July 9, 1935. C. F. OSGOOD 2,007,907

MINING APPARATUS

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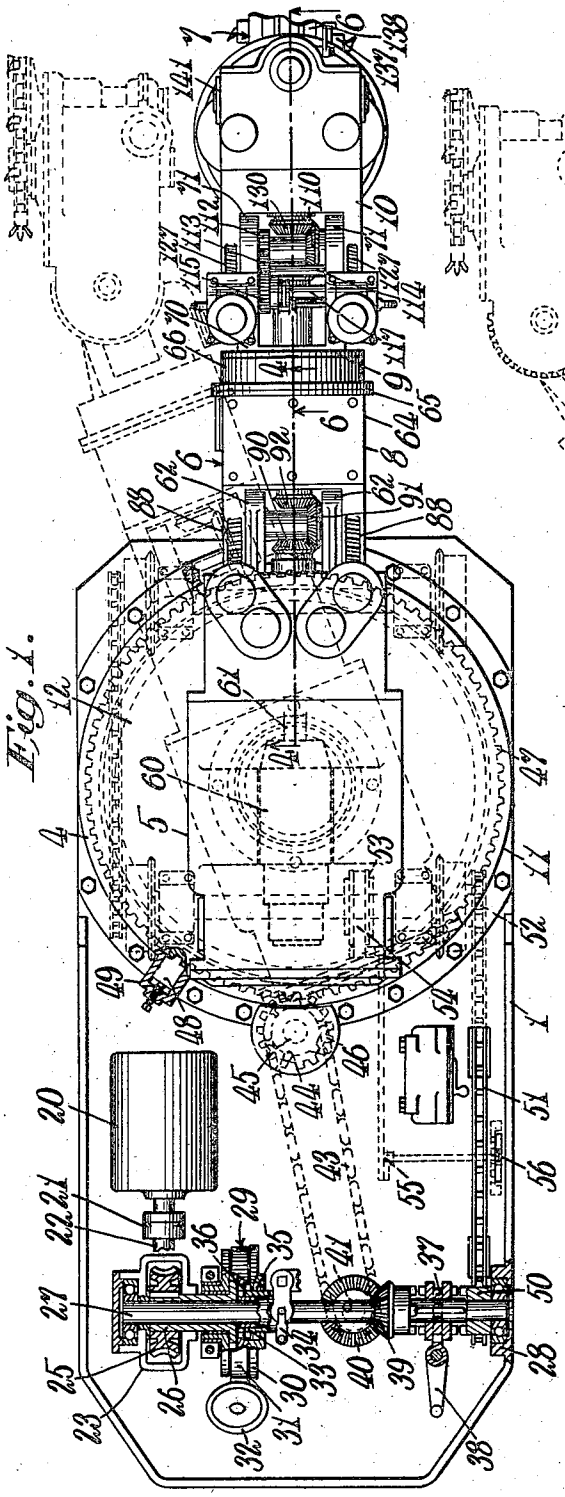


Fig. 1.

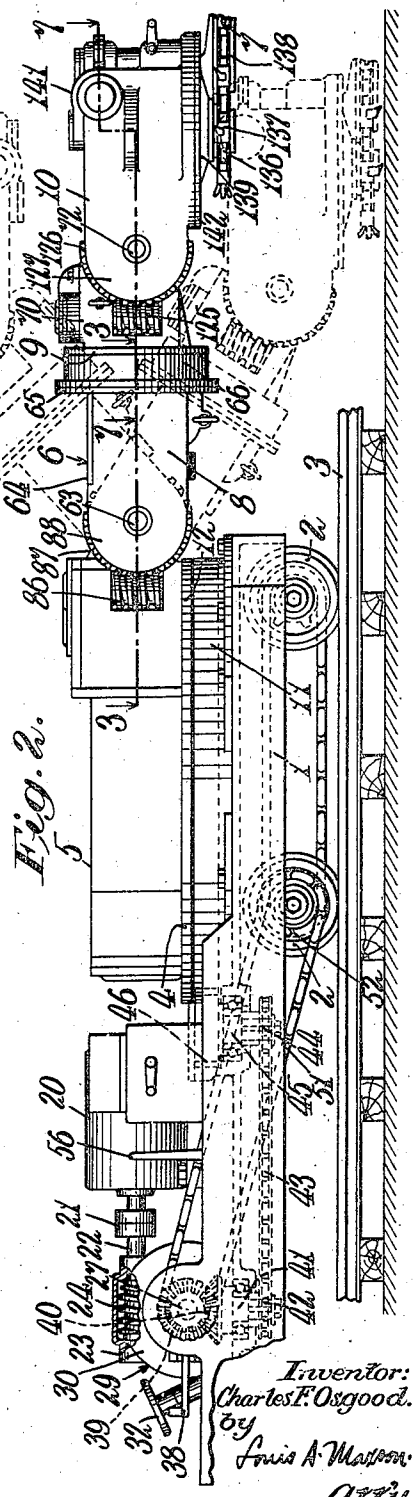


Fig. 2.

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MINING APPARATUS

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Fig. 3.

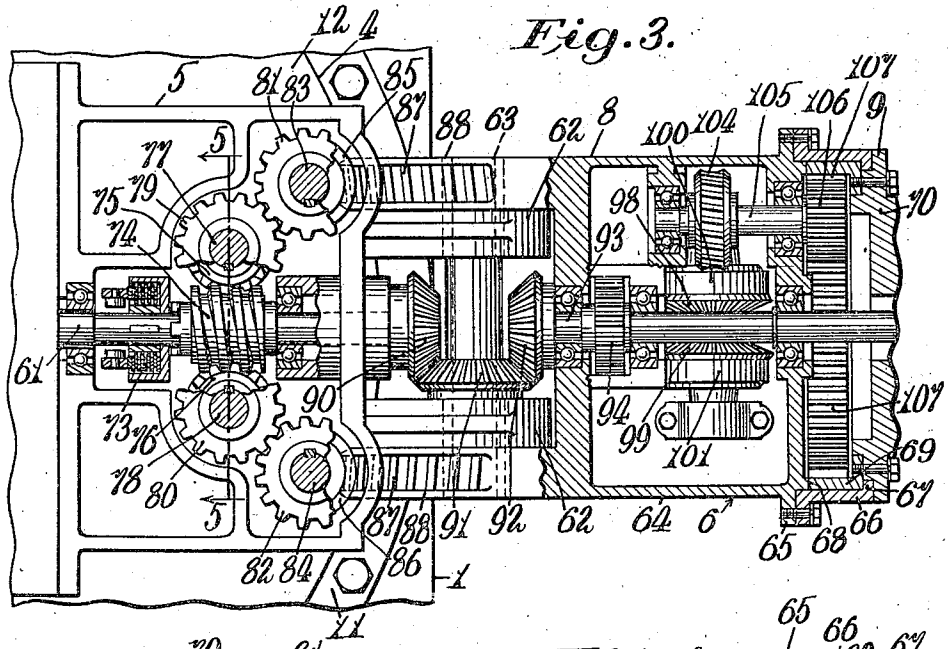


Fig. 4.

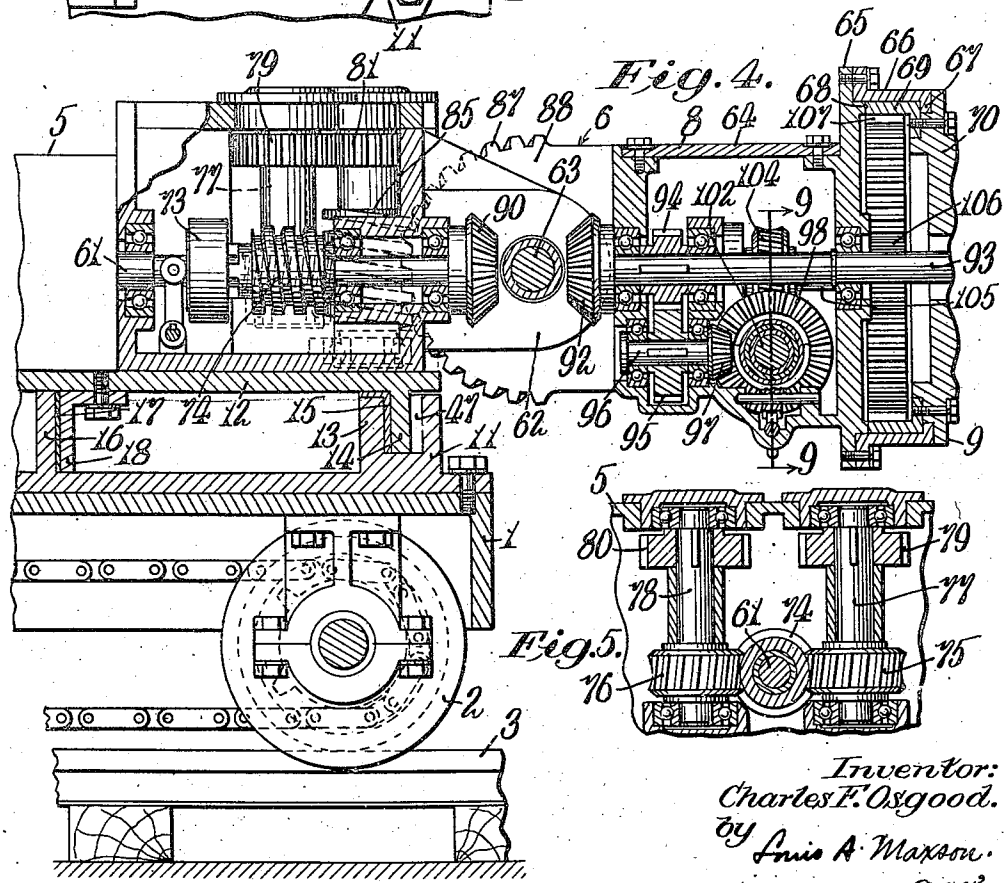


Fig. 5.

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Fig. 6.

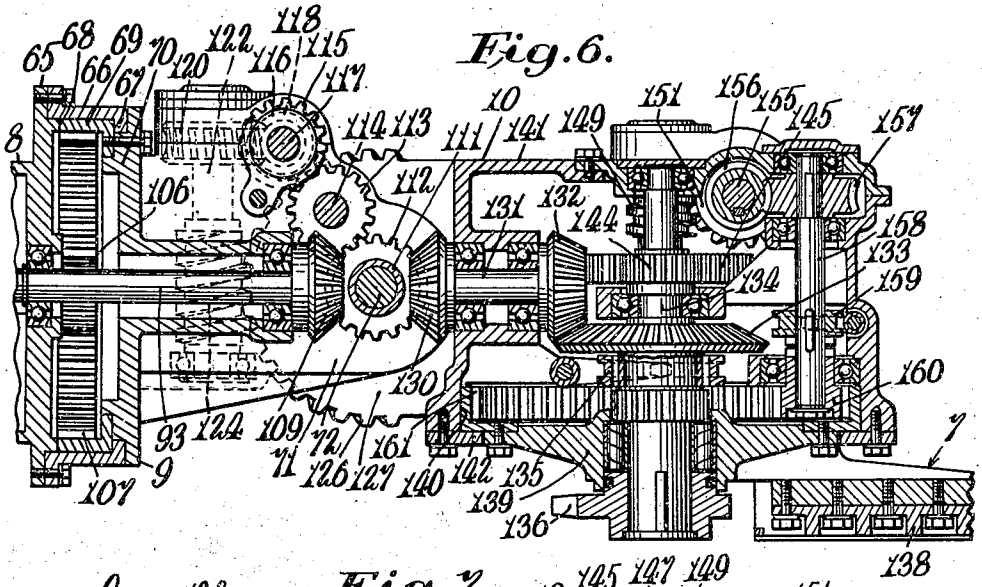


Fig. 7.

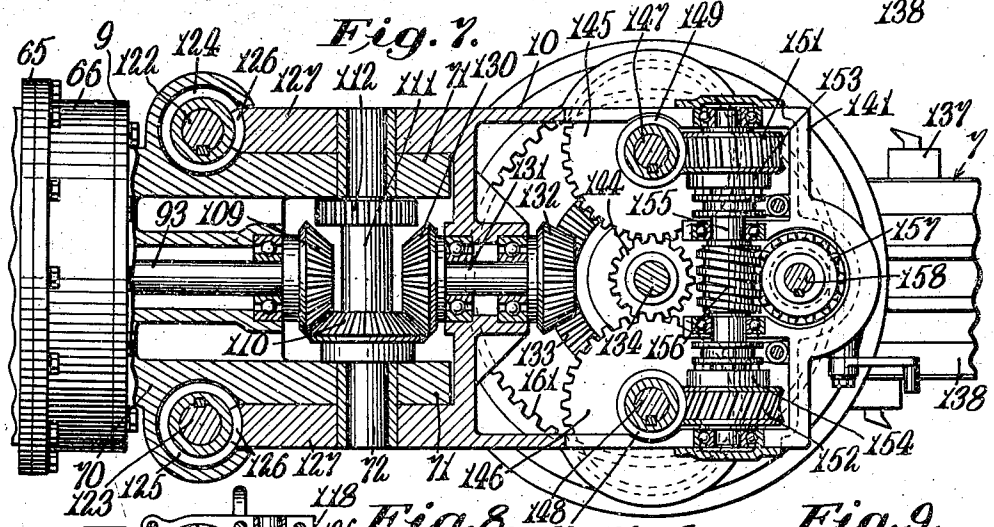


Fig. 8.

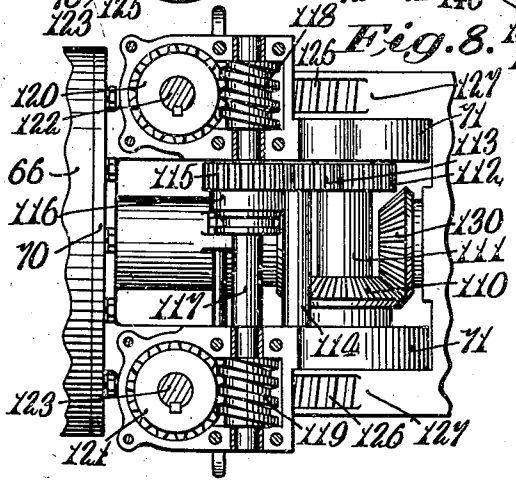
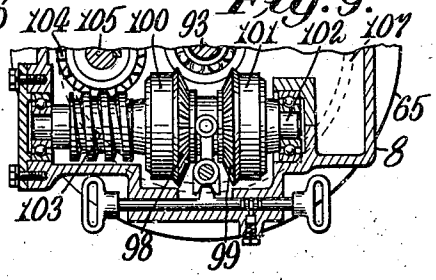


Fig. 9.



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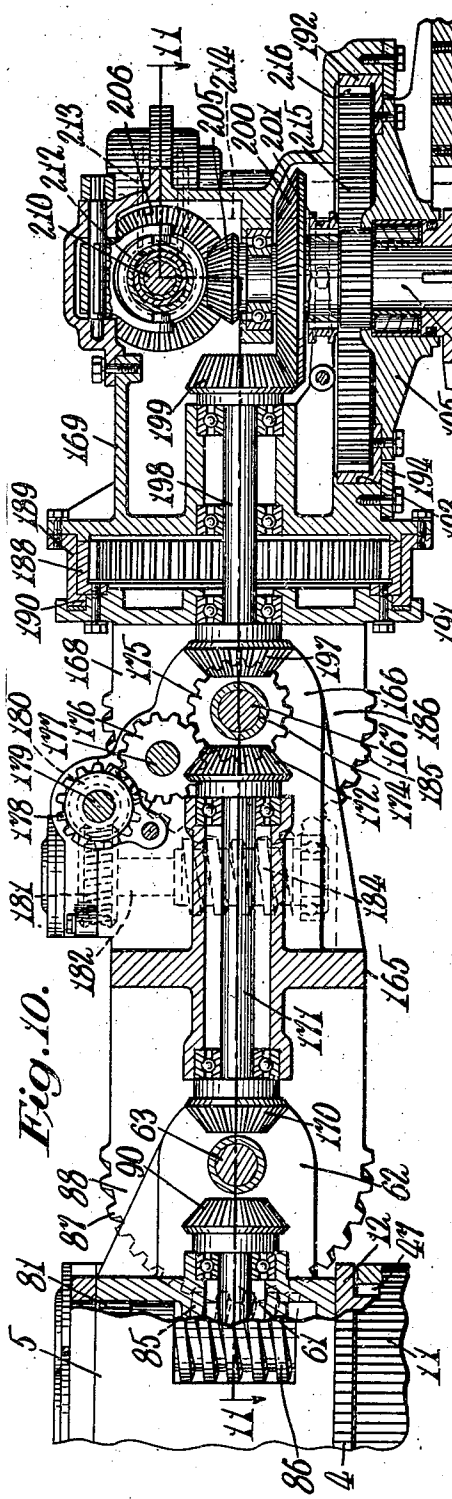


Fig. 10.

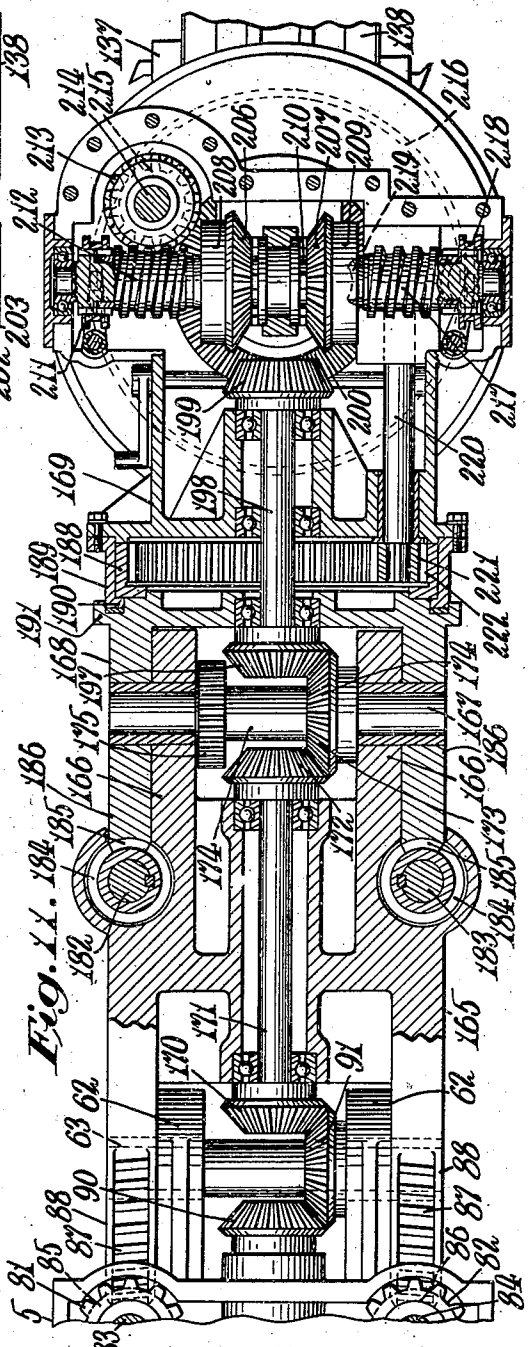


Fig. 11.

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Fig. 12.

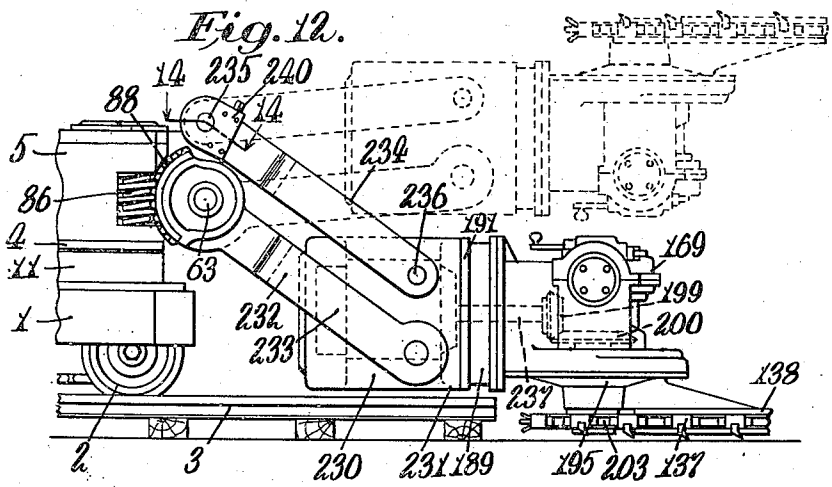


Fig. 13.

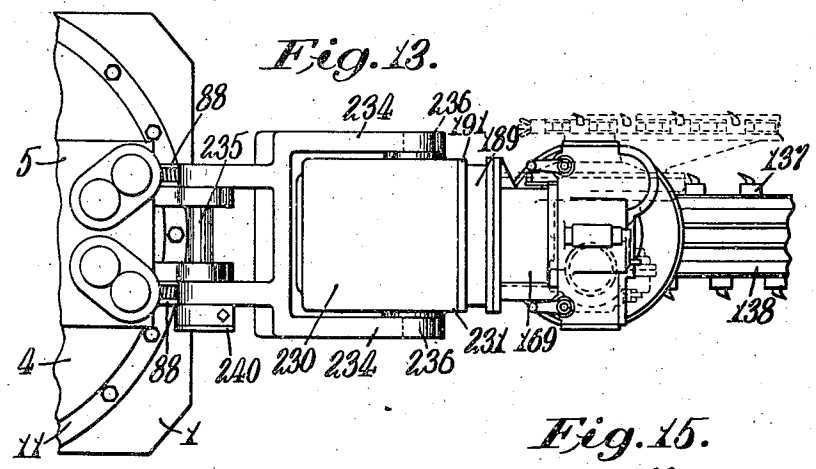


Fig. 15.

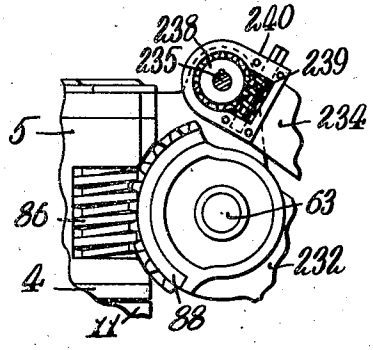
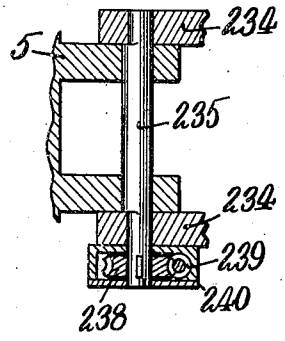


Fig. 14.



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UNITED STATES PATENT OFFICE

2,007,907

MINING APPARATUS

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Application July 28, 1932, Serial No. 625,381

118 Claims. (Cl. 262—28)

This invention relates to mining apparatus, and more particularly to improvements in coal mining apparatus of the combined horizontal and shear cutter, wheel-mounted type adapted to operate from the mine trackway.

An object of this invention is to provide an improved coal mining apparatus. Another object is to provide an improved coal mining apparatus of the combined horizontal and shear cutter type. A further object is to provide an improved adjustable supporting structure for the cutting mechanism of such an apparatus. Yet another object is to provide an improved adjustable supporting structure whereby the kerf cutting mechanism may be positioned to cut kerfs in the coal face in any desired horizontal plane between the mine roof and the mine bottom and to cut vertical kerfs. Another object is to provide, in such an apparatus, improved adjustable kerf cutting mechanism operative to cut kerfs in the coal face in parallel planes either horizontally or vertically and in intersecting planes. Yet another object is to provide an improved mining apparatus of the wheel-mounted type adapted to operate while supported and guided by the mine trackway and having improved adjustable kerf cutting mechanism whereby kerfs may be cut at or near the level of the mine bottom outside and below the level of the mine trackway, in any desired horizontal plane between the mine roof and the mine bottom and in vertical planes. A still further object is to provide in a mining apparatus of the aforesaid character improved adjustable kerf cutting mechanism whereby a vertical or shear-cut may be inserted in the coal face at any desired location between the ribs of the entry. A still further object is to provide an improved tiltable mounting structure for the kerf cutting mechanism whereby the kerf cutter may be tilted to change its angle in altitude, thereby to accommodate itself to a rolling or uneven mine bottom or pitching coal seam. Another object is to provide an improved coal mining apparatus of a truly universal character whereby an extremely wide range of adjustment of the kerf cutting mechanism is possible whereby kerfs may be cut in the mine wall at practically any desired location. These and other objects and advantages of the invention will, however, hereinafter more fully appear in the course of the following description and as more particularly pointed out in the appended claims.

In the accompanying drawings there are shown for purposes of illustration one preferred form and two modifications thereof which the invention may assume in practice.

In these drawings,—

Fig. 1 is a plan view of the preferred illustrative embodiment of the improved mining apparatus.

Fig. 2 is a side elevational view of the apparatus shown in Fig. 1.

Fig. 3 is a horizontal sectional view taken substantially on line 3—3 of Fig. 2, with parts shown in plan.

Fig. 4 is a vertical sectional view taken substantially on line 4—4 of Fig. 1.

Fig. 5 is a transverse vertical sectional view taken substantially on line 5—5 of Fig. 3.

Fig. 6 is a longitudinally extending vertical sectional view taken substantially on line 6—6 of Fig. 1.

Fig. 7 is a horizontal sectional view, with parts shown in plan, taken substantially on line 7—7 of Fig. 2.

Fig. 8 is a top plan view with cover plates removed to illustrate structural details of the kerf cutter supporting and adjusting mechanism.

Fig. 9 is a transverse vertical sectional view taken substantially on line 9—9 of Fig. 4.

Fig. 10 is a longitudinally extending vertical sectional view illustrating a modified form of adjustable supporting structure for the kerf cutter.

Fig. 11 is a horizontal sectional view taken substantially on line 11—11 of Fig. 10, with parts shown in plan to facilitate illustration.

Fig. 12 is a fragmentary side elevational view of a further modified form of adjustable supporting structure for the kerf cutter.

Fig. 13 is a plan view of the mechanism shown in Fig. 12.

Fig. 14 is an enlarged detail sectional view taken substantially on line 14—14 of Fig. 12.

Fig. 15 is a detail side elevational view of the mechanism shown in Fig. 14.

In the preferred illustrative embodiment of the invention shown in Figs. 1 to 9 inclusive, there is shown a coal mining apparatus of the combined horizontal and shear cutter, wheel-mounted type adapted to operate from the mine trackway and generally comprising a self-propelled portable base, herein in the form of a truck frame 1 mounted on wheels 2 adapted to run along a mine trackway 3. Supported on the truck frame 1 for rotative movement relative thereto about a vertical axis is a horizontal turntable 4 having mounted thereon a frame 5 which constitutes the main supporting frame for the kerf cutting

mechanism. Mounted on the forward portion of the frame 5 is the improved adjustable supporting structure, generally designated 6, for the kerf cutting mechanism 7 and comprising a swingable arm structure 8, a rotatable head 9 and a swingable kerf cutter support 10. Suitable motor operated devices are provided for rotating the turntable 4, for operating the adjustable supporting structure 6, for operating the cutting mechanism 7 and for driving the truck wheels to propel the apparatus along the mine trackway both during cutting and during transport, as will hereinafter be described.

Referring to the turntable mounting structure for the kerf cutting mechanism 7, it will be noted that secured to the truck frame above the truck wheel axles is an annular turntable receiving frame 11 on which the circular turntable frame 12 is mounted, the frame 11 having an unstanding annular flange 13, and the frame 12 having a depending annular flange 14, the flange 13 supporting a bearing sleeve 15 with which the flange 14 cooperates. Also formed on the frame 11 is an inner annular flange 16 supporting a bearing sleeve 17 for an annular bearing member 18 secured to the bottom surface of the turntable frame 12. The mechanism for rotating the turntable 4 at a relatively low speed suitable for cutting and at a relatively high cutter positioning speed herein comprises a motor 20 mounted on the truck frame at the rear of the turntable structure and having its power shaft connected by a coupling 21 to a shaft 22 suitably journaled within a housing 23 mounted on the rearward portion of the truck frame. Fixed to the shaft 22 is a worm 24 meshing with a worm wheel 25 keyed to a sleeve 26 rotatably mounted on a transverse operating shaft 27 likewise suitably journaled within the housing 23 and within an upstanding bearing bracket 28 herein formed integral with the adjacent side of the truck frame. The sleeve 26 is adapted to drive through a plural speed, frictionally controlled, planetary transmission mechanism generally designated 29, the shaft 27. This mechanism comprises a rotatable casing 30 frictionally controlled by a brake band 31 regulated by a hand wheel 32. A sliding clutch element 33 controlled by a clutch shipper member 34 is employed for attaining a relatively high and a relatively low speed, this clutch member being alternatively engageable with the high and low speed terminal members 35 and 36 respectively of the transmission mechanism. As the specific structure of this planetary transmission mechanism is well known to those skilled in the mining art, further illustration and description thereof are considered unnecessary. Splined to the transverse shaft 27 is a jaw clutch member 37 having a suitable operating lever 38, and this clutch member is shiftable to connect a bevel gear 39 to the shaft 27. This bevel gear meshes with and drives a bevel gear 40 fixed to a vertical shaft 41, and this shaft in turn has fixed thereto a chain sprocket 42 connected by an endless chain 43 to a sprocket 44 keyed to a vertical shaft 45. The shafts 41 and 45 are suitably journaled within the truck frame, and the shaft 45 has keyed thereto and drives a spur gear 46 meshing with a large spur gear 47 herein formed integral with the depending flange 14 of the rotatable frame 12 of the turntable 4 (see Fig. 4). It will thus be seen that when the bevel gear 39 is connected to the shaft 27 and the clutch member 33 is operated in an appropriate manner, the turntable 4 may be rotated at either a relatively high or a relatively low speed under frictional control of the brake band 31 of the planetary transmission 29. The motor 20 is herein of the reversible electric type, and it is accordingly evident that the turntable may be rotated in either of opposite directions at either a high speed or a low speed. When the turntable is disconnected from its rotating mechanism it may be locked against rotation by means of a slidable locking element 48 (see Fig. 1) guided in a bracket 49 attached to the turntable frame 11 and engageable with the teeth of the gear 47 formed on the rotatable turntable frame.

The motor 20 and the planetary transmission mechanism 29 also constitute driving means for the truck wheels to propel the apparatus along the mine trackway at either a relatively high transport speed or at a relatively low cutting speed. This truck wheel driving mechanism comprises a chain sprocket 50 journaled on the shaft 27 and connectible thereto by the jaw clutch member 37, and this sprocket is connected by an endless chain 51 to a chain sprocket 52 fixed to the rear truck wheel axle. A truck wheel brake is provided and comprises a brake drum 53 keyed to the rear truck wheel axle and with which cooperates a usual brake band 54 controllable through connections 55 operated by a brake lever 56. From the foregoing it is evident that the truck wheels may be driven at either a high or a low speed under the control of the planetary transmission mechanism 29 and, through the drive of the reversible motor 20, in either of opposite directions at either speed whenever the clutch member 37 is operated to connect the truck driving member 50 to the shaft 27, and that the truck wheel driving speeds may both be frictionally controlled by the brake band 31. When the clutch member 37 is in the position shown in Fig. 1, i. e. its neutral position, both the turntable rotation and the truck wheel drive are disconnected from the motor 20.

Now referring to the kerf cutting mechanism, and more particularly to the improved adjustable supporting structure therefor, it will be observed that housed within the turntable frame 5 is a horizontal motor 60, herein preferably of the reversible electric type, having the forward end of its power shaft 61 operatively connected to the devices for operating and adjusting the kerf cutting mechanism. In the present construction there are formed integral with the forward portion of the turntable frame 5 parallel, forwardly projecting frame portions 62, 62, and journaled within these frame portions is a transverse hinge shaft 63. Pivotally mounted at its rear end on this hinge shaft is a main supporting arm 64, and this arm has rotatably mounted at its forward end about an axis extending longitudinally of the arm and at right angles to the hinge shaft axis, the rotatable head 9. In this construction, formed integral with the arm structure at its outer extremity is a circular frame 65 arranged in a transverse plane perpendicular to the longitudinal axial line of the arm and the head axis, as shown in Fig. 4. Secured to this circular frame 65 is an annular retaining and bearing sleeve 66 having an inwardly directed flange 67. Between this flange and a shoulder 68 formed on the circular frame 65 there is rotatably mounted a sleeve 69 which herein forms a rotatable support for the head 9. This sleeve 69 is secured to the frame 70 of the head 9, and this frame 70 comprises parallel outwardly projecting frame portions 71, 71 extending parallel to and equidistant from the

axial line of the rotatable head 9. Supported within these frame portions 71, 71 is a transverse hinge shaft 72 arranged with its axis perpendicular to and intersecting the axial line of the rotatable head, and pivotally mounted at its rear end on this hinge shaft is the kerf cutter supporting frame 10. The arm 8 and the kerf cutter support 10 are independently swingable about their respective axes, and the head 9 is rotatable relative to the arm 8 through improved devices which will now be described. As shown in Fig. 3, connectible to the forward end of the motor power shaft 61, as by a multiple disc clutch 73, is a worm 74 meshing with worm wheels 75 and 76 and simultaneously driving the latter in the same direction. These worm wheels are fixed to parallel vertical shafts 77 and 78 respectively, suitably journaled within the turntable frame 5. Keyed to the upper ends of these shafts are spur gears 79 and 80, and these gears mesh respectively with spur gears 81 and 82 fixed to parallel vertical shafts 83 and 84, the latter likewise being suitably journaled within the turntable frame 5. Keyed to the shafts 83 and 84 respectively are worms 85 and 86 meshing with worm gear teeth 87 formed on segmental portions 88, 88 integral with the arm 8 and overlapping the frame portions 62, 62 of the turntable frame 5. It will thus be seen that when the worm 74 is connected to the motor power shaft by the disc clutch 73, the worms 85, 86 meshing with the worm gear segments on the arm 8 may be driven to swing the arm either upwardly or downwardly, depending upon the direction of motor rotation. If desired, however, a suitable reversing mechanism may be provided in the drive so that the arm may be swung either upwardly or downwardly without reversal of the motor. Keyed to the forward end of the motor power shaft 61 is a bevel gear 90 meshing with a bevel gear 91 loosely mounted on the hinge shaft 63. Meshing with the bevel gear 91 is a bevel gear 92 fixed to a shaft 93 suitably journaled within and extending longitudinally of the arm 8. The devices for rotating the head 9 relative to the arm 8 are driven by the shaft 93 and herein comprise a spur gear 94 keyed to the shaft 93 (see Fig. 4) and meshing with a spur gear 95 keyed to a parallel shaft 96, the latter likewise suitably journaled within the arm 8. Fixed to the forward end of the shaft 96 and driven thereby is a bevel pinion 97 meshing, as shown in Fig. 9, with reverse bevels 98 and 99. These reverse bevels are selectively connectible by suitable multiple disc clutches 100, 101 to a transverse shaft 102 to effect drive of the latter in opposite directions. The shaft 102 is arranged transversely of the arm 8 and is suitably journaled therein, as shown. Keyed to the shaft 102 and driven thereby is a worm 103 meshing with a worm wheel 104 keyed to a shaft 105. This shaft is arranged parallel with the shaft 93 and is likewise suitably journaled within the arm 8, as shown in Fig. 3. Keyed to the forward end of the shaft 105 and driven thereby is a spur gear 106 meshing with the teeth of a large internal gear 107, herein formed integral with the sleeve 69 of the rotatable head. It will thus be seen that depending upon which one of the disc clutches 100, 101 is applied, the head 9 may be rotated relative to the arm 8 at a cutter positioning speed in either of opposite directions while the transmission shaft 93 rotates continuously in the same direction, the shaft 93 also constituting a drive shaft for the kerf cutter, as will hereinafter be described. As shown in Fig. 6, the forward end of the transmission shaft 93 is journaled within a bearing carried within the head frame 70, and keyed to this end of the shaft is a bevel gear 109 meshing with a bevel gear 110 loosely mounted on the hinge shaft 72 (see Fig. 7). The bevel gear 110 is fixed to a sleeve 111 likewise journaled on the hinge shaft, and fixed to this sleeve and driven thereby is a spur gear 112 meshing with an intermediate gear 113 journaled on a transverse idler shaft 114 mounted within the parallel frame portions 71, 71 of the head frame 70. The gear 113 meshes with a spur gear 115 connectible by a multiple disc clutch 116 to a shaft 117 herein arranged transversely of the head frame 70 and suitably journaled therein. Keyed to the shaft 117 at the opposite ends thereof are worms 118, 119 meshing respectively with worm wheels 120 and 121 keyed to shafts 122 and 123 respectively. These shafts are herein arranged at right angles to the shaft 117 and are likewise suitably journaled within the head frame 70. Keyed respectively to the shafts 122, 123 are worms 124 and 125 (see Fig. 7) meshing with worm gear segments 126, herein formed on parallel frame portions 127, 127 herein overlapping the frame portions 71, 71 and formed integral with the swingable kerf cutter support 10; these frame portions 127, 127 receiving the outer ends of the hinge shaft 72, thereby to form a pivotal mounting for the kerf cutter support 10. It will thus be evident that when the disc clutch 116 is applied, the kerf cutter support 10 may be swung about its pivotal axis relative to the rotatable head 9 in either direction, depending upon the direction of motor rotation. It will be evident, however, that if desired a suitable reversing mechanism may be provided to enable swinging of the kerf cutter support in either direction relative to the head without reversal of the motor. It will be also noted that the worm gearings for swinging the arm 8, for rotating the head 9 and for swinging the kerf cutter support 10 are herein of the self-locking type, and lock automatically the elements adjusted thereby when disconnected from their respective driving means. It will further be noted that the gearings for swinging the arm 8 and for swinging the kerf cutter support 10 relative to the head 9 may be so proportioned that when the arm 8 is swung in one direction the support 10 is swung in the opposite direction at such speed as to maintain the kerf cutter at all times in a substantially horizontal plane, and that the slow speed of turntable rotation may be also so proportioned with the swinging speed of the support 10 that when the kerf cutter is in a vertical position it may be swung horizontally while the kerf cutter at all times remains parallel to a vertical plane.

Now referring to the improved mechanism for driving the kerf cutting mechanism and for swinging the kerf cutter about its pivot relative to the bar support 10, it will be noted that meshing with the bevel gear 110 is a bevel gear 130 keyed to a shaft 131 arranged at right angles to the hinge shaft 71 and suitably journaled within the kerf cutter support 10, as shown in Fig. 7. Keyed to the forward end of the shaft 131 is a gevel pinion 132 meshing with a large bevel gear 133 journaled on a shaft 134, herein anged with its axis coincident with the axis of swinging movement of the kerf cutter. The bevel gear 133 is connectible by a sliding clutch 135 of a usual design to the shaft 134, and keyed to the outer end of the shaft 134 and driven thereby is a sprocket 136 which engages and

drives an endless cutter chain 137 mounted for circulation about the margin of a cutter bar 138. This cutter bar is attached to a cylindrical supporting frame 139 rotatably mounted in a bore 140 formed in the frame 141 of the swingable kerf cutter support 10. A thrust ring 142 attached to the frame 141 serves to retain the frame 139 in its bore.

Now referring to the mechanism for effecting swinging of the cutter bar 138 about its pivotal axis relative to the swingable support 10, it will be noted that fixed to the shaft 134 and driven thereby is a spur gear 144 meshing with spur gears 145 and 146 respectively. The gears 145 and 146 are fixed to parallel shafts 147 and 148 herein arranged parallel with and at opposite sides of the shaft 134 and likewise suitably journaled within the support 10. Keyed to these shafts respectively are worms 149 and 150 having teeth of different inclination and meshing respectively with worm wheels 151 and 152. The worm wheel 151 is herein a slow speed worm wheel, while the worm wheel 152 is a high speed worm wheel, and these worm wheels rotate at speeds suitable to effect swinging of the cutter bar at a relatively low speed in one direction and at a relatively high bar positioning speed in the opposite direction. These worm wheels are alternatively connectible by multiple disc clutches 153 and 154 respectively to a transverse shaft 155, herein arranged parallel with the hinge shaft 72 and suitably journaled within the swingable cutter support 10. Keyed to the shaft 155 is a worm 156 meshing with a worm wheel 157 keyed to a transverse shaft 158. This shaft is herein arranged parallel with the shaft 134 and is likewise suitably journaled within the cutter support 10, and this shaft has connectible thereto by a sliding clutch 159 a spur pinion 160 meshing with teeth of a large internal gear 161, herein formed integral with the cylindrical bar support 139, as shown in Fig. 6. It will thus be seen that depending upon which one of the disc clutches 153, 154 is applied, the cutter bar may be swung about its pivot in either of opposite directions, at a slow speed in one direction and at a relatively high speed in the opposite direction. By the provision of the sliding clutch 135, the cutter chain 137 may remain idle during the various adjustments aforesaid.

The modified form of construction shown in Figs. 10 and 11 is similar to the preferred form described above with the exception that the rotatable head is mounted in advance of the pivotal axis of the swingable kerf cutter support so that the head swings with the kerf cutter support relative to the swingable arm structure. In this form of the invention the swingable arm which corresponds to the arm 8 is numbered 165, and the mechanism for swinging this arm is identical to the mechanism for swinging the arm 8, and therefore illustration and description thereof are thought unnecessary. The arm 165 has formed integral therewith forwardly projecting parallel frame portions 166, 166, and journaled within these frame portions is a transverse hinge shaft 167 arranged with its axis horizontal and parallel with the hinge shaft 63. Pivotally mounted at its rear end on this hinge shaft is a swingable support 168, and this support has rotatably mounted thereon a rotatable cutter head 169. The mechanism for swinging the support 168 about its pivotal axis relative to the arm 165 comprises a bevel gear 170 meshing with the bevel gear 91 and keyed to a shaft 171 suitably journaled within the arm 165. Keyed to the forward end of this shaft is a bevel gear 172 meshing with a bevel gear 173 loosely journaled on the hinge shaft 167. Secured to and driven by the bevel gear 173 is a hollow shaft 174, and fixed to this shaft is a spur gear 175 meshing with an intermediate gear 176 journaled on an idler shaft 177 suitably supported within the frame portions 166, 166 of the arm 165. Meshing with and driven by the gear 176 is a spur gear 178 similar to the spur gear 115 and similarly connectible by a multiple disc clutch to a transverse shaft 179 likewise suitably journaled within the frame portions 166, 166. Keyed to the shaft 179 at the opposite ends thereof are worms 180, 180 which mesh respectively with worm wheels 181, 181 keyed to the vertical shafts 182 and 183 respectively (see Fig. 11). Keyed to these shafts are worms 184, 184 which mesh with worm gear segments 185, 185 formed on segmental portions 186 integral with the support 168 and arranged parallel with and overlapping the frame portions 166. It will thus be seen that the support 168 may be swung in either direction about its pivotal axis relative to the arm 165, depending upon the direction of rotation of the worms 184, 184.

As previously mentioned, the cutter head 169 is rotatably mounted on the swingable frame or support 168, and the mounting therefor comprises a cylindrical bearing sleeve 188 having rotatably mounted thereon a cylindrical supporting frame 189 for the head. This supporting frame is attached to the cutter head frame 169 and has an inwardly directed annular retaining flange 190 cooperating with the bearing sleeve 188 and an annular flange 191 formed integral with the frame 168. Mounted on the cutter head frame 169 for rotation about an axis at right angles to the axis of the cutter head is a cylindrical supporting frame 192 rotatably mounted in a bore 193 formed in the cutter head frame. A thrust ring 194 attached to the cutter head frame serves to retain the frame 192 in its bore. Attached to the frame 192 is a support or hanger 195 which carries the cutter bar 138. Mounted for orbital movement on the margin of the cutter bar 138 is the endless cutter chain 137, this cutter bar structure being identical to that described above in the preferred embodiment of the invention.

The mechanism for actuating the cutter chain comprises a bevel gear 197 meshing with the bevel gear 173 and driven thereby. The bevel gear 197 is fixed to a shaft 198 extending through the cutter head frame along the axis of the cutter head and suitably journaled within the cutter head frame. Keyed to the forward end of the shaft 198 is a bevel pinion 199 meshing with a large bevel gear 200. The bevel gear 200 is connectible by a sliding clutch 201 to a transverse shaft 202 suitably journaled within the head frame and driving a chain sprocket 203 which engages and drives the cutter chain 137.

The mechanism for rotating the cutter head about its axis and for swinging the cutter bar will now be described. Keyed to the shaft 202 is a bevel pinion 205 meshing with reverse bevels 206 and 207. These reverse bevels are alternatively connectible by multiple disc clutches 208 and 209 of the usual design, to a transverse shaft 210 suitably journaled within the cutter head frame. Connectible to this shaft, as by a sliding clutch 211, is a worm 212 meshing with a worm wheel 213 fixed to a shaft 214, herein arranged parallel with the shaft 202 and likewise journaled in the cutter head frame. Connectible to

the shaft 214, as by a clutch similar to the clutch 159 heretofore referred to, is a spur pinion 215 meshing with the teeth of a large internal gear 216, herein formed integral with the cylindrical supporting frame 192 for the cutter bar 138. It will thus be seen that depending upon which disc clutch 208, 209 is applied, the cutter bar may be swung about its pivot at a speed appropriate for cutting in either of opposite directions. The mechanism for rotating the cutter head about its axis herein comprises a worm 217 connectible, as by a sliding clutch 218, to the shaft 210 and meshing with a worm wheel 219 fixed to a longitudinally extending shaft 220 herein arranged parallel with the shaft 198 and suitably journaled within the cutter head frame. Fixed to the rear end of the shaft 220 is a spur pinion 221 meshing with the teeth of an internal gear 222 herein formed integral with the cylindrical head support 188. It will therefore be evident that the cutter head may be rotated about its axis in either of opposite directions under the control of the friction clutches 208, 209. The worm gearings of the bar swinging mechanism and of the head rotating mechanism are self-locking, and upon release of the controlling clutches maintain automatically the cutter bar and head in their positions of adjustment. The gearings for swinging the arm 165 and for swinging the cutter head support 168 relative to the arm are so proportioned that when the arm is swung in one direction, the support may be swung simultaneously in the opposite direction, thereby to maintain the cutter bar at all times substantially parallel to a horizontal plane.

In the modification shown in Figs. 12 to 15 inclusive, the arm swinging structure and the turntable and truck mounting are identical to the forms above described, but in this form of the invention the driving connections between the motor 60 on the turntable and the devices for rotating the head and swinging the cutter bar are eliminated, and in this instance the head rotating and kerf cutter swinging devices are driven by a motor 230 carried within a support 231 on which the cutter head is rotatably mounted. Pivotally mounted on the hinge shaft 63 is an arm 232, herein in the form of a yoke having its side arms 233, 233 straddling the motor support, as shown in Fig. 13. Arranged parallel with the arm 232 is a parallel motion arm 234, also in the form of a yoke, pivotally connected at 235 to the turntable frame 5 and at 236 to the motor support 231; the arms 232 and 234 cooperating to form a parallel motion device for maintaining the cutter head axis at all times substantially parallel to a common straight line during swinging of the arm structure. The power shaft 237 of the motor 230 corresponds to the drive shaft 198 of the form of the invention shown in Figs. 10 and 11, and the mechanisms driven by this shaft for rotating the cutter head and for swinging the cutter bar about its pivot and the pivotal mountings for the head and cutter bar are identical to those described in that form of the invention, and therefore further description and illustration thereof are deemed unnecessary. As shown most clearly in Fig. 14, the ends of the hinge shaft 235 which project within the bearing portions at the sides of the arm are eccentric relative to the body of the shaft, so that by the turning of the shaft, true relation between the arm and the frame portions may be slightly varied for the purpose of putting the relations of the four bearings of the parallel arm structure out of true sufficient to intentionally slightly tilt the cutter head out of parallel relation with the longitudinal axial line of the turntable frame 5; this being at times desirable when there is a slant in the upper or lower face of the vein of coal, or if there is a slight slant in the track on which the apparatus is guided. Adjustment of the hinge shaft 235 is, in this instance, effected manually by a worm wheel 238 fixed to one end of the shaft, and meshing with this worm wheel is a worm 239 fixed to a shaft suitably journaled in a housing 240 secured to the side of the arm 234. The worm shaft is provided with suitable means for the reception of a lever or other suitable turning instrument, and the worm gearing is self-locking and automatically retains the shaft 235 in its different adjusted positions. It will thus be seen that the cutter bar may be tilted about an axis transverse to its length, as desired, the tilting mechanism above described corresponding to the tilting mechanisms for the cutter bar supports of the preferred form and modification above described.

The mode of operation of the embodiment of the invention shown in Figs. 1 to 9 inclusive is as follows: The apparatus is propelled along the mine trackway at a relatively high transport speed through the planetary transmission 29 driven by the motor 20, it being understood that at that time the cutter bar is in the full line position shown in Figs. 1 and 2. When the working face is reached, the high truck wheel drive is disconnected from the motor by releasing the friction band 31 and sliding the clutch member 33 into its neutral position. If it is desired to make a horizontal cut at or near the level of the mine bottom in front of the end of the trackway in accordance with the arcwall method, the disc clutches 73 and 116 respectively controlling the worm gearings 85, 86, 87 and 124, 125, 126 of the swinging mechanisms for the arm 8 and the bar support 10 are applied, thereby swinging the parts into the lower dotted line position in Fig. 2, the bar support 10 swinging upwardly about its pivot as the arm moves downwardly about its pivot, thereby to move the cutter bar into the horizontal bottom cutting position shown. The fast speed controlling clutch 154 of the bar swinging mechanism is then applied, and the cutter bar 138 is swung laterally from left to right until its tip end is located adjacent the right hand rib of the entry, the clutch 154 thereafter being released. The operator then operates the sliding clutch 135, connecting the cutter chain 137 to its drive. With the parts thus disposed the clutch member 33 of the planetary transmission 29 is shifted to connect the low speed gearing thereof to the motor 20, and upon connection of the clutch 37 the truck wheels are driven to propel the apparatus bodily along the mine trackway at a slow cutting speed to effect sumping of the cutter bar beneath the coal. After the completion of the sumping cut, the clutch members 33 and 37 are released, the brake 53 set, holding the truck wheels against movement, and the slow speed clutch 153 of the bar swinging mechanism is applied, thereby effecting swinging movement of the cutter bar about its pivot from its position adjacent the right hand rib transversely across the coal face to a position adjacent the left hand rib, the clutch 153 thereafter being released. After the completion of the swinging cut, the motor 20 is reversed, and upon connection of the clutches 33, 37 the apparatus is propelled bodily rearwardly along the mine trackway to effect with-

drawal of the cutter bar from beneath the coal face. The cutter bar and its adjustable supporting structure are then returned to the full line position indicated in Figs. 1 and 2, and upon connection of the fast speed drive of the planetary transmission, the apparatus is propelled bodily rearwardly along the trackway at a high transport speed to another working place.

If it is desired to cut a horizontal kerf at or near the level of the mine bottom outside and below the level of the mine trackway in accordance with the arcwall method, the operator releases the lock 48 and shifts the clutch member 33 into its high speed position and then operates the clutch 37 to connect the gear 39 to the shaft 27, thereby causing the turntable 4, together with the cutting mechanism supported thereby, to be swung horizontally at a high positioning speed from the central full line position shown in Fig. 1 to a position wherein the pivot of the cutter bar lies outside of the trackway. During horizontal swinging movement of the turntable relative to the truck, the cutter bar may be swung simultaneously about its pivot in the opposite direction under the control of the clutch 153 of the cutter swinging mechanism until the tip end of the cutter bar assumes a position adjacent the right hand rib at a less angle than the angle of the pivoted arm structure relative to the rib. When the parts are thus disposed with the bar pivot lying outside the mine trackway, the operator releases the clutches 153, 37 and 33, and upon application of the clutches 73 and 116 of the mechanisms for swinging the arm 8 and bar support 10, the arm 8 is swung downwardly about its pivot while the support 10 is simultaneously swung upwardly until the parts assume the lower dotted line position shown in Fig. 2 with the cutter bar at the level of the mine bottom outside the mine trackway. When the parts are thus disposed the turntable is locked against rotation and thereafter the truck wheels are driven from the motor 20 through the planetary transmission 29 to propel the apparatus bodily along the mine trackway at a slow cutting speed to effect sumping of the cutter bar beneath the coal face. The brake 53 is then set to hold the truck wheels stationary, the turntable lock released, and the turntable rotation mechanism is operated to effect rotation of the turntable at a relatively slow speed to effect swinging of the adjustable arm structure for the cutter bar laterally from right to left. Upon initial swinging movement of the arm structure, the cutter bar is swung about its pivot in the opposite direction until the parts assume a straight line position wherein the cutter bar lies in a vertical plane passing through the bar pivot and turntable axes. After the cutter bar has been straightened up, turntable rotation is continued, thereby swinging the cutter bar about the turntable axis from the right hand rib until the tip end of the cutter bar lies adjacent the left hand rib. After the tip end of the cutter bar has reached the left hand rib, the cutter bar is again swung about its pivot in a direction opposite from the direction of turntable rotation while rotation of the turntable 4 is continued, the turntable and cutter bar swinging simultaneously in opposite directions at that time until they assume an angular position with the cutter bar disposed at a less angle relative to the left hand rib than the angle of the adjustable arm structure relative thereto. The turntable rotation and bar swinging mechanisms are then disconnected from their drives and the turntable lock connected, the brake 53 released, and thereafter the apparatus is propelled bodily rearwardly along the mine trackway at a slow speed to effect withdrawal of the cutter bar from beneath the coal. After the completion of the bottom cut beneath the coal, the parts are again returned to their transport position, as indicated in full lines in Figs. 1 and 2, and the apparatus propelled to another working place.

A horizontal kerf may be cut at or near the level of the mine roof by applying one or the other of the friction clutches 100, 101 of the head rotating mechanism to effect rotation of the cutter head 9 from the full line position shown in Fig. 2 to a position wherein the cutter bar overlies the bar support, the cutter bar moving through an arc of a circle from its lower position to its upper position. When the parts are thus disposed the clutches controlling the mechanisms for swinging the arm 8 and the bar support 10 about their respective pivots are operated to effect swinging movement of the arm upwardly to the upper dotted line position shown in Fig. 2, the bar support 10 swinging downwardly as the arm swings upwardly until the parts assume the top cutting position shown. The cutter bar is then sumped in, swung transversely in its plane and withdrawn from the coal face in accordance with the usual arcwall method of cutting.

It will be noted that during any of the horizontal cutting operations above described, for instance when it is desired to cut a rolling or uneven bottom, the cutter bar may be tilted about transverse and longitudinal axes, i. e. about the axes of the head 9 and the bar support 10, to change its angle in altitude. For instance if it is desired to tilt the tip end of the cutter bar upwardly or downwardly, this may be accomplished simply by swinging the bar support 10 upwardly and downwardly about its pivotal axis, while if it is desired to tip the cutter bar edgewise, the head 9 is rotated about its axis.

A shear or vertical cut may be inserted in the coal face by applying one or the other of the reverse frictions 100, 101 of the head rotating mechanism, thereby rotating the head 9 about its axis to bring the cutter bar into a position to swing vertically. During the shearing operation, the cutter bar is first sumped in, then swung downwardly in its plane and thereafter withdrawn from the coal face in a manner similar to that described above in connection with horizontal cutting in accordance with the usual arcwall method. It will further be noted that by rotating the turntable and simultaneously swinging the bar support 10 about its pivot, the cutter bar may be positioned to cut vertical kerfs at any desired location between the center of the entry and either rib, one shearing position being indicated in dotted lines in Fig. 1. When the parts are in the dotted line position shown in Fig. 1 the arm 8 may be swung upwardly to position the tip end of the cutter bar at the roof and the apparatus may then be propelled bodily along the trackway to effect sumping of the cutter bar within the coal face. After the completion of the sumping cut, the arm may be swung downwardly to move the cutter bar in an arcuate path about the arm axis as a pivot to cut an upright slightly curved kerf in the coal face from a point adjacent the mine roof to a point at the mine floor. Thereafter the cutter bar may be moved rearwardly to effect its withdrawal cut by propulsion of the apparatus bodily rearwardly

along the trackway. By swinging the bar support 10 about its vertical pivot from the dotted line position shown in Fig. 1 to an angularly disposed position with the tip end of the cutter bar adjacent the left hand rib, a similar upright slightly curved kerf may be cut in the rib. By swinging the arm to the opposite side of the apparatus a similar cut may be inserted in the opposite rib. It will further be noted that by rotating the head 9, the cutter bar may be moved through an arc of a circle to shearing positions at either side of the cutter head axis, this being necessary when vertical kerfs are cut at opposite ribs.

In the form of the invention shown in Figs. 10 and 11 the apparatus operates to make horizontal cuts in the same manner as in the form of the apparatus described above. Therefore detailed description of these methods of cutting is unnecessary. However, in this form of the apparatus, shear cuts can be inserted in the coal face when in positions only at either side of the head axis, it being impossible with this form of construction to insert shear cuts at any desired location between the ribs of the entry. In this form of the invention the arm 165 is swung about its pivot while the frame 168 and cutter head 169 supported thereby are simultaneously swung in the opposite direction, the cutter head swinging with the support 168 in this form of the invention instead of with the swingable arm 165, as in the preferred form of the invention. The cutter bar is moved into its vertical cutting position by rotating the cutter head 169 relative to the support 168. The operation of the form of the invention shown in Figs. 12 to 15 inclusive is identical to that of the modification shown in Figs. 10 and 11, and therefore further detailed illustration and description thereof are deemed unnecessary.

As a result of this invention, it will be noted that an improved coal mining apparatus is provided having improved adjustable kerf cutting mechanism whereby horizontal kerfs may be cut at or near the level of the mine bottom either in front of or outside and below the level of the mine trackway, horizontal cuts at any desired location between the mine roof and mine bottom, and vertical cuts may be cut at any desired location between the ribs of the entry. It will further be noted that by the provision of the improved adjustable supporting structure for the kerf cutting mechanism, the cutter bar may not only be positioned at any desired location between the mine roof and mine bottom and the ribs of the entry, but may also be tilted about longitudinal and transverse axes, to change its angle in altitude, thereby to accommodate itself to a rolling or uneven bottom or pitching coal seam. It will still further be noted that an improved coal mining apparatus is provided wherein the adjusting mechanism for the kerf cutter is extremely flexible and has a wide range of adjustment, it being possible to operate the apparatus as a bottom cutter, top cutter, center cutter, shear cutter and slabbing machine, thereby enabling the apparatus to accommodate itself to practically every mining condition encountered. These and other uses and advantages of the improved mining apparatus will be clearly apparent to those skilled in the art.

While there are in this application specifically described one preferred form and two modifications thereof which the invention may assume in practice, it will be understood that this form and modifications of the same are 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, a horizontal turntable on said base, an arm structure extending forwardly in advance of said base and pivotally mounted at its rear end on the forward edge of said turntable to swing in a vertical direction relative thereto, a kerf cutter support pivotally mounted on the outer extremity of said arm structure to swing relative thereto about an axis parallel with the arm structure pivot axis, a kerf cutter carried by said support, devices for swinging said arm structure relative to said turntable, and devices for swinging said kerf cutter support relative to said arm structure to vary the plane of cut thereof, said cutter support being swingable relative to said arm structure while the latter remains stationary.

2. In a mining apparatus, a portable base, a horizontal turntable on said base, an arm pivotally mounted on said turntable to swing in a vertical direction relative thereto, a head mounted on said arm to rotate relative thereto, a kerf cutter support pivotally mounted on said rotatable head, and a kerf cutter pivotally mounted on said cutter support to swing relative thereto.

3. In a mining apparatus, a portable base, a horizontal turntable on said base, an arm pivotally mounted on said turntable to swing in a vertical direction relative thereto, a head mounted on said arm to rotate relative thereto, a kerf cutter support pivotally mounted on said rotatable head, and a kerf cutter pivotally mounted on said cutter support to swing relative thereto, said arm and cutter support being simultaneously swingable about their respective axes in opposite directions to maintain the kerf cutter always in a substantially horizontal position.

4. In a mining apparatus, a portable base, a horizontal turntable on said base, an arm pivotally mounted on said turntable to swing in a vertical direction relative thereto, a head mounted on said arm to rotate relative thereto, a kerf cutter support pivotally mounted on said rotatable head, and a kerf cutter pivotally mounted on said cutter support to swing relative thereto, said head being rotatable relative to said arm to adjust the kerf cutter into horizontal and vertical cutting positions.

5. In a mining apparatus, a portable base, an arm structure mounted on said base to swing horizontally and vertically relative thereto, the axis of vertical swinging movement of said arm structure located in advance of the axis of horizontal swinging movement thereof, a kerf cutter, and an adjustable supporting structure carried by said arm structure and adjustable therewith for adjusting said kerf cutter into horizontal and vertical cutting positions and for tilting said kerf cutter lengthwise relative to said arm structure while the latter is stationary to change the plane of cut.

6. In a mining apparatus, a wheel supported base adapted to run along a mine trackway, a horizontal turntable mounted on said base, a kerf cutter, and an adjustable supporting structure for said kerf cutter, said turntable and supporting structure being adjustable to position said kerf cutter to cut horizontal kerfs at any desired location between the mine roof and mine bottom, to

cut a horizontal kerf at the level of the mine bottom outside and below the level of the mine trackway and to cut vertical kerfs parallel with the trackway at any desired location between the ribs of the entry, said adjustable supporting structure including means adjustable relative to the turntable for tilting said kerf cutter, when in horizontal cutting position, to change the angle in altitude of said kerf cutter.

7. In a mining apparatus, a wheel supported base adapted to run along a mine trackway, a horizontal turntable on said base, a kerf cutter, an adjustable supporting structure intervening said turntable and kerf cutter and adjustably mounted on said turntable, said turntable and supporting structure being adjustable to move said kerf cutter into horizontal cutting positions at any desired location between the mine roof and mine bottom and said supporting structure including supporting means adjustable bodily relative to said turntable and including supporting elements adjustable about longitudinal and transverse axes to move said kerf cutter relative to the turntable into a vertical cutting position and to tilt the kerf cutter, when in horizontal cutting position, about a transverse axis to change its angle in altitude relative to the turntable, and a motor on said turntable for adjusting said supporting means about said longitudinal and transverse axes.

8. In a mining apparatus, a wheel supported base adapted to run along a mine trackway, a horizontal turntable on said base, a kerf cutter, an adjustable supporting structure intervening said turntable and kerf cutter and adjustably mounted on said turntable, said turntable and supporting structure being adjustable to move said kerf cutter into horizontal cutting positions at any desired location between the mine roof and mine bottom and said supporting structure including supporting means adjustable bodily relative to said turntable and including supporting elements adjustable about longitudinal and transverse axes to move said kerf cutter relative to the turntable into a vertical cutting position and to tilt the kerf cutter, when in horizontal cutting position, about a transverse axis to change its angle in altitude relative to the turntable, and said kerf cutter being adjustable into aforesaid horizontal cutting positions and said tilted position while the turntable remains stationary, and a motor on said turntable for adjusting said supporting means about said longitudinal and transverse axes.

9. In a mining apparatus, a wheel supported base adapted to run along a mine trackway, a horizontal turntable on said base, a kerf cutter, and an adjustable supporting structure intervening said turntable and kerf cutter, said turntable and supporting structure being adjustable to move said kerf cutter into horizontal cutting positions at any desired location between the mine roof and mine bottom and including supporting means adjustable about longitudinal and transverse axes to move said kerf cutter relative to the turntable into a vertical cutting position and to tilt the kerf cutter about a transverse axis to change its angle in altitude relative to the turntable, and said kerf cutter being adjustable into aforesaid horizontal cutting positions and said tilted position while said turntable remains stationary and adjustable with the turntable as the latter turns upon its axis into vertical cutting positions to cut vertical kerfs parallel with the trackway at any desired location between the ribs of the entry.

10. In a mining apparatus, a wheel supported base adapted to run along a mine trackway, a horizontal turntable on said base, a kerf cutter, and an adjustable supporting structure intervening said turntable and kerf cutter, said turntable and supporting structure being adjustable to move said kerf cutter into horizontal cutting positions at any desired location between the mine roof and mine bottom and including supporting means adjustable about longitudinal and transverse axes to move said kerf cutter relative to the turntable into a vertical cutting position and to tilt the kerf cutter about a transverse axis to change its angle in altitude relative to the turntable, and said kerf cutter being adjustable into aforesaid horizontal cutting positions and said tilted position while said turntable remains stationary and adjustable with the turntable as the latter turns upon its axis into vertical cutting positions to cut vertical kerfs parallel with the trackway at any desired location between the ribs of the entry, said turntable and supporting structure also being adjustable to position the kerf cutter to cut a horizontal kerf at the level of the mine bottom outside and below the level of the mine trackway.

11. In a mining apparatus, a portable base, an arm structure swingable vertically relative to said base, a support pivotally mounted on said arm structure to swing relative thereto about a transverse axis, said support remaining stationary as regards swinging movement about its pivot relative to said arm structure during vertical swinging of the latter, a cutter head rotatably mounted on said swingable support for rotation relative thereto, and a kerf cutter pivotally mounted on said cutter head for swinging movement relative thereto.

12. In a mining apparatus, a portable base, an arm structure swingable horizontally and vertically relative to said base, a support pivotally mounted on said arm structure to swing relative thereto when said arm structure is swinging or when it is stationary, a cutter head rotatably mounted on said swingable support for rotation relative thereto, and a kerf cutter pivotally mounted on said cutter head for swinging movement relative thereto.

13. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing relative thereto, a support carried at the outer extremity of said arm structure, a cutter head rotatably mounted on said support, a kerf cutter on said head, and a motor carried by said support for actuating said kerf cutter and for rotating said head relative to said support.

14. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in vertical planes, a head rotatably mounted on said arm structure, a kerf cutter support pivotally mounted on said head to swing relative thereto, a kerf cutter pivotally mounted on said support to swing relative thereto, and devices for swinging said arm structure, for rotating said head and for swinging said cutter support and including a common drive shaft journaled within said arm structure.

15. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in vertical planes, a head rotatably mounted on said arm structure, a kerf cutter support pivotally mounted on said head to swing relative thereto, a kerf cutter pivotally mounted on said support to swing relative thereto, and motor operated devices for swinging said arm structure, for rotating said head and for swinging said cut-

ter support relative to said head, said devices including a common driving motor on said base.

16. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base, a head rotatably mounted on said arm structure, a kerf cutter support pivotally mounted on said head to swing relative thereto, a kerf cutter pivotally mounted on said support to swing relative thereto, and a motor carried by said base and relative to which the arm structure is swingable for swinging said arm structure, for rotating said head and for swinging said cutter support relative to said head.

17. In a mining apparatus, a portable base, an arm structure mounted on said base to swing horizontally and vertically relative thereto, a kerf cutter, and an adjustable supporting structure carried by said arm structure and by which said kerf cutter is supported for adjustment relative to said arm structure into horizontal and vertical cutting positions, said arm structure being swingable as aforesaid relative to said base and said supporting structure being adjustable relative to said arm structure to position said kerf cutter to cut horizontal kerfs at any desired location between the mine roof and mine bottom and parallel vertical kerfs at any desired location between the ribs of the entry.

18. In a mining apparatus, a portable base, an arm structure mounted on said base to swing horizontally and vertically relative thereto, a kerf cutter, and an adjustable supporting structure carried by said arm structure and by which said kerf cutter is supported, said arm structure being swingable as aforesaid relative to said base and said supporting structure being adjustable relative to said arm structure to position said kerf cutter to cut horizontal kerfs at any desired location between the mine roof and mine bottom and parallel vertical kerfs at any desired location between the ribs of the entry, said adjustable supporting structure including means for tilting said kerf cutter about a transverse axis parallel to its cutting planes.

19. In a mining apparatus, a portable base, an arm structure mounted on said base to swing horizontally and vertically relative thereto, a kerf cutter, and an adjustable supporting structure carried by said arm structure and by which said kerf cutter is supported, said arm structure being swingable as aforesaid relative to said base and said supporting structure being adjustable relative to said arm structure to position said kerf cutter to cut horizontal kerfs at any desired location between the mine roof and mine bottom and parallel vertical kerfs at any desired location between the ribs of the entry, said adjustable supporting structure including means for tilting said kerf cutter about transverse and longitudinal axes parallel to its cutting planes.

20. In a mining apparatus, a wheel supported base adapted to run along a mine trackway, an arm structure mounted on said base to swing horizontally and vertically relative thereto, a kerf cutter, and an adjustable supporting structure carried by said arm structure and by which said kerf cutter is supported for adjustment relative to said arm structure into horizontal and vertical cutting positions, said arm structure being swingable as aforesaid relative to said base and said supporting structure being adjustable relative to said arm structure to position said kerf cutter to cut horizontal kerfs at any desired location between the mine roof and mine bottom, to cut a horizontal kerf at the level of the mine bottom outside and below the level of the mine trackway and parallel vertical kerfs at any desired location between the ribs of the entry.

21. In a mining apparatus, a portable base, a horizontal turntable on said base, a motor on said turntable, an arm pivotally mounted on said turntable to swing in a vertical direction relative thereto, a frame rotatably mounted on said arm about an axis extending longitudinally of said arm and at all times at right angles to the arm pivot axis, a kerf cutter support pivotally mounted on said rotatable frame to swing relative thereto about an axis at right angles to the frame axis, and devices driven by said motor for swinging said arm, for rotating said frame and for swinging said cutter support.

22. In a mining apparatus, a portable base, a horizontal turntable on said base, a motor on said turntable, an arm pivotally mounted on said turntable to swing in a vertical direction relative thereto, a frame rotatably mounted on said arm about an axis extending longitudinally of said arm and at right angles to the arm pivot axis, a kerf cutter support pivotally mounted on said rotatable frame to swing relative thereto about an axis at right angles to the frame axis, a kerf cutter pivotally mounted on said support to swing relative thereto, devices driven by said motor for swinging said arm, for rotating said frame and for swinging said cutter support, and devices driven by said motor for actuating said kerf cutter and for swinging said kerf cutter relative to said cutter support.

23. In a mining apparatus, a portable base, a horizontal turntable on said base, an arm structure comprising but a single rigid arm pivotally mounted on said turntable at the forward end of said base and extending forwardly in advance of said base, said arm structure swingable about a horizontal axis in a vertical direction relative to said turntable and base, a support pivotally mounted on the outer extremity of said arm structure to swing through a relatively wide range relative thereto about an axis parallel with the arm structure axis while said arm remains stationary as regards vertical swinging movement, and a kerf cutter pivotally mounted on said support to swing relative thereto about an axis angularly disposed with respect to said support axis, said support being swingable relative to said arm to move the kerf cutter into cutting positions at substantial angles at opposite sides of a plane including the support axis.

24. In a mining apparatus, a portable base, an arm structure pivotally mounted on the forward end of said base and extending forwardly in advance of said base, said arm structure swingable about a horizontal axis in a vertical direction relative to said base, a frame mounted on said arm structure for rotation relative thereto about an axis extending longitudinally of the arm structure, a support pivotally mounted on said frame to swing relative thereto about an axis at right angles to the frame axis, and a kerf cutter pivotally mounted on said support for swinging movement relative thereto about an axis at right angles to said support axis.

25. In a mining apparatus, a portable base, an arm structure pivotally mounted on the forward end of said base and extending forwardly in advance of said base, said arm structure swingable about a horizontal axis in a vertical direction relative to said base, a frame mounted on said arm structure for rotation relative thereto about an axis extending longitudinally of the arm struc-

ture, a support pivotally mounted on said frame to swing relative thereto about an axis at right angles to the frame axis, and a kerf cutter pivotally mounted on said support for swinging movement relative thereto about an axis at right angles to said support axis, said support axis being parallel with said arm structure axis when said kerf cutter is in a horizontal cutting position.

26. In a mining apparatus, a portable base, an arm structure pivotally mounted on the forward end of said base and extending forwardly in advance of said base, said arm structure swingable about a horizontal axis in a vertical direction relative to said base, a frame mounted on said arm structure for rotation relative thereto about an axis extending longitudinally of the arm structure, a support pivotally mounted on said frame to swing relative thereto about an axis at right angles to the frame axis, and a kerf cutter pivotally mounted on said support for swinging movement relative thereto about an axis at right angles to said support axis, said support axis being parallel with said arm structure axis when said kerf cutter is in a horizontal cutting position and said support axis, when said kerf cutter is in a vertical cutting position, extending at right angles to said arm structure axis.

27. In a mining apparatus, a wheeled truck adapted to run along a mine trackway, an arm structure pivotally mounted on the forward end of said truck and extending forwardly in advance of said truck, said arm structure swingable in a vertical direction relative to the truck about a horizontal axis located in advance of the front truck wheel axes, a frame mounted on said arm structure for rotation relative thereto about an axis extending longitudinally of said arm structure, a support pivotally mounted on said rotatable frame at the forward extremity of said arm structure, said support swingable relative to said frame about an axis at right angles to the frame axis, and a kerf cutter pivotally mounted on said support.

28. In a mining apparatus, a wheeled truck adapted to run along a mine trackway, an arm structure pivotally mounted on the forward end of said truck and extending forwardly in advance of said truck, said arm structure swingable in a vertical direction relative to the truck about a horizontal axis located in advance of the front truck wheel axes, a frame mounted on said arm structure for rotation relative thereto about an axis extending longitudinally of said arm structure, a support pivotally mounted on said rotatable frame at the forward extremity of said arm structure, said support swingable relative to said frame about an axis at right angles to the frame axis, and a kerf cutter pivotally mounted on said support to swing relative thereto about an axis extending at right angles to said support axis.

29. In a mining apparatus, a portable base, a horizontal turntable on said base, a motor on said turntable, an arm structure pivotally mounted on the forward edge of said turntable to swing in a vertical direction relative thereto about a horizontal axis, said arm structure swingable relative to said motor, a support pivotally mounted on the outer extremity of said arm structure to swing relative thereto about an axis parallel with the arm structure axis, a kerf cutter pivotally mounted on said support to swing relative thereto, devices driven by said motor for swinging said arm structure relative to said turntable, devices driven by said motor for swinging said support relative to said arm structure irrespective of the swinging of the latter, and devices driven by said motor for swinging said kerf cutter relative to said support.

30. In a mining apparatus, a portable base, a horizontal turntable on said base, a motor on said turntable, an arm structure pivotally mounted at the forward edge of said turntable and extending forwardly in advance of said base, said arm structure swingable in a vertical direction relative to the turntable about a horizontal axis, a frame mounted on said arm structure for rotation relative thereto about an axis extending longitudinally of said arm structure, a support pivotally mounted on said frame, a kerf cutter pivotally mounted on said support to swing relative thereto, devices driven by said motor for swinging said arm structure, devices actuated by said motor for rotating said frame relative to said arm structure, devices driven by said motor for swinging said support relative to said frame, and devices driven by said motor for swinging said kerf cutter relative to said support.

31. In a mining apparatus, a portable base, a horizontal turntable on said base, a motor on said turntable, an arm structure pivotally mounted on said turntable to swing in a vertical direction relative thereto, said arm structure swingable relative to said motor, a frame mounted on said arm structure for rotation about the longitudinal axis of said arm structure, a support pivotally mounted on said frame at the forward extremity of said arm structure, a kerf cutter pivotally mounted on said support to swing relative thereto, devices driven by said motor for swinging said arm structure, devices driven by said motor for rotating said frame, devices driven by said motor for swinging said support, and devices driven by said motor for swinging said kerf cutter relative to said support.

32. In a mining apparatus, a portable base, a horizontal turntable on said base, an arm structure pivotally mounted on said turntable to swing in a vertical direction relative thereto and extending forwardly in advance of said base, a head mounted on said arm structure for rotation relative thereto about the longitudinal axis of said arm structure, a kerf cutter support pivotally mounted on said head, a kerf cutter pivotally mounted on said support to swing relative thereto, motor operated devices carried by said arm structure for rotating said head, and motor operated devices carried by said head for swinging said cutter support.

33. In a mining apparatus, a portable base, a horizontal turntable on said base, an arm structure pivotally mounted on said turntable to swing in a vertical direction relative thereto and extending forwardly in advance of said base, a head mounted on said arm structure for rotation relative thereto about the longitudinal axis of said arm structure, a kerf cutter support pivotally mounted on said head, a kerf cutter pivotally mounted on said support to swing relative thereto, motor operated devices carried by said arm structure for rotating said head, motor operated devices carried by said head for swinging said cutter support, and motor operated devices carried by said cutter support for swinging said kerf cutter.

34. In a mining apparatus, a portable base, a horizontal turntable on said base, an arm structure pivotally mounted on the turntable to swing in a vertical direction relative thereto and ex-

tending forwardly in advance of said base, a motor on said turntable relative to which said arm structure is swingable, a head mounted on said arm structure to rotate relative thereto about the longitudinal axis of said arm structure, a cutter support pivotally mounted on said head, a kerf cutter pivotally mounted on said cutter support to swing relative thereto, devices carried by said turntable and driven by said motor for swinging said arm structure, devices driven by said motor and carried by said arm structure for rotating said head, and devices driven by said motor and carried by said head for swinging said cutter support.

35. In a mining apparatus, a portable base, a horizontal turntable on said base, an arm structure pivotally mounted on the turntable to swing in a vertical direction relative thereto and extending forwardly in advance of said base, a motor on said turntable relative to which said arm structure is swingable, a head mounted on said arm structure to rotate relative thereto about the longitudinal axis of said arm structure, a cutter support pivotally mounted on said head, a kerf cutter pivotally mounted on said cutter support to swing relative thereto, devices carried by said turntable and driven by said motor for swinging said arm structure, devices driven by said motor and carried by said arm structure for rotating said head, devices driven by said motor and carried by said head for swinging said cutter support, and devices driven by said motor and carried by said support for swinging said kerf cutter.

36. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in horizontal and vertical directions relative thereto, a head mounted on said arm structure for rotation relative thereto about the longitudinal axis of said arm structure, a cutter support pivotally mounted on said head, a kerf cutter pivotally mounted on said cutter support to swing relative thereto, motor operated devices for swinging said arm structure in aforesaid directions relative to said base, motor operated devices carried by said arm structure for rotating said head, and motor operated devices carried by said head for swinging said cutter support.

37. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in horizontal and vertical directions relative thereto, a head mounted on said arm structure for rotation relative thereto about the longitudinal axis of said arm structure, a cutter support pivotally mounted on said head, a kerf cutter pivotally mounted on said cutter support to swing relative thereto, motor operated devices for swinging said arm structure in aforesaid directions relative to said base, motor operated devices carried by said arm structure for rotating said head, motor operated devices carried by said head for swinging said cutter support, and motor operated devices carried by said cutter support for swinging said kerf cutter.

38. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in horizontal and vertical directions relative thereto, the axis of vertical swinging movement of said arm structure located a substantial distance in advance of the axis of horizontal swinging movement of said arm structure, a head mounted on said arm structure to rotate relative thereto about the longitudinal axis of said arm structure, said head rotatable about an axis perpendicular to the axis of vertical swinging movement of said arm structure, a cutter support pivotally mounted on said head to swing relative thereto about an axis at right angles to the head axis, and a kerf cutter pivotally mounted on said support to swing relative thereto about an axis at right angles to the support axis.

39. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in horizontal and vertical directions relative thereto, the axis of vertical swinging movement of said arm structure located a substantial distance in advance of the axis of horizontal swinging movement of said arm structure, a head mounted on said arm structure to rotate relative thereto about the longitudinal axis of said arm structure, said head rotatable about an axis perpendicular to the axis of vertical swinging movement of said arm structure, a cutter support pivotally mounted on said head to swing relative thereto about an axis at right angles to the head axis, a kerf cutter pivotally mounted on said support to swing relative thereto about an axis at right angles to the support axis, and motor operated devices for swinging said arm structure in aforesaid directions relative to said base.

40. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in horizontal and vertical directions relative thereto, the axis of vertical swinging movement of said arm structure located a substantial distance in advance of the axis of horizontal swinging movement of said arm structure, a head mounted on said arm structure to rotate relative thereto about the longitudinal axis of said arm structure, said head rotatable about an axis perpendicular to the axis of vertical swinging movement of said arm structure, a cutter support pivotally mounted on said head to swing relative thereto about an axis at right angles to the head axis, a kerf cutter pivotally mounted on said support to swing relative thereto about an axis at right angles to the support axis, motor operated devices for swinging said arm structure in aforesaid directions relative to said base, and motor operated devices for rotating said head relative to said arm structure.

41. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in horizontal and vertical directions relative thereto, the axis of vertical swinging movement of said arm structure located a substantial distance in advance of the axis of horizontal swinging movement of said arm structure, a head mounted on said arm structure to rotate relative thereto about the longitudinal axis of said arm structure, said head rotatable about an axis perpendicular to the axis of vertical swinging movement of said arm structure, a cutter support pivotally mounted on said head to swing relative thereto about an axis at right angles to the head axis, a kerf cutter pivotally mounted on said support to swing relative thereto about an axis at right angles to the support axis, motor operated devices for swinging said arm structure in aforesaid directions relative to said base, motor operated devices for rotating said head relative to said arm structure, and motor operated devices for swinging said cutter support relative to said head.

42. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in horizontal and vertical directions relative thereto, the axis of vertical swinging movement of said arm structure located a substantial distance in advance of the axis of horizontal swinging movement of said arm structure, a head mounted on said arm structure to rotate relative

thereto about the longitudinal axis of said arm structure, said head rotatable about an axis perpendicular to the axis of vertical swinging movement of said arm structure, a cutter support pivotally mounted on said head to swing relative thereto about an axis at right angles to the head axis, a kerf cutter pivotally mounted on said support to swing relative thereto about an axis at right angles to the support axis, motor operated devices for swinging said arm structure in aforesaid directions relative to said base, motor operated devices for rotating said head relative to said arm structure, motor operated devices for swinging said cutter support relative to said head, and motor operated devices for swinging said kerf cutter relative to said cutter support.

43. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in horizontal and vertical directions relative thereto, said arm structure extending forwardly in advance of said base, the axis of vertical swinging movement of said arm structure located a substantial distance in advance of the axis of horizontal swinging movement of said arm structure, a head rotatably mounted on said arm structure, a cutter support swingably mounted on said head to swing relative thereto, and a kerf cutter swingably mounted on said cutter support to swing relative thereto.

44. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in horizontal and vertical directions relative thereto, said arm structure extending forwardly in advance of said base, the axis of vertical swinging movement of said arm structure located a substantial distance in advance of the axis of horizontal swinging movement of said arm structure, a head rotatably mounted on said arm structure, a cutter support swingably mounted on said head to swing relative thereto, and a kerf cutter swingably mounted on said cutter support to swing relative thereto, said head rotating relative to said arm structure about an axis extending longitudinally of said arm structure.

45. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in horizontal and vertical directions relative thereto, said arm structure extending forwardly in advance of said base, the axis of vertical swinging movement of said arm structure located a substantial distance in advance of the axis of horizontal swinging movement of said arm structure, a head rotatably mounted on said arm structure, a cutter support swingably mounted on said head to swing relative thereto, and a kerf cutter swingably mounted on said cutter support to swing relative thereto, said head rotating relative to said arm structure about an axis extending longitudinally of said arm structure and the swing axis of said cutter support arranged at right angles to the head axis.

46. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in horizontal and vertical directions relative thereto, said arm structure extending forwardly in advance of said base, the axis of vertical swinging movement of said arm structure located a substantial distance in advance of the axis of horizontal swinging movement of said arm structure, head rotatably mounted on said arm structure, a cutter support swingably mounted on said head to swing relative thereto, and a kerf cutter swingably mounted on said cutter support to swing relative thereto, said head rotating relative to said arm structure about an axis extending longitudinally of said arm structure and the axis of said cutter support arranged at right angles to the head axis, the support axis extending parallel with the axis of vertical swinging movement of said arm structure when said kerf cutter is in a horizontal cutting position.

47. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in horizontal and vertical directions relative thereto, said arm structure extending forwardly in advance of said base, the axis of vertical swinging movement of said arm structure located a substantial distance in advance of the axis of horizontal swinging movement of said arm structure, a frame mounted on said arm structure for rotation about the longitudinal axis of said arm structure, a support swingably mounted on said frame to swing relative thereto about an axis at right angles to the frame axis, and a kerf cutter pivotally mounted on said support to swing relative thereto about an axis at right angles to the support axis.

48. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in horizontal and vertical directions relative thereto, said arm structure extending forwardly in advance of said base, the axis of vertical swinging movement of said arm structure located a substantial distance in advance of the axis of horizontal swinging movement of said arm structure, the axis of vertical swinging movement of said arm structure located in advance of said base, a frame mounted on said arm structure for rotation about the longitudinal axis of said arm structure, a support swingably mounted on said frame to swing relative thereto about an axis at right angles to the frame axis, and a kerf cutter pivotally mounted on said support to swing relative thereto about an axis at right angles to the support axis.

49. In a mining apparatus, a portable base, a horizontal turntable on said base, said turntable rotatable about a vertical axis, an arm structure pivotally mounted at the forward edge of said turntable to swing upward and downwardly in a vertical direction relative thereto about a horizontal axis located in advance of said turntable, a frame mounted on said arm structure to rotate relative thereto about the longitudinal axis of said arm structure, a support swingably mounted on said frame to swing relative thereto, and a kerf cutter pivotally mounted on said support to swing relative thereto.

50. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing relative thereto, said arm structure extending longitudinally in advance of said base, a head mounted on said arm structure for rotation about the longitudinal axis of said arm structure, said head rotatable about an axis perpendicular to the axis of swinging movement of said arm structure, a cutter support pivotally mounted on said head for swinging movement relative thereto, a kerf cutter pivotally mounted on said cutter support for swinging movement relative thereto, said cutter support being swingable about its pivot relative to said head to move said kerf cutter into relatively inclined cutting planes, and motor operated devices for swinging said arm structure, for rotating said head and for swinging said cutter support and said kerf cutter about their respective pivots, said cutter support swinging devices including motor operated gearing carried by said head.

51. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing relative thereto, said arm structure extending longitudinally in advance of said base, a head mounted on said arm structure for rotation about the longitudinal axis of said arm structure, said head rotatable about an axis perpendicular to the axis of swinging movement of said arm structure, a cutter support pivotally mounted on said cutter head for swinging movement relative thereto, a kerf cutter pivotally mounted on said cutter support for swinging movement relative thereto, said cutter support being swingable about its pivot relative to said head to move said kerf cutter into relatively inclined cutting planes, and motor operated devices for swinging said arm structure, for rotating said head and for swinging said cutter support and said kerf cutter about their respective pivots, said cutter support swinging devices including motor operated gearing carried by said head, and said kerf cutter swinging devices including motor operated gearing carried by said cutter support.

52. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in horizontal and vertical directions relative thereto, said arm structure extending longitudinally in advance of said base, a head mounted on said arm structure for rotation about the longitudinal axis of said arm structure, said head rotatable about an axis perpendicular to the axis of vertical swinging movement of said arm structure, a cutter support pivotally mounted on said head for swinging movement relative thereto, a vertical kerf cutter pivotally mounted on said support for swinging movement relative thereto, and motor operated devices for swinging said arm structure relative to said base, for rotating said head and for swinging said cutter support and said kerf cutter about their respective pivots, said support swinging devices including motor operated gearing carried by said head.

53. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in horizontal and vertical directions relative thereto, said arm structure extending longitudinally in advance of said base, a head mounted on said arm structure for rotation about the longitudinal axis of said arm structure, said head rotatable about an axis perpendicular to the axis of vertical swinging movement of said arm structure, a cutter support pivotally mounted on said head for swinging movement relative thereto, a vertical kerf cutter pivotally mounted on said support for swinging movement relative thereto, and motor operated devices for swinging said arm structure relative to said base, for rotating said head and for swinging said cutter support and said kerf cutter about their respective pivots, said support swinging devices including motor operated gearing carried by said head, and said kerf cutter swinging devices including motor operated gearing carried by said cutter support.

54. In a mining apparatus, a portable base, a horizontal turntable mounted on said base for rotation about a vertical axis, an arm structure pivotally mounted on said turntable for vertical swinging movement relative thereto about a horizontal axis, a head mounted on said arm structure for rotation relative thereto about the longitudinal axis of said arm structure, said head rotatable about an axis perpendicular to said arm structure axis of vertical swinging movement, a cutter support pivotally mounted on said head for swinging movement relative thereto, a kerf cutter pivotally mounted on said support for swinging movement relative thereto, and motor operated devices for rotating said turntable, for swinging said arm structure relative to said turntable, for rotating said head and for swinging said cutter support and kerf cutter about their respective pivots, said head rotating devices including motor operated gearing carried by said arm structure.

55. In a mining apparatus, a portable base, a horizontal turntable mounted on said base for rotation about a vertical axis, an arm structure pivotally mounted on said turntable for vertical swinging movement relative thereto about a horizontal axis, a head mounted on said arm structure for rotation relative thereto about the longitudinal axis of said arm structure, said head rotatable about an axis perpendicular to said arm structure axis of vertical swinging movement, a cutter support pivotally mounted on said head for swinging movement relative thereto, a kerf cutter pivotally mounted on said support for swinging movement relative thereto, and motor operated devices for rotating said turntable, for swinging said arm structure relative to said turntable, for rotating said head and for swinging said cutter support and kerf cutter about their respective pivots, said head rotating devices including motor operated gearing carried by said arm structure, and said cutter support swinging devices including motor operated gearing carried by said head.

56. In a mining apparatus, a portable base, a horizontal turntable mounted on said base for rotation about a vertical axis, an arm structure pivotally mounted on said turntable for vertical swinging movement relative thereto about a horizontal axis, a head mounted on said arm structure for rotation relative thereto about the longitudinal axis of said arm structure, said head rotatable about an axis perpendicular to said arm structure axis of vertical swinging movement, a cutter support pivotally mounted on said head for swinging movement relative thereto, a kerf cutter pivotally mounted on said support for swinging movement relative thereto, and motor operated devices for rotating said turntable, for swinging said arm structure relative to said turntable, for rotating said head and for swinging said cutter support and kerf cutter about their respective pivots, said head rotating devices including motor operated gearing carried by said arm structure, said cutter support swinging devices including motor operated gearing carried by said head, and said kerf cutter swinging devices including motor operated gearing carried by said cutter support.

57. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base for swinging movement in a plurality of angularly related directions relative thereto, said arm structure extending longitudinally in advance of said base, a support pivotally mounted on the outer extremity of said arm structure for swinging movement independently thereof and relative thereto about an axis parallel with the arm structure swing axis, a cutter head mounted on said support for rotation relative thereto about an axis extending perpendicularly to said support axis, and a kerf cutter pivotally mounted on said cutter head for swinging movement relative thereto about an axis at right angles to the head axis.

58. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base

for swinging movement relative thereto, said arm structure extending longitudinally in advance of said base, a support pivotally mounted on the outer extremity of said arm structure for swinging movement relative thereto about an axis parallel with the arm structure pivot axis, a cutter head mounted on said support for rotation relative thereto about an axis extending perpendicularly to said support axis, a kerf cutter pivotally mounted on said cutter head for swinging movement relative thereto about an axis at right angles to the head axis, and motor operated devices for swinging said arm structure relative to said base, for swinging said support relative to said arm structure independently of swing of the latter, for rotating said head relative to said support and for swinging said kerf cutter relative to said head.

59. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base for swinging movement relative thereto, said arm structure extending longitudinally in advance of said base, a support pivotally mounted on the outer extremity of said arm structure for swinging movement relative thereto about an axis parallel with the arm structure pivot axis, a cutter head mounted on said support for rotation relative thereto about an axis extending perpendicularly to said support axis, a kerf cutter pivotally mounted on said cutter head for swinging movement relative thereto about an axis at right angles to the head axis, and motor operated devices for swinging said arm structure relative to said base, for independently swinging said support relative to said arm structure, for rotating said head relative to said support and for swinging said kerf cutter relative to said head, said arm structure swinging devices including motor operated gearing carried by said base.

60. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base for swinging movement relative thereto, said arm structure extending longitudinally in advance of said base, a support pivotally mounted on the outer extremity of said arm structure for swinging movement relative thereto about an axis parallel with the arm structure pivot axis, a cutter head mounted on said support for rotation relative thereto about an axis extending perpendicularly to said support axis, a kerf cutter pivotally mounted on said cutter head for swinging movement relative thereto about an axis at right angles to the head axis, and motor operated devices for swinging said arm structure relative to said base, for swinging said support relative to said arm structure, for rotating said head relative to said support and for swinging said kerf cutter relative to said head, said arm structure swinging devices including motor operated gearing carried by said base, and said support swinging devices including other motor operated gearing carried by said arm structure.

61. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base for swinging movement relative thereto, said arm structure extending longitudinally in advance of said base, a support pivotally mounted on the outer extremity of said arm structure for swinging movement relative thereto about an axis parallel with the arm structure pivot axis, a cutter head mounted on said support for rotation relative thereto about an axis extending perpendicularly to said support axis, a kerf cutter pivotally mounted on said cutter head for swinging movement relative thereto about an axis at right angles to the head axis, and motor operated devices for swinging said arm structure relative to said base, for swinging said support relative to said arm structure, for rotating said head relative to said support and for swinging said kerf cutter relative to said head, said arm structure swinging devices including motor operated gearing carried by said base, said support swinging devices including other motor operated gearing carried by said arm structure, and said head rotating devices including motor operated gearing carried by said head.

62. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base for swinging movement relative thereto, said arm structure extending longitudinally in advance of said base, a support pivotally mounted on the outer extremity of said arm structure for swinging movement relative thereto about an axis parallel with the arm structure pivot axis, a cutter head mounted on said support for rotation relative thereto about an axis extending perpendicularly to said support axis, a kerf cutter pivotally mounted on said cutter head for swinging movement relative thereto about an axis at right angles to the head axis, and motor operated devices for swinging said arm structure relative to said base, for swinging said support relative to said arm structure, for rotating said head relative to said support and for swinging said kerf cutter relative to said head, said arm structure swinging devices including motor operated gearing carried by said base, said support swinging devices including other motor operated gearing carried by said arm structure, and said head rotating devices and said kerf cutter swinging devices including motor operated gearing carried by said head.

63. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in a vertical direction relative thereto, said arm being disposable in a position extending lengthwise of said base and in a position at right angles to the longitudinal axis of said base, a cutter frame mounted on the outer extremity of said arm structure for rotation relative thereto independently of arm structure swing, a cutter support pivotally mounted on said cutter frame to swing relative thereto about a transverse axis, and a kerf cutter pivotally mounted on said cutter support to swing relative thereto.

64. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in a vertical direction relative thereto, said arm being disposable in a position extending lengthwise of said base and in right angle positions at either side of said base, a cutter frame mounted on the outer extremity of said arm structure for rotation relative thereto independently of arm structure swing, a cutter support pivotally mounted on said cutter frame to swing relative thereto about a transverse axis, and a kerf cutter pivotally mounted on said cutter support to swing relative thereto.

65. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in a vertical direction relative thereto about a horizontal axis extending transversely of said base, said arm structure extending lengthwise of said base, a cutter frame mounted on the outer extremity of said arm structure for rotation relative thereto independently of arm structure swing, a cutter support pivotally mounted on said cutter frame to swing relative thereto about a transverse axis, a kerf cutter pivotally mounted on said cutter support to swing relative

thereto, a motor, means driven by said motor for actuating said kerf cutter, and means driven by said motor for swinging said cutter support relative to said rotatable cutter frame.

66. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in a vertical direction relative thereto about a horizontal axis extending transversely of said base, said arm structure extending lengthwise of said base, a cutter frame mounted on the outer extremity of said arm structure for rotation relative thereto independently of arm structure swing, a cutter support pivotally mounted on said cutter frame, a kerf cutter pivotally mounted on said cutter support to swing relative thereto, a motor, means driven by said motor for actuating said kerf cutter, means driven by said motor for swinging said cutter support relative to said rotatable cutter frame, and means driven by said motor for swinging said arm structure relative to said base.

67. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in a vertical direction relative thereto about a horizontal axis extending transversely of said base, said arm structure extending lengthwise of said base, a cutter frame mounted on the outer extremity of said arm structure for rotation relative thereto about an axis extending longitudinally of said arm structure, a cutter support pivotally mounted on said cutter frame, a kerf cutter pivotally mounted on said cutter support for swinging movement relative thereto, a motor, means driven by said motor for actuating said kerf cutter, means driven by said motor for swinging said cutter support relative to said rotatable cutter frame, and means driven by said motor for swinging said arm structure relative to said base.

68. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in a vertical direction relative thereto about a horizontal axis extending transversely of said base, said arm structure extending lengthwise of said base, a cutter frame mounted on the outer extremity of said arm structure for rotation relative thereto about an axis extending longitudinally of said arm structure disposed at right angles to the pivotal axis of said arm structure, a cutter support pivotally mounted on said cutter frame, a kerf cutter pivotally mounted on said cutter support for swinging movement relative thereto, a motor, means driven by said motor for actuating said kerf cutter, means driven by said motor for swinging said cutter support relative to said rotatable cutter frame, and means driven by said motor for swinging said arm structure relative to said base.

69. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in a vertical direction relative thereto about a horizontal axis extending transversely of said base, said arm structure extending lengthwise of said base, a cutter frame mounted on the outer extremity of said arm structure for rotation relative thereto about an axis extending longitudinally of said arm structure, a cutter support pivotally mounted on said cutter frame for swinging movement relative thereto about an axis at right angles to the cutter frame axis, a kerf cutter pivotally mounted on said cutter support for swinging movement relative thereto, a motor, means driven by said motor for actuating said kerf cutter, means driven by said motor for swinging said cutter support relative to said rotatable cutter frame, and means driven by said motor for swinging said arm structure relative to said base.

70. In a mining apparatus, a portable base, an arm structure pivotally mounted on said base to swing in a vertical direction relative thereto about a horizontal axis extending transversely of said base, said arm structure extending lengthwise of said base, a cutter frame mounted on the outer extremity of said arm structure for rotation relative thereto about an axis extending longitudinally of said arm structure, a cutter support pivotally mounted on said cutter frame for swinging movement relative thereto about an axis at right angles to the cutter frame axis, a kerf cutter pivotally mounted on said cutter support for swinging movement relative thereto, said support axis when said kerf cutter is in horizontal cutting position extending parallel with said arm structure axis, a motor, means driven by said motor for actuating said kerf cutter, means driven by said motor for swinging said cutter support relative to said rotatable cutter frame, and means driven by said motor for swinging said arm structure relative to said base.

71. In a mining apparatus, a portable base, an arm structure comprising but a single rigid arm pivotally mounted on said base to swing in a vertical direction relative thereto, a frame mounted on said arm for rotation relative thereto, a cutter support pivotally mounted on said rotatable frame to swing relative thereto about a transverse axis, said cutter support being swingable through at least 90° relative to said frame, a kerf cutter pivotally mounted on said cutter support to swing relative thereto, and means for swinging said arm structure and cutter support about their respective pivots and for rotating said frame relative to said arm structure.

72. In a mining apparatus, a portable base, an arm structure comprising but a single rigid arm pivotally mounted on said base to swing in a vertical direction relative thereto, a frame mounted on said arm for rotation relative thereto, a cutter support pivotally mounted on said rotatable frame to swing relative thereto about a transverse axis, said cutter support being swingable through an angle substantially greater than 90° relative to said frame, a kerf cutter pivotally mounted on said cutter support to swing relative thereto, and means for swinging said arm structure and cutter support about their respective pivots and for rotating said frame relative to said arm structure.

73. In a mining apparatus, a portable base, a horizontal turntable on said base, an arm pivotally mounted on said turntable to swing in a vertical direction relative thereto about a transverse axis, a cutter support pivotally mounted on the outer extremity of said arm to swing relative thereto about an axis parallel with the arm pivot axis, a horizontal kerf cutter carried by said cutter support, and means for swinging said cutter support about its pivot relative to said arm to move said kerf cutter into relatively inclined cutting planes and for swinging said arm relative to said turntable and said cutter support relative to said arm to move said kerf cutter into parallel horizontal planes including horizontal planes above and below said turntable while the kerf cutter at all times remains in a substantially horizontal cutting position.

74. In a mining apparatus, a portable base, a horizontal turntable on said base, an arm pivotally mounted on said turntable to swing in a vertical direction relative thereto about a transverse

axis, a cutter support pivotally mounted on the outer extremity of said arm to swing relative thereto about an axis parallel with the arm pivot axis, a horizontal kerf cutter carried by said cutter support, and means for swinging said cutter support about its pivot relative to said arm to move said kerf cutter into relatively inclined cutting planes and for swinging said arm relative to said turntable and said cutter support relative to said arm to move said kerf cutter into parallel horizontal planes including horizontal planes adjacent the mine floor and horizontal planes a substantial distance above the top of said turntable while the kerf cutter at all times remains in a substantially horizontal cutting position.

75. In a mining apparatus, a portable base, an arm pivotally mounted on said base to swing in a vertical direction relative thereto about a horizontal axis extending transversely of said base, said arm extending longitudinally of said base a substantial distance in advance of said base, a frame rotatably mounted on the outer extremity of said arm, a cutter support pivotally mounted on said rotatable frame to swing relative thereto about an axis lying in a plane parallel to a plane including the arm pivot axis, said cutter support being swingable through at least 90° relative to said rotatable frame and arm, a kerf cutter pivotally mounted on said cutter support to swing relative thereto, and means for swinging said arm and cutter support about their respective axes and for rotating said frame relative to said arm irrespective of arm swing.

76. In a mining apparatus, a portable base, an arm pivotally mounted on said base to swing in a vertical direction relative thereto about a horizontal axis extending transversely of said base, said arm extending longitudinally of said base a substantial distance in advance of said base, a frame rotatably mounted on the outer extremity of said arm, a cutter support pivotally mounted on said rotatable frame to swing relative thereto about an axis lying in a plane parallel to a plane including the arm pivot axis, said cutter support being swingable through an angle substantially greater than 90° relative to said rotatable frame and arm, a kerf cutter pivotally mounted on said cutter support to swing relative thereto, and means for swinging said arm and cutter support about their respective axes and for rotating said frame relative to said arm irrespective of arm swing.

77. In a mining apparatus, a wheeled truck adapted to run along a mine trackway a horizontal turntable on said truck, an arm pivotally mounted on said turntable at the forward end of said truck to swing in a vertical direction relative thereto about a horizontal axis extending transversely of the apparatus in advance of the front truck wheel axes, a cutter support pivotally mounted on the outer extremity of said arm to swing on a parallel axis independently of arm swing, a horizontal kerf cutter carried by said cutter support, and motor operated means for swinging said arm and cutter support about their respective axes to move the kerf cutter into parallel horizontal planes including horizontal planes above and below said turntable, said axis of swinging movement of said arm always remaining horizontal during adjustment of said kerf cutter into aforesaid horizontal planes.

78. In a mining apparatus, a wheeled truck adapted to run along a mine trackway, a horizontal turntable on said truck, an arm pivotally mounted on said turntable at the forward end of said truck to swing in a vertical direction relative thereto about a horizontal axis extending transversely of the apparatus in advance of the front truck wheel axes, a cutter support pivotally mounted on the outer extremity of said arm to swing on a parallel axis, a horizontal kerf cutter carried by said cutter support, and motor operated means for swinging said cutter support about its pivot relative to said arm to move said kerf cutter into relatively inclined cutting planes and for swinging said arm and cutter support about their respective axes to move the kerf cutter into parallel horizontal planes including horizontal planes adjacent the mine floor and horizontal planes a substantial distance above the top of said turntable, said axis of swinging movement of said arm always remaining horizontal during adjustment of said kerf cutter into aforesaid horizontal planes.

79. In a mining apparatus, a portable base, a horizontal turntable on said base, an arm pivotally mounted on said turntable to swing in a vertical direction relative thereto, a cutter support pivotally mounted on the outer extremity of said arm to swing relative thereto about an axis parallel with the arm pivot axis, a kerf cutter carried by said cutter support, and a motor on said turntable and relative to which said arm is swingable for swinging said arm relative to said turntable, for swinging said cutter support relative to said arm and for actuating said kerf cutter, said cutter support being swingable relative to said arm by said motor while said arm remains stationary as regards swinging movement about is own axis.

80. In a mining apparatus, a portable base, a horizontal turntable on said base, an arm pivotally mounted on said turntable to swing in a vertical direction relative thereto, a cutter support pivotally mounted on the outer extremity of said arm to swing relative thereto about an axis parallel with the arm pivot axis, a kerf cutter carried by said cutter support, and motor operated means for independently swinging said arm and cutter support about their respective pivots.

81. In a mining apparatus, a portable base, an arm structure comprising but a single rigid arm pivotally mounted on said base to swing in a vertical direction relative thereto, said arm being disposable in a position extending lengthwise of said base and in a position at right angles to the longitudinal axis of said base and swingable vertically in either position about the same pivot, a cutter support pivotally mounted on the outer extremity of said arm structure to swing through a relatively wide range relative thereto about an axis parallel to the arm structure axis while said arm remains stationary as regards vertical swinging movement, and a kerf cutter pivotally mounted on said cutter support to swing relative thereto, said cutter support being swingable relative to said arm to move the kerf cutter into cutting positions at substantial angles at opposite sides of a plane including the support axis.

82. In a mining apparatus, a portable base, an arm structure comprising but a single rigid arm pivotally mounted on said base to swing in a vertical direction relative thereto, said arm being disposable in a position extending lengthwise of said base and in right angle positions at either side of said base and swingable vertically in any of said positions about the same pivot, a cutter support pivotally mounted on the outer

extremity of said arm structure to swing through a relatively wide range relative thereto about an axis parallel to the arm structure axis while said arm remains stationary as regards vertical swinging movement, and a kerf cutter pivotally mounted on said cutter support to swing relative thereto, said cutter support being swingable relative to said arm to move the kerf cutter into cutting positions at substantial angles at opposite sides of a plane including the support axis.

83. In a mining apparatus, a portable base, a horizontally swingable frame thereon, an arm structure pivotally mounted at its rear end on said frame to swing in a vertical direction relative thereto, a motor carried by said arm structure in advance of the arm structure pivot, a frame rotatably mounted on the outer extremity of said arm structure, and a kerf cutter carried by said frame and actuated by said motor.

84. In a mining apparatus, a portable base, an arm structure pivotally mounted at its rear end on said base to swing in a vertical direction relative thereto, a motor carried by said arm structure in advance of the arm structure pivot, a frame rotatably mounted on the outer extremity of said arm structure, a kerf cutter carried by said frame and actuated by said motor, and means driven by said motor for rotating said frame relative to said arm structure.

85. In a mining apparatus, a portable base, an arm structure pivotally mounted at its rear end on said base to swing in a vertical direction relative thereto, a motor carried by said arm structure in advance of the arm structure pivot, a frame rotatably mounted on the outer extremity of said arm structure, a kerf cutter pivotally mounted on said rotatable frame and actuated by said motor, and means driven by said motor for rotating said frame and for swinging said kerf cutter.

86. In a mining apparatus, a wheeled truck adapted to run along a mine trackway, a horizontal turntable on said truck, an arm pivotally mounted at its rear end on said turntable to swing in a vertical direction relative thereto, a motor carried by said arm in advance of the arm pivot, and a kerf cutter pivotally mounted on the outer extremity of said arm and actuated by said motor.

87. In a mining apparatus, a wheeled truck adapted to run along a mine trackway, a horizontal turntable on said truck, an arm pivotally mounted at its rear end on said turntable to swing in a vertical direction relative thereto, a motor carried by said arm in advance of the arm pivot, a frame rotatably mounted on the outer extremity of said arm, a kerf cutter pivotally mounted on said frame and actuated by said motor, and means for swinging said kerf cutter.

88. In a mining apparatus, a portable base, an arm structure mounted on said base to swing horizontally and vertically relative thereto about axes arranged in fixed spaced relation with respect to each other, a kerf cutter, and an adjustable supporting structure carried by said arm structure and by which said kerf cutter is supported for adjustment relative to said arm structure into horizontal and vertical cutting positions, said arm structure being swingable as aforesaid relative to said base and said supporting structure being adjustable relative to said arm structure to position said kerf cutter to cut horizontal kerfs at any desired location between the mine roof and mine bottom and parallel vertical kerfs at any desired location between the ribs of the entry.

89. In a mining apparatus, a portable base, an arm structure mounted on said base to swing horizontally and vertically relative thereto about axes arranged in fixed spaced relation with respect to each other, a kerf cutter, and an adjustable supporting structure carried by said arm structure and by which said kerf cutter is supported, said arm structure being swingable as aforesaid relative to said base and said supporting structure being adjustable relative to said arm structure to position said kerf cutter to cut horizontal kerfs at any desired location between the mine roof and mine bottom and parallel vertical kerfs at any desired location between the ribs of the entry, said adjustable supporting structure including means for tilting said kerf cutter about a transverse axis parallel to its cutting planes.

90. In a mining apparatus, a portable base, an arm structure mounted on said base to swing horizontally and vertically relative thereto about axes arranged in fixed spaced relation with respect to each other, a kerf cutter, and an adjustable supporting structure carried by said arm structure and by which said kerf cutter is supported, said arm structure being swingable as aforesaid relative to said base and said supporting structure being adjustable relative to said arm structure to position said kerf cutter to cut horizontal kerfs at any desired location between the mine roof and mine bottom and parallel vertical kerfs at any desired location between the ribs of the entry, said adjustable supporting structure including means for tilting said kerf cutter about transverse and longitudinal axes parallel to its cutting planes.

91. In a mining apparatus, a wheel supported base adapted to run along a mine trackway, an arm structure mounted on said base to swing horizontally and vertically relative thereto about axes arranged in fixed spaced relation with respect to each other, a kerf cutter, and an adjustable supporting structure carried by said arm structure and by which said kerf cutter is supported for adjustment relative to said arm structure into horizontal and vertical cutting positions, said arm structure being swingable as aforesaid relative to said base and said supporting structure being adjustable relative to said arm structure, to position said kerf cutter to cut horizontal kerfs at any desired location between the mine roof and mine bottom, to cut a horizontal kerf at the level of the mine bottom outside and below the level of the mine trackway, and parallel vertical kerfs at any desired location between the ribs of the entry.

92. In a mining apparatus, a portable base, a horizontal turntable on said base, an elongated arm structure pivotally mounted on said turntable to swing horizontally therewith and to swing in a vertical direction relative thereto about a transverse axis arranged at substantially right angles to a line parallel to a line parallel to the turntable axis, said arm structure at its forward extremity overhanging the forward end of said base, a cutter support pivotally mounted on the outer overhanging extremity of said arm structure to swing through a relatively wide range relative thereto about a substantially upright axis, a kerf cutter pivotally mounted on said cutter support to swing relative thereto about a substantially horizontal axis parallel with the arm structure axis and swingable horizontally with said cutter support relative to said

arm structure, means for swinging said arm structure vertically relative to the turntable to move the kerf cutter in an arcuate path about the arm structure pivot axis as a pivot to cut an upright slightly curved kerf in the mine wall from a point adjacent the mine roof to a point at the mine floor and while the kerf cutter remains stationary as regards swinging movement about its own axis relative to the cutter support.

93. In a mining apparatus, a portable base, a horizontal turntable on said base, an elongated arm structure pivotally mounted on said turntable to swing horizontally therewith and to swing in a vertical direction relative thereto about a transverse axis arranged at substantially right angles to a line parallel to a line parallel to the turntable axis, said arm structure at its forward extremity overhanging the forward end of said base, a cutter support pivotally mounted on the outer overhanging extremity of said arm structure to swing through a relatively wide range relative thereto about a substantially upright axis, a kerf cutter pivotally mounted on said cutter support to swing relative thereto about a substantially horizontal axis parallel with the arm structure axis and swingable horizontally with the cutter support relative to said arm structure, means for swinging said arm structure vertically relative to the turntable to move the kerf cutter in an arcuate path about the arm structure pivot axis as a pivot to cut an upright slightly curved kerf in the mine wall from a point adjacent the mine roof to a point at the mine floor either in advance of the base or at the side of said base and while the kerf cutter remains stationary as regards swinging movement about its own axis relative to the cutter support.

94. In a mining apparatus, a portable base, a horizontal turntable on said base, an elongated arm structure pivotally mounted on said turntable to swing horizontally therewith and to swing in a vertical direction relative thereto about a transverse axis arranged at substantially right angles to a line parallel to a line parallel to the turntable axis, said arm structure at its forward extremity overhanging the forward end of said base, a cutter support pivotally mounted on the outer overhanging extremity of said arm structure to swing through a relatively wide range relative thereto about a substantially upright axis, a kerf cutter pivotally mounted on said cutter support to swing relative thereto about a substantially horizontal axis parallel with the arm structure axis and swingable horizontally with said cutter support relative to said arm structure, means for swinging said arm structure vertically relative to the turntable to move the kerf cutter in an arcuate path about the arm structure pivot axis as a pivot to cut an upright slightly curved kerf in the mine wall from a point adjacent the mine roof to a point at the mine floor and while the kerf cutter remains stationary as regards swinging movement about its own axis relative to the cutter support, and means for rotating said turntable to swing said arm structure horizontally relative to the base and for swinging the cutter support horizontally relative to the arm structure to move the kerf cutter into a series of substantially parallel substantially vertical cutting positions to operate in the front mine wall in advance of the base and between the side mine walls.

95. In a mining apparatus, a portable base, a horizontal turntable on said base, an elongated arm structure pivotally mounted on said turntable to swing horizontally therewith and to swing in a vertical direction relative thereto about a transverse axis arranged at substantially right angles to a line parallel to a line parallel to the turntable axis, said arm structure at its forward extremity overhanging the forward end of said base, a cutter support pivotally mounted on the outer overhanging extremity of said arm structure to swing through a relatively wide range relative thereto about a substantially upright axis, a kerf cutter pivotally mounted on said cutter support to swing relative thereto about a substantially horizontal axis parallel with the arm structure axis and swingable horizontally with said cutter support relative to said arm structure, means for swinging said arm structure vertically relative to the turntable to move the kerf cutter in an arcuate path about the arm structure pivot axis as a pivot to cut an upright slightly curved kerf in the mine wall from a point adjacent the mine roof to a point at the mine floor either in advance of the base or at the side of said base, depending on turntable position, and while the kerf cutter remains stationary as regards swinging movement about its own axis relative to the cutter support, and means for rotating said turntable to swing said arm structure horizontally relative to the base and for swinging the cutter support horizontally relative to the arm structure to move the kerf cutter into a series of substantially parallel substantially vertical cutting positions for operation in the front mine wall in advance of the base and between the side mine walls.

96. In a mining apparatus, a portable base, a horizontal turntable on said base, an elongated arm structure pivotally mounted on said turntable to swing horizontally therewith and to swing in a vertical direction relative thereto about a transverse axis arranged at substantially right angles to a line parallel to a line parallel to the turntable axis, said arm structure at its forward extremity overhanging the forward end of said base, a cutter support pivotally mounted on the outer overhanging extremity of said arm structure to swing through a relatively wide range relative thereto about a substantially upright axis, a kerf cutter pivotally mounted on said cutter support to swing relative thereto about a substantially horizontal axis parallel with the arm structure axis and swingable horizontally with said cutter support relative to said arm structure, means for swinging said arm structure vertically relative to the turntable to move the kerf cutter in an arcuate path about the arm structure pivot axis as a pivot to cut an upright slightly curved kerf in the mine wall from a point adjacent the mine roof to a point at the mine floor and while the kerf cutter remains stationary as regards swinging movement about its own axis relative to the cutter support, and means for swinging the kerf cutter about its pivot relative to said cutter support in any of aforesaid cutting positions.

97. In a mining apparatus, a portable base, a horizontal turntable on said base, an elongated arm structure pivotally mounted on said turntable to swing horizontally therewith and to swing in a vertical direction relative thereto about a transverse axis arranged at substantially right angles to a line parallel to a line parallel to the turntable axis, said arm structure at its

forward extremity overhanging the forward end of said base, a cutter support pivotally mounted on the outer overhanging extremity of said arm structure to swing through a relatively wide range relative thereto about a substantially upright axis, a kerf cutter pivotally mounted on said cutter support to swing relative thereto about a substantially horizontal axis parallel with the arm structure axis and swingable horizontally with said cutter support relative to said arm structure, means for swinging said arm structure vertically relative to the turntable to move the kerf cutter in an arcuate path about the arm structure pivot axis as a pivot to cut an upright slightly curved kerf in the mine wall from a point adjacent the mine roof to a point at the mine floor either in advance of the base or at the side of said base, depending on turntable position, and while the kerf cutter remains stationary as regards swinging movement about its own axis relative to the cutter support, and means for swinging the kerf cutter about its pivot relative to said cutter support in any of aforesaid cutting positions.

98. In a mining apparatus, a portable base, a horizontal turntable on said base, an elongated arm structure pivotally mounted on said turntable to swing horizontally therewith and to swing in a vertical direction relative thereto about a transverse axis arranged at substantially right angles to a line parallel to a line parallel to the turntable axis, said arm structure at its forward extremity overhanging the forward end of said base, a cutter support pivotally mounted on the outer overhanging extremity of said arm structure to swing through a relatively wide range relative thereto about a substantially upright axis, a kerf cutter pivotally mounted on said cutter support to swing relative thereto about a substantially horizontal axis parallel with the arm structure axis and swingable horizontally with said cutter support relative to said arm structure, means for swinging said arm structure vertically relative to the turntable to move the kerf cutter in an arcuate path about the arm structure pivot axis as a pivot to cut an upright slightly curved kerf in the mine wall from a point adjacent the mine roof to a point at the mine floor and while the kerf cutter remains stationary as regards swinging movement about its own axis relative to the cutter support, means for rotating said turntable relative to the base and for swinging the cutter support relative to the arm structure to move the kerf cutter into a series of substantially parallel cutting positions to operate in the front mine wall in advance of the base and between the side mine walls, and means for swinging the kerf cutter about its pivot relative to said support in any of aforesaid cutting positions.

99. In a mining apparatus, a portable base, a horizontal turntable on said base, an elongated arm structure pivotally mounted on said turntable to swing horizontally therewith and to swing in a vertical direction relative thereto about a transverse axis arranged at substantially right angles to a line parallel to a line parallel to the turntable axis, said arm structure at its forward extremity overhanging the forward end of said base, a cutter support pivotally mounted on the outer overhanging extremity of said arm structure to swing through a relatively wide range relative thereto about a substantially upright axis, a kerf cutter pivotally mounted on said cutter support to swing relative thereto about a substantially horizontal axis parallel with the arm structure axis and swingable horizontally with said cutter support relative to said arm structure, means for swinging said arm structure vertically relative to the turntable to move the kerf cutter in an arcuate path about the arm structure pivot axis as a pivot to cut an upright slightly curved kerf in the mine wall from a point adjacent the mine roof to a point at the mine floor either in advance of the base or at the side of said base and while the kerf cutter remains stationary as regards swinging movement about its own axis relative to the cutter support, means for rotating said turntable relative to the base and for swinging the cutter support relative to the arm structure to move the kerf cutter into a series of substantially parallel cutting positions to operate in the front mine wall in advance of the base and between the side mine walls, and means for swinging the kerf cutter about its pivot relative to said support in any of aforesaid cutting positions.

100. In a mining apparatus, a portable base, an arm pivotally mounted on said base to swing in a vertical direction relative thereto, a frame mounted on said arm for rotation relative thereto about an axis extending longitudinally of the arm, a cutter support pivotally mounted on said rotatable frame to swing relative thereto about a transverse axis, said cutter support being swingable through at least 90° relative to said frame, a kerf cutter carried by said cutter support, said kerf cutter being swingable with said cutter support relative to said rotatable frame, while the latter remains stationary, into different angularly disposed cutting planes, and means for swinging said arm and cutter support about their respective pivots and for rotating said frame relative to said arm.

101. In a mining apparatus, a portable base, an arm pivotally mounted on said base to swing in a vertical direction relative thereto, a frame mounted on said arm for rotation relative thereto about an axis extending longitudinally of the arm, a cutter support pivotally mounted on said rotatable frame to swing relative thereto about a transverse axis, said cutter support being swingable througt at least 90° relative to said frame, a kerf cutter pivotally mounted on said cutter support to swing relative thereto, and means for swinging said arm and cutter support about their respective pivots and for rotating said frame relative to said arm.

102. In a mining apparatus, a portable base, an arm pivotally mounted on said base to swing in a vertical direction relative thereto about a transverse axis and extending longitudinally of said base, a frame mounted on the outer extremity of said arm for rotation about an axis extending longitudinally of said arm, a cutter support pivotally mounted on said rotatable frame to swing relative thereto about a transverse axis lying in a plane parallel to a plane including the arm axis, said cutter support being swingable independently of and through at least 90° relative to said rotatable frame and arm, a kerf cutter carried by said cutter support, said kerf cutter being swingable with said cutter support into different angularly disposed cutting planes, and means for swinging said arm and cutter support about their respective axes and for rotating said frame relative to said arm.

103. In a mining apparatus, a wheeled truck adapted to run along a mine trackway, an arm pivotally mounted on said truck to swing in a

vertical direction relative thereto about a transverse axis and extending longitudinally of said truck, a frame rotatably mounted on the outer extremity of said arm, a cutter support pivotally mounted on said rotatable frame to swing relative thereto about an axis lying in a plane parallel to a plane including the arm axis, said cutter support being swingable through at least 90° relative to said rotatable frame and arm, a kerf cutter carried by said cutter support, said kerf cutter being swingable with said cutter support into different angularly disposed cutting planes, and means for swinging said arm and cutter support about their respective axes permitting independent swinging of one of the same, and for rotating said frame relative to said arm.

104. In a mining apparatus, a portable base, a horizontal turntable on said base, a kerf cutter, and an adjustable supporting structure intervening said turntable and kerf cutter comprising but a single arm hinged to said turntable at the forward end of said base to swing about an axis at right angles to a line extending radially from the turntable axis and on which the kerf cutter is pivotally mounted, said arm constituting the sole supporting connection between the kerf cutter and said turntable, and mechanism for adjusting said supporting structure to position said kerf cutter into parallel planes, said adjusting mechanism including means for swinging said arm about its pivot to move said kerf cutter into aforesaid parallel planes.

105. In a mining apparatus, a portable base, a horizontal turntable on said base, a kerf cutter, and an adjustable supporting structure intervening said turntable and kerf cutter comprising but a single arm hinged to said turntable at the forward end of said base to swing about an axis at right angles to a line extending radially from the turntable axis and on which the kerf cutter is pivotally mounted, said arm constituting the sole supporting connection between the kerf cutter and said turntable, and mechanism for adjusting said supporting structure to position said kerf cutter into parallel planes adjacent the mine floor and parallel planes a substantial distance above the top of said turntable, said adjusting mechanism including means for swinging said arm about its pivot to move said kerf cutter into aforesaid parallel planes.

106. In a mining apparatus, a portable base, a horizontal turntable on said base, an arm pivotally mounted on said turntable to swing in a vertical direction relative thereto about an axis transverse to a line extending radially from the turntable axis, a cutter support pivotally mounted on the outer extremity of said arm to swing relative thereto about an axis parallel with the arm pivot axis, a horizontal kerf cutter mounted on said cutter support, said cutter support being swingable about its pivot relative to said arm to move said kerf cutter into relatively inclined cutting planes, and means for swinging said arm relative to said turntable and said cutter support relative to said arm to move said kerf cutter into parallel horizontal planes including horizontal planes above and below said turntable while the kerf cutter at all times remains in a horizontal cutting position.

107. In a mining apparatus, a portable base, a horizontal turntable on said base, an arm pivotally mounted on said turntable to swing in a vertical direction relative thereto about an axis transverse to a line extending radially from the turntable axis, a cutter support pivotally mounted on the outer extremity of said arm to swing relative thereto about an axis parallel with the arm axis, a horizontal kerf cutter mounted on said cutter support, and means for swinging said cutter support about its pivot relative to said arm to move said kerf cutter into relatively inclined cutting planes and for swinging said arm relative to said turntable and said cutter support relative to said arm to move said kerf cutter into parallel horizontal planes including horizontal planes adjacent the mine floor and horizontal planes a substantial distance above the top of said turntable while the kerf cutter at all times remains in a horizontal cutting position.

108. In a mining apparatus, a portable base, a horizontal turntable on said base, an arm pivotally mounted on said base to swing in a vertical direction relative thereto about an axis transverse to a line extending radially from the turntable axis, said arm extending longitudinally of the base a substantial distance in advance of the base, a cutter support pivotally mounted on the outer extremity of said arm to swing relative thereto about an axis parallel with the arm axis, said cutter support being swingable through at least 90° relative to said arm, a kerf cutter mounted on said cutter support, said cutter support being swingable about its pivot relative to said arm to move said kerf cutter into relatively inclined cutting planes, and means for swinging said arm and support about their respective axes.

109. In a mining apparatus, a portable base, a horizontal turntable on said base, an arm pivotally mounted on said base to swing in a vertical direction relative thereto about an axis transverse to a line extending radially from the turntable axis, said arm extending longitudinally of the base a substantial distance in advance of the base, a cutter support pivotally mounted on the outer extremity of said arm to swing relative thereto about an axis parallel with the arm axis, said cutter support being swingable through substantially 180° relative to said arm, a kerf cutter mounted on said cutter support, said cutter support being swingable about its pivot relative to said arm to move said kerf cutter into relatively inclined cutting planes, and means for swinging said arm and support about their respective axes.

110. In a mining apparatus, a portable base, a horizontal turntable on said base, kerf cutting mechanism including a cutter support, and an adjustable supporting structure intervening said turntable and cutter support including an arm pivotally connected to the turntable and on which the cutter support is pivotally mounted, said arm and support being swingable about parallel axes lying in planes parallel to a plane including the turntable axis to move the kerf cutter into parallel planes, motor operated devices for swinging said arm about its pivot relative to said turntable while said cutter support remains in a fixed relation to said arm, and separate motor operated devices for swinging said cutter support about its pivot relative to said arm.

111. In a mining apparatus, a portable base, a horizontal turntable on said base, kerf cutting mechanism including a cutter support, and an adjustable supporting structure intervening said turntable and cutter support including an arm pivotally connected to the turntable and on which the cutter support is pivotally mounted, said arm and support being swingable about parallel axes lying in planes parallel to a plane including the turntable axis to move the kerf cutter into par-

allel planes, motor operated devices for swinging said arm about its pivot relative to said turntable, and separate motor operated devices for swinging said cutter support about its pivot relative to said arm, said means for swinging said cutter support relative to said arm being operable independently of said arm swinging means.

112. In a mining apparatus, a wheeled truck adapted to run along a mine trackway, a horizontal turntable on said truck, an arm pivotally mounted on the turntable at the forward end of said truck to swing in a vertical direction relative thereto about a horizontal axis lying in a plane parallel to a plane including the turntable axis and in advance of the front truck wheel axes, a cutter support pivotally mounted on the outer extremity of said arm, a horizontal kerf cutter carried by said cutter support, and motor operated means for swinging said cutter support about its pivot relative to said arm to move said kerf cutter into relatively inclined cutting planes and for swinging said arm and cutter support about their respective axes to move the kerf cutter into parallel horizontal planes including horizontal planes above and below said turntable.

113. In a mining apparatus, a wheeled truck adapted to run along a mine trackway, a horizontal turntable on said truck, an arm pivotally mounted on the turntable at the forward end of said truck to swing in a vertical direction relative thereto about a horizontal axis lying in a plane parallel to a plane including the turntable axis and in advance of the front truck wheel axes, a cutter support pivotally mounted on the outer extremity of said arm, a horizontal kerf cutter carried by said cutter support, and motor operated means for swinging said cutter support about its pivot relative to said arm to move said kerf cutter into relatively inclined cutting planes and for swinging said arm and cutter support about their respective axes to move the kerf cutter while the same remains throughout in horizontal cutting position, into parallel horizontal planes including horizontal planes adjacent the mine floor and horizontal planes a substantial distance above the top of said turntable.

114. In a mining apparatus, a portable base, a horizontal turntable on said base, an arm pivotally mounted on said base to swing in a vertical direction in planes extending radially from the turntable axis, a kerf cutter support pivotally mounted on the outer extremity of said arm to swing relative thereto and independently of swinging thereof about an axis parallel with the arm pivot axis, a kerf cutter mounted on said cutter support, and a motor on said turntable relative to which said arm is swingable for swinging said arm relative to said base and for actuating said kerf cutter.

115. In a mining apparatus, a portable base, a horizontal turntable on said base, an arm pivotally mounted on said turntable to swing in a vertical direction in planes extending radially from the turntable axis, a cutter support pivotally mounted on the outer extremity of said arm to swing relative thereto about an axis parallel to the arm axis, a kerf cutter mounted on the cutter support, and motor operated means for independently swinging said arm and cutter support about their respective pivots.

116. In a mining apparatus, a portable base, a horizontal turntable on said base, an arm pivotally mounted on said turntable to swing in a vertical direction relative thereto, a head mounted on said arm to rotate relative thereto, a kerf cutter support pivotally mounted on said rotatable head, and a kerf cutter pivotally mounted on said cutter support to swing relative thereto, said arm and cutter support being simultaneously swingable about their respective axes in opposite directions to maintain the kerf cutter in a substantially horizontal position or in any other desired position.

117. In a mining apparatus, a portable base, an arm structure pivotally mounted on the forward end of said base and extending forwardly in advance of said base, said arm structure swinging about an axis in a vertical direction relative to said base, a frame mounted on said arm structure for rotation relative thereto about an axis extending longitudinally of the arm structure, a support pivotally mounted on said frame to swing relative thereto about an axis at an angle to the frame rotation axis, and a kerf cutter pivotally mounted on said support for swinging movement relative thereto about an axis at an angle to said support axis.

118. In a mining apparatus, a portable base, a horizontal turntable on said base, an arm pivotally mounted on said turntable to swing in a vertical direction relative thereto, a head mounted on said arm to rotate relative thereto, a kerf cutter support pivotally mounted on said rotatable head, and a kerf cutter pivotally mounted on said cutter support to swing relative thereto, said arm and cutter support being simultaneously swingable about their respective axes, when the latter are parallel, in opposite directions to maintain the kerf cutter in any desired position.

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DISCLAIMER

2,007,907.—*Charles F. Osgood*, Claremont, N. H. MINING APPARATUS. Patent dated July 9, 1935. Disclaimer filed June 15, 1940, by the assignee, *Sullivan Machinery Company*.

Hereby enters this disclaimer to claims 2, 3, 4, 116, and 118 in said specification.

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