

May 3, 1960

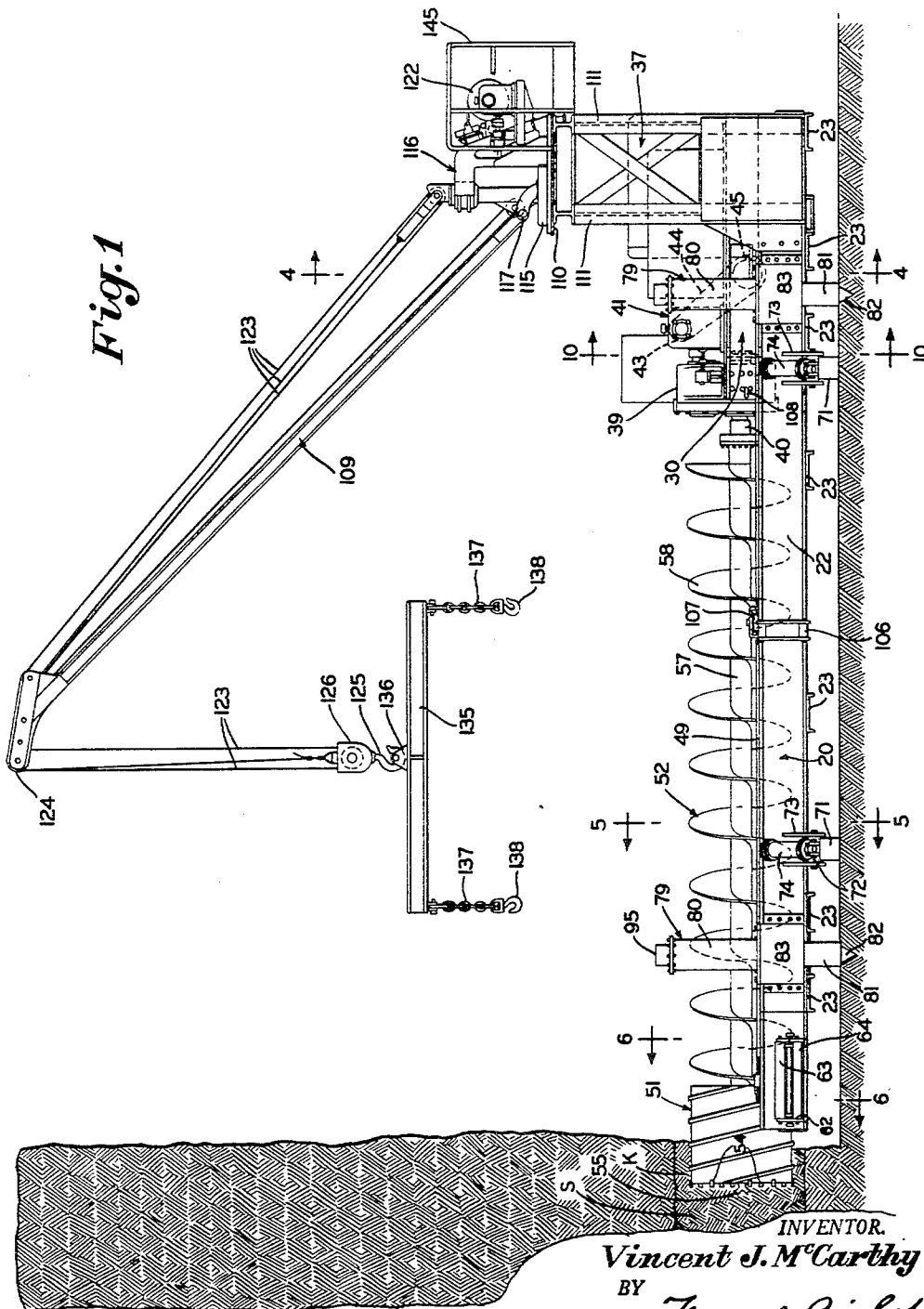
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2,935,309

MINING MACHINE HAVING INDEPENDENTLY OPERABLE SKIDS

Original Filed Aug. 17, 1953

9 Sheets-Sheet 1



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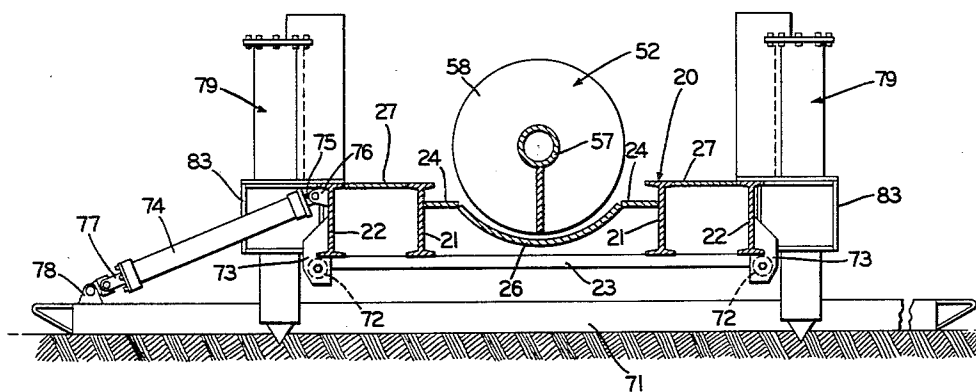


Fig. 9

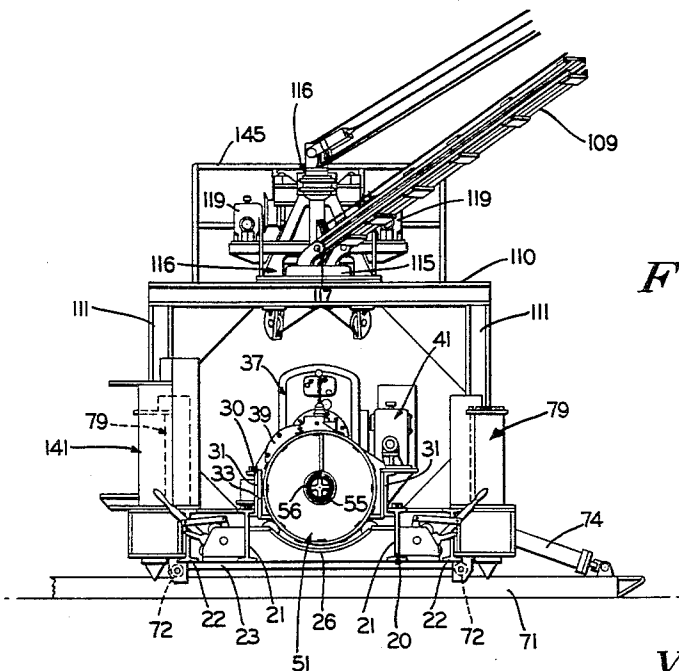


Fig. 2

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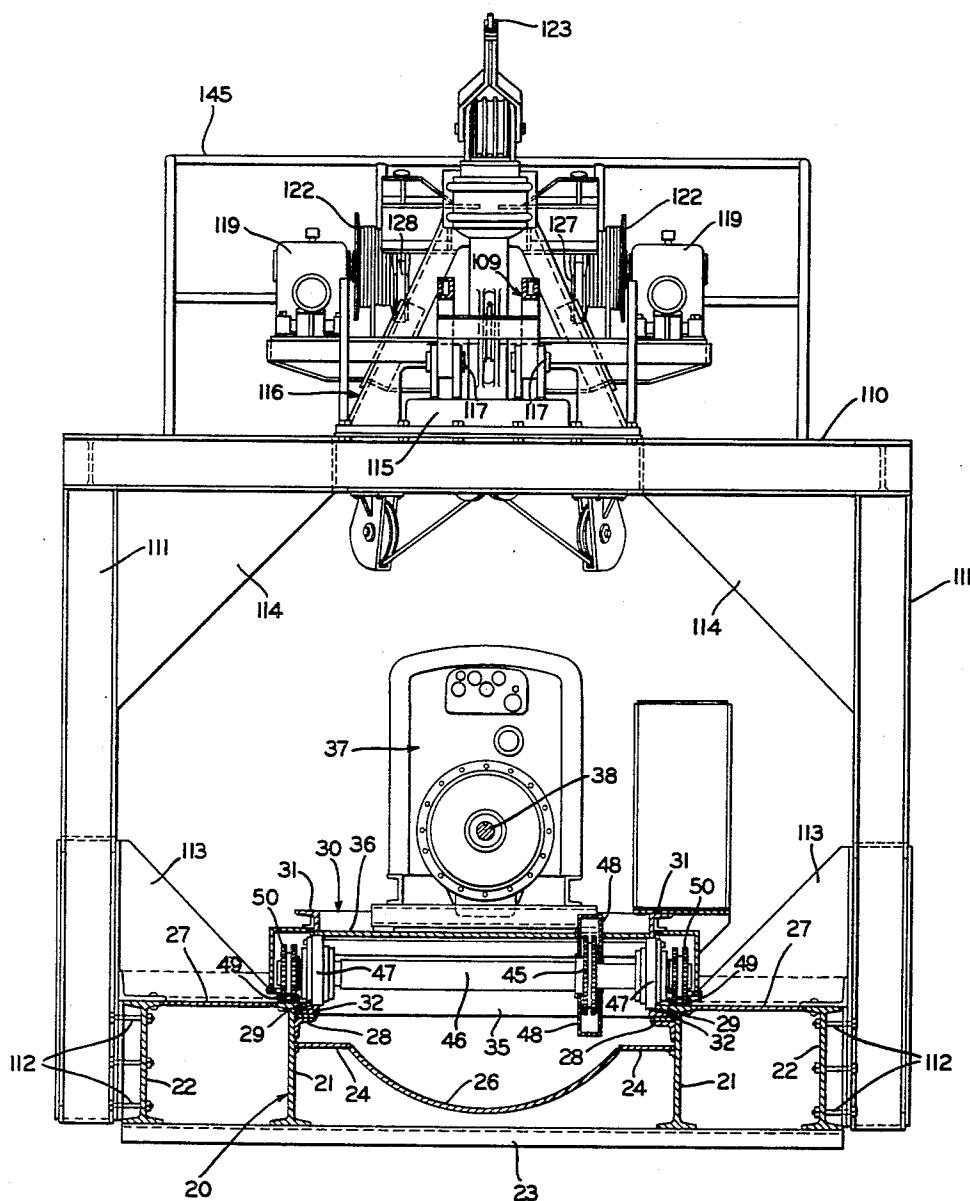


Fig. 4

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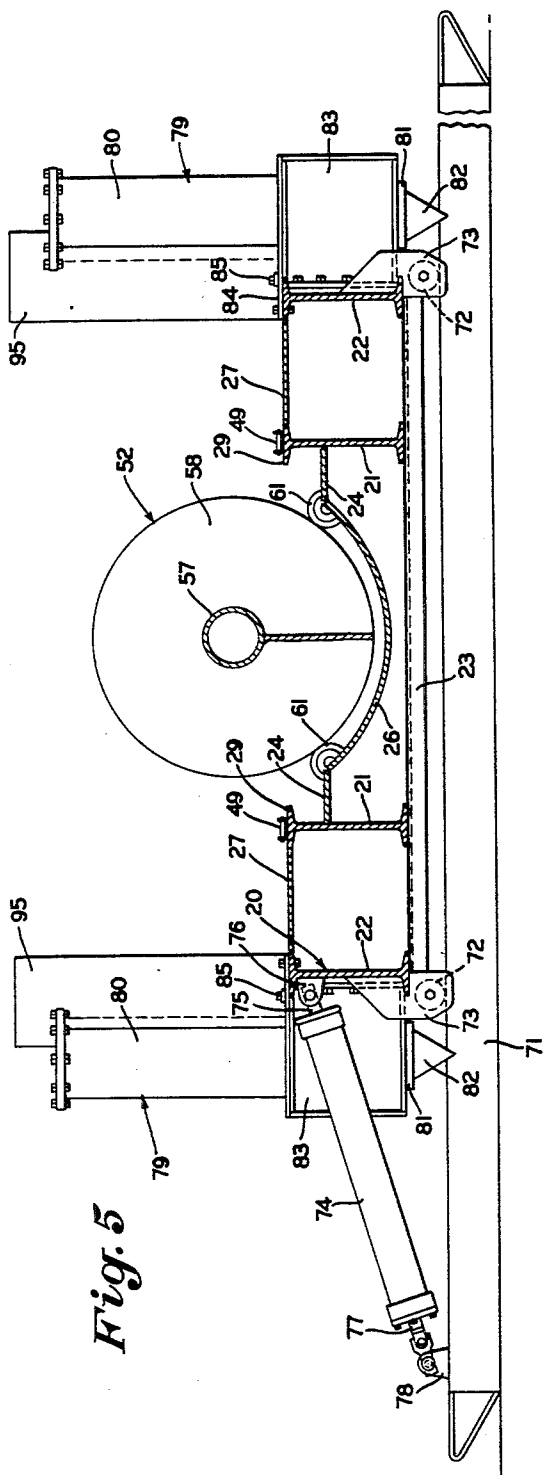


Fig. 5

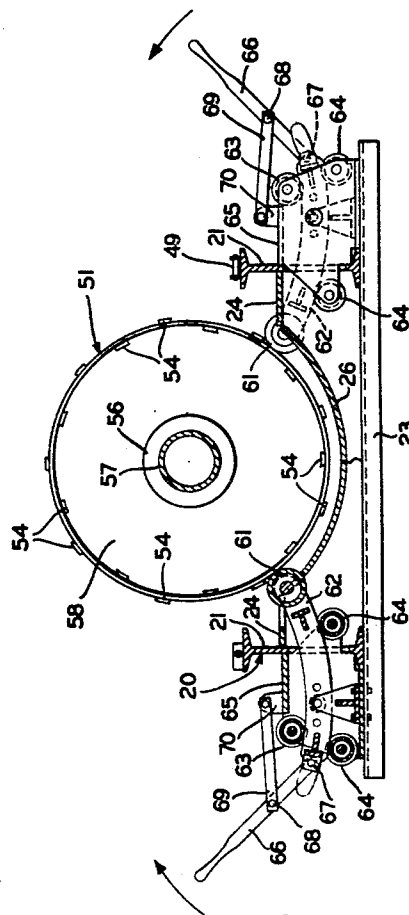


Fig. 6

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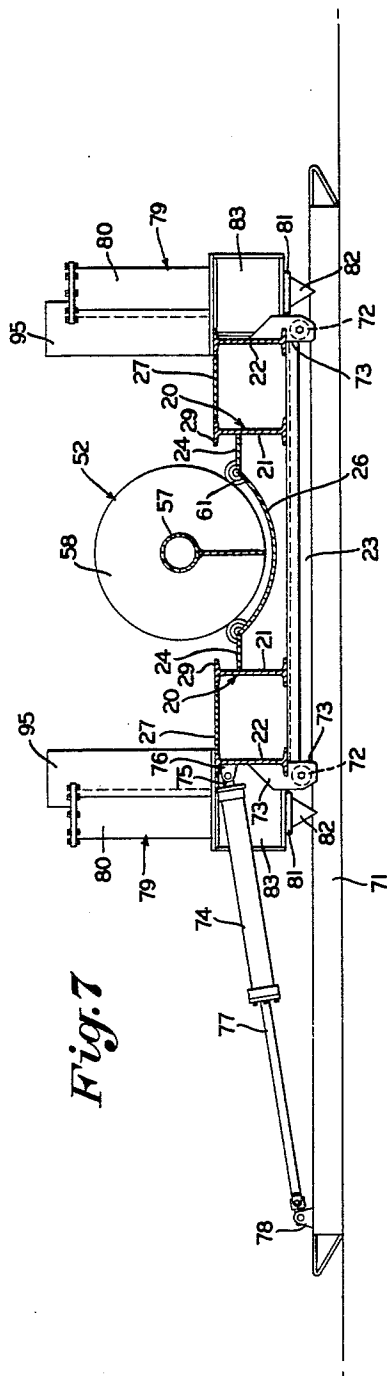


Fig. 7

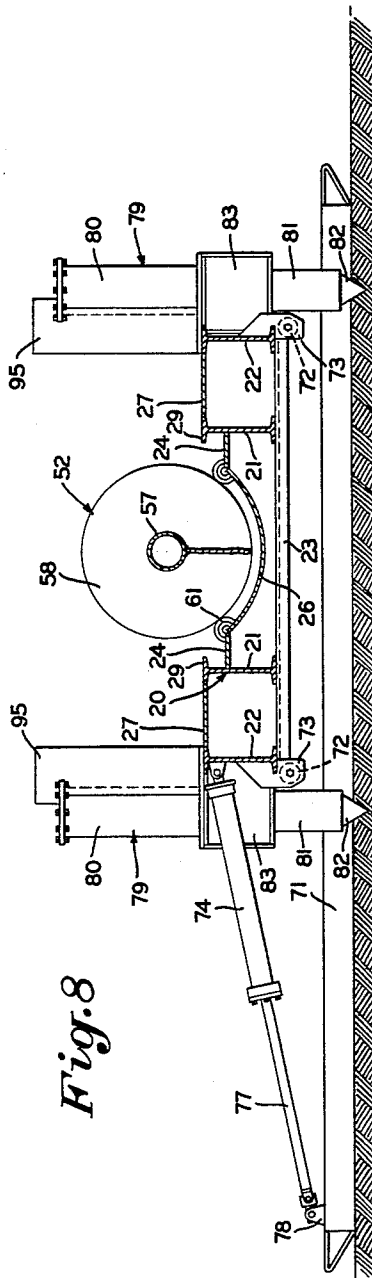


Fig. 8

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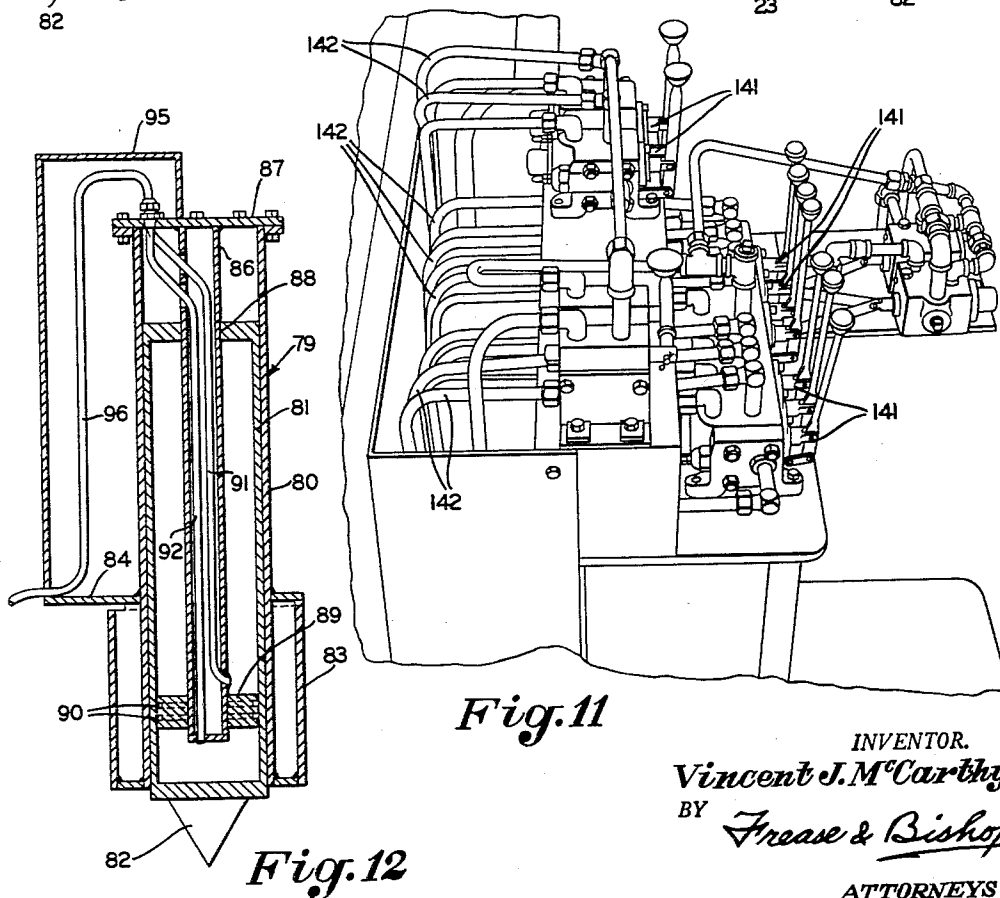
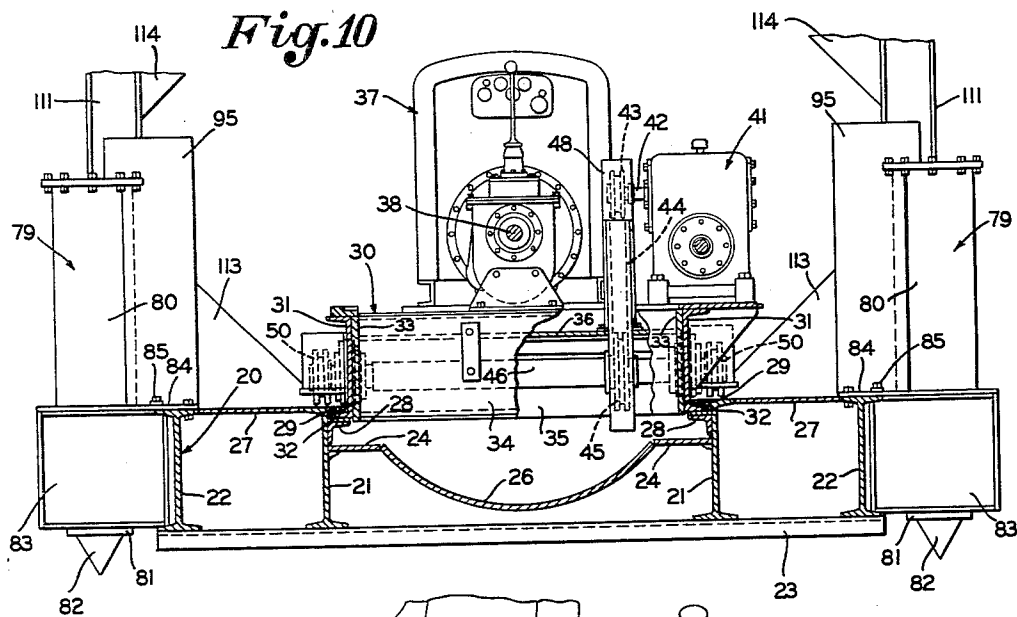
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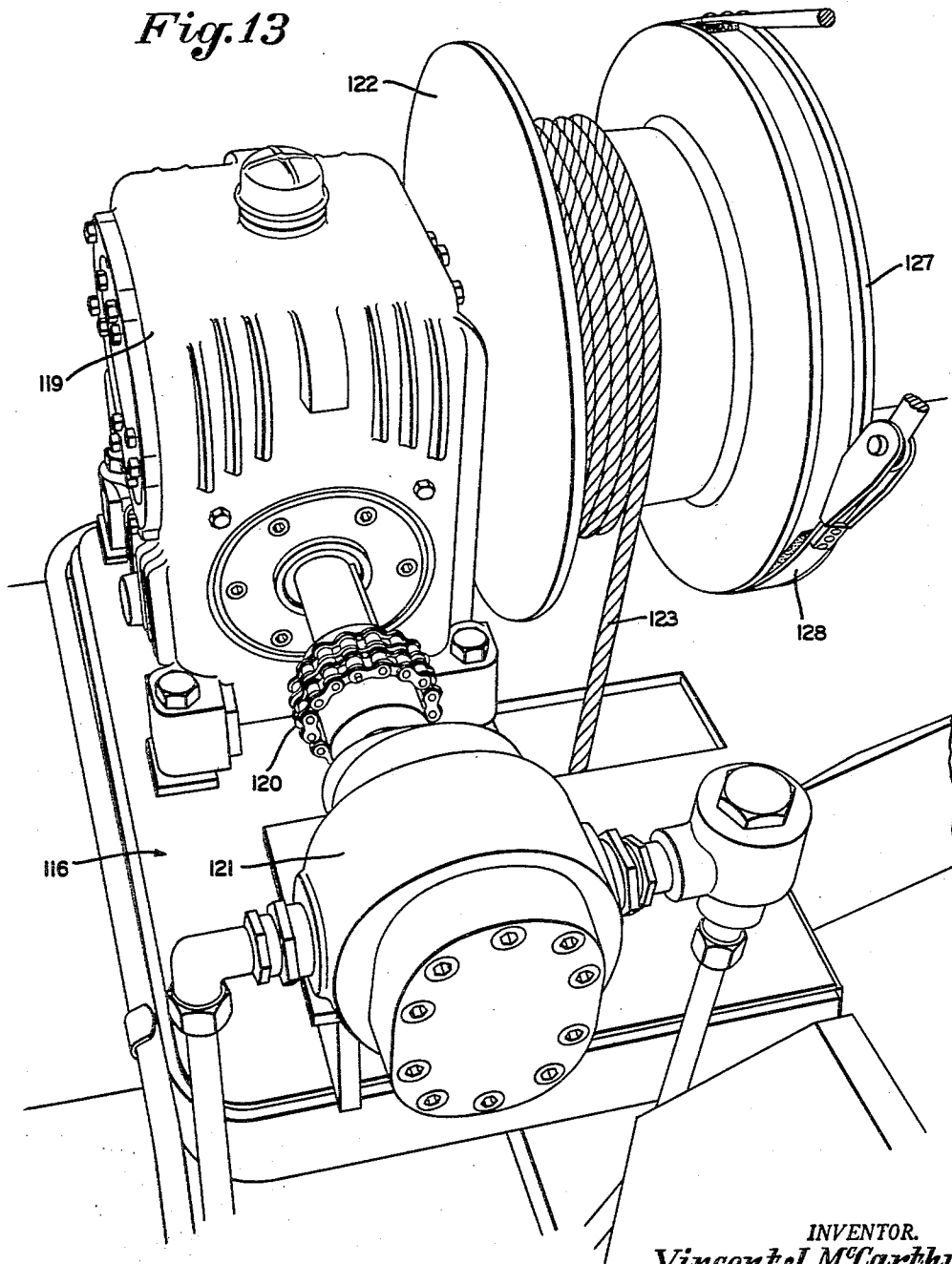
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Fig. 13



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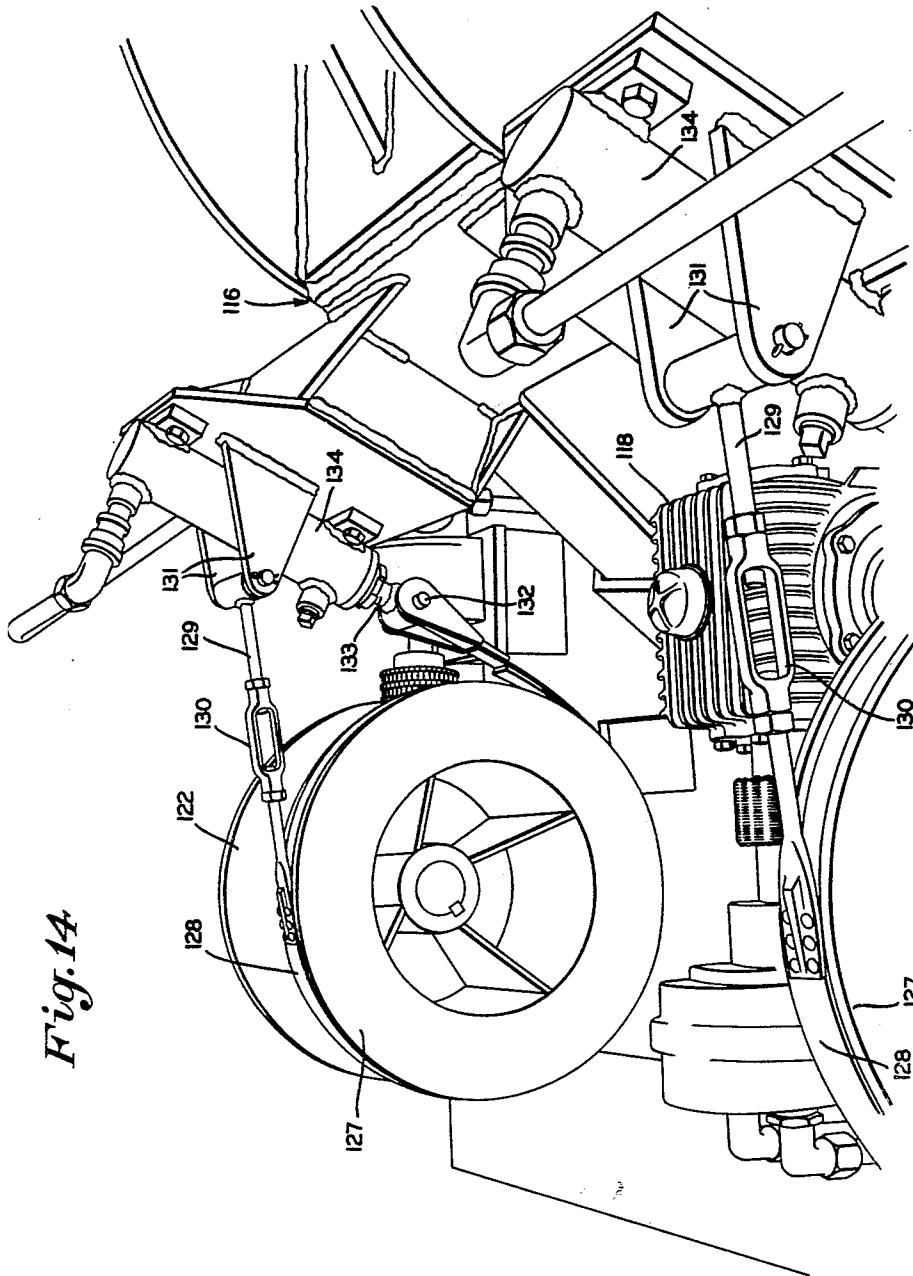


Fig. 14

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2,935,309

MINING MACHINE HAVING INDEPENDENTLY OPERABLE SKIDS

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Continuation of application Serial No. 374,484, August 17, 1953. This application July 2, 1956, Serial No. 596,382

10 Claims. (Cl. 262—26)

The invention relates to apparatus for mining coal and the like, and more particularly to a machine in which a mining head and spiral or helical conveyor, of the general type disclosed in Joseph F. Joy Patent No. 1,445,085, is advanced into a coal vein to mine and remove coal therefrom, and this application is a continuation of my copending application, Serial No. 374,484, filed August 17, 1953, now abandoned.

In the practical operation of such a machine for economically recovering a maximum of coal or other mineral from an open pit or high wall strip mine, the helical conveyor comprises a plurality of detachable sections, each of considerable length, whereby the coal vein may be penetrated, and mined coal recovered therefrom, to a considerable distance from the point of entry of the boring head into the face of the coal.

Such machines as are now in use have certain objections and disadvantages, which it is an object of the present invention to overcome. For instance, the boring head and conveyor sections, making up the mining assembly, are of considerable size and weight, being provided in diameters up to sixty inches, depending upon the thickness of the coal seam to be mined.

These conveyor sections are commonly made in twenty-four foot lengths, and usually seven conveyor sections are provided with each machine, whereby a maximum penetration of nearly one-hundred and seventy feet into the coal seam is possible.

A powerful engine or motor is required to drive this large, heavy mining assembly into the coal seam to mine and remove the coal therefrom. All of this naturally requires a large, heavy frame, making an extremely heavy, bulky machine.

Machines of this general type, which have been produced heretofore, are thus difficult to move from place to place in an open pit or high wall strip mine, in order to bore a succession of holes into the coal seam to recover the maximum amount of coal therefrom. It is customary, under present practice, to drag such machines laterally from one hole to the next, by means of a heavy tractor bulldozer, or other extraneous power means.

It is therefore an important object of the invention to provide a mining machine which overcomes the disadvantages and difficulties encountered in machines of this general type now in use.

It is also an object to provide a self-propelled coal mining machine of the character referred to, whereby the machine will quickly and easily move itself from one hole to the next, during a mining operation.

A further object is to provide such a machine comprising a frame, a carriage movable longitudinally upon the frame, and transverse tracks or skids upon which the frame is movable laterally.

A still further object is to provide a mining machine of this type having hydraulic jacks connected to the four corner portions of the frame for leveling the frame and/or positioning the mining assembly relative to the coal vein or seam.

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It is also an object of the invention to provide means for moving the frame laterally upon the tracks or skids, and/or for moving the tracks or skids laterally of the frame.

Another object is to provide hydraulic cylinder means for moving the frame and/or the tracks or skids relative to each other.

A further object is to provide hydraulic valve control means for operating the hydraulic jacks for raising the frame relative to the ground, and for operating the hydraulic cylinders for moving the frame and/or the tracks or skids relative to each other.

Another object is to provide such a mining machine in which the transverse tracks or skids slidably engage transversely disposed channel brackets on the frame.

A further object of the invention is to provide a mining machine of this type in which the hydraulic cylinder means for the tracks or skids may be independently operated to move the tracks or skids relative to each other in order to steer the machine in any desired direction as it is moved upon the tracks or skids.

A further object of the invention is to provide a novel form of hydraulic jack for raising and lowering the frame relative to the ground.

Other objects of the invention are to generally improve and simplify the construction and operation of coal mining machines of the general type referred to.

The above and other objects, apparent from the drawings and following description, may be attained, the above described difficulties overcome and the advantages and results obtained, by the apparatus, construction, arrangement and combinations, sub-combinations and parts which comprise the present invention, a preferred embodiment of which, illustrative of the best mode in which applicant has contemplated applying the principle, being set forth in detail in the following description and illustrated in the accompanying drawings, in which:

Fig. 1 is a side elevation of a mining machine embodying the invention, showing the same engaged in a coal mining operation;

Fig. 2 is a front elevation of the mining machine shown in Fig. 1, showing the boom broken away;

Fig. 3 is a top plan view of the mining machine, with the mining assembly operatively mounted therein, showing the transverse tracks or skids operated in opposite directions for steering the machine as it is moved upon the tracks or skids;

Fig. 4 is an enlarged, transverse, sectional view through the improved mining machine, with the mining assembly removed for the purpose of illustration, looking toward the rear end of the machine, taken as on the line 4—4, Fig. 1;

Fig. 5 is a transverse, sectional view through the machine, on the same scale as Fig. 4, with the mining assembly therein, looking toward the front or forward end of the machine, taken as on the line 5—5, Figs. 1 and 3;

Fig. 6 is a transverse, sectional view through the machine, on the same scale as Figs. 4 and 5, showing the roller guides for the auger boring head of the mining assembly, showing the boring head therein, taken as on the line 6—6, Figs. 1 and 3;

Fig. 7 is a transverse sectional view through the machine, taken as on the line 5—5, Figs. 1 and 3, showing the frame in the opposite position upon the tracks or skids to that shown in Figs. 3 and 5;

Fig. 8 is a view similar to Fig. 7, showing the hydraulic jacks in extended or lowered position, raising the entire frame above the skids or tracks;

Fig. 9 is a similar view, showing the fluid cylinders

operated to move the tracks or skids, relative to the frame, to the position shown in Fig. 5;

Fig. 10 is a transverse, sectional view through the machine, taken as on the line 10—10, Fig. 1;

Fig. 11 is a fragmentary, perspective view of the control valves for controlling and operating the fluid cylinders and hydraulic jacks;

Fig. 12 is a vertical, sectional view through one of the hydraulic jacks, showing the same in retracted position;

Fig. 13 is a fragmentary, perspective view of one cable drum for the boom, and the hydraulic motor which operates the same; and,

Fig. 14 is a fragmentary, perspective view of the brake mechanism for the cable drums for the boom.

Referring now more particularly to the embodiment of the invention illustrated in the drawings, in which similar numerals refer to similar parts throughout the several views, the improved mining machine comprises generally an elongated frame, mounted upon laterally disposed skids or tracks, to which it is operatively connected by fluid cylinders adapted for moving the frame laterally upon the skids or tracks.

Near the forward and rear ends of the frame, and on opposite sides thereof, are provided vertically disposed, hydraulic jacks, adapted to be extended into contact with the ground for raising the frame above the skids or tracks, and for leveling and properly positioning the mining assembly relative to the coal seam in the high wall.

This mining assembly comprises generally the boring head and one or more screw or spiral conveyor sections, connected end to end, positioned longitudinally in the frame of the machine, and operatively connected to an engine or motor, mounted upon a carriage longitudinally movable upon the frame, for rotating and advancing or retracting the mining assembly.

The structure thus briefly described will now be set forth in detail, with particular reference to the accompanying drawings in which one embodiment of the invention is illustrated as including a large and substantially massive frame, indicated generally at 20.

This frame is shown as made up of spaced pairs of inner and outer I-beams 21 and 22 respectively, extending longitudinally of the frame, and connected together at intervals by the spaced, transversely disposed channel iron 23.

As best shown in Figs. 4, 5 and 7 to 10, inclusive, the inner I-beams 21 are spaced a substantial distance apart, and are connected together throughout their length by a longitudinally disposed belly plate, having the flat side portions 24, welded or otherwise rigidly secured to the inner surfaces of the I-beams 21, at points spaced below the upper edges thereof, and having the central, transversely arcuate portion 26.

Longitudinally disposed top plates 27 are bolted, riveted, or otherwise rigidly connected to the upper flanges of each pair of inner and outer I-beams 21—22 and extend throughout the length of the frame 20 on opposite sides of, and above the plane of, the belly plate 26.

An angle iron 28 is welded, or otherwise rigidly attached to the inner side of each of the inner I-beams 21, at a point slightly below the top flanges 29 thereof, forming therebetween longitudinal guide-ways upon which the carriage may slide forwardly and backwardly throughout the entire length of the frame to advance and retract the mining assembly as will be later described in detail.

The carriage, illustrated generally at 30, is mounted for longitudinal movement upon the frame 20, and is provided for rotating, advancing and retracting the elongated mining assembly, as will be later described in detail.

This carriage comprises generally the longitudinally disposed, vertical angle irons 31, forming the side frames of the carriage, the lower, out-turned flanges 32 of said angle irons being slidably located in the guide-ways

formed between the top flanges 29 of the I-beams 21 and the angle irons 28.

These side frames may be reinforced, as by the plates 33, and are connected together at their forward and rear ends respectively by the front and back plates 34 and 35 (see Fig. 10). A horizontal platform plate 36 is attached at its side edges to the upper portions of the side frames of the carriage, for supporting a prime mover, which may be a motor, engine or the like, and is shown on the drawings as comprising an internal combustion or diesel engine indicated generally at 37.

The crankshaft 38 of the engine is operatively connected, through a gear box 39, with a coupling member 40, located concentrically with the belly plate 26, and adapted to be coupled to the rear end of the mining assembly for rotating the same as it is advanced into the coal seam by operation of the carriage.

For the purpose of moving the carriage 30 longitudinally upon the frame, another engine or motor, indicated generally at 41, is mounted upon the carriage, and provided with a shaft 42, extending inwardly in a transverse direction from its inner side, and having a dual sprocket wheel 43 fixed thereon.

A double sprocket chain 44 operatively connects the sprocket wheel 43 of said engine with the dual sprocket wheel 45 fixed upon the axle 46 of the carriage, which axle is located transversely of the carriage and journaled in suitable bearings 47 mounted in the side frames 31 of the carriage. A gear housing 48 may enclose these sprocket wheels and chains, as best shown in Figs. 4 and 10 of the drawings.

The carriage is adapted to be propelled longitudinally upon the frame 20 by a rack and gear drive, which, as best shown in Figs. 3 and 4, may comprise sprocket chains 49 fixed upon the top flanges of the inner I-beams 21 of the frame, and cooperating dual sprocket wheels 50 fixed upon the carriage axle 46.

While a conventional rack bar and pinion drive may be used, the sprocket chain racks and sprocket wheels are preferred, as this prevents any dirt, rock dust or coal dust which may be deposited upon the rack bars, from interfering with the operation of the carriage, as any such foreign matter will pass down through the chain rack bars and not impede movement of the sprocket wheels 50 thereover.

The mining assembly may include a boring head, indicated generally at 51, of the general construction, as shown in the above-mentioned Joy Patent No. 1,445,085, and the helical or spiral conveyors generally indicated at 52.

As best shown in Figs. 1, 2 and 6, the boring head may be in the form of a hollow cylinder, open at both ends, and provided at its forward end with the peripheral cutting bits 54, preferably arranged as shown in the drawings, so as to cut a cylindrical kerf, as indicated at K in Fig. 1, in a coal seam indicated at S.

As in usual practice in such boring heads, a center cutter 55 is carried by the boring head, and in customary manner preferably extends forwardly, slightly beyond the peripheral cutters 54, and a conical or wedge breaker 56 is also mounted upon the center shaft of the boring head, rearwardly of the center cutter 55, for the purpose of bursting the cylindrical bore of coal cut by the peripheral cutters 54, all as disclosed in detail in the Joy patent above referred to.

A plurality of conveyor sections 52 is provided for making up the mining assembly of each machine. In actual practice these conveyor sections are each about 24 feet in length, and may usually be from 24 inches to 60 inches in diameter, depending upon the thickness or depth of the coal seam to be mined and the diameter of holes desired to be bored therein. Usually about seven of these 24 foot long conveyor sections are carried with a mining machine, as the combined length thereof, together

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with the boring head, is about the maximum depth of hole which it is practical to bore into a coal seam.

Each conveyor section may comprise a center shaft 57, which may be tubular as shown, and a helical or spiral vane or flight 58, fixed to the shaft as by welding or other usual and well known means.

For the purpose of coupling the conveyor sections to each other, and to the boring head, in order to assemble the mining assembly in operative condition, each conveyor section has a reduced shank at one end for engagement in a corresponding socket in the other end of a similar conveyor section, or the boring head, as the case may be which is an old and expedient practice in the art and is therefore not shown.

In order to facilitate handling of the conveyor sections by the boom, as will be later described in detail, for placing the sections in the mining assembly on the machine, or for removing the sections therefrom, eyes or loops, not shown may be attached or holes cut into each section, at equidistant points thereon, to be engaged by hooks carried by the boom which is also an old practice not shown.

Guide rollers 61 are provided at the forward end of the frame for guiding the boring head 51 of the mining assembly at the start of each operation of boring a hole into the coal seam. In order that these guide rollers may be retracted after the boring head has entered the coal seam, they are journaled upon the inner ends of arcuate frames 62.

The frames 62 are slidably mounted for movement transversely to the frame of the machine, being shown clearly in Fig. 6 as mounted for movement between the upper and lower rolls 63 and 64 respectively, journaled in the guide roll frames 65, attached to the forward portions of the inner I-beam 21.

For the purpose of transversely moving the arcuate frames 62, in order to advance or retract the guide rollers 61, a linkage is provided as best shown in Fig. 6, comprising a lever 66 pivotally connected at its lower end as at 67 to the rear end of the arcuate frame 62, and fulcrumed intermediate its ends, as at 68, to one end of a link 69, the other end of which is pivotally connected to an ear 70 upon the frame 65.

The levers 66 are shown in the drawings as adapted for manual operation, although it should be understood that these levers may be mechanically operated by any suitable mechanism. With the parts in the position shown in Fig. 6, with the guide rollers 61 engaging the boring head 51, in order to retract the guide rollers, the levers 66 should be swung in the direction of the arrows shown on this figure, sliding the arcuate frames 62 outwardly and withdrawing the guide rollers 61 from contact with the boring head. This is the position in which these parts remain throughout the remainder of each mining operation.

The frame 20 normally rests upon transversely disposed skids or tracks 71, and is adapted for lateral movement relative thereto. In order to reduce friction, and to facilitate the movement of the heavy frame and apparatus carried thereby, rollers 72 may be carried on the underside of the frame for rolling contact with the tracks or skids 71.

These rollers, as best shown in Figs. 1 to 3, 5 and 7 to 9, may be journaled in the channel brackets 73, welded or otherwise rigidly attached to the outer I-beams 22 of the frame, and extending therebelow. These channel brackets 73 are track guide means, as clearly shown in Fig. 1, and extend downwardly below the rollers 72 and slidably engage opposite sides of the transverse tracks or skids 71, so as to cause the track supported frame 20 to move perpendicular to the tracks or skids.

For the purpose of providing relative movement between the frame 20 and the skids or tracks 71, double-acting fluid cylinders 74 are operatively connected to the frame and the skids or tracks 71. As shown in the

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drawings, this connection may be made by providing a lug 75 on one end of each cylinder and pivotally connecting it to an ear 76 on the adjacent outer I-beam 22 of the frame, and by pivoting the piston rod 77 to an ear 78 on the skid or track 71.

Each of the fluid cylinders 74 is adapted to be independently operated, so that the machine may be moved in any desired manner upon the tracks or skids. For instance, if it is desired to move the frame laterally, perpendicular to the tracks or skids, both cylinders 74 are operated to the same extent in the same direction.

If it is desired to turn the frame in either direction as it is moved, one cylinder 74 may be operated in either direction as described and the other cylinder may be operated in the opposite direction, or may be held against movement as may be necessary to steer the machine in the desired direction.

In order to raise the entire frame 20, and the mechanism carried thereby, above the ground, and for truing up and leveling the machine preparatory to boring into the coal seam, a plurality of jacks are carried by the frame.

These jacks may be fluid-operated jacks, as indicated generally at 79, and preferably four are provided, located near the four corners of the machine as best shown in Fig. 3. As shown in detail in Fig. 12, each jack comprises a stationary cylinder 80 and a hollow, cylindrical piston 81 closed at both ends and slidably mounted within the cylinder 80, and having a conical point 82 upon its lower end for contact with the ground.

Each jack may be connected to the frame 20 by means of a substantially square box 83, welded or otherwise rigidly attached to the lower portion of the stationary cylinder 80, and fitted between the flanges of, and welded or otherwise connected to the outer I-beams 22 of the frame. Also, it will be seen that the top wall of the box 83 has an extension 84 which is bolted or otherwise attached to the top of the I-beam 22, as shown at 85.

A stationary piston is carried by the stationary cylinder 80 and extends into the hollow piston 81 for purpose of operating the latter. This stationary piston comprises a tube 86, connected at its upper end to the head 87 of the cylinder 80, and extending downward through an opening 88 in the top of the piston 81, to a point near the lower end of the cylinder 80.

The stationary piston 89 is fixed upon the lower end of the tube 86, within the movable, cylindrical piston 81, and has piston rings 90 therein contacting the inner wall of the cylindrical piston. Fluid inlet and discharge pipes 91 and 92 are located within the tube 86 and terminate respectively at points above and below the stationary piston 89, as indicated at 93 and 94 respectively.

Each of the pipes 91 and 92 is located through the head 87 of the cylinder 80, and through the housing 95, as shown at 96, and leads to a source of fluid under pressure for selectively admitting fluid, through either pipe as desired, to the interior of the hollow piston 81, either above or below the stationary piston 89, for raising and lowering the cylindrical piston 81, in order to lower the frame 20 onto the tracks or skids 71, or raise the frame above the skids.

In this latter operation, the entire frame with carriage, mining assembly, boom and other mechanism mounted thereon, may be raised to any desired or necessary height above the ground, depending upon the height of the coal seam.

It will be obvious, of course, that the entire machine will thus be supported entirely upon the four jacks, and as the jacks are each independently operable the machine may be leveled and trued up to the desired angle or position for boring a hole into the coal seam.

In the operation of the cylinders 74 and jacks 79, to move the machine laterally within a coal bed along the face of the coal seam, for boring a succession of holes

into the coal seam to recover the coal therefrom, the sequence of operations may be as follows:

Assuming the parts to be in the relative positions shown in Fig. 5, if it is desired to move the frame 20 upon the skids or tracks 71 to the right, as viewed in said figure, the cylinders 74 are operated to project the piston rods 77 therefrom as shown in Fig. 7, sliding the frame 20 to the right upon the tracks or skids 71, as shown in said figure.

The jacks 79 will then be operated to lower the pistons 81 into contact with the ground, thus raising the entire frame 20, and mechanism carried thereby, to the desired height, as shown in Fig. 8. After the machine is properly leveled and trued at the proper height for boring into the coal seam by independent operation of one or more of the jacks 79, the boring operation may be carried out.

When it is desired to move the machine to the right, as viewed in the drawings, with the parts in the position shown in Fig. 8, the cylinders 74 are operated to retract the piston rods 77 to the position shown in Fig. 9, sliding the tracks or skids 71 upon the ground, beneath the frame 20.

The frame is then lowered onto the skids or tracks 71 to the position shown in Fig. 5, by retracting the pistons 81 of the jacks 79, and the above operations may be repeated from time to time as each hole is bored into the coal seam and the machine is moved to position for boring the next hole.

In each mining operation to bore a hole of considerable depth into the coal seam and recover the coal therefrom, the operation is started by operating the engine to rotate the first conveyor section 52, with boring head 51 thereon, and at the same time the engine 41 is operated to advance the carriage 38 upon the frame.

The levers 66 are manually operated to bring the guide rollers 61 into engagement with the boring head 51, so that the same is properly guided into the coal seam, as indicated in Fig. 1, and as the mining assembly is continually rotated and advanced it will bore into the coal seam as indicated at B, until the first conveyor section 52 has been driven substantially entirely into the coal seam.

For the purpose of transferring the conveyor sections 52 to and from the machine, a jib boom, indicated generally at 109, is mounted at the rear end of the frame 20. This boom is preferably centrally located upon the frame and, as best shown in Figs. 1, 2 and 3, is mounted upon a platform 110 supported by uprights 111 extending upward from opposite sides of the frame 20 and straddling the path of the carriage 30, so that in the rearward position of the carriage, as shown in Figs. 1 and 3, it may be received beneath the platform 110.

As best shown in Fig. 4, the uprights 111 may be bolted to the outer sides of the outer I-beams 22 of the frame, as indicated at 112, and may be further reinforced by gusset plates 113 connecting the uprights 111 to the frame 20, and by the upper gusset plates 114 between the upper portions of the uprights 111 and the platform 110.

The boom 109 may be mounted for oscillating movement on the platform 110, by means of a turntable 115. The base of the boom is indicated generally at 116, and the boom or jib 109 is fulcrumed thereon in customary manner, as indicated at 117, so that it may swing upward and downward as well as oscillating from side to side.

A hydraulic motor 118, as shown in Fig. 17, may be provided for oscillating the turntable to swing the boom from side to side, and hydraulic motors 119, connected by flexible couplings 120 to pumps 121, may be provided for operating the drums 122 which control the cables 123, one of which cables raises and lowers the boom 109 upon its fulcrum 117, while the other cable passes over a pulley block 124 on the end of the boom and a hook 125 is suspended therefrom as by the block and tackle 126.

A brake drum 127 may be formed integrally with each cable drum 122, the brake bands 128 thereof each being connected at one end, as by the T-rod 129 with turnbuckle 130 therein, to ears 131 on the base 116, the other

end thereof being connected as at 132 to the piston rod 133 of hydraulic cylinder 134.

A beam 135, having a central eye 136 (Figs. 1, 2 and 3) is suspended from the hook 125 of the crane and has depending from each end thereof a short length of chain 137 having a hook 138 at its lower end for engagement with the eyes 60 upon the conveyor sections.

An engine or motor 140 is mounted upon the rear portion of the frame 20 and operates the various hydraulic motors and cylinders and associated pumps which operate the jacks 79, the frame and track-moving cylinders 74, and the hydraulically operated mechanism for the boom as above described, and all of these several hydraulic devices are adapted to be controlled independently by a series of valves, indicated generally at 141 (Figs. 1, 2 and 11), through a series of piping indicated generally at 142 connecting these valves to the various hydraulic devices. Thus each cylinder 74 may be independently controlled as above described.

A platform 143 may be mounted on the frame 20, with guard rail 144 to accommodate a workman in operating the various valves 141. A similar guard rail 145 may be provided around the crane platform 110 to protect a workman at that point.

In the course of a usual mining operation, after the machine has been properly located and positioned relative to the coal seam S, with the first conveyor section 52 with boring head 51 thereon, as shown in Fig. 1, the mining operation is started by operating the motors 37 and 41 to rotate the mining assembly and simultaneously advance it into the coal seam by continuous advancing movement of the carriage 30.

The guide rollers 61 are held in contact with the boring head 51 until the same has been guided into the coal seam, as shown in Fig. 1, after which the guide rollers may be moved away from the mining assembly.

The operation is continued until the carriage 30 has traveled to the forward end of the frame 20, at which time the entire first conveyor section 52 will have been driven into the coal seam, the mined coal being conveyed backward out of the hole thus bored.

Any suitable conveyor or the like (not shown) may be located in position along side of the high wall to receive the mined coal as it is recovered from the hole and to load it onto a truck or the like for transportation.

The carriage 30 is then backed to the rear end of the frame 20 and the boom 109 is operated to pick up another conveyor section 52, and to swing it into position in the machine so that it may be coupled into the mining assembly, one end thereof being coupled to the protruding end of the first conveyor section and the other end coupled to the coupling 40 upon the carriage, and the operation is repeated until each of the conveyor sections has been transferred to the mining assembly of the machine, and driven into the coal seam.

The motors 37 and 41 are then operated to withdraw the conveyor sections 52 from the hole thus bored into the coal seam, one at a time, and by means of the boom 109 each conveyor section is removed as it is withdrawn from the hole and uncoupled from the mining assembly.

The pistons 81 of the hydraulic jacks 79 are then raised, lowering the entire frame and mechanism carried thereby onto the tracks or skids 71, and the cylinders 74 are operated in the manner above described, with reference to Figs. 5 and 7 to 9, to move the frame 20 laterally upon the tracks or skids to the point where it is desired to bore the next hole into the coal seam. The jacks 79 are then operated to raise the machine to the right height with reference to the coal seam and to level the same, and the next mining operation is carried out in the manner above described.

It will thus be obvious that the coal mining machine disclosed herein overcomes the disadvantages and difficulties encountered in machines of this general type now in use; that a self-propelled coal mining machine is pro-

vided which will quickly and easily move itself along the face of the high wall of a coal pit, so that a series of holes may be bored into the coal seam at desired points; and that the machine is quickly and easily adjusted to desired height and level by means of the independently operated hydraulic jacks.

It will also be obvious that such a mining machine may be steered in any desired direction as it is moved by means of the transverse tracks or skids 71, since each track or skid is independently controlled and operated so that the machine may be steered or turned as it is moved. Thus, regardless of the contour of the high wall into which the auger mining machine is operating, the machine may be quickly and easily moved to desired position for drilling therein.

In the foregoing description, certain terms have been used for brevity, clearness and understanding, but no unnecessary limitations are to be implied therefrom beyond the requirements of the prior art, because such words are used for descriptive purposes herein and are intended to be broadly construed.

Moreover, the embodiments of the improved construction illustrated and described herein are by way of example, and the scope of the present invention is not limited to the exact details of construction.

Having now described the invention or discovery, the construction, the operation, and use of preferred embodiments thereof, and the advantageous new and useful results obtained thereby; the new and useful constructions, and reasonable mechanical equivalents thereof obvious to those skilled in the art, are set forth in the appended claims.

I claim:

1. A mining machine comprising a frame, a carriage movably on the frame, a rotatable mining assembly connected to the carriage a spaced pair of parallel track members located beneath the frame for supporting the frame for movement upon the ground, means on the carriage for rotating the mining assembly, means for moving the carriage on the frame, power means independently connecting each of the track members to the frame for moving the frame along the track members, track member guide means secured to said frame for entraining the movement of each track member when moving said frame thereon, and independently operating means for each power means to independently move each track member in either direction and for moving one track member further in one direction than said other track member, said track member guide means causing said other track member to pivot on the ground for steering the frame as it is moved on the track members.

2. A mining machine comprising an elongated frame, a carriage movably mounted upon the frame, means for moving the carriage upon the frame, an elongated mining assembly detachably connected to the carriage, means on the carriage for rotating said mining assembly, a spaced pair of track members located beneath the frame, vertical lifting jacks connected to opposite sides of the frame for raising and lowering the frame relative to the ground, independently operated fluid cylinders connected to the frame, pistons in said cylinders independently connected to each of the track members for moving the frame upon the track members when the frame is in lowered position and for moving the track members relative to the frame when the frame is in raised position, and transversely disposed channel brackets on the underside of said frame and slidably engaged by said track members when moving said frame thereon, when one cylinder and piston for one track member is moved further in one direction than the other cylinder and piston for the other track member said channel brackets causes the other of said track members to pivot on the ground to steer the movement of said frame.

3. A mining machine comprising a frame, a carriage movably mounted upon the frame, means for moving the

carriage upon the frame, a mining assembly detachably connected to the carriage, means on the carriage for rotating said mining assembly, independent track members located beneath the frame, vertical lifting jacks connected to opposite sides of the frame for raising and lowering the frame relative to the track members, an independently operated fluid cylinder for each track member pivotally connected to the frame and pistons in said cylinders pivotally connected to the track members for moving the frame upon the track members when the frame is in lowered position and for moving the track members relative to the frame when the frame is in raised position, and track member guide means secured to said frame for entraining the movement of each track member when moving said frame thereon, when said cylinder and piston for one track member is moved further in one direction than the other cylinder and piston for the other track member said track member guide means causes the other of said track members to pivot on the ground to steer the movement of said frame.

4. A mining machine comprising a frame, a carriage movably mounted upon the frame, means for moving the carriage upon the frame, a rotatable mining assembly detachably connected to the carriage, means on the carriage for rotating said mining assembly, independent track members located beneath the frame, vertical lifting jacks connected to opposite sides of the frame for raising and lowering the frame relative to the track members, an independently operated fluid cylinder and piston assembly for each track member pivotally connected to opposite ends to the frame and to the track members for moving the frame upon the track members when the frame is in lowered position and for moving the track members relative to the frame when the frame is in raised position, said fluid cylinder and piston assemblies providing the only supporting connection of the track members to the frame, and track member guide means secured to said frame for entraining the movement of each track member when moving said frame thereon, when said cylinder and piston assembly for one track member is moved further in one direction than the other cylinder and piston assembly for the other track member said track member guide means causes the other of said track members to pivot on the ground to steer the movement of said frame.

5. A mining machine comprising a frame, a carriage movably mounted upon said frame, means for moving the carriage along said frame, a rotatable mining assembly detachably connected to the carriage, means on the carriage for rotating the mining assembly, a spaced pair of independent track members suspended from the frame, rollers mounted upon the frame for rolling contact with said track members, vertical lifting jacks connected to opposite sides of the frame for raising and lowering the frame, independently operated fluid cylinder and piston assemblies for each track member, each connected between the frame and its track member for moving the frame upon said track members when the frame is resting on the track and for moving the track members relative to the frame when the frame is not resting on the track, and track member guide means secured to said frame for entraining the movement of each track member when moving said frame thereon, when said cylinder and piston assembly for one track member is moved further in one direction than the other cylinder and piston assembly for the other track member said track member guide means causes the other of said track members to pivot on the ground to steer the movement of said frame.

6. A mining machine comprising a frame, a carriage movably mounted upon said frame, means for moving the carriage upon said frame, a mining assembly detachably connected to said carriage, means on the carriage for rotating said mining assembly, vertical elevating jacks connected to opposite sides of said frame for raising and lowering the same relative to the ground, spaced channel bracket means secured in fixed relation on the underside

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of said frame, an independent track member entrained in and guided by each of said spaced channel bracket means in parallel relation to each other for supporting the movement of the frame thereon, two double-acting fluid cylinders connected to said frame, pistons in said cylinders connected to their respective track members, and a fluid control valve member for each of said cylinders to independently control the movement of each piston in either direction for moving one track member further in one direction than said other track member, said channel bracket means causing said other track member to pivot on the ground for steering the frame laterally or turning it around when the weight of said frame is on said track members.

7. A lateral track for a coal augering machine having a frame with a carriage movable therealong by power, a rotary mining assembly connected with the carriage to obtain rotary and longitudinal movement, characterized by a pair of independent track members under the frame to support the frame for movement on the ground, track guide means secured to said frame for entraining the movement of each track means when moving said frame thereon, independent power means for each track means, pivot means to independently connect each of said power means between its respective track means and said frame for moving one track means further in one direction than said other track means, said track guide means causing said other track means to pivot on the ground to steer and to manipulate said frame and mining assembly.

8. The lateral track for the coal augering machine of

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claim 7 characterized by elevating jacks connected to opposite sides of said frame to raise the same for vertically guiding the auger and for permitting said power means to shift said track means under said frame and free of the load thereof for manipulation of said frame and mining assembly.

9. The lateral track for the coal augering machine of claim 7 characterized in that said guide means comprises a pair of spaced transversely disposed brackets retaining each of said track means on the underside of said frame and to slidably engage said track means in steering and manipulating said frame and mining assembly.

10. The lateral track for the coal augering machine of claim 9 characterized by roller means carried by said brackets and engaging said track means to support said frame with reduced friction.

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