraulic cylinder and piston device for vertically adjusting said vertically adjustable support relative to said rotatable frame, and a motor driven pump carried by said tiltable frame and relative to which said support is tiltable for supplying fluid under pressure to said hydraulic cylinder and piston devices.

21. In a mining apparatus, a frame, a tiltable support mounted on the front end of said frame to rock relative thereto about a horizontal axis extending longitudinally of the apparatus, said support projecting forwardly in advance of said frame, a kerf cutter supported by said tiltable support and pivotally mounted on said support to swing relative thereto, said support tiltable relative to said frame to adjust said cutter into relatively inclined cutting planes, and means for swinging said kerf cutter about its pivotal axis relative to said support including hydraulic jacks mounted at their front ends on said support and projecting rearwardly therefrom, said jacks comprising cylinders containing reciprocable pistons, and flexible transmission means connected to said kerf cutter and actuated by said pistons of said jacks.

22. In a mining apparatus, a frame, a tiltable support mounted on said frame to rock relative thereto about a horizontal axis extending longitudinally of the apparatus, a kerf cutter pivotally mounted on said support to swing relative thereto, and means for swinging said kerf cutter about its pivotal axis relative to said support including hydraulic jacks mounted at their front ends on said support and extending rearwardly along and spaced from the opposite sides of said frame, said jacks comprising cylinders containg reciprocable pistons, and flexible transmission means connected to said kerf cutter and actuated by said pistons of said jacks.

23. In a mining apparatus, a frame, a tiltable support mounted on said frame to rock relative thereto about a horizontal axis extending longitudinally of said frame, said support having lateral projections projecting from the opposite sides of said frame, a kerf cutter pivotally mounted on said support to swing relative thereto, and means for swinging said kerf cutter about its pivotal axis relative to said support including hydraulic cylinders mounted on said projections and extending rearwardly along the opposite sides of said frame, said cylinders containing reciprocable pistons, and flexible transmission means connected to said kerf cutter and actuated by said pistons.

24. In a mining apparatus, a portable base including wheeled axles and a frame extending between and connecting said axles, said axles journaled in said frame and said frame having plane vertical sides, a second frame pivotally mounted on said first frame to swing in a vertical direction with respect thereto and having guide members providing plane guide surfaces engaging said plane sides of said first frame, and kerf cutting mechanism carried by said second frame.

25. In a mining apparatus, a portable base including wheeled axles and a frame extending between and connecting said axles, said axles journaled in said frame and said frame having plane vertical sides, a second frame pivotally mounted on said first frame to swing in a vertical direction with respect thereto about an axis coincident with the axis of rotation of the rear truck wheel axle, said second frame having guide members providing plane guide surfaces engaging said plane sides of said first frame, and kerf cutting mechanism carried by said second frame.

26. In a mining apparatus, a portable base including wheeled axles and a frame extending between and connecting said axles, said axles journaled in said frame and said frame having ver-

tical plane sides, a second frame pivotally mounted on said first frame to swing in a vertical direction with respect thereto about an axis coincident with the axis of rotation of the rear truck wheel axle, said second frame having depending guides providing plane guiding surfaces engaging said plane sides of said first frame, adjustable means extending between the front wheel axle and said second frame for tilting said second frame about its pivotal axis relative to said first frame, and kerf cutting mechanism carried by said second frame.

27. In a mining apparatus, a portable base including wheeled axles and a frame extending between and connecting said axles, said axles journaled in said frame and said frame having plane vertical sides, a second frame pivotally mounted on said first frame to swing in a vertical direction with respect thereto about an axis coincident with the axis of rotation of the rear truck wheel axle, said second frame having depending guides providing plane guiding surfaces engaging said plane sides of said first frame, a tiltable support mounted on said second frame to rock relative thereto about an axis extending longitudinally of the apparatus, means extending between the front truck wheel axle and said tiltable support for tilting said second frame about its pivot relative to said first frame, said means being adjustable to rock said tiltable support about its pivotal axis relative to said second frame, and kerf cutting mechanism carried by said tiltable support.

28. In a mining apparatus, a portable base embodying a vertically tiltable frame, a motor carried by said tiltable frame, base propelling mechanism carried by said tiltable frame and driven by said motor, a tiltable support mounted on said frame to rock with respect thereto, a kerf cutter carried by said tiltable support, devices actuated by said motor and connected to said tiltable support for rocking the latter relative to said frame and for vertically tilting said frame, and means driven by said motor for actuating said kerf cutter.

29. In a mining apparatus, a portable base, a frame pivotally mounted on said base to swing in a vertical direction with respect thereto, a tiltable support mounted on said frame to rock relative thereto about a horizontal axis extending longitudinally of said base, a kerf cutter mounted on said tiltable support, and means for tilting said frame relative to said base and for rocking said support relative to said frame including a pair of hydraulic jacks universally pivotally connected at one end to said support and at their opposite ends pivotally connected to said base.

30. In a mining apparatus, a portable base, a frame pivotally mounted on said base to swing in a vertical direction with respect thereto, a support mounted on said frame to rock relative thereto about a horizontal axis extending longitudinally of said base, a kerf cutter mounted on said tiltable support, and means for tilting said frame relative to said base and for rocking said support relative to said frame including a pair of hydraulic jacks universally pivotally connected at one end to said support and at their opposite ends pivotally connected to said base, said jacks including hydraulic cylinders having rear heads, members pivotally mounted on said frame for rotation about horizontal axes extending transversely of said frame, a longitudinal pivotal connection between said cylinder heads and said members, pistons contained in said cylinders and having depending piston rods, and longitudinal pivotal connections between the lower ends of said piston rods and said base.

31. In a mining apparatus, a portable base, a frame pivotally mounted on said base to swing in a vertical direction with respect thereto, a tiltable support pivotally mounted on said frame at the forward end of said base to rock relative thereto about an axis extending longitudinally of said base, a kerf cutter pivotally mounted on said support to swing relative thereto and adjustable with respect to said support into parallel cutting planes, hydraulic jacks extending between said base and said support for tilting said frame and support about their respective axes, hydraulic jacks carried by said support for swinging said kerf cutter about its pivot, and a hydraulic jack carried by said support for moving said kerf cutter into parallel cutting planes relative to said support.

32. In a mining apparatus, a portable base embodying a vertically tiltable frame, a tiltable support mounted on said frame at the forward end of said base to rock with respect thereto, a kerf cutter carried by said support, a motor mounted on said tiltable frame and relative to which said support is tiltable, and devices driven by said motor and connectible to said tiltable support for rocking the latter relative to said frame and for vertically tilting said frame.

33. In a mining apparatus, a portable base embodying a vertically tiltable frame, a tiltable support mounted on said frame at the forward end of said base to rock with respect thereto about an axis extending longitudinally of said frame, a kerf cutter carried by said support, a motor mounted on said tiltable frame and relative to which said support is tiltable, and devices driven by said motor and connectible to said tiltable support for rocking the latter relative to said frame and for vertically tilting said frame.

34. In a mining apparatus, a portable base, an elongated horizontal frame overlying said base and pivotally mounted on said base to swing in a vertical direction with respect thereto, a tiltable support mounted on the forward end of said frame at the forward end of said base to rock with respect to said frame, a kerf cutter carried by said tiltable support and having orbitally movable cutting elements, said kerf cutter swingable about its pivot to cut a plane kerf in a mine wall, and power operated devices connected to said tiltable support for rocking the latter relative to said frame and for vertically tilting said frame, said power operated devices common both to rocking said support and tilting said frame.

35. In a mining apparatus, a portable base, an elongated horizontal frame overlying said base and pivotally mounted on said base to swing in a vertical direction with respect thereto, a tiltable support mounted on the forward end of said frame at the forward end of said base to rock with respect to said frame about an axis extending longitudinally of said frame, a kerf cutter carried by said tiltable support and having orbitally movable cutting elements, said kerf cutter swingable about its pivot to cut a plane kerf in a mine wall, and power operated devices connected to said tiltable support for rocking the latter relative to said frame and for vertically tilting said frame, said power operated devices common both to rocking said support and tilting said frame.

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