Dec. 15, 1925. 1,565,376

N. D. LEVIN

COAL MINING MACHINE

Original Filed Oct. 18, 1917 6 Sheets-Sheet 1

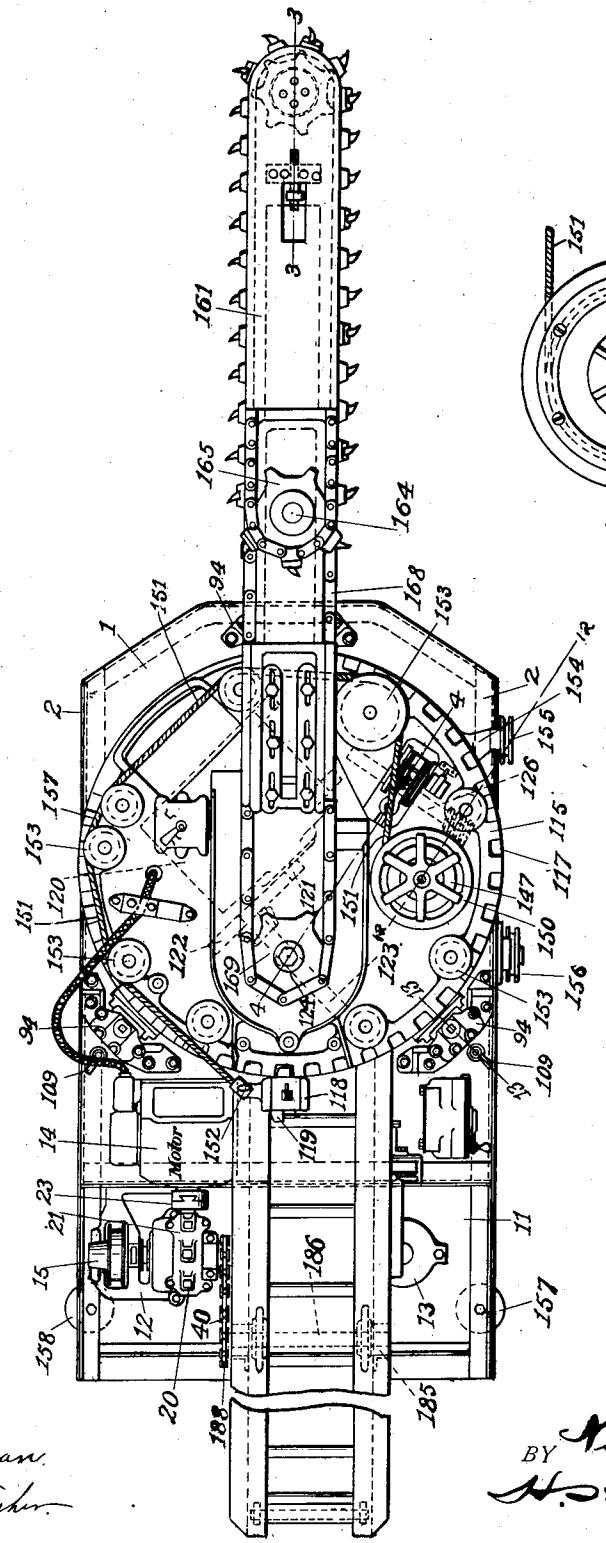


Fig. 1.

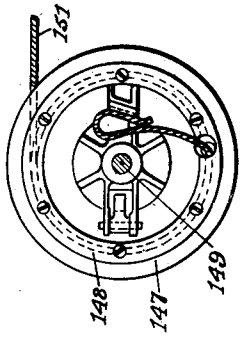


Fig. 4.

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Dec. 15, 1925. 1,565,376

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COAL MINING MACHINE

Original Filed Oct. 18, 1917 6 Sheets-Sheet 2

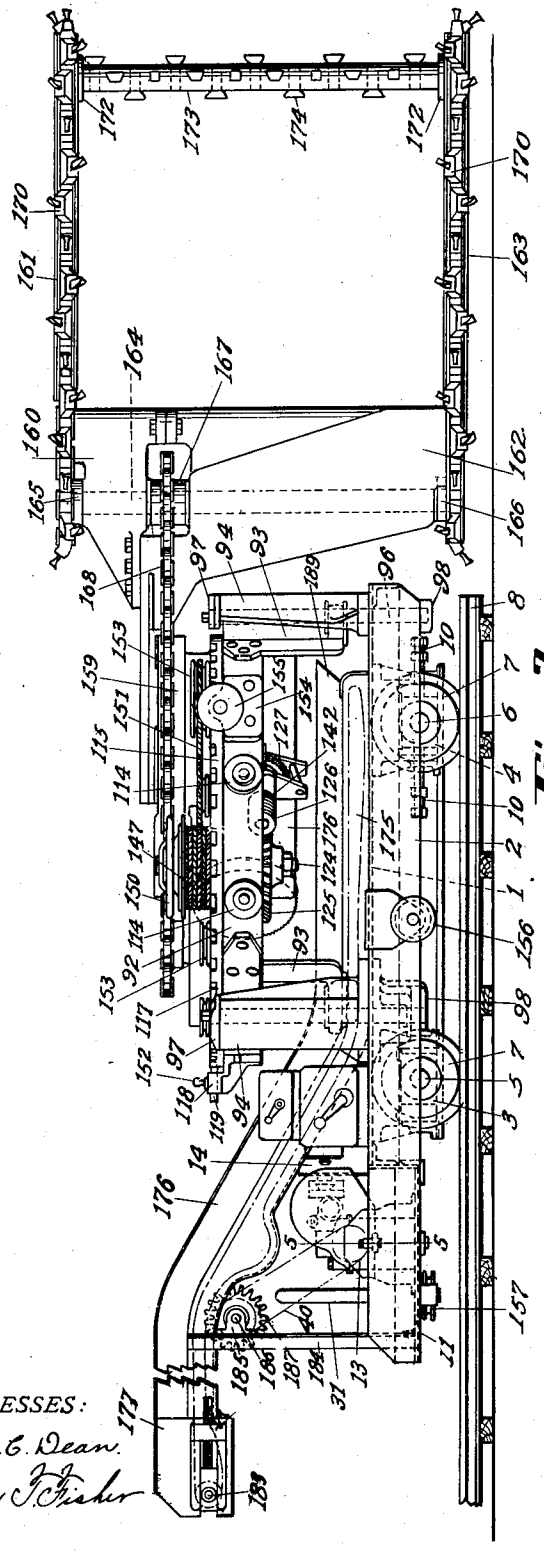


Fig. 2.

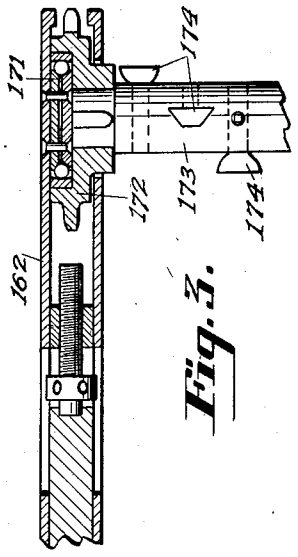


Fig. 3.

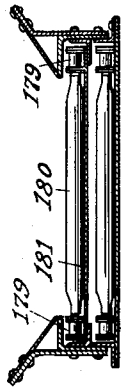


Fig. 15.

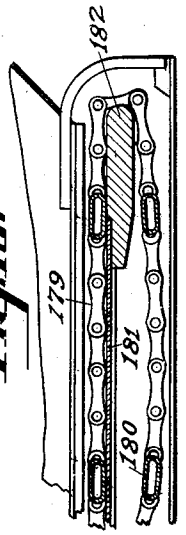


Fig. 16.

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COAL MINING MACHINE

Original Filed Oct. 18, 1917 6 Sheets-Sheet 3

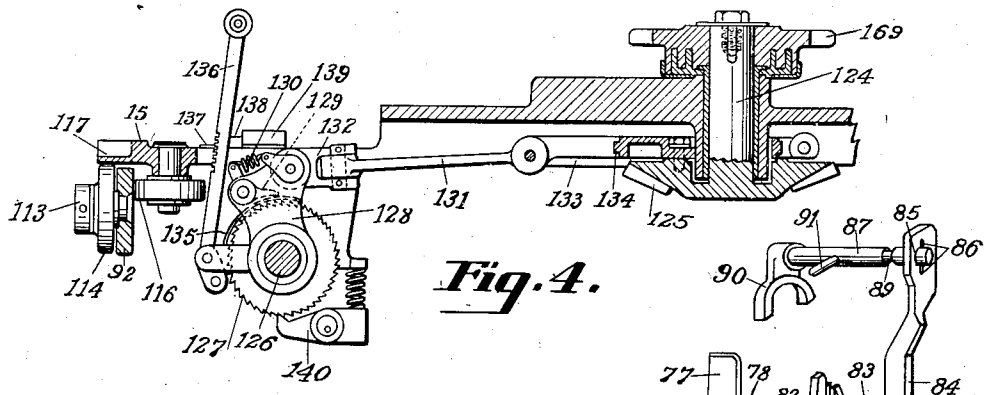


Fig. 4.

Fig. 7.

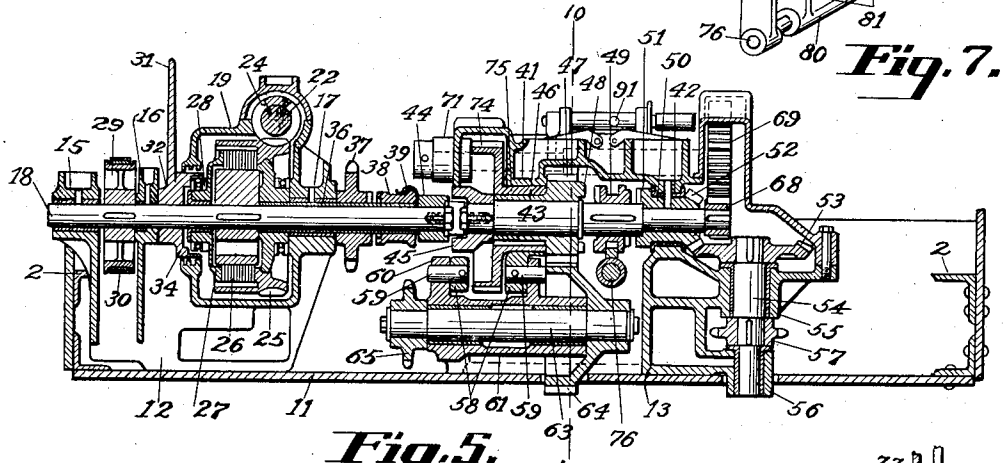


Fig. 5.

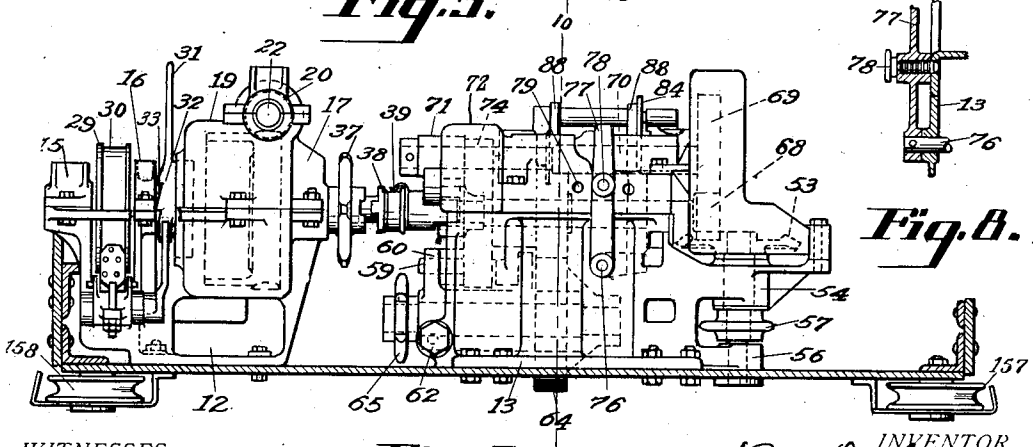


Fig. 6.

Fig. 8.

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Dec. 15, 1925. 1,565,376

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COAL MINING MACHINE

Original Filed Oct. 18, 1917 6 Sheets-Sheet 4

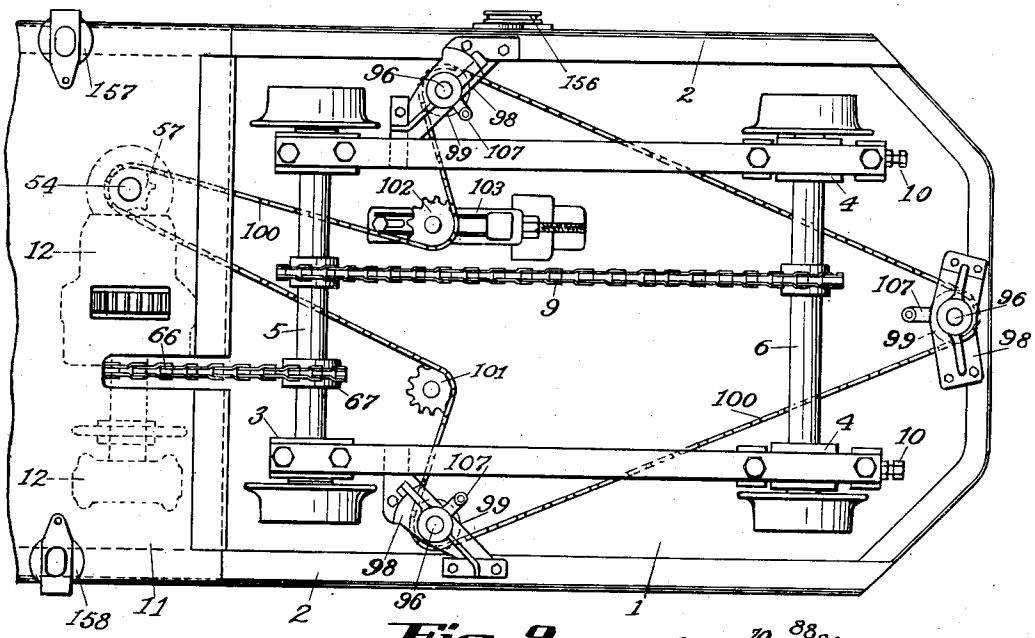


Fig. 9.

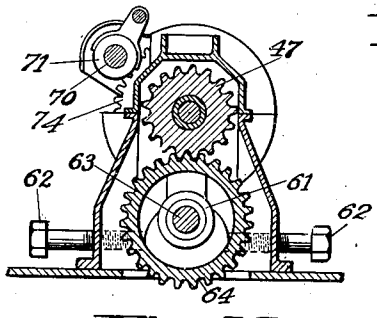


Fig. 10.

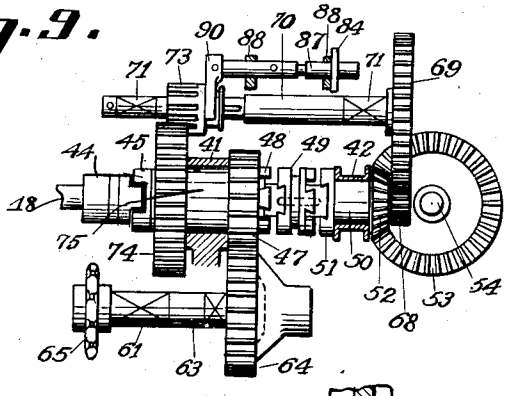


Fig. 11

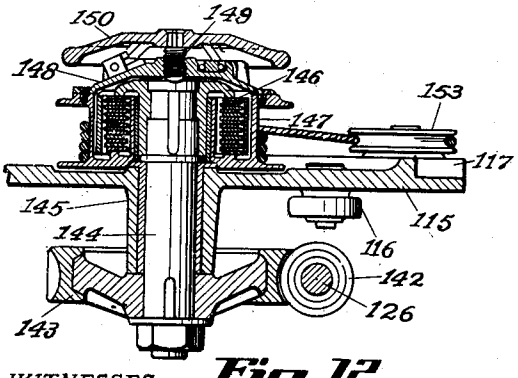


Fig. 12.

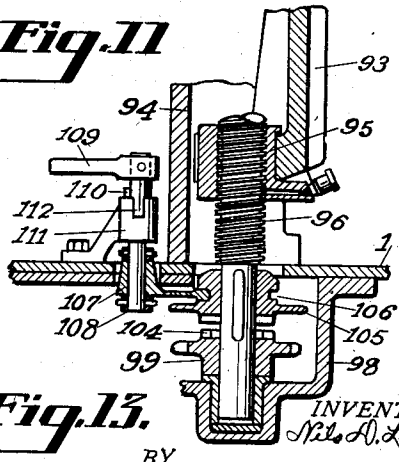


Fig. 13.

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COAL MINING MACHINE

Original Filed Oct. 18, 1917 6 Sheets-Sheet 5

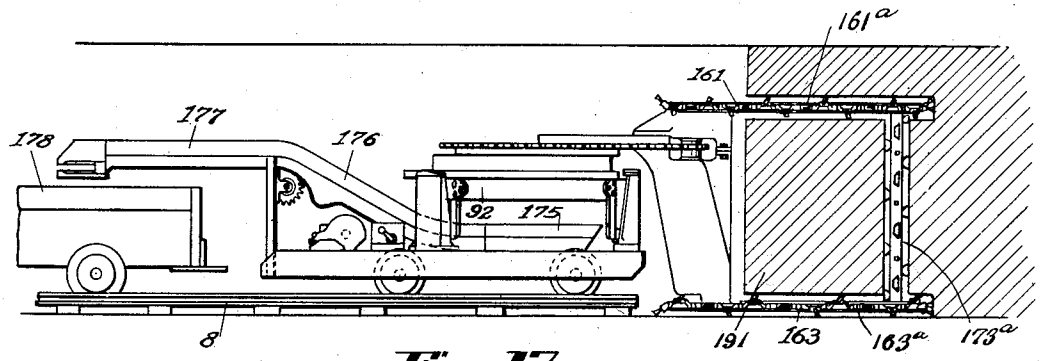


Fig. 17.

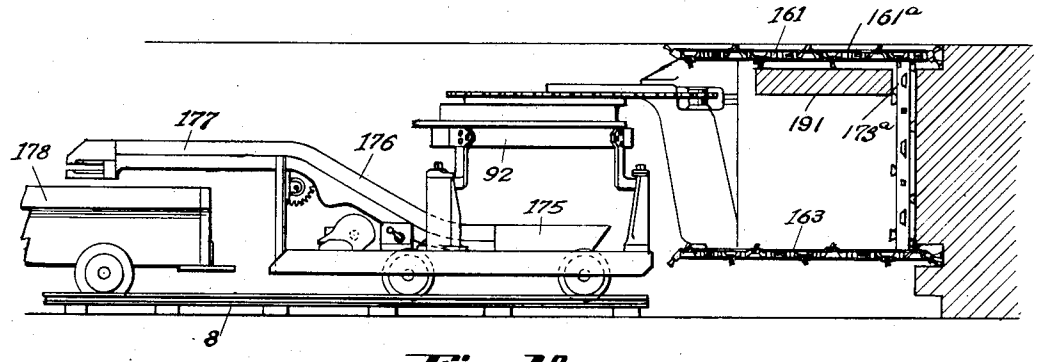


Fig. 18.

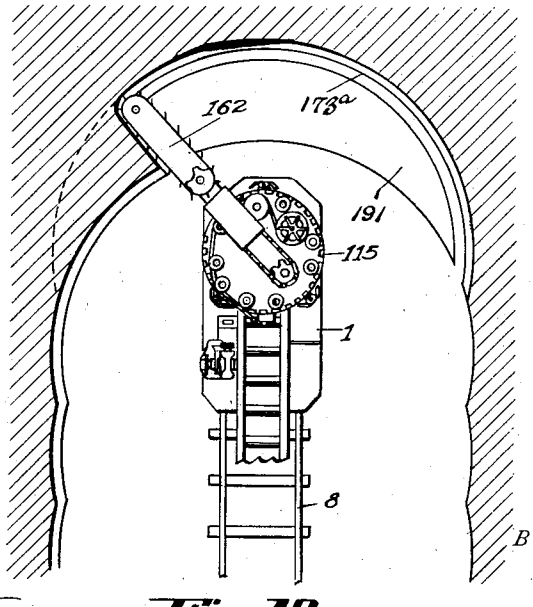


Fig. 19.

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COAL MINING MACHINE

Original Filed Oct. 18, 1917 6 Sheets-Sheet 6

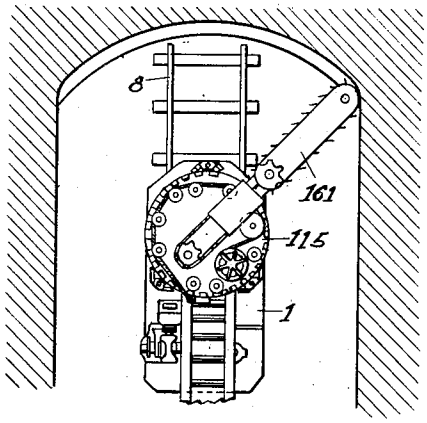


Fig. 20

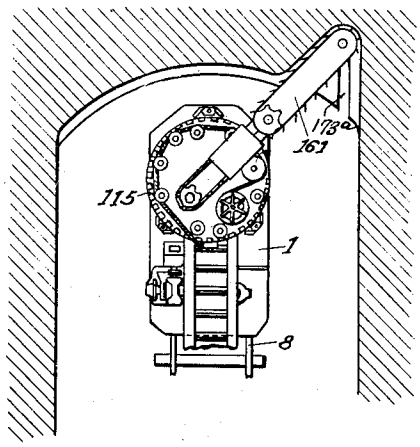


Fig. 21.

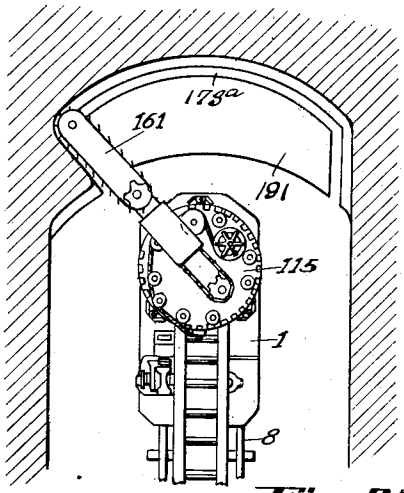


Fig. 22.

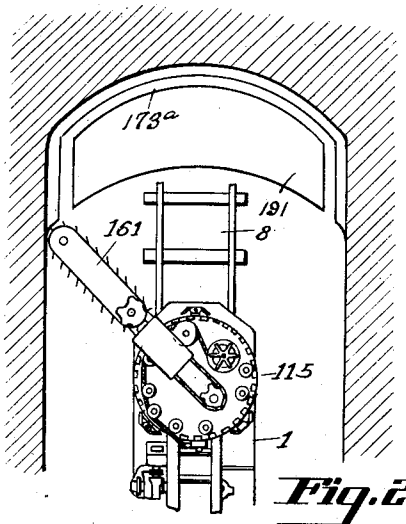


Fig. 23.

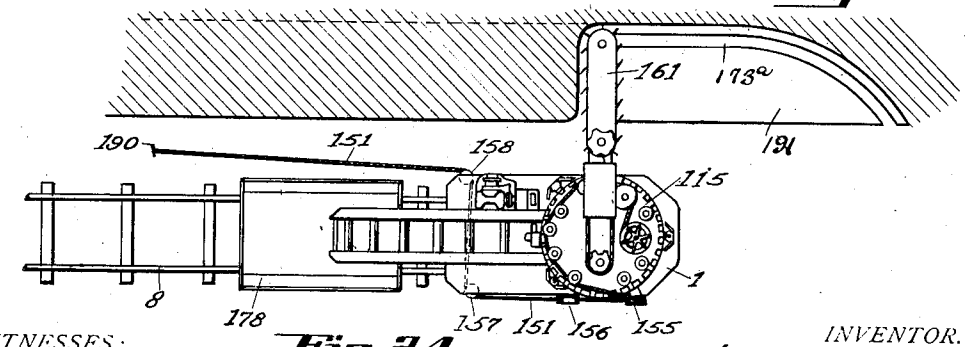


Fig. 24.

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Patented Dec. 15, 1925.

1,565,376

UNITED STATES PATENT OFFICE.

NILS D. LEVIN, OF COLUMBUS, OHIO, ASSIGNOR TO THE JEFFREY MANUFACTURING COMPANY, OF COLUMBUS, OHIO, A CORPORATION OF OHIO.

COAL-MINING MACHINE.

Application filed October 18, 1917, Serial No. 197,291. Renewed April 18, 1925.

To all whom it may concern:

Be it known that I, NILS D. LEVIN, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Coal-Mining Machines, of which the following is a specification, reference being had therein to the accompanying drawing.

The present invention relates to coal mining machines of the class which is adapted to completely sever blocks of material from the walls of the mine.

I am aware that numerous machines have been heretofore proposed provided with cutting mechanisms whereby both horizontal and vertical kerfs have been simultaneously cut in the mine wall to completely sever blocks of material therefrom. In such earlier constructions the cutting mechanisms have been of such character that the machine could be fed only laterally across the face of the vein either in long sweeping curves, thereby severing a succession of crescent shaped blocks, or in straight lines approximately parallel to the coal face. In the latter case it has been necessary to form a free end to the coal face to permit of the cutting mechanism being advanced to the line of cutting. Such machines are necessarily restricted to operation in relatively wide rooms or upon the long wall system and are not adapted to universal application.

It is the especial object of this invention to provide a machine of the class described provided with cutting mechanism adapted to be moved either inwardly or outwardly or laterally in either direction relative to the coal face to completely sever blocks of material from the body of the vein.

The devices by which I attain this object are fully set forth in the following specification and illustrated in the accompanying drawings of which—

Fig. 1 is a general plan view of the preferred embodiment of my invention.

Fig. 2 is a side elevation of the machine illustrated in Fig. 1.

Fig. 3 is a fragmentary sectional view taken along the line 3—3 of Fig. 1.

Fig. 4 is a fragmetnary sectional view taken along the line 4—4 of Fig. 1.

Fig. 5 is a transverse vertical sectional view of the auxiliary transmission mechanism taken along the line 5—5 of Fig. 2.

Fig. 6 is an elevation of the parts illustrated in Fig. 5.

Figs. 7 and 8 are details of the clutch shifting mechanism associated with the auxiliary transmission mechanism.

Fig. 9 is an inverted plan view of the truck.

Fig. 10 is a section along the line 10—10 of Figs. 5 and 6 showing details of the auxiliary transmission mechanism.

Fig. 11 is a diagrammatic development of the gearing of the auxiliary transmission mechanism.

Fig. 12 is a vertical section taken along the line 12—12 of Fig. 1.

Fig. 13 is a section taken along the line 13—13 of Fig. 1.

Fig. 14 is a detail of the feed drum.

Fig. 15 is a cross section of the loading conveyer.

Fig. 16 is a longitudinal sectional view of the forward end of the loading conveyer.

Figs. 17 and 18 are diagrammatic elevational views showing the method of operating the machine.

Fig. 19 is a diagrammatic plan view showing the method of operating the machine upon the room and pillar plan of mining.

Figs. 20, 21, 22, and 23 are diagrammatic figures illustrating the method of operating the machine for driving entries.

Fig. 24 is a diagrammatic plan view illustrating the method of operating the machine upon the long wall system.

Like numerals refer to similar parts in the several figures.

Referring to the drawings, the numeral 1 represents a steel plate to the edges of which are secured the stiffening angles 2 and which is otherwise reinforced to produce a rigid base frame upon which is mounted the coal cutting mechanism. Fixed to the underside of the plate 1 are suitable journal boxes 3 and 4 in which are journaled the axles 5 and 6 having wheels 7 adapted to travel along

the rails 8 of the mine track. The above described base frame together with the wheels and axles constitutes a supporting truck upon which the entire apparatus is supported. The axles 5 and 6 are connected together by the chain 9 which engages with suitable sprocket wheels secured to the axles. Provision for adjusting the tension of the chain 9 is made in the axle journal boxes 4 which are slidable in the direction of the length of the base frame, and which are controlled by the adjusting screws 10. The angles 2 are extended rearwardly of the base frame and support an extension platform 11 upon which is mounted the controller mechanism and which affords a convenient place for the operator to ride while the machine is being moved from one part of the mine to another.

Mounted upon the extension platform 11 are two castings 12 and 13 which support the transmission mechanism by which the motor 14 is connected to the several auxiliary elements of the machine.

Carried by the casting 12 are the bearings 15, 16, and 17 in which is journaled a transverse shaft 18. Formed as part of the casting 12 is the lower half of the clutch and gear case. The upper half of the clutch and gear case is formed by the casting 19. The casting 19 carries bearings 20 and 21 in which is journaled the longitudinal shaft 22 having at its forward end a flange shaft coupling 23 by which it is connected with the armature shaft of the motor 14. Secured to the shaft 22 is a worm 24 which meshes with the worm wheel 25, rotatably mounted on the shaft 18, to which it may be operatively connected by means of the clutch 26 of the well known friction disc type. This clutch is shown in the drawings and need not be described in detail. The disc 27 is provided for applying pressure to the discs of the clutch and a ball bearing 28 is provided for carrying that pressure.

Rigidly mounted upon the shaft 18, preferably between the bearings 15 and 16, is a brake wheel 29 which is engaged by the friction band 30 arranged to be controlled by movement of the hand lever 31. The lever 31 is formed integral with the collar 32 loosely mounted on the shaft 18. The casting 12, at points adjacent the bearing 16, is provided with a series of inclined teeth 33, and the collar 32 is provided with a series of oppositely inclined teeth adapted to mesh with the teeth 33. The collar has formed upon it a flange 34 and between this flange and the disc 27 is interposed a ball bearing 28. The surfaces of the teeth are so inclined that when the collar 32 is rotated in a direction to release the brake said collar is forced longitudinally of the shaft 18 and its motion is transmitted through the ball bearing 28 to the disc 27 to press together the discs of the friction clutch 26. When the collar 32 is rotated in the opposite direction, the brake is applied and the clutch released.

Attached to the worm wheel 25, to rotate with it independently of the shaft 18, is a sleeve 36 upon which is loosely mounted the sprocket wheel 37. The sprocket wheel 37 is provided with clutch teeth adapted to mesh with similar teeth on the clutch member 38 which is splined to the sleeve 36. This clutch member 38 can be slid along the sleeve into or out of operative position and is frictionally held against accidental movement in either direction by the spring clip 39. The sprocket wheel 37 is engaged by an endless chain 40 for a purpose which will be hereinafter set forth.

Carried by the casting 13 are bearings 41 and 42 in which is journaled a shaft 43 in alignment with the shaft 18. The shafts 18 and 43 are connected together by a jaw clutch coupling one member 44 of which is attached to the shaft 18 and the other member 45 of which is fixed to the shaft 43.

Rotatably mounted upon the shaft 43 is a sleeve 46 extending through the bearing 41 to the hub of the clutch coupling 45. Formed at the end of this sleeve 46 remote from the clutch coupling is a spur gear 47 upon the end of which is formed clutch teeth 48 adapted to engagment with corresponding teeth of the sliding clutch member 49 which is splined to the shaft. At the other end of the shaft 43 is rotatably mounted a sleeve 50, which extends through the bearings 42, having on one end a flange 51 provided with clutch teeth to engage the corresponding teeth of the clutch member 49 and at the other end a bevel pinion 52 which meshes with a bevel gear 53 attached to the upper end of the vertical shaft 54. The shaft 54 is journaled in the bearings 55 and 56 of the casting 13 between which is mounted a sprocket wheel 57 for a purpose which will be hereinafter set forth.

Attached to two lugs 58 of the casting 13 are the stud pins 59 upon which is suspended, by lugs 60, a journal bearing 61 adapted to be rotated in a direction parallel with the length of the truck by the adjusting screws 62. Journaled in the bearing 61 is a shaft 63 to one end of which is attached a spur gear 64, which meshes with the gear 47 of the shaft 43, and to the other end is fixed a sprocket wheel 65 which engages the endless chain 66. The chain 66 passes around a sprocket wheel 67 attached to the axle 5 to drive it to propel the truck. The chain 66 may be properly tensioned by the rotation of the shaft 63 about the studs 59 by means of the adjusting screws 62. The variation of the distance between the centers of the gears 64 and 47, due to the rotation of the shaft 63 about the studs 59 to

effect the adjustment of the chain 66, is within the permissible variation of the meshing of the teeth of the gears.

Attached to the shaft 43 adjacent the bevel pinion 52 is a spur pinion 68 which meshes with the gear 69 attached to the shaft 70. The shaft 70 is journaled in bearings 71 of the gear case casting 72 bolted to the casting 13. Splined to the shaft 70 is a spur pinion 73 adapted to slide into and out of engagement with the spur gear 74. The spur gear 74 has an extension hub 75 surrounding and attached to the sleeve 46. The outer surface of the hub 75 is finished to form a journal in the bearing 41. By the gearing above described the sprocket wheel 65 may be connected directly with the shaft 43 through the gears 47 and 64 and the clutch 49, to propel the truck at a relatively high speed for transporting the machine from place to place, or it may be connected through the gears 68, 69, 73, 74, 47, and 64 to propel the truck at a relatively slow speed to feed cutting mechanism into the coal to cut it. It is obvious, however, that the pinion 73 must not be in mesh with the gear 74 at the same time that the clutch 49 is engaged with the gear 47, and to prevent such an occurrence I have provided a system of interlocking levers for the manipulation of these parts.

Journaled in apertures of the casting 13 is a shaft 76 to the rearward end of which is attached a hand lever 77 by which the shaft may be rocked. This hand lever is provided with a spring pressed latch 78 adapted to engage the apertures 79 of the casting 13 to prevent the accidental movement of the hand lever from either of its three operative positions. Attached to the shaft 76 is a sleeve 80 having two upstanding arms 81 each provided with a notch to engage the lugs of the shifting yoke 82 which engages the clutch 49 to shift it. To the forward end of the shaft 76 is fixed a crank arm 83, connected to the lower end of the lock bar 84 to move it vertically. Near the upper end of the lock bar 84 is an aperture in the form of a double key hole having a circular part 85 and two narrow vertical extensions 86. Extending through the key hole is a shaft 87 which is slidably supported in bearings 88 on the casting 72. The diameter of this shaft 87 is such that it will fill the circular part of the key hole and prevent the vertical movement of the lock bar. Formed in the shaft 87 is a circumferential groove 89 of such proportions that when in position to register with the lock bar 84 said bar will be free to move vertically. Fixed to the shaft 87 is a shifting yoke 90 which engages the groove in the body of the pinions 73 to cause it to move longitudinally of the shaft 70 with movement of the shaft 87. A pin 91 projecting from the shaft 87 affords a handle by which it may be conveniently moved. The proportions of the parts are such that when the clutch 49 is in engagement either with the gear 47 or the bevel gear 52 the lock bar 84 will engage the groove 89 to hold the pinion 73 out of engagement with the gear 74, and when the clutch 49 is in its central, or neutral position, the shaft 87 will be free to move to shift the pinion 73 into its engagement. When the pinion 73 is in engagement with the gear 74 the lock bar 84 will be held by the body of the shaft 87 against vertical movement and will thereby prevent the engagement of the clutch 49.

Supported for vertical adjustment relative to the base plate 1 is a supporting frame in the form of an annular ring 92, adapted to support the coal cutting mechanism as will hereinafter appear. To this ring are attached three depending brackets 93 the lower ends of which are shaped to engage respectively with the upstanding guide members 94 which are secured to the base plate 1 and which serve to prevent lateral movement of the ring and attached parts relative to the truck. Secured to these depending brackets are screw nuts 95 which engage with screw shafts 96 supported at their top ends by the bearing plate 97, attached to the upstanding guide members 94, and at their lower end in step bearings formed in the bearing brackets 98 attached to the lower side of the base plate 1. The three sets of screw shafts and guide members constitute upright supports for the annular supporting frame, and the latter can be adjusted vertically in parallelism, or angularly by suitable rotation of the screw shaft. Mounted for free rotation upon the screw shaft 96 are sprocket wheels 99 which are driven by the chain 100 from the sprocket wheel 57. Idler sprocket wheels 101 and 102 serve to guide the chain 100, the sprocket wheel 102 being mounted in the adjustable support 103 to afford means for adjusting the tension of the chain 100. The sprocket wheels 99 as shown in Fig. 13 have formed upon their upper surface clutch teeth 104 adapted to engage with similar teeth on clutch members 105 splined to the screw shafts. The clutch members 105 are each provided with a groove 106 in engagement with the arm 107 attached to a vertical shaft 108. The shaft 108 extends through the floor plate 1 and is provided with a convenient handle 109 by which the movement of the clutch members 105 may be controlled. In the shaft 108 is fixed a projecting pin 110 which engages the upper surface of the castings 111 to support the clutch members 105 when the handle is in the position shown. When the handle is turned the pin 110 is brought into alignment with a notch 112 and the

clutch member can be lowered into engagement with the sprocket wheel. By this mechanism the power of the motor 14 may be applied to any or all of the adjusting screw shafts to effect the vertical adjustment of the ring 92 and with it the cutting mechanism mounted thereon.

Attached to the ring 92 by stud pivot pins 113 are a plurality of rollers 114 upon the edges of which rests the circular casting 115 which constitutes the main base frame of the cutting mechanism. This casting 115 forms a turn table, rotatable about the center of the ring 92 and is held against lateral displacement by the guide rollers 116 which engage the inner surface of the ring. In the outer edge of the turn table casting 115 is formed a series of notches 117. A bracket 118 is secured to the ring 92 and in this bracket is slidably mounted a bolt 119 which, when in its inner position, is adapted to engage the notches 117 to lock the turn table against rotation. 120 is an electric motor secured to the underside of the turn table. This motor is connected through the pinion 121 and the spur gear 122 with the horizontal power shaft 123. A vertical power shaft 124 is operatively connected with the shaft 123 by means of a bevel pinion and a bevel gear 125.

126 is a horizontal shaft mounted in suitable bearings on the underside of the turn table. This shaft 126 carries a ratchet wheel 127 near its center. Pivotally mounted at each side of the ratchet wheel 127 are arms 128 between which there is pivotally mounted a pawl 129 which is normally held in engagement with the ratchet wheel by means of the spring 130. The arms 128 are oscillated about their pivotal axis by means of a link 131 which is connected therewith by means of a knuckle joint 132, and is connected at its other end to the eccentric strap 133 of the eccentric 134 which is mounted on the vertical shaft 124, being preferably formed as a part of the gear 125. 135 is an arcuate shield mounted concentrically with the ratchet wheel 127, and adapted to be oscillated about the axis of the wheel by means of the hand rod 136. The hand rod 136 is notched to engage the edge of the plate 137 attached to the turn table 115, to hold the shield 135 in any desired position, and is held in contact therewith by a spring pressed plunger 138 mounted in a bearing 139 on the turn table casting. 140 is a second pawl normally engaging the ratchet wheel 127 and held in engagement by the spring 141.

In operation when the shaft 124, together with the eccentric 134, is being continuously rotated, oscillatory movement is given to the arms 128 and the pawl 129, which movement is transmitted to the shaft 126 by means of the ratchet wheel. The shield 135 serves to hold the pawl out of engagement with the ratchet wheel during part of its movement. By varying the position of the shield, the pawl may be held inoperative during a greater or less part of its movement and the rate of rotation of the ratchet wheel 127 and the shaft 126 may be thereby regulated. The pawl 140 serves to prevent retrograde movement of the ratchet wheel and shaft.

The shaft 126 carries at one end a worm 142 which meshes with the worm wheel 143 fixed to the lower end of the vertical shaft 144. The vertical shaft 144 is journaled in a journal bearing 145 formed in the frame casting 115. To the upper end of the shaft 144 is fixed the driving member 146 of a multiple disc friction clutch, the driven member of which is formed in the hub of the winding drum 147. To the upper flange of the drum is attached a disc 148 through the center of which is threaded a screw 149 adapted to contact with the end of the shaft 144. The screw 149 is provided with a hand wheel 150 by which it may be rotated to raise or lower the drum relative to the shaft 144 and clutch member 146, thereby applying pressure to or releasing the friction disc of the clutch. Attached to the drum 147 and windable thereon is a cable 151 the outer end of which may, if desired, be secured, as shown in Fig. 1, to the vertical stud, or holder 152, which is provided on a ring 92. Horizontal idler sheaves 153 are arranged in a circumferential series around the turn table. These sheaves serve to guide the cable from the holder 152 tangentially to the edge of the turn table. It will now be apparent that when the cable is connected to the holder 152 and the winding drum is caused to rotate in a winding direction, the winding of the cable will cause the rotation of the turn table about the center of the ring.

Mounted upon a bracket 154 attached to the ring 92 is a vertical guide sheave 155 in alignment with a similar sheave 156 attached to the side angle 2 of the truck frame. Two similar sheaves 157 and 158 are mounted horizontally under the rear end of the truck frame. These sheaves are provided to guide the feed cable 151 for use under special conditions which will be hereinafter fully set forth.

Attached to the turn table 115 is a radially extending bracket 159 having an upwardly extending arm 160 to the top of which is fixed a cutter arm 161, and a downwardly extending arm 162 to the bottom of which is secured the cutter arm 163. In the arms 160 and 162 are formed journal bearings wherein is journaled a vertical shaft 164 to the projecting ends of which are attached the driving sprocket wheels 165 and 166 of the respective cutter arms. Mounted upon the vertical shaft 164, between the arms 160 and 162 is a sprocket wheel 167 which is en-

gaged by the endless driving chain 168. The chain 168 also passes around the sprocket wheels 169 fixed to the upper end of the vertical shaft 124. Through the chain 168 and sprocket wheels 167 and 169 power from the motor 120 is transmitted to the vertical shaft 164 to actuate the cutting mechanism. The cutter arms 161 and 163 are of a well known construction each consisting of an elongated frame around the edges of which travels a cutter chain 170 provided with renewable cutter bits adapted to form horizontal kerfs 161[a] and 163[a] in the coal body. At the forward end of each of the cutter arms is secured a ball bearing 171 upon which is rotatable a sprocket wheel 172 engaged and driven by the respective cutter chains. Extending between and attached to the sprocket wheels 172 is a vertical shaft 173 provided with transverse sockets in which are set renewable cutter bits 174 and constitutes a cutter bar adapted to form a vertical kerf 173[a] in the coal body. The cutter arms 161 and 163 and the cutter bar 173 constitute a cutting mechanism which when moved transversely of the coal body will form a continuous kerf above, behind, and below the coal to completely sever sections 191 therefrom.

In order to avoid frequent interruptions in the operation of the machine, and its withdrawal from the mine room after each successive cut to permit of the removal of the broken down coal, I have provided a conveyer which affords convenient means for removing the coal rearwardly of the machine and loading it into conveniently placed cars for transportation from the mines. This conveyer has a relatively low horizontal portion 175, resting upon the base plate of the truck and extending forwardly beneath the turn table 115, an inclined portion 176 and a relatively high horizontal portion 177 which extends rearwardly of the machine to discharge the coal into cars 178 conveniently positioned upon the mine tracks 8. This conveyer may be of any preferred type but for the purpose of illustration I have shown a conveyer of the well known chain and scraper type comprising a pair of endless chains 179 joined at spaced intervals by cross bars 180 and adapted to travel over the bottom plates 181 of the conveyer trough to propel material therealong. The conveyer trough is composed of suitable plates and angles joined together in the manner well known in conveyer practice and need not be further described at this time. At the forward end of the conveyer the chains 179 pass around a cross bar 182 fixed in the conveyer frame and at the rearward end around the customary foot shaft 183 which is provided with the usual devices for adjusting the tension of the chains. The rearward part of the conveyer is supported by upright angle bars 184 on the extension platform 11 and on these angle bars are supported journal bearings 185 in which is mounted the cross shaft 186. Fixed to the cross shaft 186 are sprocket wheels 187 adapted to engage the return strand of the conveyer chains 179 to drive the conveyer. Mounted upon the projected end of the shaft 186 is a sprocket wheel 188 which is engaged by the driving chain 40 through which power is transmitted from the motor 14 to drive the conveyer. The side plates 189 of the lower horizontal portion 175 of the conveyer constitutes a convenient hopper into which material may be shoveled by the operator to be moved along the trough by the chain and scrapers and deposited in the car 178 for transportation from the mine.

When working on the room and pillar plan, at each successive operation the cutting mechanism is turned to the right hand side of the room and the machine advanced to a suitable position relative to the coal face. The supporting ring 92 is then vertically adjusted to bring the lower cutter arm 163 to the level of the mine floor as illustrated in Fig. 17. The feed rope 151 is then drawn out from the winding drum 147 passed around the guide sheaves 153 and attached to the abutment 152, as illustrated in Fig. 1. The motor 120 is then started to drive the cutting mechanism, and the hand wheel 150 manipulated to cause the feed rope 151 to be wound upon the drum 147. The cutting mechanism will thus be caused to swing through a semicircular arc from right to left, cutting a crescent shaped block of coal from the vein. As the cutting progresses the overhanging weight of the coal will break off fragments which falling to the floor of the mine will be broken up into convenient size to be shoveled onto the conveyer 175 and by it loaded into the car 178 for removal from the mine. After the removal of the lower portion of the vein as above described, the cutting mechanism will be returned to the right hand side of the room and the supporting ring 92 adjusted vertically to bring the upper cutter arm 161 to the level of the mine roof as illustrated in Fig. 18. The cutting mechanism will again be swung to the left to remove the upper part of the vein, completing the operation as illustrated in Fig. 19.

In order to hold the machine to its work, suitable jacks may be placed against the truck frame in any preferred manner, but as their use will vary with local conditions which are well understood by those engaged in the operation of such machines, description of them is not thought to be necessary at this time.

In Figs. 20, 21, 22, and 23 I have illustrated a method of operation by which this machine may be used to drive entries or other narrow work. In Fig. 20 is shown the initial position of the machine with the forward end of the cutting mechanism advanced to the right hand rib adjacent the coal face. The turn table 115 is then locked against rotation by the bolt 119 and the motor 120 is started to drive the cutting mechanism, and the auxiliary motor 14 is started and the clutch mechanism manipulated to cause the machine to move bodily forward upon the track rails 8 to the position illustrated in Fig. 21. When the cutting mechanism has penetrated the coal to a sufficient depth the turn table is again released and the hand wheel 150 manipulated to wind the feed rope to cause the cutting mechanism to swing to the left to the position illustrated in Fig. 22, after which the turn table is again locked and the truck moved rearwardly along the track to the position shown in Fig. 23 thus completing the cut.

In Fig. 24 is illustrated a method of operating the machine upon the long wall system. In such a case the machine is initially advanced to the forward end of the coal face with the cutting mechanism extending forward. The cutting mechanism is then rotated towards the left to make the entering or sumping cut. When it has reached a position at right angles to the coal face the turn table 115 will be locked against further rotation and the feed rope 151 drawn out from the drum 147, carried around the guide sheaves 155, 156, 157, and 158 and attached to a suitable anchor 190 positioned adjacent the coal face at the rear of the machine. Upon winding the feed rope 151 the machine will be moved bodily rearwardly causing the cutting mechanism to sever a section from the long wall face of the vein.

After the removal of the lower portion of the vein the machine may be returned to the point of beginning and the upper part removed as above described. Other methods of operation will suggest themselves to persons skilled in the art, but the above examples are thought to be sufficient to demonstrate that the cutting mechanism here described is adapted to be moved either inwardly or outwardly or laterally in the direction relative to the coal face to completely sever blocks of material from the body of the vein.

What I claim is:

1. In a mining machine, the combination with a supporting base, of cutting mechanism mounted thereon comprising two spaced apart kerf cutters adapted to form kerfs above and below a section of the mine wall, and a kerf cutter extending between the inner ends of said spaced apart kerf cutters and having cutter bits arranged to cut a kerf between the aforesaid kerfs when said cutting mechanism is moving either inwardly or outwardly or laterally in either direction relative to the material to be mined.

2. In a mining machine, the combination with a supporting base, of cutting mechanism mounted thereon comprising two parallel spaced apart kerf cutters adapted to form parallel kerfs in the mine wall, and a kerf cutter extending between the inner ends of said parallel kerf cutters and having cutter bits arranged to cut a kerf extending between said parallel kerfs while said cutting mechanism is moving either inwardly or outwardly or transversely in either direction relative to the materials to be mined.

3. In a mining machine, the combination with a supporting base adapted to be moved towards or from a coal face, of cutting mechanism pivotally mounted thereon comprising two spaced apart kerf cutters adapted to form spaced apart kerfs in the mine wall, and a kerf cutter extending between the inner ends of said spaced apart kerf cutters and having cutter bits arranged to cut a kerf between said spaced apart kerfs when said supporting base is moving either inwardly or outwardly or when said cutting mechanism is moving laterally in either direction about its pivot.

4. In a mining machine, the combination with a supporting base adapted to be moved toward or from a coal face, of cutting mechanism pivotally mounted thereon comprising two spaced apart parallel kerf cutters adapted to form parallel kerfs in the mine wall and a kerf cutter extending between the inner ends of said spaced apart kerf cutters and having cutter bits arranged to cut a kerf between said parallel kerfs when said supporting base is moving either inwardly or outwardly or said cutting mechanism is moving laterally in either direction about its pivot.

5. In a mining machine, the combination with a supporting base, of vertically adjustable cutting mechanism pivotally mounted thereon comprising two spaced apart kerf cutters adapted to form spaced apart kerfs in the mine wall, and a kerf cutter extending between the inner ends of said spaced apart kerf cutters and having cutter bits arranged to cut a kerf between said spaced apart kerfs when said supporting base is moving either inwardly or outwardly or when said cutting mechanism is moving laterally in either direction above its pivot.

6. In a mining machine, the combination with a supporting base, of pivotally mounted cutting mechanism comprising two vertically spaced parallel elongated cutter

arms, cutter chains upon the cutter arms, and a vertical rotary cutter bar extending between the inner ends of the cutter arm and arranged to be actuated by the cutter chain.

7. In a mining machine, the combination with a vertically adjustable supporting base, of pivotally mounted cutting mechanism comprising two vertically spaced parallel elongated cutter arms, cutter chains upon the cutter arms, and a vertical rotary cutter bar extending between the inner ends of the cutter arms and arranged to be actuated by the cutter chains.

8. In a mining machine, the combination with a supporting base, of pivotally mounted cutting mechanism comprising a plurality of spaced parallel elongated cutter arms, cutter chains upon the cutter arms, and a rotary cutter bar perpendicular to said cutter arm extending between the inner ends thereof and arranged to be actuated by the cutter chains.

9. In a mining machine, the combination with a cutting mechanism comprising a plurality of spaced parallel elongated cutter arms, cutter chains upon the cutter arms, and a rotary cutter bar perpendicular to said cutter arms and extending between the inner ends thereof and arranged to be actuated by said cutter chains, with means to move said cutting mechanism relative to the material to be mined to sever blocks of material therefrom.

10. In a mining machine, the combination with cutting mechanism comprising a plurality of spaced parallel elongated cutter arms, cutter chains upon the cutter arms, and a rotary cutter bar perpendicular to said cutter arms and extending between the inner ends thereof and arranged to be actuated by said cutter chains, with means to move said cutting mechanism either inwardly or outwardly or laterally in either direction relative to the material to be mined to sever blocks of material therefrom.

11. In a mining machine, the combination with a cutting mechanism comprising a plurality of spaced parallel elongated cutter arms, cutter chains upon the cutter arms, and a rotary cutter bar perpendicular to said cutter arms and extending between the inner ends thereof and arranged to be actuated by the cutter chains, with means to move said cutting mechanism either inwardly or outwardly or laterally in either direction relative to the material to be mined to sever blocks of material therefrom, and means to adjust the cutting mechanism perpendicularly relative to the direction of cutting movement.

12. In a mining machine, the combination with a wheel supported truck, of a pivotally mounted supporting base, cutting mechanism extending laterally from the supporting base comprising two laterally spaced parallel elongated cutter arms, cutter chains upon the cutter arms, a vertical rotary cutter bar extending between the inner ends of the cutter arms and arranged to be actuated by the cutter chains, means to rotate the supporting base relative to the truck, and means to move the truck relative to the material to be mined.

13. In a mining machine, the combination with a wheel supported truck, of a pivotally mounted supporting base, cutting mechanism extending laterally from the supporting base comprising two vertically spaced parallel elongated cutter arms, cutter chains upon the cutter arms, a vertical rotary cutter bar extending between the inner ends of the cutter arms and arranged to be actuated by the cutter chains, means to adjust the supporting base vertically, means to rotate the supporting base, and means to move the truck relative to the material to be mined.

In testimony whereof, I affix my signature.

NILS D. LEVIN.