July 19, 1955 D. WIEBE 2,713,479

CONTINUOUS MINING APPARATUS WITH FLOOR CLEAN UP DEVICES

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Fig. 1.

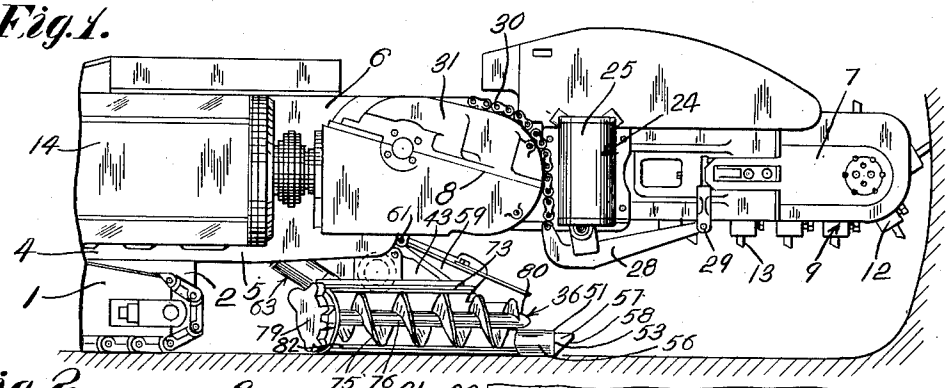


Fig. 2.

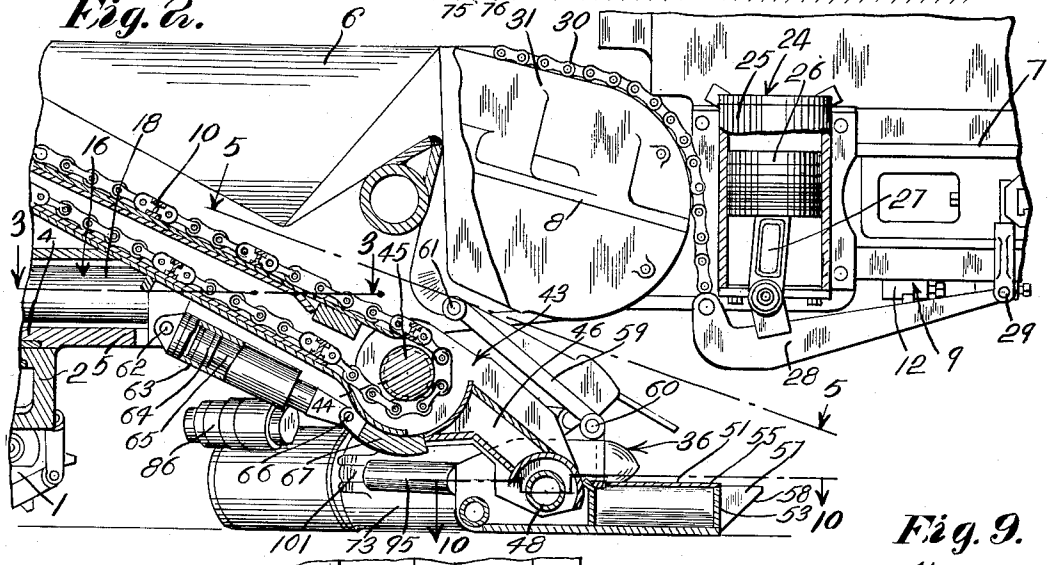


Fig. 3.

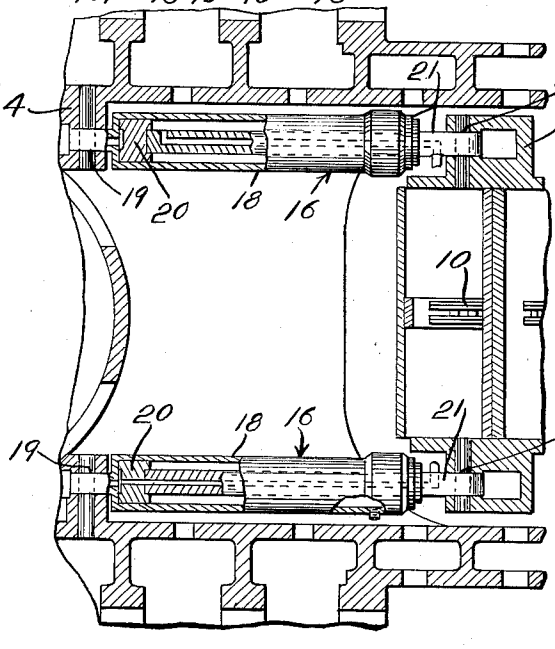
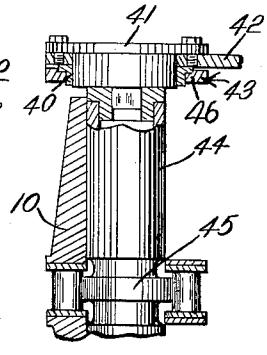


Fig. 9.



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CONTINUOUS MINING APPARATUS WITH FLOOR CLEAN UP DEVICES

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Fig. 4.

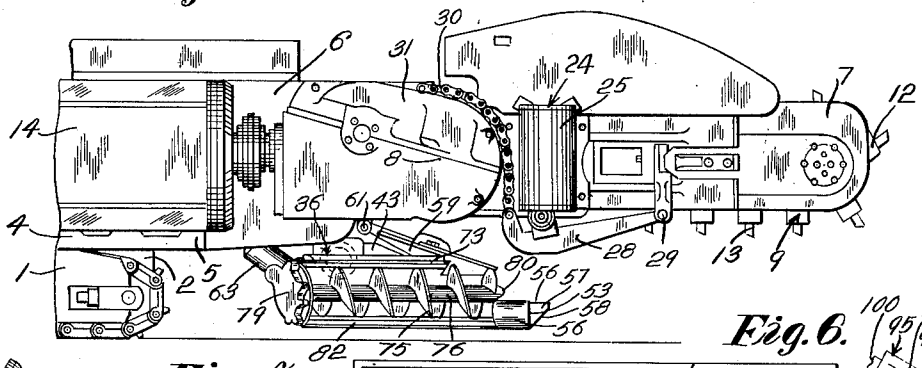


Fig. 5.

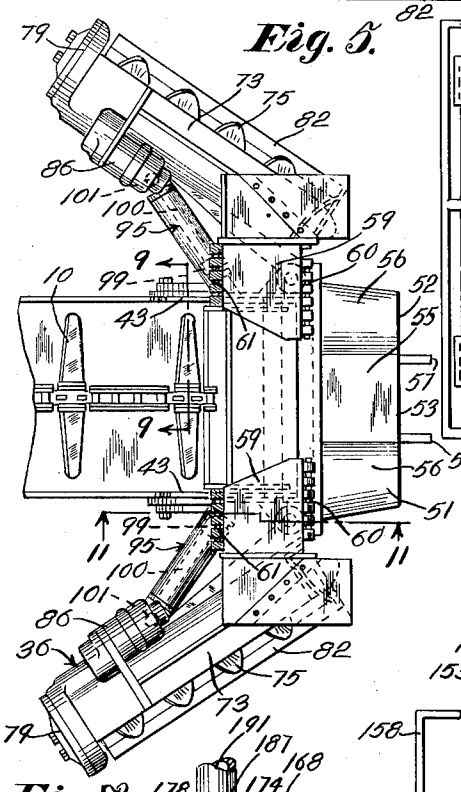
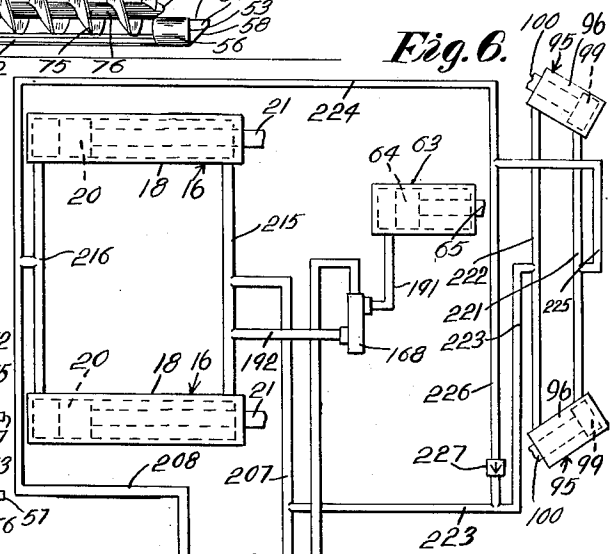


Fig. 6.



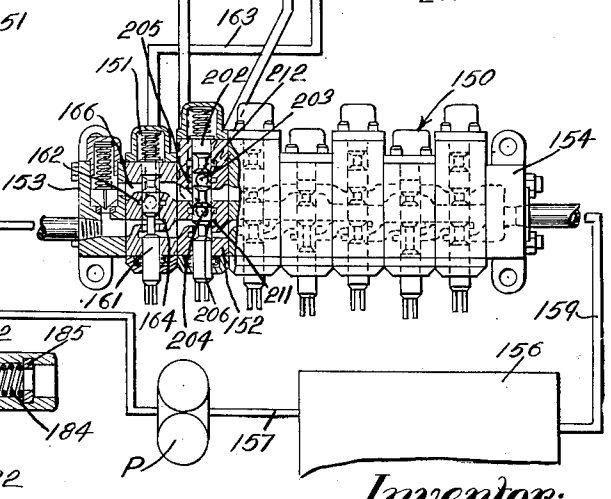


Fig. 7.

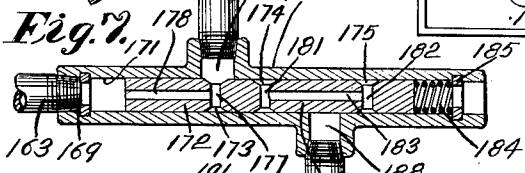
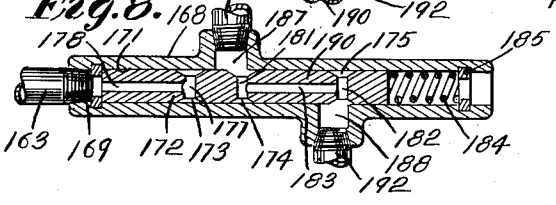


Fig. 8.



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CONTINUOUS MINING APPARATUS WITH FLOOR CLEAN UP DEVICES

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Fig. 10.

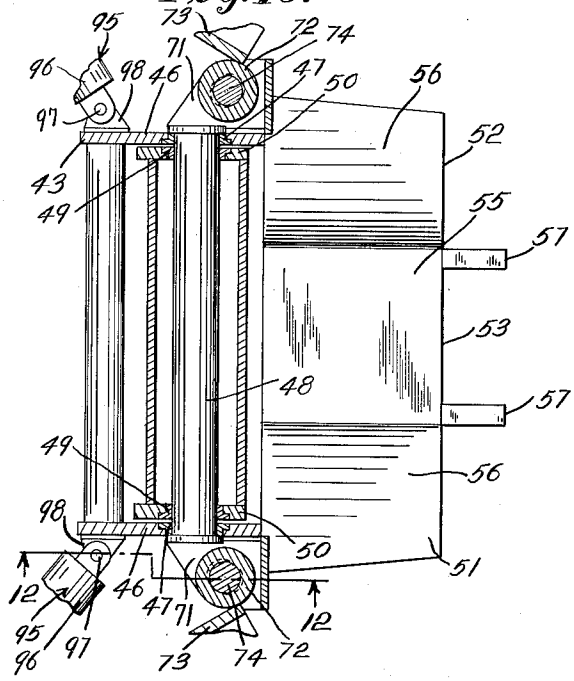


Fig. 11.

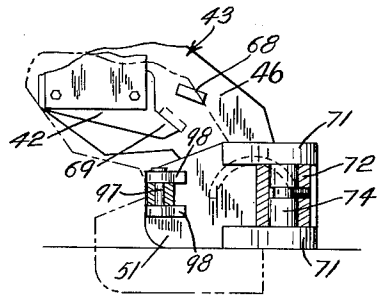


Fig. 12.

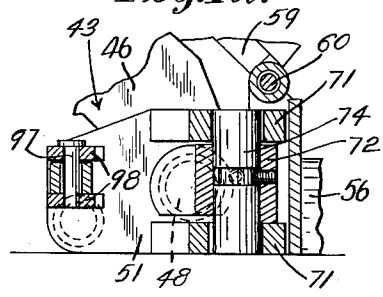


Fig. 13.

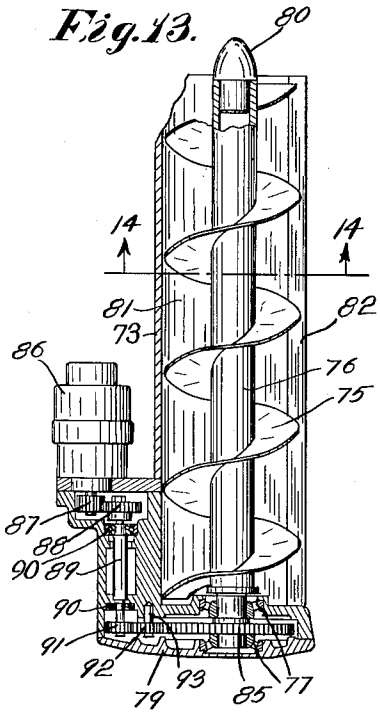
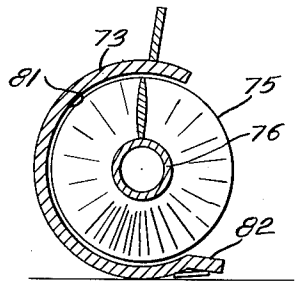


Fig. 14.



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United States Patent Office

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CONTINUOUS MINING APPARATUS WITH FLOOR CLEAN UP DEVICES

Donald Wiebe, Franklin, Pa., assignor to Joy Manufacturing Company, Pittsburgh, Pa., a corporation of Pennsylvania

Application February 28, 1951, Serial No. 213,209

10 Claims. (Cl. 262—29)

My invention relates to mining apparatus, and more particularly to that type of mining apparatus which is known as a continuous miner. This type of apparatus is used to mine coal or other suitable minerals from a seam or vein without the use of explosives, and to load out the material as mining progresses.

In a preferred embodiment, a continuous miner may include a mobile base, such as a tractor base, adapted to travel over a mine floor, and carrying a frame which is mounted for horizontal swinging movement relative to the base and which has, slidably mounted on it, for rectilinear movements in radial lines with respect to the axis about which the swiveled frame is turnable, another frame. The miner may further include a vertically swingable disintegrating mechanism extending outwardly from the swiveled frame and carried by the radially slidable frame and including orbitally moving disintegrating elements which are adapted to disintegrate an upright band of coal or other mineral by sumping, swinging and withdrawal movements of the disintegrating mechanism; and, by adjustments of the horizontally swingable swiveled frame, and repeated performance of the sumping, swinging and withdrawing cycle, the seam or vein may be disintegrated to the desired width. While the disintegrating operation is in progress, the disintegrating mechanism discharges to a material-receiving conveyor system, which includes material receiving and conveying means extending downwardly and forwardly beneath at least the rearward portion of the vertically swingable disintegrating mechanism, and which is adapted to be advanced with the latter during the sumping operation and to be retracted with the latter during the withdrawal movements of said disintegrating mechanism. The forward end of the material-receiving conveyor may desirably be vertically adjustable, and, to clean up material which may fall to the mine bottom during the disintegrating operation, clean-up devices may be associated with the forward end of the conveying means.

The disintegrating apparatus is provided with means for swinging it in upright planes as well as advancing and retracting it to effect its sumping and withdrawal movements. And the clean-up devices are provided with power means for advancing them from rearwardly inclined positions to positions at least nearly, if not completely, in alinement with each other and at right angles to the paths of reciprocation of the disintegrating mechanism and conveyor means.

It is desirable that the clean-up devices shall be able to traverse the mine floor as they are swung from their rearwardly angled positions to their at least nearly alined positions, and as they advance with the disintegrating mechanism and the forward end of the material-receiving conveyor; that they be controllable to facilitate their passing over projections of the mine bottom, and that they be lifted from the mine bottom during retraction, so that they will both be easier to retract and so that they will not tend to scrape loose material which gets behind them backwards and beyond the possibility of being

cleaned up by the apparatus in its normal operation. Briefly, it is desirable that the clean up devices remain normally in lowered position during their forward movements, that they be capable of being lifted at any time during such movements to facilitate passing over obstructions, that they be lifted during retraction in all events, and that they have their amount of lift during retraction controllable.

A principal object of the present invention is to provide an improved mining apparatus incorporating clean-up devices having improved control means. Another object is to provide improved reciprocable apparatus for effecting the cleaning up of loose material from a mine floor and including improved control means for effecting controlled elevation during advance and automatic elevation during retraction. Other objects of the invention will hereinafter appear.

In the accompanying drawings, in which one illustrative embodiment of the invention is shown,

Fig. 1 is a side elevational view of the forward portion of a continuous miner in which the illustrative embodiment of the invention is incorporated.

Fig. 2 is an enlarged central longitudinal vertical section through the apparatus of Fig. 1.

Fig. 3 is a horizontal section on the plane of the line 3—3 of Fig. 2, showing details of the sumping and withdrawing mechanism.

Fig. 4 is a view similar to Fig. 1, showing the clean-up devices elevated above the mine floor.

Fig. 5 is a section, taken on the plane of the line 5—5 of Fig. 2, showing the pusher and conveyor scroll arrangement with the scrolls in rearward, retracted position.

Fig. 6 is a hydraulic diagram.

Fig. 7 is an enlarged detail sectional view through a valve device which forms a part of the elevation control of the clean-up apparatus.

Fig. 8 is another detail sectional view showing the valve device of Fig. 7 in its other extreme position.

Fig. 9 is an enlarged detail section taken on the plane of the line 9—9 of Fig. 5.

Fig. 10 is an enlarged horizontal sectional view taken on the plane of the line 10—10 of Fig. 2, illustrating details of the pusher frame.

Fig. 11 is an enlarged longitudinal vertical section taken on the plane of line 11—11 of Fig. 5, with parts omitted.

Fig. 12 is an enlarged detail vertical section taken on the plane of the line 12—12 of Fig. 10, illustrating the pivotal mounting of one of the scroll housings.

Fig. 13 is an enlarged sectional view taken through one of the conveyor scrolls, showing details of the scroll drive.

Fig. 14 is an enlarged detail cross-sectional view taken on the plane of the line 14—14 of Fig. 13 showing the scroll housing structure and its relation to an associated scroll.

The invention is shown incorporated in a continuous mining apparatus comprising a mobile support or base 1, having a frame 2, which has swivelled upon it for swinging about a vertical axis (not shown) a horizontal supporting frame or turntable 4. Turntable 4 has a horizontal portion 5 projecting forwardly in advance of the base 1; and a sliding frame or support 6 is guided on this horizontal frame portion for horizontal rectilinear movement thereon radially with respect to the axis of the turntable 4. The sliding frame or support 6 has pivotally mounted upon it, for swinging on a horizontal transverse axis 8, a frame or bar structure 7, and this frame or bar structure also swings horizontally with the turntable 4 relative to the base 1.

The vertically swingable bar structure 7 extends forwardly in advance of the turntable 4, with its pivotal axis

8 located, when the sliding frame 6 is retracted, a substantial distance in advance of the base, so that the sliding frame always overhangs by a substantial amount the front end of the base.

The swingable bar structure 7 carries a mineral vein attacking and disintegrating mechanism generally designated 9. A front loading conveyor 10 on the sliding frame 6 extends forwardly and downwardly beneath the attacking and disintegrating mechanism (as shown in Fig. 2) for receiving the disintegrated material discharged from the attacking and disintegrating mechanism and for delivering the disintegrated material rearwardly.

For the purpose of this case, further description of this portion of the structure of the continuous mining apparatus appears unnecessary, particularly in view of the fact that there is a full disclosure thereof in applications of John D. Russell, Serial No. 102,995 and John R. Sibley, Serial No. 102,996, both owned by the assignee of the present invention.

The vein attacking and disintegrating mechanism 9 includes the frame or bar structure 7 and endless, orbitally moving chains 12, each equipped with disintegrating elements or teeth 13, and driven as in the said Sibley and Russell applications, by power from motors 14 carried at the sides of the turntable 4 (but one is shown in the drawings of this application) and relative to which the sliding frame 6 is slidable. The motors 14 are also the source of power for the conveyor 10. The driving connections for the chains are not illustrated herein, being fully shown in the Russell and Sibley applications. The front loading conveyor 10 and the vein attacking and disintegrating mechanism 9 are advanced and retracted with the sliding frame 6 relative to the turntable 4 by two cylinder and piston devices 16, to which devices fluid under pressure may be supplied from a pump P embodied in the continuous mining apparatus. The cylinder and piston devices 16, as shown in Fig. 3, comprise horizontal cylinders 18, pivotally connected at 19 to the turntable 4 and containing reciprocable pistons 20 having piston rods 21 extending forwardly from the front ends of the cylinders 18 and connected at 22 with the sliding frame 6, as is also fully disclosed in the Sibley and Russell applications.

The vein attacking and disintegrating mechanism 9 may be swung upwardly in vertical planes about the axis 8 by cylinder and piston devices 24, as is fully disclosed in a copending application of John D. Russell, Serial No. 139,631, owned by the assignee of the present invention, and these devices include single acting cylinders 25 mounted one on either side of the swingable bar structure 7 and having in them pistons 26 connected by piston rods 27 with links 28 pivotally supported at their forward ends 29 by the bar structure 7 and having their other ends connected by flexible chain sections 30 to a gear casing portion 31 of the frame 6. Further description of this swinging mechanism for the vein attacking and disintegrating mechanism 9 is unnecessary, but it may be noted that the supply of fluid to the cylinders 25 will effect upward swing of the disintegrating mechanism, and release of the fluid so supplied will permit downswing of the mechanism 9.

Beneath the vein attacking and disintegrating mechanism 9 and forwardly of the base 1 there is a substantial space, and in this space there is arranged a floor clean-up arrangement generally designated 36, which acts in conjunction with the vein attacking and disintegrating mechanism in the cleaning up and discharge of any loose material which falls to the mine floor in advance of the base. This clean-up mechanism moves loose material on the mine floor laterally toward the center line of the conveyor 10 and collects it beneath the vein attacking and disintegrating mechanism 9 so that it may be engaged by the latter and be moved forwardly, upwardly and rearwardly by the chains 12 onto the front loading conveyor 10.

Pivotally mounted on bearings 40 supported by caps 41 secured to vertical side frames 42 of the frame of the front loading conveyor 10 is a swingable frame 43. This is arranged between the side plates of the conveyor frame, and the caps 41 support a tubular shaft 44 which has a centrally located circular flange 45 which guides the chain of the front loading conveyor 10, as shown in Fig. 9. Accordingly, the swingable frame 43 may swing upwardly and downwardly about an axis in the same straight line with the longitudinal axis of the tubular shaft 44. The pivoted frame 43 has vertical side plates 46 which pivotally engage the bearings 40. These side plates 46, at their forward portions, carry bearings 47 in which a horizontal transverse shaft 48 is mounted, as shown in Fig. 10. The axis of the shaft 48 is parallel with the pivotal axis of the frame 43 and supports, at the inner sides of the plates 46, bearings 49 on which vertical side plates 50 of a pivoted pusher frame 51 are mounted.

The pusher frame 51 has a forward horizontal portion 52, which has a plane transverse upright front pusher surface 53, and rearwardly of the surface 53 there is a central plane surface 55 having upwardly concave lateral surfaces 56 at either side of it. These concave surfaces curve from their outer edges inwardly and upwardly toward the plane top surface 55. Projecting from the front surface of the pusher frame are lugs 57 which have forwardly and upwardly inclined surfaces 58 to reduce the possibility that the pusher frame might dig into the floor as it is advanced. Links 59 are pivotally connected at their forward ends at 60 to the pusher frame 51, and at their rear ends are connected at 61 to lugs integral with the conveyor frame. The links 59 cooperate with the pivoted frame 43 to provide a parallel motion mounting for the pusher frame 51 whereby the latter is maintained substantially horizontal as the frame 43 is swung about its pivot.

Pivotally connected at 62 to the conveyor frame beneath the front loading conveyor is a single acting fluid cylinder 63 which contains a reciprocable piston 64 having a piston rod 65 projecting forwardly from the front head of the cylinder 63 and connected at 66 to lugs 67 which are integral with the rear portion of the pivoted frame 43.

Supply of fluid under pressure to the rear end of the cylinder 63 will cause the piston 64 to effect swing of the frame 43 upwardly and will thereby lift the pusher frame 51 above the mine floor. Fig. 4 shows this lifted position. On the other hand, venting of fluid from the cylinder 63 will permit the frame 43 to swing downwardly, and the pusher frame will be lowered to the mine floor. Incidentally, the swingable frame 43 and the links 59 cooperate to provide a floating mounting for the pusher frame so that the latter may freely ride up and down in passing over an uneven mine surface. Excessive downward movement of the pusher frame 51 is prevented by the provision of lugs 68 on the swingable frame 43, which lugs are engageable with abutment lugs 69 at the sides of the conveyor frame, as shown in Fig. 11. Projecting from the sides of the pusher frame 51, as shown in Figs. 11 and 12, are spaced lugs 71 between which, lugs 72 on scroll housings 73 are loosely interfitted, and the lugs 71 have alined vertical openings for receiving pivot pins 74 with which the lugs 72 are pivotally engaged. These pivot pins are loosely mounted in the openings of the lugs 71, and these openings are made oval as shown in dotted lines in Fig. 10, so that the scroll housings 73, when in their forward positions have some freedom of vertical tilting movement, as well as horizontal swinging movement with respect to the pusher frame. The provision of such limited tilt of the scroll housings enables the latter to ride freely over any small obstructions on the mine floor, but the lug openings which receive the pivot pins 74 are so shaped that the scroll housings are not able to tilt downwardly at

their outer ends when in forward position; and when in their rearward position the scroll housings are held rigid against vertical tilt.

Each conveyor scroll arrangement includes a conveyor scroll or spiral conveyor in the form of a helix **75** mounted on a tubular shaft **76** journaled solely at its outer end in spaced bearings **77** (see Fig. 13) supported by a housing **79** secured to the scroll housing and providing an outer closure for the scroll housing. The inner ends of the scrolls are open, and generally conical plugs **80** are secured to the inner ends of the scroll shafts. Each scroll housing, as shown in Figs. 13 and 14, extends more than half way around the scroll and has a substantially semi-cylindrical inner surface **81** with which the outer peripheral edges of the scroll vanes may engage to supplement the outer bearings **77** in the mounting of the scroll for rotation. Each scroll housing has a bottom lip **82** which is beveled or inclined and which is adapted to move over the floor and to direct loose material toward the scroll as the housing is moved forwardly and outwardly from the position of Fig. 5. The conveyor scrolls gather the loose material on the mine floor and move it inwardly toward the curved recesses **56** in the pusher frame, and, as the latter is moved forwardly with the sliding frame **6**, it acts as a bulldozer to pile up the material on the floor beneath the attacking and disintegrating mechanism **9**. Thus, the material is gathered and collected beneath the attacking and disintegrating mechanism **9** so that when the latter is swung downwardly toward its sumping position with its forward end at the floor level the bottom runs of the disintegrating chains **12** engage the collected material on the floor and move it forwardly and upwardly, and then the top runs of the chains move the material rearwardly along the top of the attacking and disintegrating mechanism to discharge onto the front loading conveyor **10**.

Each scroll shaft **76** has fixed to it, intermediate its bearings **77**, a spur gear **85** which is enclosed in the housing **79**. Mounted on the housing **79** is a conventional hydraulic motor **86** having a spur pinion **87** fixed to its power shaft and meshing with a spur gear **88** fixed to a shaft **89** journaled in bearings **90** supported within the housing **79**. Fixed to each shaft **89** is a spur gear **91** meshing with a spur gear **92** journaled on a shaft **93** suitably supported within the housing **79**. The gear **92** meshes with and drives the spur gear **85**. These scrolls drives are similar to those disclosed in the co-pending application of John D. Russell, Serial No. 95,673, now abandoned, owned by the assignee of the present invention.

Double acting cylinder and piston devices **95** are provided for swinging the scroll housings **73** horizontally about their pivots relative to the pusher frame **51**, and include fluid cylinders **96** loosely pivotally connected at their inner ends at **97** to lugs **98** projecting from the sides of the pusher frame, so that they may swing horizontally and tilt slightly in a vertical direction. Reciprocable in these cylinders are pistons **99** having piston rods **100** projecting outwardly from the outer cylinder heads, and the piston rods are loosely pivotally connected at **101** at their outer ends to the rear sides of the scroll housings **73**. Liquid under pressure may be supplied to the motors **86** from any suitable source, and one such source is described in the co-pending application of John D. Russell, Serial No. 95,673, mentioned above.

Referring now to Figs, 2, 3, 6, 7 and 8, and first particularly to Fig. 6, it will be noted that a series of valve box units are illustrated at **150**. These include a unit **151** for the control of the cylinder and piston mechanism **63**, **64**, a unit **152** for the control of the sumping and withdrawing cylinder and piston mechanisms **16**, **16**, a fluid supply and relief-valve unit **153**, a discharge unit **154**, and several other units providing controls for other mechanisms of the mining apparatus with which there is no present concern.

The pump P supplies hydraulic fluid drawn from a tank **156** via a conduit **157** to a conduit **158** which leads to the unit **153**, which may be of any well known construction; and a discharge or return conduit **159** connects the unit **154** back with the tank **156**.

The unit **151** contains a valve element **161** operable by any suitable means and adapted to connect an annular groove **162** with which a conduit **163** communicates with a supply groove **164** when the valve **161** is moved upwardly from the position shown in Fig. 6, and to connect the conduit **163** with an exhaust passage **166** when the valve **161** is moved downwardly from the position of Fig. 6. As is common in such valve units the exhaust passage **166** extends from the unit **153** completely through to the unit **154**, and when the valves of the several units are "initial," so to speak, the supply groove is connected also with the unit **154**, and there is a flow through of fluid under pressure which is interrupted where displacement of any valve sufficient to effect fluid supply to the device which it controls takes place. Conduit **163** leads to one end of a shuttle valve casing **168**, being connected with the latter at **169**. The casing **168** has a bore **171** in which there is reciprocable a shuttle valve **172**, which is provided peripherally with three annular grooves **173**, **174** and **175**. The groove **173** is connected by a diametric passage **177** and an axial passage **178** with the end of the valve **172** adjacent the connection **169**. The grooves **174** and **175** are connected together by diametric passages **181** and **182** and a longitudinal passage **183**. A spring **184** acting against an abutment ring **185** normally maintains the valve **172** in the position shown in Fig. 8, but is compressible to permit the valve **172** to move to the position of Fig. 7. The casing **168** is provided with lateral chambers **187** and **188**. The annular groove **173** communicates with the chamber **187** when the valve **172** is moved to the right as in Fig. 7, and, when the valve is in its other extreme position the chamber **187** communicates with the annular groove **174**. In the latter position of the valve **172**, the chamber **188** communicates with the annular groove **175**, and accordingly there is established a connection between the chambers **187** and **188** through the diametric passages **181**, **182**, the longitudinal passage **183**, and the annular grooves **174** and **175**. In the position of the valve shown in Fig. 7, chamber **188** is blocked off by an imperforate portion **190** of the periphery of the valve **172**. A conduit **191** communicates with the chamber **187**, and a conduit **192** communicates with the chamber **188**. The conduit **191** leads to the rear end of the cylinder **63**, and, when fluid is supplied to the conduit **191**, the clean-up mechanism is raised, depending upon the amount of fluid supplied, from the position shown in Fig. 1 towards or to the position shown in Fig. 4. The unit **152** contains a multispool valve **202** having spools **203** and **204** which control the communication of grooves **205** and **206**, which communicate respectively with conduits **207** and **208**, with the central exhaust passage **166** and with a pair of connected supply grooves **211** and **212** of which the former forms a part of the flow-through passage. Downward movement of the valve element **202** connects the passage **208** to the exhaust and the passage **207** to supply, while upward movement of the valve **202** effects opposite connections. The conduit **207** connects with a conduit **215** which leads to the forward ends of both of the cylinders **18** and with which the conduit **192** is also connected. The conduit **208** leads to a conduit **216** which is connected with the rearward ends of both of the cylinders **18**. A conduit **221** connects the ends of the cylinders **96**, fluid supply to which extends the scroll swing jacks. A conduit **222** connects the ends of the cylinders **96**, supply of fluid to which effects collapse of these jacks and rearward swinging of the scrolls. A conduit **223** connects the conduit **207** with the conduit **222**. A conduit **224** connects the conduit **208** with a conduit

225, which connects with the conduit 221 and with a conduit 226, controlled by spring loaded pressure relief valve 227 opening in the direction of the arrow, i. e. towards the conduit 223, with the latter.

The mode of operation of the structure described may now be readily understood. It will be appreciated that the resistance to forward swing of the scrolls will normally be less than the resistance to sumping and, accordingly, that admission of fluid to the conduit 208 will ordinarily cause the extension of the scrolls before commencement of sumping, and that is the object of the hookup of the sumping and withdrawing cylinders and the scroll cylinders which is illustrated. In like manner, retraction by the cylinder and piston mechanisms 16 will ordinarily be delayed, on the supply of fluid to conduit 207, until the scrolls are retracted.

The operator will normally prefer to have the clean-up device rest on the mine floor as indicated in Fig. 1, during the sumping operation. Fig. 1 shows the disintegrating mechanism in retracted position, and the scrolls in retracted position, and the disintegrating mechanism has not been lowered into sumping position. It will be lowered to a position substantially to continue the mine floor before sumping takes place. Unless it is desired not to have the scrolls traverse the mine floor during the sumping operation, it will be unnecessary to shift the valve 161, if the latter has been used to vent the conduit 163; and shifting of the valve 202 upwardly will supply fluid to the cylinder and piston devices 16 and to the cylinder and piston devices 95. The cylinder 63 will be vented through the conduit 191, chamber 187, diametric passage 181, longitudinal passage 183, diametric passage 182, chamber 188, conduit 192 and conduits 215 and 207 and the exhaust passage through the valve unit 150 and the conduit 159, back to the tank, so that the clean-up devices will rest on the mine floor. If it be desired to raise the clean-up device somewhat during the sumping operation, or during the forward swing of the scrolls before the sumping operation starts, the valve 161 may be shifted to supply fluid to the conduit 163 and this will result in a positioning of the valve 172, as shown in Fig. 7, and the supply of fluid via the passages 178 and 177, the chamber 187, and the conduit 191 in desired quantity to the cylinder 63 to lift the clean-up device. The clean-up device may be held raised during retraction either by supply of fluid to the conduit 163 under control of the valve element 161, or, if this valve is centered and the fluid has been exhausted from the cylinder 63 as previously described, fluid will be automatically supplied to the cylinder 63 when shifting of the valve 202 effects supply of fluid to the conduit 207, for a portion of this fluid will traverse the conduit 192, chamber 188, the diametric passage 182, the axial passage 183, the diametric passage 181, the groove 174, chamber 187 and conduit 191, and lift the scrolls and the clean-up mechanism. It will thus be evident that withdrawal movement of the entire disintegrating apparatus and rearward swing of the scrolls will be automatically attended by lift of the clean-up mechanism under the action of the shuttle valve.

The operations may be briefly summarized as follows: ordinarily the clean-up devices are free to ride on the mine bottom during forward swing of the scrolls and advance, during sumping, bodily of the whole clean-up mechanism, but the operator can operate the valve 161 to lift the clean-up devices at will during such movements. The clean-up devices will remain raised as long as pressure is furnished to or trapped in the conduit 163 by the valve 161. On retraction, the chamber 188 is supplied with pressure virtually immediately upon supply of fluid to the conduit 207, and accordingly the clean-up devices will be raised throughout retraction. Thus, (1) the apparatus described permits lifting of the clean-up devices whenever it is desirable during the forward movements of the clean-up devices. (2) The clean-up devices are lifted at all times during retraction. (3) When the valve 161 is operated to supply fluid to the cylinder 63, the amount of lift is controllable but, with the structure shown and described, the maximum potential lift is always effected under automatic control. Further description appears unnecessary.

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 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 and desire to secure by Letters Patent is:

1. In an apparatus of the character described, a base, a frame supported by said base for reciprocation with respect thereto, cylinder and piston mechanism for effecting such reciprocation, floor clean-up devices supported by said frame and having means including cylinder and piston mechanism for raising them relative to said frame and to a mine floor on which said base rests and for controlling lowering of said devices relative to said frame and the mine floor, means for effecting fluid supply and exhaust of fluid relative to said first mentioned cylinder and piston mechanism including conduits for supplying fluid respectively to effect advance and retraction of said frame relative to said base and valve means for effecting the supplying of fluid to and the exhausting of fluid from said conduits, means for supplying and venting fluid with respect to said second mentioned cylinder and piston mechanism including (*a*) a fluid supplying and venting conduit connected thereto, (*b*) a connection with the conduit for the supply of fluid to effect retraction of said frame relative to said base, (*c*) a separate valve controlled fluid supply and exhaust conduit and (*d*) means including a valve controlled by fluid supplied through said separate valve controlled fluid supply and exhaust conduit and movable relative to said connection, said fluid supplying and venting conduit and said separate valve controlled fluid supply and exhaust conduit to connect said separate valve controlled fluid supply conduit and said connection only alternatively with said fluid supplying and venting conduit, for preventing venting of fluid supplied through said separate valve controlled fluid supply and exhaust conduit through the conduit for supplying fluid to effect retraction of said frame relative to said base when the conduit last mentioned is effecting exhaust.

2. In an apparatus of the character described, a base, a frame supported by said base for reciprocation with respect thereto, cylinder and piston mechanism for effecting such reciprocation, floor clean-up devices supported by said frame and having means including cylinder and piston mechanism for raising them relative to said frame and to a mine floor on which said base rests and for controlling lowering of said devices relative to said frame and the mine floor, means for effecting fluid supply and exhaust of fluid relative to said first mentioned cylinder and piston mechanism including conduits for supplying fluid respectively to effect advance and retraction of said frame relative to said base, and means for supplying and venting fluid with respect to said second mentioned cylinder and piston mechanism including a conduit connected with the conduit for the supply of fluid to effect retraction of said frame relative to said base, a valve controlled fluid supply and exhaust conduit, a conduit connected with said second mentioned cylinder and piston mechanism and valve mechanism responsive to the pressure in said valve controlled fluid supply and exhaust conduit for alternatively connecting the conduit connected with said second mentioned cylinder and piston mechanism with the other two of the three conduits included in said means for supplying and venting fluid with respect to said second mentioned cylinder and piston mechanism.

3. In an apparatus of the character described, a base, a frame supported by said base for reciprocation with

respect thereto, cylinder and piston mechanism for effecting such reciprocation, floor clean-up devices supported by said frame and having means including a cylinder and piston mechanism for raising them relative to said frame and to a mine floor on which said base rests and for controlling lowering of said devices relative to said frame and the mine floor, means for effecting fluid supply and exhaust of fluid relative to said first mentioned cylinder and piston mechanism including conduits for supplying fluid respectively to effect advance and retraction of said frame relative to said base, and means for supplying and venting fluid with respect to said second mentioned cylinder and piston mechanism including a conduit connected with the conduit for the supply of fluid to effect retraction of said frame relative to said base, a valve controlled fluid supply and exhaust conduit, a conduit connected with said second mentioned cylinder and piston mechanism and a shuttle valve device with which the last three conduits recited are connected.

4. In an apparatus of the character described, a base, a frame supported by said base for reciprocation with respect thereto, cylinder and piston mechanism for effecting such reciprocation, floor clean-up devices supported by said frame and having means including a cylinder and piston mechanism for raising them relative to said frame and to a mine floor on which said base rests and for controlling lowering of said devices relative to said frame and the mine floor, means for effecting fluid supply and exhaust of fluid relative to said first mentioned cylinder and piston mechanism including conduits for supplying fluid respectively to effect advance and retraction of said frame relative to said base, and means for supplying and venting fluid with respect to said second mentioned cylinder and piston mechanism including a conduit connected with the conduit for the supply of fluid to effect retraction of said frame relative to said base, a valve controlled fluid supply and exhaust conduit, a conduit connected with said second mentioned cylinder and piston mechanism and a shuttle valve device with which the last three conduits recited are connected, said shuttle valve device including a valve element controlled by the fluid pressure in said valve controlled fluid supply and exhaust conduit.

5. In an apparatus of the character described, a base, a frame supported by said base for reciprocation with respect thereto, cylinder and piston mechanism for effecting such reciprocation, floor clean-up devices supported by said frame and having means including a cylinder and piston mechanism for raising them relative to said frame and to a mine floor on which said base rests and for controlling lowering of said devices relative to said frame and the mine floor, means for effecting fluid supply and exhaust of fluid relative to said first mentioned cylinder and piston mechanism including conduits for supplying fluid respectively to effect advance and retraction of said frame relative to said base, and means for supplying and venting fluid with respect to said second mentioned cylinder and piston mechanism including a conduit connected with the conduit for the supply of fluid to effect retraction of said frame relative to said base, a valve controlled fluid supply and exhaust conduit, a conduit connected with said second mentioned cylinder and piston mechanism and a shuttle valve device with which the last three conduits recited are connected, said shuttle valve device including a valve element controlled by the fluid pressure in said valve controlled fluid supply and exhaust conduit and having fluid conducting means for connecting the conduit connected with the second cylinder and piston mechanism alternatively with the other two of the last three conduits recited.

6. In combination, a frame reciprocable with respect to a mine floor, pressure fluid operated mechanism for effecting such reciprocation, floor clean-up devices supported by said frame and having means including pressure fluid operated mechanism for raising them relative to said frame and to the mine floor and for controlling lowering of said devices relative to said frame and the mine floor, means for effecting fluid supply and exhaust of fluid relative to said first mentioned pressure fluid operated mechanism including conduits for supplying fluid respectively to effect advance and retraction of said frame, means for supplying and venting fluid with respect to said second mentioned pressure fluid operated mechanism including a connection with the conduit for the supply of fluid to effect retraction of said frame, and means for supplying fluid to said connection at will when said last mentioned conduit is vented and preventing venting of the fluid so supplied through said vented conduit.

7. In combination, a frame reciprocable with respect to a mine floor, pressure fluid operated mechanism for effecting such reciprocation, floor clean-up devices supported by said frame and having means including pressure fluid operated mechanism for raising them relative to said frame and to the mine floor and for controlling lowering of said devices relative to said frame and the mine floor, and means for supplying and venting fluid with respect to said second mentioned pressure fluid operated mechanism including a connection with the conduit for the supply of fluid to effect retraction of said frame, means for supplying fluid with respect to said second mentioned pressure fluid operated mechanism at will when the last mentioned conduit is vented, and valve means automatically controlled by fluid supplied by said means for supplying fluid with respect to said second mentioned pressure fluid operated mechanism at will, and controlling communication between said connection and said second mentioned pressure fluid operated mechanism, for preventing venting, through said connection and the conduit for supplying fluid to effect retraction of said frame when the conduit last mentioned is effecting exhaust, of fluid supplied to effect actuation of said second mentioned pressure fluid operated mechanism.

8. In combination, a frame reciprocable with respect to a mine floor, pressure fluid operated mechanism for effecting such reciprocation, floor clean-up devices supported by said frame and having means including pressure fluid operated mechanism for raising them relative to said frame and to the mine floor and for controlling lowering of said devices relative to said frame and the mine floor, means for effecting fluid supply and exhaust of fluid relative to said first mentioned pressure fluid operated mechanism including conduits for supplying fluid respectively to effect advance and retraction of said frame, means for supplying and venting fluid with respect to said second mentioned pressure fluid operated mechanism including a connection with the conduit for the supply of fluid to effect retraction of said frame, and means for supplying fluid to said connection at will when said last mentioned conduit is vented including a manually operable control valve and a pressure fluid actuated shuttle valve controlled by and traversed by fluid supplied under the control of said manually operable control valve.

9. In a continuous mining apparatus, the combination comprising a mobile base, a disintegrating mechanism for dislodging coal or other mineral from a solid seam or vein and mounted on said base for horizontal rectilinear movement forwardly and rearwardly with respect thereto, a floor clean-up mechanism disposed beneath the said disintegrating mechanism in advance of said base for cleaning up any loose material which has fallen to the mine floor, said clean-up mechanism comprising coacting gathering devices pivotally mounted to move horizontally back and forth near the floor level, means for moving said disintegrating mechanism forwardly and rearwardly rectilinearly relative to said base, coacting means for effecting swinging of said gathering devices forwardly and outwardly about their pivots as said disintegrating mechanism is moved forwardly rectilinearly by its moving-means and for effecting swinging of said gathering devices rearwardly and inwardly about their pivots as

said disintegrating mechanism is moved rearwardly rectilinearly by its moving-means, means for automatically lifting said floor clean-up mechanism from the mine floor and holding it out of contact with the floor each time said disintegrating mechanism is moved rearwardly and said gathering devices move rearwardly and inwardly, and means for effecting lifting of said clean-up mechanism at will at other times than during rearward movement of said gathering devices.

10. In combination, a mobile base, a disintegrating mechanism for dislodging a mineral from a solid seam, means for supporting said disintegrating mechanism for sumping and withdrawing movements with respect to said base, cylinder and piston means for effecting such sumping and withdrawing movements, floor clean-up mechanism supported for reciprocation with said disintegrating mechanism and having supporting means including cylinder and piston means for raising the same above a mine

floor and lowering it into supported relation to the floor, fluid supply and discharge conduits leading to the opposite ends of said first mentioned cylinder and piston means, a fluid supply and exhaust conduit leading to the second cylinder and piston means, a source of fluid under pressure, a discharge line for fluid under pressure, valve means for connecting said last mentioned conduit selectively with said source and with said discharge line, and valve means for connecting said fluid supply and discharge conduits selectively with said source and with said discharge line, said last recited conduit having a shuttle valve between its ends and said shuttle valve having a connection with the fluid supply and discharge conduit through which fluid is supplied to said first mentioned cylinder and piston means to effect withdrawing movement of said disintegrating mechanism.

No references cited.