

May 30, 1961

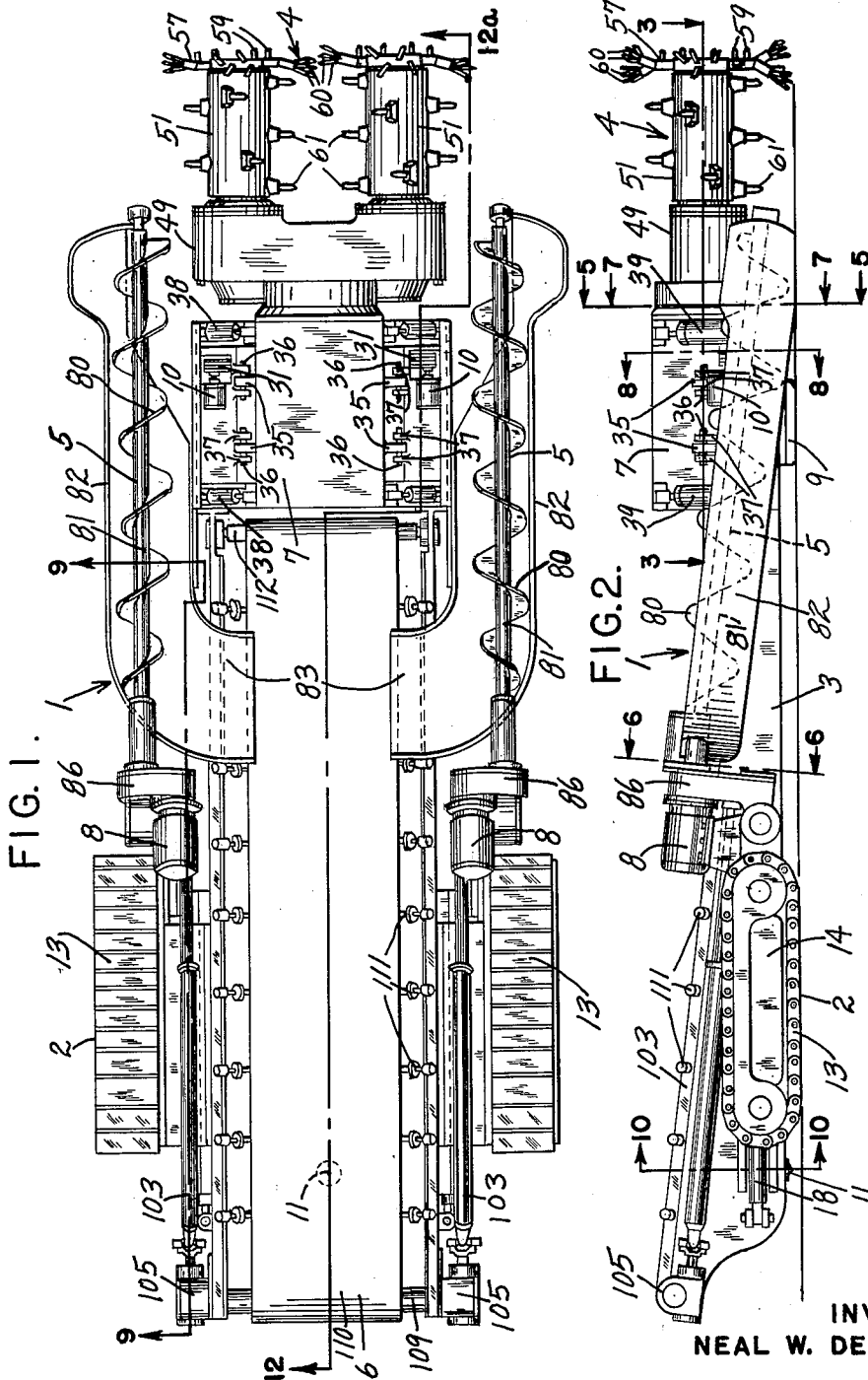
N. W. DENSMORE

2,986,384

MINING MACHINE HAVING TILTABLE DUAL MINING HEAD

Filed Oct. 9, 1956

9 Sheets-Sheet 1



INVENTOR:
NEAL W. DENSMORE

BY *Charles F. Osgood,*

ATTORNEY

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N. W. DENSMORE

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9 Sheets-Sheet 2

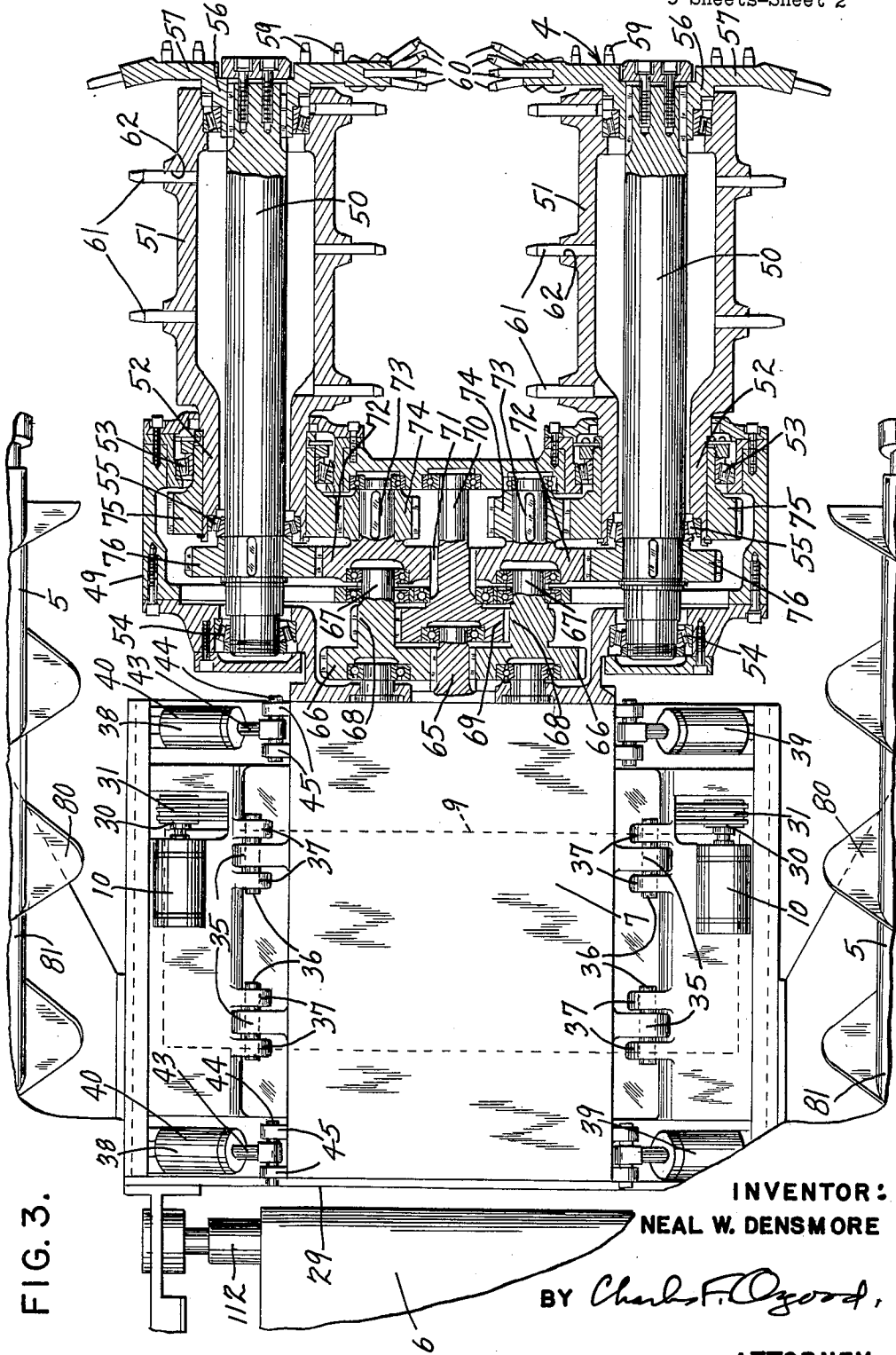


FIG. 3.

INVENTOR:
NEAL W. DENSMORE

BY *Charles F. Osgood,*

ATTORNEY

May 30, 1961

N. W. DENSMORE

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9 Sheets-Sheet 3

FIG. 4.

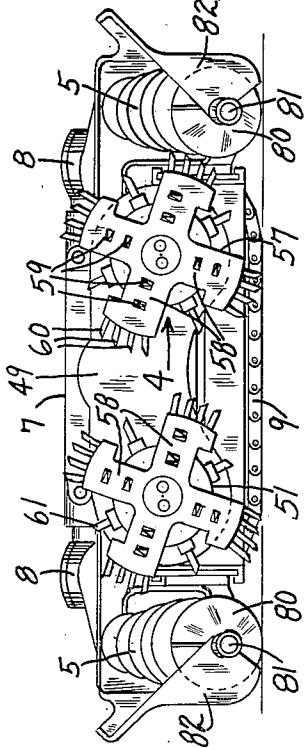


FIG. 5.

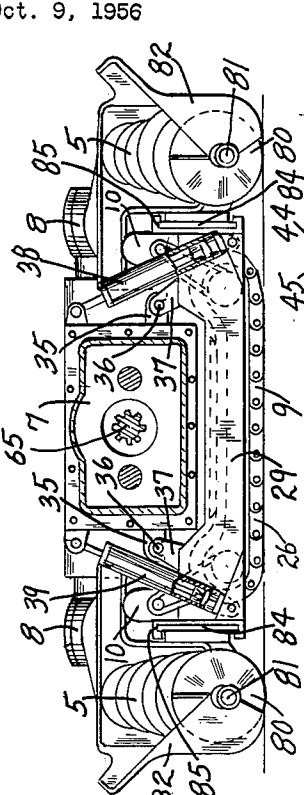


FIG. 6.

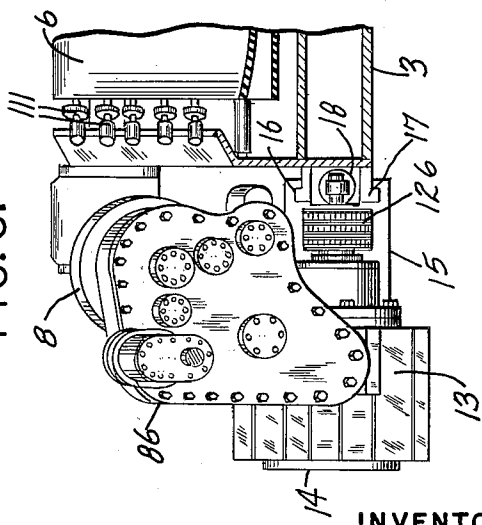


FIG. 7.

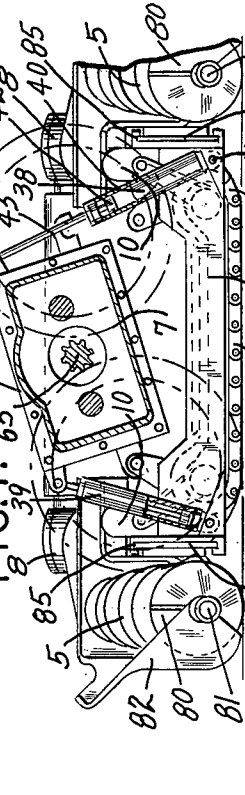
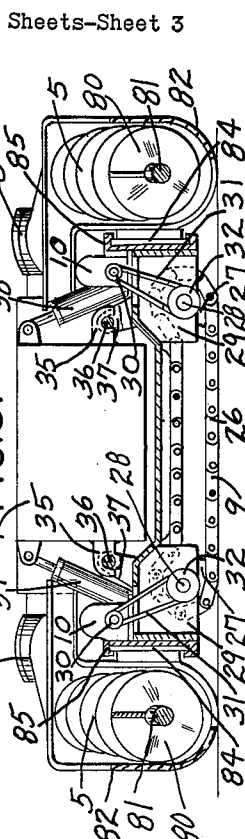


FIG. 8.



INVENTOR:
NEAL W. DENSMORE

BY *Charles F. Osgood*,

ATTORNEY

May 30, 1961

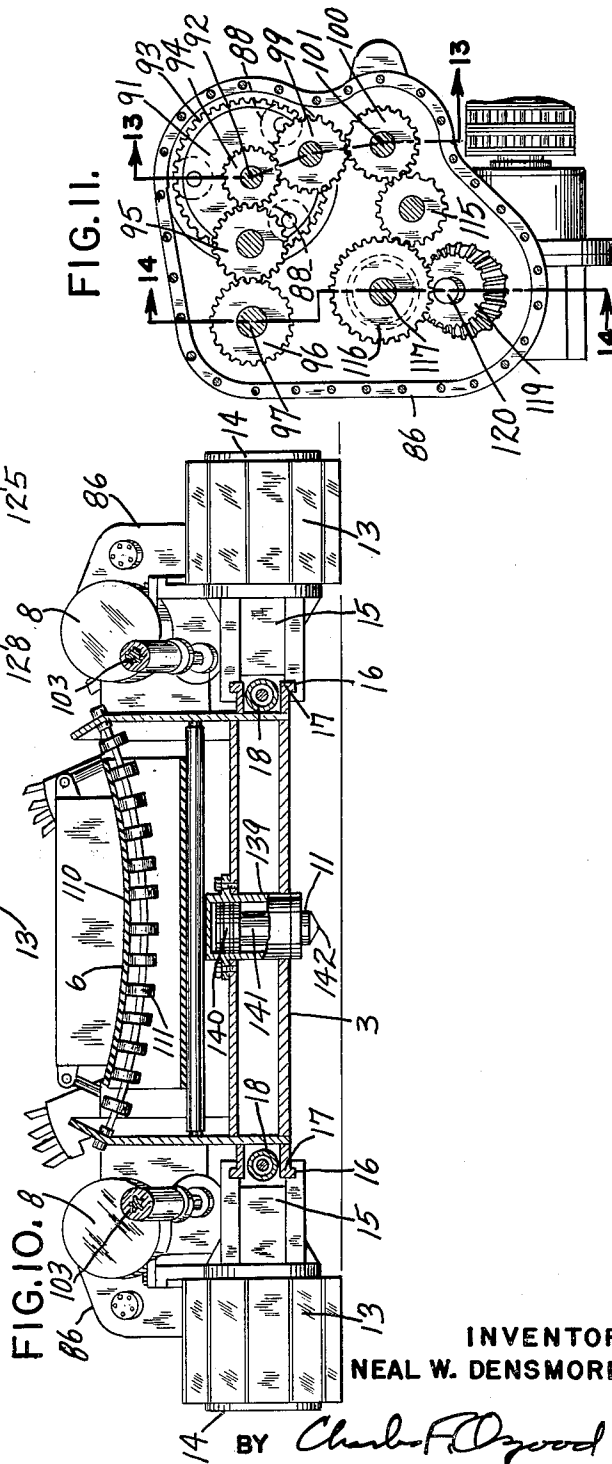
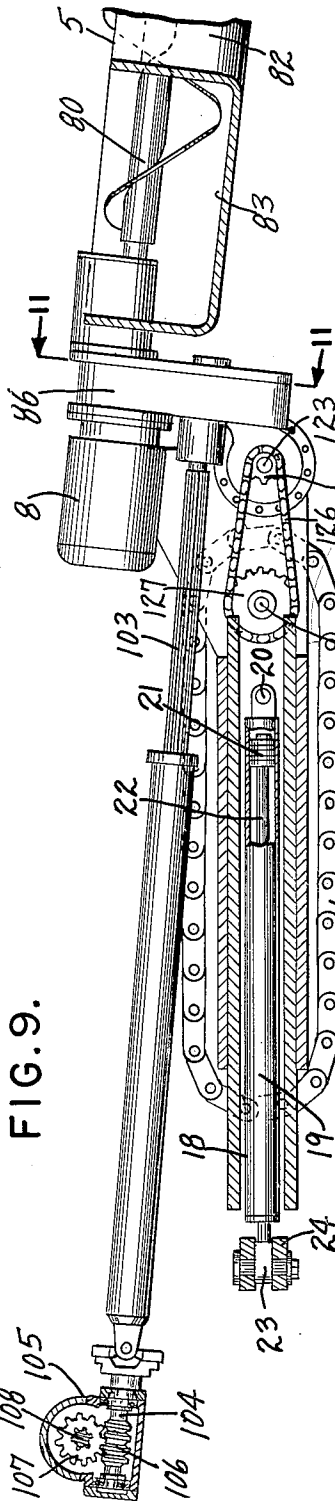
N. W. DENSMORE

2,986,384

MINING MACHINE HAVING TILTABLE DUAL MINING HEAD

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9 Sheets-Sheet 4



INVENTOR:
NEAL W. DENSMORE

BY *Charles F. Dwyer*

ATTORNEY

May 30, 1961

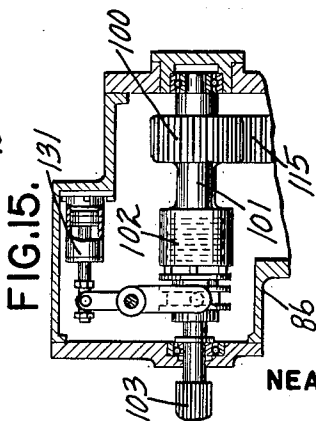
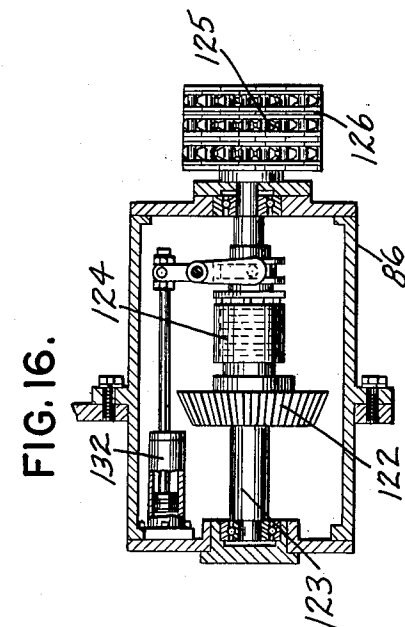
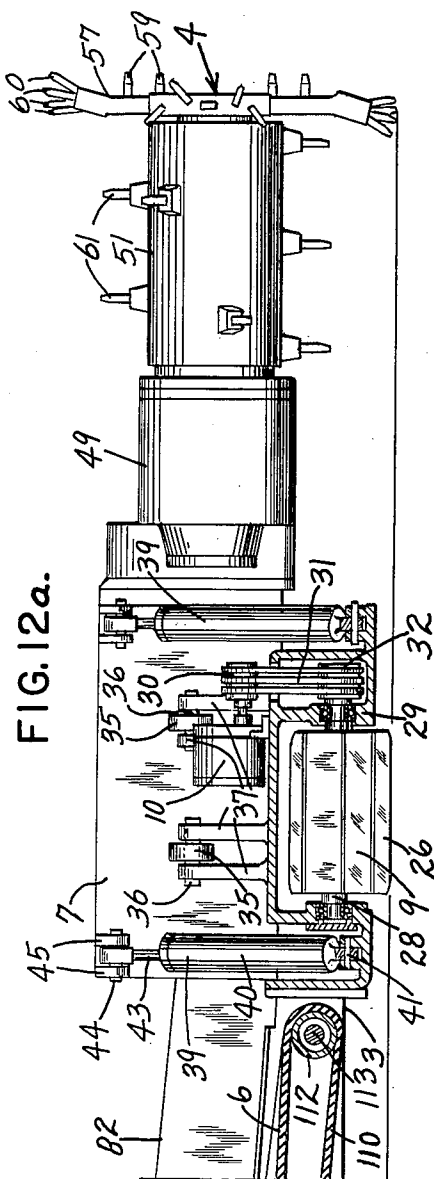
N. W. DENSMORE

2,986,384

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9 Sheets-Sheet 6



INVENTOR:
NEAL W. DENSMORE

BY *Charles F. Orgood.*

ATTORNEY

May 30, 1961

N. W. DENSMORE

2,986,384

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Filed Oct. 9, 1956

9 Sheets-Sheet 7

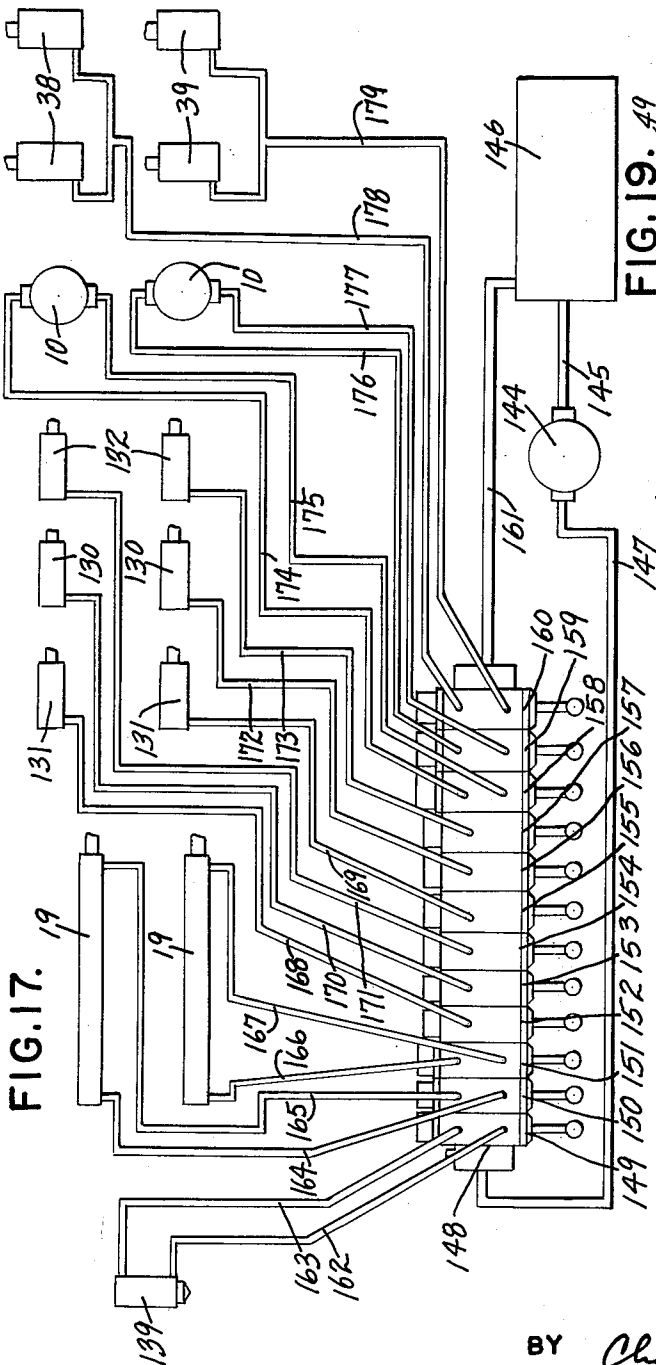


FIG. 19. 49

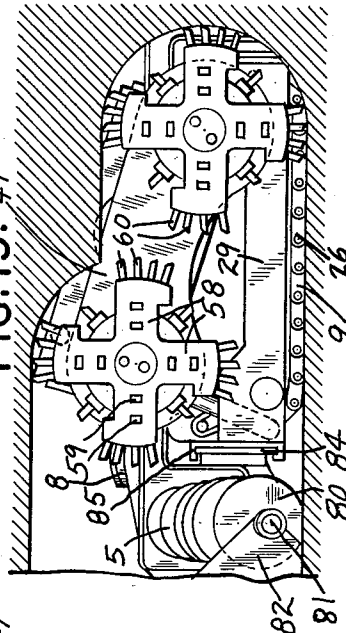
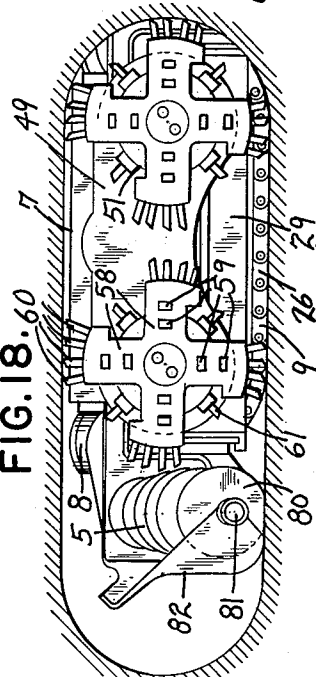


FIG. 18. 60



INVENTOR:
NEAL W. DENSMORE

BY *Charles F. Osgood,*

ATTORNEY

May 30, 1961

N. W. DENSMORE

2,986,384

MINING MACHINE HAVING TILTABLE DUAL MINING HEAD

Filed Oct. 9, 1956

9 Sheets-Sheet 8

FIG. 21.

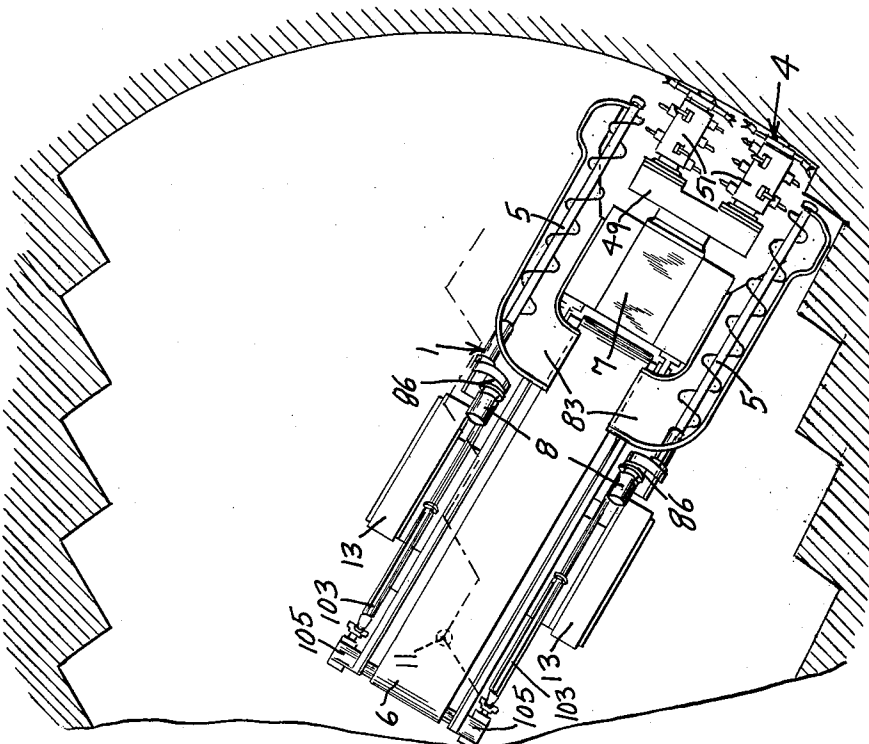
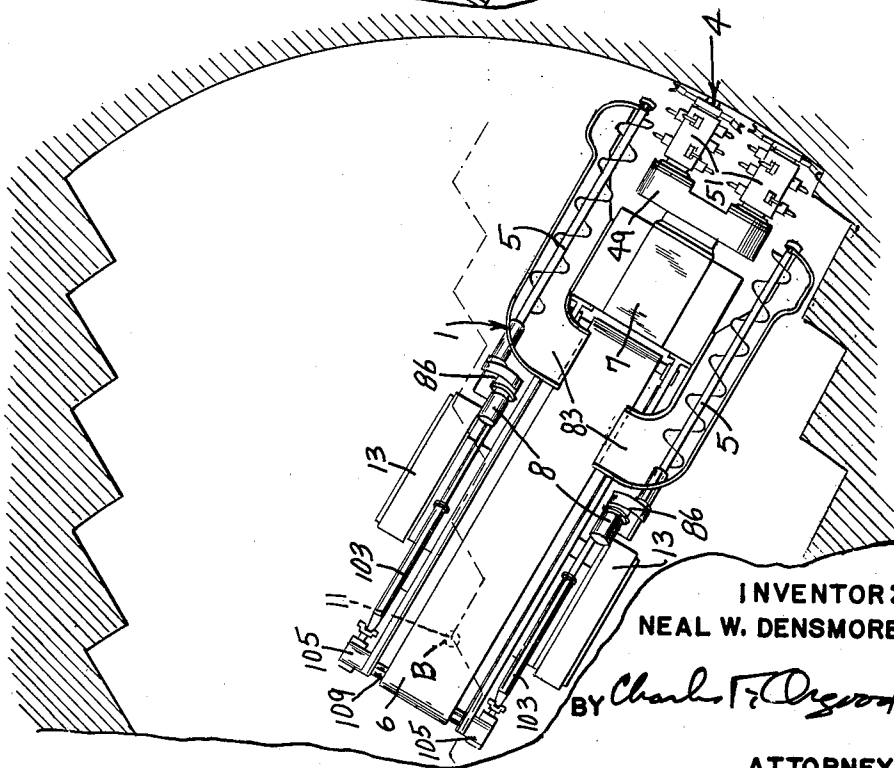


FIG. 20.



INVENTOR:
NEAL W. DENSMORE

BY *Charles F. Osgood*

ATTORNEY

May 30, 1961

N. W. DENSMORE

2,986,384

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9 Sheets-Sheet 9

FIG. 23.

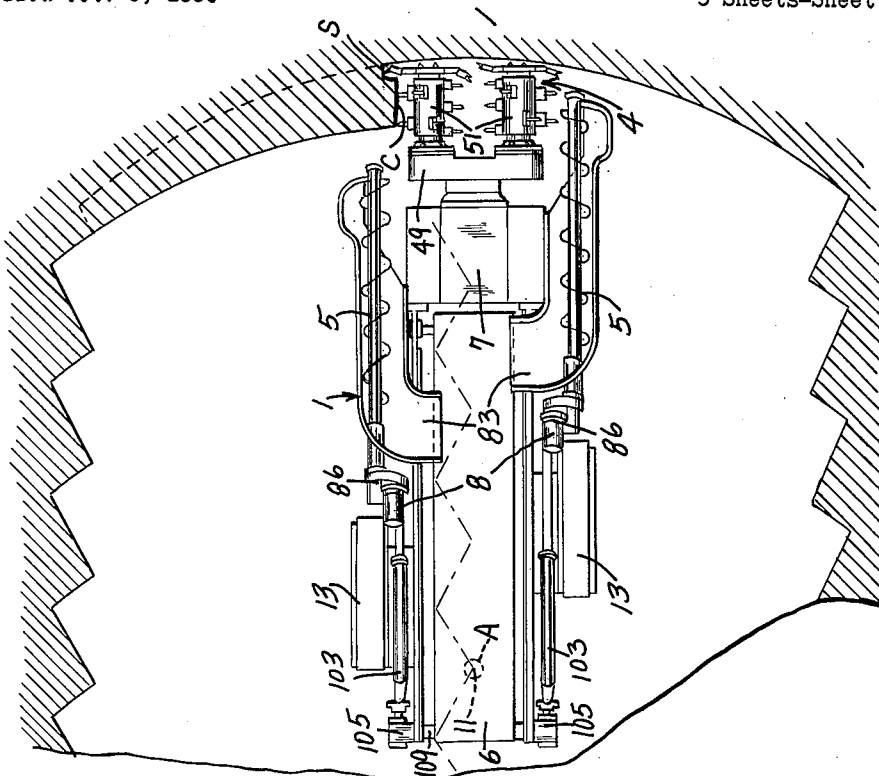
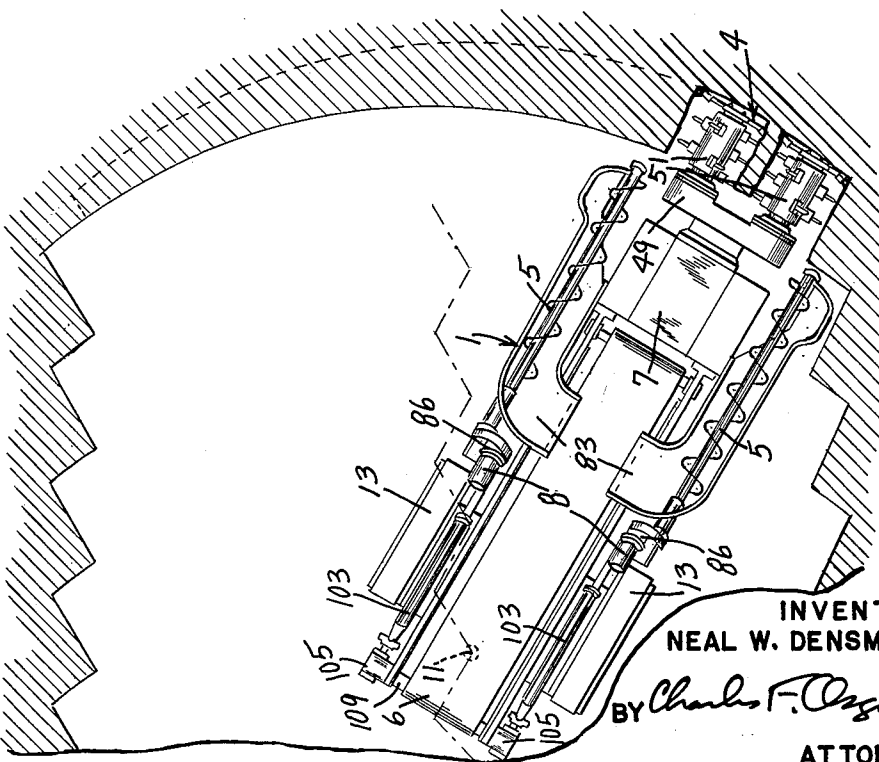


FIG. 22.



INVENTOR:
NEAL W. DENSMORE

By *Charles F. Osgood*

ATTORNEY

1

2,986,384

MINING MACHINE HAVING TILTABLE DUAL
MINING HEAD

Neal W. Densmore, Franklin, Pa., assignor to Joy Manufacturing Company, Pittsburgh, Pa., a corporation of Pennsylvania

Filed Oct. 9, 1956, Ser. No. 614,977

9 Claims. (Cl. 262—19)

This invention relates to mining apparatus and more particularly to a mining and loading machine for dislodging mineral from a solid mine vein and for loading out the dislodged mineral.

In mining and loading machines of known types the cutting, dislodging and disintegrating mechanism usually lacks sufficient vertical compactness to obtain the desired low height for low vein work while retaining the desired lateral flexibility to provide for wide mine passages or entries without frequent repositioning of the entire machine. The cutting, dislodging and disintegrating mechanism of the present invention is not only extremely vertically compact but also has the desired lateral flexibility, thereby being well adapted for use in mines having low headroom.

The present invention is an improvement over those disclosed in the copending applications of A. L. Barrett, Serial No. 355,975, filed May 19, 1953 now Patent No. 2,776,809; Serial No. 430,175, filed May 17, 1954 now Patent No. 2,776,823 and Serial No. 574,528, filed March 28, 1956 now Patent No. 2,836,408, owned by the assignee of the present invention. The machine of the present invention has its cutting, dislodging and disintegrating mechanism adjustable in height to accommodate itself to mine veins of varying heights thereby enabling mining out the full width of the face of the vein in one operation, and improved, more flexible floor clean-up means is provided for gathering loose mineral which has fallen to the mine floor during the mining operation, and both the cutting, dislodging and disintegrating mechanisms and the floor clean-up means are reversible whereby the machine may operate in either of opposite directions. Further, the machine of the present invention is more vertically compact than the machines of the copending applications while still retaining the desired lateral flexibility and adjustability in height to compensate for variations in mining conditions. The machine of the present invention is not only extremely low in height and flexible in operation but is also relatively simple and rugged in design and may be readily maneuvered and controlled.

An object of the present invention is to provide an improved mining and loading machine especially designed for use in the mining of mineral in low vein mines. Another object is to provide an improved mining machine having improved cutting and dislodging mechanism which is adjustable in height to compensate for varying heights of mine veins. Yet another object is to provide an improved mining and loading machine which is extremely vertically compact while retaining its desired lateral flexibility and adjustability in operating height thereby to enable the machine to be accommodated to varying mining conditions. A further object is to provide an improved mining machine of the multiple cutting and disintegrating head type. Still another object of the invention is to provide an improved multiple-head-type mining mechanism whereby the effective height of the mechanism may be adjusted for accommodation to mine

2

veins of varying heights. Yet another object of the invention is to provide an improved mining and loading machine which is reversible and embodies reversible cutting and dislodging mechanism. These and other objects and advantages of the invention will, however, hereinafter more fully appear.

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

10 In these drawings:

Fig. 1 is a plan view of the improved mining and loading machine.

Fig. 2 is a side view of the mining and loading machine shown in Fig. 1.

15 Fig. 3 is an enlarged horizontal section with parts shown in full, taken on line 3—3 of Fig. 2.

Fig. 4 is a front end view of the mining and loading machine.

20 Fig. 5 is an enlarged cross section taken on line 5—5 of Fig. 2.

Fig. 6 is a fragmentary detail section taken on line 6—6 of Fig. 2.

Fig. 7 is an enlarged cross section taken on line 7—7 of Fig. 2, showing parts in a vertically adjusted position.

25 Fig. 8 is an enlarged cross section taken on line 8—8 of Fig. 2.

Fig. 9 is a longitudinal vertical section taken on line 9—9 of Fig. 1.

30 Fig. 10 is an enlarged cross section taken on line 10—10 of Fig. 2.

Fig. 11 is an enlarged detail section taken on line 11—11 of Fig. 9.

35 Figs. 12 and 12a, taken together, constitute an enlarged longitudinal vertical section taken on line 12—12a of Fig. 1.

Figs. 13 and 14 are enlarged longitudinal vertical sections taken respectively on lines 13—13 and 14—14 of Fig. 11.

40 Fig. 15 is a detail section taken on line 15—15 of Fig. 13.

Fig. 16 is a detail section taken on line 16—16 of Fig. 4.

Fig. 17 is a diagrammatic view illustrating the hydraulic fluid system.

45 Figs. 18 and 19 are cross sectional views taken through a mine passageway showing the cutting, dislodging and disintegrating mechanism in different operating positions.

50 Figs. 20, 21, 22 and 23 are diagrammatic views showing a mine passageway in horizontal section and with the mining and loading machine in different operating positions thereby to illustrate the method of removing the mineral from the solid.

55 In this illustrative construction, as shown in the drawings, the mining and loading machine is generally designated 1 and generally comprises a mobile base 2 carrying a frame 3 which is guided on the base for longitudinal sliding movement relative thereto and on the forward end of which a cutting and dislodging mechanism, generally designated 4, is adjustably mounted. Gathering devices 5 extend generally longitudinally at the opposite sides of the forward portion of the sliding frame for gathering the disintegrated mineral dislodged from the face by the cutting and dislodging mechanism and for moving the mineral gathered thereby rearwardly for discharge onto a conveying means 6 which in turn moves the disintegrated mineral rearwardly of the machine to a convenient point of discharge. A motor 7 serves to drive the cutting and dislodging mechanism while motors 8 serve to drive the gathering devices, the base propelling means and the conveying means. A transversely disposed propulsion device 9 (Figs. 8 and 12a) is driven by motors 10 for swinging the cutting and dislodging mechanism laterally along an

arcuate path with the base and a rearwardly located jack device or spud 11 at the rearward portion of the sliding frame serves to provide a pivot point during such lateral swinging movement. The jack device or spud 11 also serves to relieve the base of a substantial portion of the weight of the machine during swinging movement of the base.

The mobile base 2 is herein in the form of a crawler base having parallel crawler treads 13 guided for orbital circulation about tread side frames 14 and extending along the inner sides of these tread frames are frame structures 15 which provide longitudinal guideways 16. The sliding frame 3 has extending longitudinally along its opposite sides lateral guides 17 which are slidably engaged in the guideways 16. Thus the sliding frame 3 may slide longitudinally relative to the tread side frames of the base and, as hereinafter described, the tread side frames have independent sliding movement relative to the frame 3 while the latter may remain relatively stationary. Extending longitudinally within the guide structure at the sides of the sliding frame are extensible power devices 18 (Figs. 9 and 10) desirably in the form of hydraulic jacks comprising cylinders 19 pivotally connected at 20 at their forward ends to the inner sides of the tread side frames and containing reciprocable pistons 21 having rearwardly extending piston rods 22 which are pivotally connected at 23 to lugs 24 secured to the outer sides of the rearward portion of the sliding frame 3. These hydraulic jack devices may be operated simultaneously to effect movement of the sliding frame longitudinally relative to the tread side frames, as later explained. Under certain conditions, when the tread drive clutches are released the hydraulic jacks 18 may be employed to move the tread frames longitudinally relative to the frame 3, although customarily this would be accomplished by driving the treads themselves.

The forward portion of the sliding frame is supported by the transversely disposed propelling device 9 which is herein likewise of the crawler type movable over the mine floor and comprising an endless crawler tread 26 which passes around chain sprockets 27 secured to longitudinally extending shafts 28 suitably journaled within a transverse frame portion 29 (Fig. 12a) secured to the forward portion of the sliding frame 3. The motors 10 are herein desirably of the conventional hydraulic type and are mounted at the top of the frame portion 29 and the motor power shafts are connected to drive pulleys 30 connected by endless drive belts 31 to drive pulleys 32 secured to the forward portions of the shafts 28. One of the motors 10 serves to drive the crawler tread 26 in one direction while the other motor serves to drive the crawler tread in the opposite direction and these motors are provided with conventional control means whereby they may be selectively operated. When the crawler tread is driven the outer portion of the sliding frame and the cutting and dislodging mechanism carried thereby may be swung laterally about the pivotal axis provided by the rear jack 11 and when the sliding frame is fed longitudinally relative to the base the usual shoe-plates of the crawler tread 26 slide over the mine floor. If desired, a sliding shoe or skid may be mounted at the forward portion of the sliding frame or may be inserted beneath the transverse crawler tread to facilitate movement of the transverse crawler tread as it moves sidewise over the floor surface.

Now referring to the detail structure of the cutting and dislodging mechanism 4, it will be noted that the motor 7, which is desirably an electric motor, has at its sides lateral projections 35 which are hooklike in shape (Fig. 8) and these hook-shape projections engage longitudinally extending pivot pins 36 carried by spaced lugs 37 integral with the transverse frame portion 29 of the sliding frame. Pairs of oppositely inclined extensible power devices 38 and 39, desirably in the form of hydraulic jacks, comprise cylinders 40 pivotally

mounted at their lower ends at 41 on the transverse frame portion 29 and containing reciprocable pistons 42 having their piston rods 43 pivotally connected at their upper ends at 44 to lateral lugs 45 integral with the upper portion of a casing 46 of the motor 7. By separately operating the pairs of jacks 38 and 39, the motor casing together with the cutting and dislodging mechanism supported thereby may be tilted in vertical planes selectively about either the pivot pins 36 at one side of the motor or the other as desired. By trapping liquid in the jack cylinders the motor frame may be rigidly locked in adjusted position. As shown in Fig. 3, secured to the forward portion of the motor casing is a gear casing or housing 49 which provides a tiltable support for the cutting and dislodging heads, and this housing has journaled therein parallel longitudinally extending transmission shafts 50. These shafts, when the heads are in lowered positions (Figs. 3 and 18), desirably have their longitudinal axes aligned with the longitudinal axes of the pivot pins 36. By properly supplying liquid under pressure to the pairs of hydraulic jacks 38 and 39 either of the cutting and breaker heads may be swung arcuately about the axis of rotation of the other cutting and breaker head, as shown in Fig. 7, to vary the elevation of one rotary head with respect to the other, as hereinafter described. Coaxial with the shafts 50 are tubular drumlike supports or tubular members 51 having sleeve-like rearward portions 52 journaled in bearings 53 suitably supported within the gear casing. The rearward portions of the shafts 50 are journaled in spaced bearings 54 and 55, the former being supported within the gear casing and the latter being supported within the rearward portions of the rotary supports 51 (Fig. 3). Carried by the shafts 50 and the rotary supports 51 are drilling, core cutting and dislodging elements which may be generally similar to those disclosed in the compending applications above referred to. Keyed to the outer ends of the drive shafts 50 are the hubs 56 of rotary drilling and core cutting heads 57 having radial arms 58 which carry face cutters 59 and peripheral cutters 60. The rotary support carries a series of radially disposed core breaking bits 61 suitably secured in sockets 62 and these core breaker bits may be spirally arranged in the manner disclosed in the above mentioned application Serial No. 574,528, for conveying the disintegrated mineral outwardly from the face.

The driving means for the dual drilling and core cutting heads and for the rotatable breaker supports comprises a spur pinion 65 secured to the forward end of the motor power shaft and meshing at its opposite sides with and driving in relatively opposite directions spur gears 66 secured to parallel longitudinally extending shafts 67 suitably journaled within the gear casing 49. Also secured to the shafts 67 are spur pinions 68 meshing with the opposite sides of a centrally located spur gear 69, the latter being secured to a longitudinally extending shaft 70 likewise suitably journaled within the gear casing. Formed on the shaft 70 is a spur pinion 71 meshing at its opposite sides with and driving in relatively opposite directions spur gears 72 secured to longitudinally extending shafts 73 herein aligned with the shafts 67 and likewise suitably journaled within the gear casing. Keyed to the shafts 73 are spur gears 74 which mesh with relatively large spur gears 75 keyed or otherwise secured to the sleeve-like rearward portions 52 of the rotary breaker supports. Also meshing with and driven by the spur gear 72 are spur gears 76 keyed to the rearward portions of the drive shafts 50. It will thus be seen that the dual drilling and cutting heads are driven through the gearings above described in relatively opposite directions at a relatively high drilling and core cutting speed while the rotary breaker supports 51 may be concurrently driven in similar directions at a relatively slow core breaking speed.

The gathering devices 5 are herein desirably in the form of relatively oppositely rotating conveyor screws

or scrolls 80 having their shafts 81 forwardly and downwardly inclined and suitably journaled within scroll housings 82 mounted in inclined positions at the sides of the forward portion of the sliding frame 3. The scroll housings are open at the inner sides of their forward portions near the floor level to permit free entrance of the disintegrated mineral into the housings, as shown in Figs. 1, 5 and 7. Lateral chute-like discharge portions 83 at the upper rearward portions of the scroll housings overlie the side edges of the conveying means 6 so that the disintegrated mineral conveyed rearwardly and upwardly through the scroll housings by the scrolls may be discharged laterally through these chutes onto the conveying means. These scroll housings have lateral guides 84 at their inner sides, which slidably engage longitudinal guideways 85 at the outer sides of the transverse frame portion 29 of the sliding frame 3. Gear casings or housings 86 are mounted on the inner sides of the tread side frames 14 (Fig. 10) and are rigidly secured to the scroll housings. Thus when the crawler treads are driven the scroll housings, together with the scrolls, may be moved along the guideways 85 relative to the frame 3. Also the sliding frame together with the cutting and dislodging mechanism may be moved longitudinally relative to the scroll housings and tread side frames while the base remains stationary.

The motors 8, which are desirably electric motors, are mounted on the gear housings 86, and secured to the motor power shafts are spur pinions 87 (Fig. 13) meshing with planet gears 88 journaled on shafts 89 secured at 90 to rotatable spiders or carriers 91. These planet-carriers are secured to shafts 92 suitably journaled within the gear housings 86. The planet gears 88 also mesh with large internal gears 93 formed on the gear housings, and the planet gears roll around these internal gears during drive of the carrier-shaft 92. Secured to the shaft 92 are spur gears 94 meshing with intermediate gears 95 which in turn mesh with and drive spur gears 96 secured to parallel shafts 97 likewise journaled within the gear housings. The shafts 97 are connectible by a conventional fluid operated clutch 98 (Fig. 14) to the scroll shafts 81. Also meshing with and driven by the spur gears 94 are intermediate gears 99 which mesh with and drive spur gears 100 secured to longitudinally extending shafts 101 likewise suitably journaled in the gear housings. Shafts 101 are connectible by conventional fluid operated clutches 102 (Fig. 13) to extensible, telescopic, universal drive shafts 103 (see also Fig. 9), which drive shafts 104 suitably journaled within gear housings 105 mounted at the sides of the rearward portion of the sliding frame 3. Secured to the shafts 104 are worms 106 meshing with worm wheels 107 secured to the ends of a transverse shaft 108. This transverse shaft is suitably journaled within the rearward portion of the sliding frame 3 and has secured thereto a driving pulley 109 (Fig. 12) for engaging and driving the endless conveyor belt 110 of the conveying means 6. The upper run of this conveyor belt is guided by flexible guide rollers 111 (see also Fig. 10), and at its forward portion passes around a front idler pulley 112 mounted on a transverse shaft 113 on the sliding frame 3 (Fig. 12a).

Meshing with and driven by the spur gears 100 are intermediate gears 115 which in turn mesh with and drive spur gears 116 (Figs. 11 and 14) secured to longitudinally extending shafts 117 suitably journaled in the gear housings. Secured to and driven by the shafts 117 are bevel gears 118 which mesh with and drive bevel gears 119 secured to downwardly inclined shafts 120 likewise suitably journaled within the gear housings. Secured to and driven by the shafts 120 are bevel gears 121 which mesh with and drive bevel gears 122 journaled on transverse shafts 123 (see also Fig. 9). The shafts 123 are connectible by conventional fluid operated clutches 124 (Fig. 16) to the shafts 123 and the latter drive chain sprockets 125 connected by endless drive chains 126 to sprockets

127 which drive transverse shafts 128 suitably journaled within the tread side frames 14. The shafts 128 are operatively connected to the endless crawler treads 13. The drive of the treads may be reversed simply by reversing the motors 8.

It will thus be seen that when the motors 8 are running the conveyor scrolls, the endless conveyor belt and the endless crawler treads may be driven.

The clutches 98, 102 and 124 for respectively controlling the drive of the gathering scrolls, the conveyor belt and the endless crawler treads are fluid operated and are provided with hydraulic cylinders 130, 131 and 132. The cylinder 130 contains a reciprocable piston 133 (Fig. 14) having its piston rod 134 operatively connected to a shifter yoke 135 engaging a shifter ring 136. The clutches 102 and 124, as shown in Figs. 15 and 16, are provided with similar shifter rings and yokes and the cylinders 131 and 132 likewise contain reciprocable pistons having their piston rods operatively connected to the shifter yokes.

The pivot providing jack or spud 11 is of the hydraulic type comprising a vertical cylinder 139 (Figs. 10 and 12) mounted on the rearward portion of the sliding frame 3 and containing a reciprocable piston 140 having its piston rod 141 extending downwardly and provided with a floor engaging point 142. When liquid under pressure is supplied to the upper end of the cylinder the piston is forced downwardly to cause the point 142 to engage and penetrate the floor, thereby to provide a relatively stable pivot point for the swivelled frame about which the cutting and dislodging mechanism 4 is horizontally swingable into different laterally located positions. This jack device relieves the base of a substantial portion of the weight of the machine during horizontal swing of the base and sliding frame.

Now referring to the hydraulic fluid system as shown diagrammatically in Fig. 17, it will be noted that a conventional pump 144 has its suction side connected by a conduit 145 to a liquid reservoir or tank 146 and the discharge side of this pump is connected by a conduit 147 to the pressure passage of the valve box 148 of a conventional control valve mechanism. This valve box has a series of parallel bores containing slide valves 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159 and 160 of the balanced spool type, each having a suitable operating handle. The discharge passage of the valve box is connected by a return conduit 161 leading back to the tank 146. The bore containing the slide valve 149 is connected by conduits 162 and 163 to the opposite ends of the cylinder 139 of the hydraulic jack or spud 11 while the bores containing the slide valves 150 and 151 are respectively connected by conduits 164, 165 and 166, 167 to the opposite end of the cylinders 19 of the sumping jacks. The bores containing the slide valves 152 and 155 are respectively connected by conduits 168 and 169 to the operating cylinders 131 for the conveyor drive clutches 102. The bores containing the slide valves 153 and 154 are connected by conduits 170 and 171 to the operating cylinders 130 and 132 for the clutches for respectively controlling the conveyor scrolls and endless crawler treads at one side of the machine while the bores containing the slide valves 156 and 157 are connected by conduits 172 and 173 to the operating cylinders 130 and 132 at the opposite side of the machine. The bores containing the slide valves 158 and 159 are respectively connected by conduits 174, 175 and 176, 177 to the opposite sides of the hydraulic motors 10 for driving the front transverse crawler device 9. The bore containing the slide valve 160 is connected by conduits 178 and 179 to the pairs of hydraulic jack cylinders 38 and 39 for tilting the support for the cutting and dislodging mechanism.

The general mode of operation of the improved mining and loading machine is as follows. The machine may be trammed about the mine under the propulsion of the

crawler base and the crawler treads may be separately or simultaneously driven by one or both of the motors 8 under the control of the fluid operated clutches 124 to effect steering of the machine. When the working face is reached the machine may be positioned, as shown in Fig. 21, ready to sump at the right-hand rib and the feed cylinders 19 may be operated under the control of the slide valve 150 to sump the rotary cutting and dislodging heads into the mineral of the mine vein into the position shown in Fig. 22. Upon completion of the sumping operation the rear jack or spud 11 may be lowered into contact with the mine floor as indicated at A in Fig. 23 to relieve the base of a substantial portion of the weight of the machine and fluid under pressure may be supplied to the proper one of the hydraulic motors 10 under the control of the slide valve 158 to effect drive of the front transverse crawler tread to swing the entire machine horizontally about the axis of the rear jack 11 thereby to move the cutting and dislodging heads along an arcuate path extending across the working face.

In Fig. 18 the dual cutting and dislodging heads are shown moving from left to right with both heads in lowered position to operate at the floor level. If it is desired to adjust the heads to mine out a mine vein of greater height one pair or the other of the pairs of hydraulic jacks 38 and 39 may be operated to swing the trailing one of the heads upwardly along an arcuate path about an axis coincident with the axis of rotation of the advancing head as shown in Fig. 19, thereby to increase the operating height of the cutting and dislodging mechanism. As the dual cutting and dislodging heads start to move laterally from their sumped positions from right to left in Fig. 22 the right-hand crawler tread 13 may be advanced to feed the right-hand gathering device 5 forwardly into the position shown in Fig. 23 at the rear side of the trailing head so that the disintegrated mineral moved outwardly from the face by the cutting and dislodging heads may be gathered and moved rearwardly and upwardly and then laterally onto the conveyor belt. When the dual cutting and dislodging heads complete the swinging cut from right to left and the heads are located at the left-hand rib, the rear jack or spud 11 may be released and the feed cylinders 19 may be operated first to advance the retracted tread and thereafter to slide the frame 3 forwardly relative to the treads to sump the dual cutting and dislodging heads into the face at the left-hand rib. Thereafter the jack device or spud 11 may again be lowered into contact with the mine floor, as indicated at B in Fig. 20. The other of the hydraulic motors 10 may then be operated under the control of the slide valve 159 to drive the transverse crawler tread 26 in the opposite direction to swing the frame 3 together with the dual cutting and dislodging heads from left to right laterally across the working face and in Fig. 20 the machine is shown in its position at the completion of this swinging operation. The rear jack device 11 is then again released and the operations above described are repeated to continue the advance of the working face.

During the horizontal swinging operation of the machine about the pivot provided by the rear jack device the front transverse crawler tread 26 effects arcuate movement of the dual cutting and dislodging heads across the face and as the machine swings laterally the rear crawler treads 13 may slide laterally over the mine floor. If desired, however, during the lateral swinging operation suitable skid devices may be associated with the rear crawler treads 13 to facilitate lateral movement thereof over the mine floor.

As is fully disclosed in the above mentioned application Serial No. 355,975, each of the cutting and dislodging heads as they are sumped into the working face of the mine vein form a hole with a rotary boring action and as the heads are swung laterally the advancing head cuts a slot S in the mineral inside of the face to form a core C of mineral and the rotary breaker device, which rotates

relatively slowly about the axis of head-rotation, engages and dislodges the core. The machine of the present invention is reversible and may cut and dislodge the mineral by lateral swinging movements across the face in either direction. During the mining operation from left to right the advancing gathering device 5 is retracted by its crawler tread while the other gathering device is moved forwardly by its crawler tread into a position wherein its forward portion lies rearwardly of the trailing head in a reverse manner. During swinging of the dual cutting and dislodging heads in either direction the trailing one of the gathering devices 5 engages the loose mineral on the mine floor and moves it rearwardly and upwardly to discharge through the lateral chute 83 onto the conveyor belt and the latter conveys the mineral received thereby rearwardly of the machine to a convenient point of discharge at the rear end of the machine. Since either of the dual cutting and dislodging heads may be swung arcuately in a vertical direction about the axis of rotation of the other head by the pairs of hydraulic jacks 38 and 39 the operating height of the cutting and dislodging mechanism may be varied irrespective of the direction of operation of the machine.

As a result of this invention an improved mining and loading machine is provided whereby mineral may be removed from a solid mine vein in mines having relatively low headroom. By the provision of the dual cutting and dislodging heads one of the heads may be adjusted vertically relative to the other to accommodate the cutting and dislodging mechanism to mine veins of varying heights. This and other advantages of the invention will be clearly apparent to those skilled in the art.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form of the same is shown for purpose 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. A mining machine comprising, in combination, a mobile base, a frame mounted on said base to swing horizontally across the working face of a mine vein, a support mounted at the outer portion of said swingable frame to tilt relative to said frame in vertical planes extending transversely of said frame, cutting and dislodging mechanism mounted on said tiltable support comprising dual cutting and dislodging heads similar in size and shape rotating about parallel axes extending longitudinally of said frame and spaced equidistantly from the longitudinal median line of said frame, means for tilting said support in said transverse planes to vary the elevation of either of said heads at the opposite sides of said longitudinal median line, and means for swinging said frame horizontally to cause said heads to make a horizontal cut in the mine vein arcuately across the working face irrespective of the elevated positions of said heads.

2. A mining machine comprising, in combination, a mobile base, a frame mounted on said base, a support mounted on the outer portion of said frame to tilt relative to said frame in vertical planes extending transversely of said frame, cutting and dislodging mechanism mounted on said tiltable support comprising dual cutting and dislodging heads similar in size and shape journaled on said support to rotate about parallel axes extending longitudinally of said frame, said head axes spaced equidistantly from the longitudinal median line of said support at opposite sides thereof, and means for tilting said support in said transverse planes to vary the elevation of either head axis relative to said frame to vary the operating height of said cutting and dislodging mechanism.

3. A reversible mining machine comprising, in combination, a frame movable in either of opposite directions relative to the face of a mine vein, reversible cutting and

dislodging mechanism carried by said frame for cutting and dislodging the mineral of a mine vein during either direction of movement of said frame across the face, said cutting and dislodging mechanism including dual cutting and dislodging heads mounted to revolve in relatively opposite directions, and means for mounting said heads for relative adjustment in vertical planes relative to said frame to vary the operating height of said cutting and dislodging mechanism irrespective of the direction of operation of the latter, said mounting means including means for separately tilting said heads in vertical planes either about an axis coincident with the axis of rotation of the other head.

4. A reversible mining machine comprising, in combination, a mobile base, a frame mounted on said base and movable horizontally in either direction along the face of a mine vein, reversible cutting and dislodging mechanism mounted at the outer portion of said frame comprising dual drilling and core cutting heads rotatable in relatively opposite directions about parallel axes extending longitudinally of said frame, and means for elevating either head relative to the other to vary the operating height of said cutting and dislodging mechanism irrespective of the direction of operation of the latter, said elevating means for said heads embodying means for swinging either head in vertical planes along an arcuate path about an axis coincident with the axis of rotation of the other head.

5. A mining machine comprising, in combination, a longitudinally extending frame, a tiltable support carried by said frame, means for mounting said support on said frame to tilt selectively about spaced parallel axes extending longitudinally of said frame, and cutting and dislodging mechanism mounted on said tiltable support including dual cutting and dislodging heads having their axes of rotation respectively aligned with said axes of tilt of said support when said support and said heads are in lowered horizontal positions.

6. A combination as set forth in claim 5 wherein as means is provided for tilting either of said heads about an axis coincident with the axis of rotation of the other head to swing the head being tilted upwardly along an arcuate path.

7. A mining machine comprising a mobile base frame, a transverse frame at the forward end of said base frame, means for mounting said transverse frame for rocking movement relative to said base frame in vertical planes extending transversely of said base frame, dual rotary cutting and disintegrating heads similar in size and shape journaled on the opposite sides of said transverse frame

to rotate about parallel axes spaced equidistantly from the longitudinal median line of said base frame,, means for rocking said transverse frame in said transverse planes to vary the elevation of either of said heads relative to said base frame, means for driving said heads, and means for moving said base frame to move said heads both longitudinally and laterally to effect their cutting and disintegrating operations irrespective of the elevated positions of said heads.

8. A mining machine comprising a support movable across the floor of a mine, means on said support providing parallel pivots, a frame having pivot engaging elements at the sides thereof, means for tilting said frame selectively about either of said parallel pivots with one or the other of said pivot elementsa in cooperation with said pivots, and cutting and dislodging means carried by said tiltable frame.

9. A mining machine as set forth in claim 8 wherein said cutting and dislodging mechanism comprises dual cutting and dislodging heads having their parallel axes of rotation disposable in coincidence with said parallel pivots to enable either head to swing arcuately upwardly about the pivotal axis of the other head.

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