March 6, 1956 C. F. BALL 2,737,284

FLOOR CLEAN-UP MECHANISM FOR CONTINUOUS MINING APPARATUS

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Fig. 1.

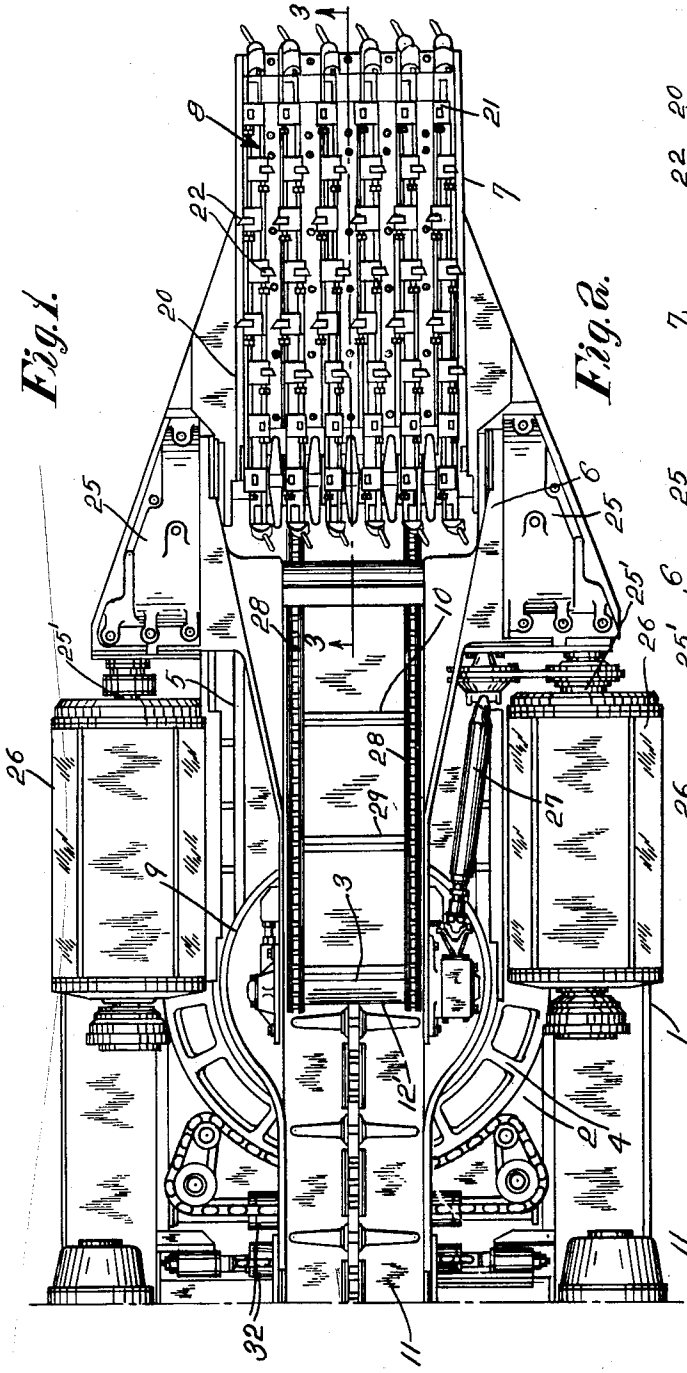
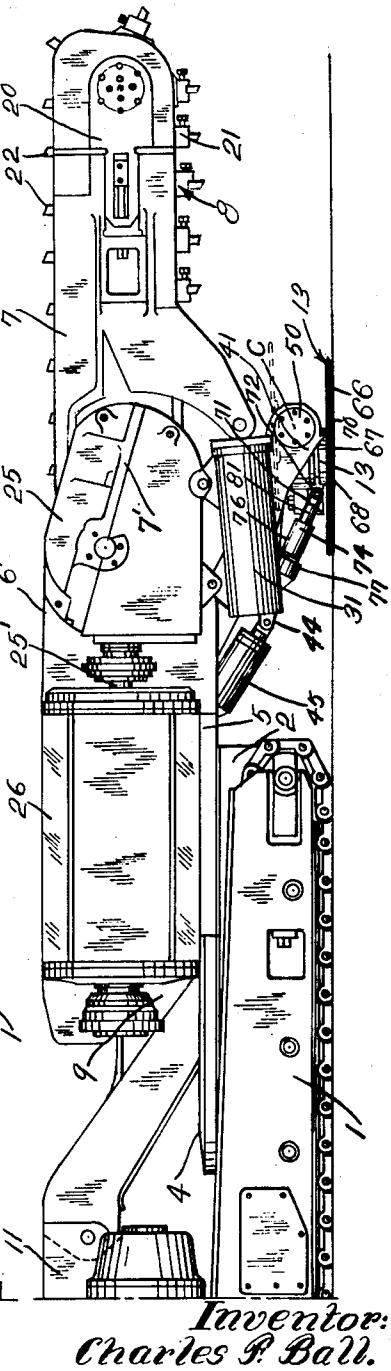


Fig. 2.



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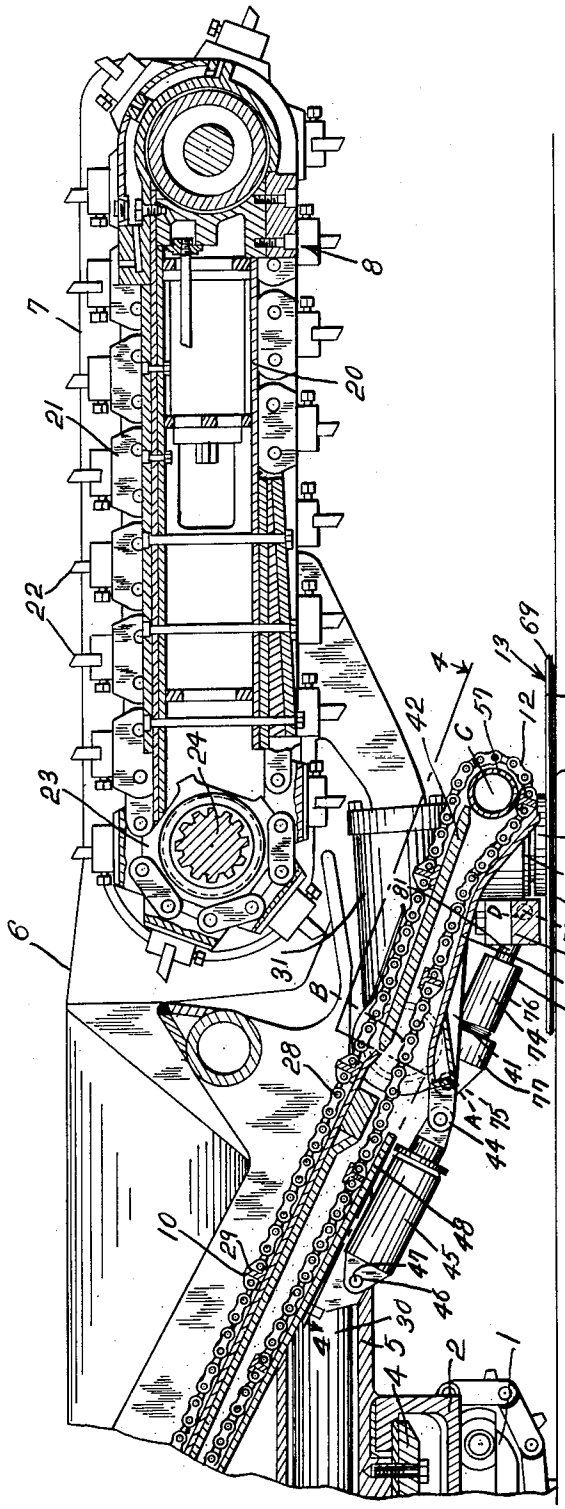
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FLOOR CLEAN-UP MECHANISM FOR CONTINUOUS MINING APPARATUS

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Fig. 3.



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FLOOR CLEAN-UP MECHANISM FOR CONTINUOUS MINING APPARATUS

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Fig. 4.

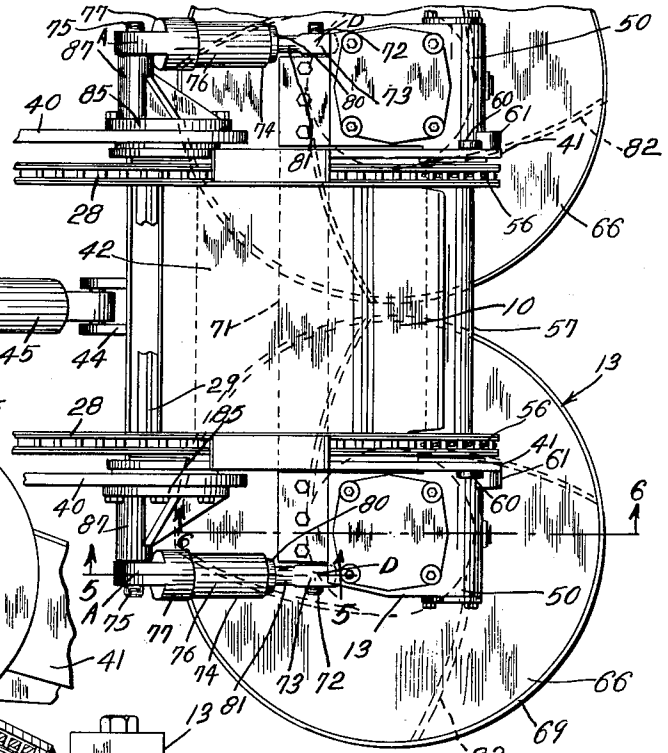
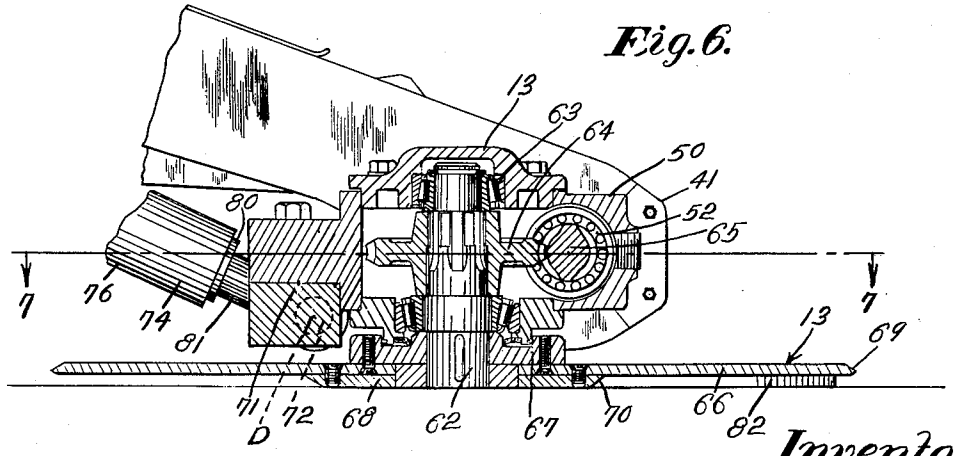


Fig. 5.

Fig. 6.



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FLOOR CLEAN-UP MECHANISM FOR CONTINUOUS MINING APPARATUS

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Fig. 7.

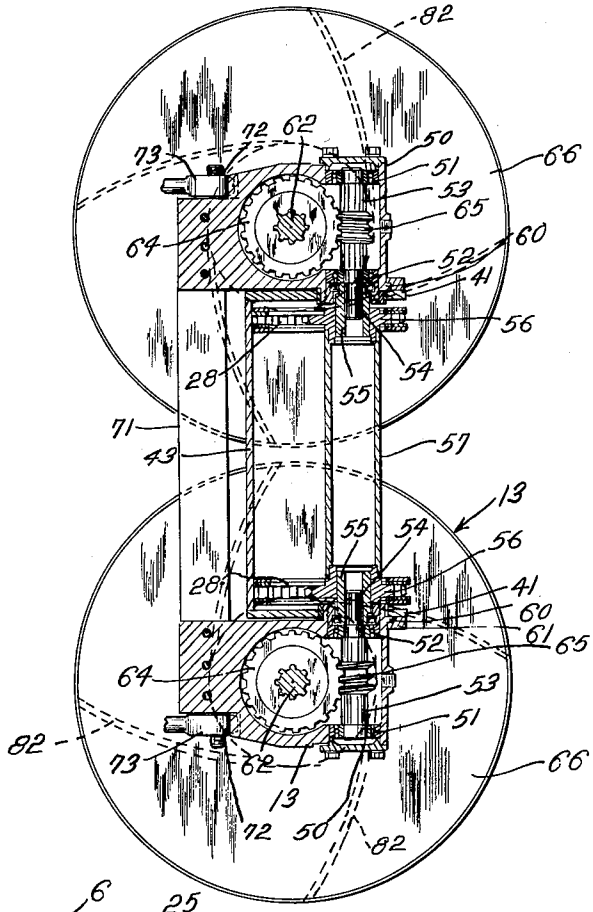
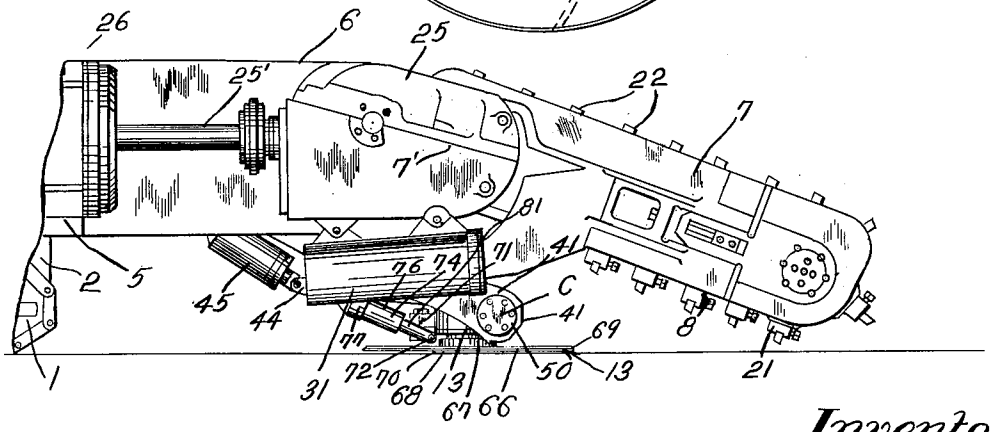


Fig. 8.



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United States Patent Office

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2,737,284

FLOOR CLEAN-UP MECHANISM FOR CONTINUOUS MINING APPARATUS

Charles F. Ball, Franklin, Pa., assignor to Joy Manufacturing Company, Pittsburgh, Pa., a corporation of Pennsylvania

Application May 26, 1949, Serial No. 95,468

6 Claims. (Cl. 198—9)

My invention relates to mining apparatus, and more particularly to "Continuous Miners," which are apparatus for mining coal, or other mineral suited to mining by them, from a seam or vein, without the use of explosives, and for loading the material detached from the seam or vein as mining progresses.

A "Continuous Miner" may, in a preferred embodiment, include a mobile base, such as a tractor base, adapted to travel over the floor of a mine and carrying a frame which is pivotable relative to the base about an upright axis and which supports a disintegrating apparatus upon it for reciprocatory movement—for sumping and withdrawing movements—radially with respect to the upright axis. The disintegrating apparatus may include, upon an inwardly and outwardly moving carriage, a disintegrating device proper, the latter swingable up and down about a horizontal axis and including numerous disintegrating elements moving in similar orbits and adapted to disintegrate a vertical band of coal or other mineral by a cycle of attacking operations including sumping, upward swinging and withdrawal movements, and to remove a transverse band of the desired width by a series of laterally differently directed attacks, effected by repositioning the disintegrating apparatus about the upright axis and repeatedly performing the cycle of attacking operations. During and throughout the disintegrating of the mineral, the disintegrating apparatus discharges to a conveying system including a material receiving conveyor, and the material is adapted to be discharged to such devices as mine cars, belt or shaker conveyors, or other means for transporting it away from the "Miner."

Mine bottom clean up calls for attention with such "Miners," in part because fine pieces of disintegrated mineral tend to fall between the disintegrating elements in front of the disintegrating device, particularly during the upswing portions of the cycles of operation, and also in part because detached fragments or particles of mineral tend to fly out from the face with considerable velocity when detached and, particularly in the angled positions of attack, some of these particles travel beyond the confines of the apparatus and fall to the mine floor. Simply to leave this material which falls to the mine floor presents a number disadvantages. The fire and dust-explosion hazards would be increased, and the expense of rock dusting in an attempt to minimize these dangers would be very substantially greater. Because of the need to rest props on a solid surface, the time and labor of timbering would be made greater. There will be an actual loss in money, because, while the fines may for some purposes be worth less, and cleaning of them may be more difficult, they do possess value. And another very important point is that the actual performance of the disintegrating operations will be made much more difficult, because the tractors should operate on the firm bottom, and the apparatus as a whole should be maintained on the bottom in order not to have to be constantly making adjustments to keep the mining operations at the desired level and, in low coal or other mineral veins, the

use of a particular "Miner" may be practicable where it is kept down on the bottom, but be impracticable if it has to move along over inches of bug dust.

It is an object of my invention to provide an improved mining apparatus having improved clean up mechanism associated with it. A further object is to provide an improved clean up mechanism for use with apparatus of the "Continuous Miner" type. Other objects and advantages of the invention will hereinafter appear.

In the accompanying drawings, in which one illustrative embodiment of my invention is shown for purposes of illustration,

Fig. 1 is a plan view and Fig. 2 is a side elevational view of the forward end of a "Continuous Miner' 'in which the illustrative embodiment of the invention is incorporated.

Fig. 3 is an enlarged longitudinal vertical section on the plane of the line 3—3 of Fig. 1.

Fig. 4 is an enlarged plan view of the clean up mechanism, with associated and overlying parts removed.

Figs. 5 and 6 are further enlarged, detail vertical sectional views on the planes of the lines 5—5 and 6—6 of Fig. 4.

Fig. 7 is a horizontal sectional view on the plane of the line 7—7 of Fig. 6, on a reduced scale.

Fig. 8 is a fragmentary side elevational view similar to Fig. 2 but with the disintegrating device in a lowered position.

The mining and loading apparatus of the present invention is an improvement over the one shown in John R. Sibley application, Serial No. 102,996, filed July 5, 1949, which is a continuation-in-part of the John R. Sibley abandoned application, Serial No. 47,422, filed September 2, 1948, both applications being owned by the assignee of the present invention. As shown in the drawings, it consists generally of a mobile base 1, having a frame 2, which has swiveled thereon, to swing about a vertical axis 3, a horizontal supporting frame or turntable 4. The latter has a horizontal portion 5 projecting forwardly in advance of the base 1, and guided on this horizontal frame portion for movement rectilinearly relative thereto in a radial direction relative to the swivel axis is a sliding frame or support 6, on which a swingable frame or bar structure 7 is pivotally mounted on a horizontal transverse axis 7', to swing in vertical planes with respect thereto and to swing horizontally with the swiveled supporting frame or turntable 4 relative to the base 1.

The vertically swingable frame or bar structure 7 extends forwardly in advance of the swivel frame, with its pivotal axis located, when the sliding frame 6 is retracted, a substantial distance in advance of the base. The swingable frame structure 7 carries a mine vein-attacking and disintegrating mechanism generally designated 8 for dislodging and disintegrating the coal or other mineral in vertical segments from a solid seam or vein. Arranged substantially coaxial with the swivel of the horizontally swinging frame 4 is a hopper 9, mounted in stationary relation with respect to the base frame 1. A front loading conveyor 10 receives disintegrated material from the vein-attacking and disintegrating mechanism 8 and delivers it to the hopper 9. It also has a mine bottom clean-up function as will shortly appear. A delivery conveyor 11 takes material from the hopper 9, and, as more fully disclosed in the application of Sibley above mentioned conveys it to a desired point of discharge. The loading conveyor 10 extends from a point 12 closely adjacent the mine bottom rearwardly to a point 12' overlying the hopper 9 and delivers not only the material discharged to it by the vein-attacking and disintegrating apparatus 8 but also material picked up from the mine bottom. Carried by the sliding frame 6 beneath the rearward portion of the vein-attacking and disintegrating mechanism 8 and partially underlying the forward end

of the front loading conveyor **10** is an improved clean-up mechanism **13** which will shortly be more fully described.

The vein-attacking and disintegrating mechanism **8** includes a frame structure **20** about which there are guided for orbital movement several chains **21**, each of these being equipped with disintegrating elements **22**. The chains are driven by sprockets **23** mounted on and driven by a transversely extending splined shaft **24** to the opposite ends of which power is delivered by gearing (not shown) enclosed in gear casings **25**, the gearing being driven through telescopic shafting **25'** by motors **26** mounted on the sides of the turntable **4**. One of the motors **26** drives, through transmission mechanism **27**, the side chains **28** of the flight conveyor **29** which constitutes the front loading conveyor **10**. This front loading conveyor, the gear housings **25** and their contained gearing, and the disintegrating mechanism are adapted to be advanced and retracted with respect to the turntable **4** by hydraulic feed cylinder and piston mechanisms, one of which is shown in part at **30**, to which fluid may be supplied from a suitable source not shown. The disintegrating mechanism **8** may be swung upwardly by hydraulic cylinder and piston mechanisms **31** supported by the frame **6**, and the turntable may be swung by hydraulically actuated mechanism **32** and held in its different positions of adjustment. The structure described, except for the clean-up mechanism **13** and the modified construction of the front loading conveyor **10**, is disclosed in detail in the Sibley application mentioned, and does not need further illustration or description in this case.

The front loading conveyor **10** has side plates **40**. These pivotally support forwardly extending side plate elements **41**. Between the latter there extend upper and lower flight conveyor guiding plates **42** and **43**. To the latter, at its rear end, is connected by ears **44**, a cylinder and piston mechanism **45** whose other end is connected as at **46** to a pivot pin **47** carried by the lower plate **48** of the front loading conveyor **10**. The structure of the cylinder and piston mechanism **45** and its fluid supply are essentially the same as the shovel control cylinder of the Sibley application above mentioned, hence need not be more fully described here. It will be understood that fluid supply to the left hand end of the mechanism **45** will raise the outer ends of the side plate elements **41** and venting of the fluid so supplied will permit lowering by gravity of the outer ends of such plates.

Referring now to Figs. 4, 5, 6 and 7, it will be noted that the forward ends of the plate elements **41** have pivotally mounted on them housings or casings **50, 50**. In each housing, in bearings **51** and **52**, there is journaled a transverse worm shaft **53**. These have inwardly projecting—inwardly towards the center line of the front loading conveyor **10**—splined portions **54** received in sleeves **55** to which sprockets **56** are secured, and a tubular shaft **57** is secured to the sprockets **56**. The sprockets are driven by the chains **28**, and drive the worm shafts. Arcuate guides **60** cooperate with arcuate flanges **61** to guide the housings or casings **50, 50** for pivotal movement on the axial line of the sleeves **55**. Also within the casings **50, 50** are vertical shafts **62**, mounted on bearings **63**, and each carrying a worm wheel **64** meshing with and driven by a worm **65** on one of the worm shafts **53**. The lower ends of the shafts **62** project downwardly from the casings and carry circular conveyor discs **66**, secured to collars **67** fixed to the shafts **62**, said discs having plates **68** adapted to underlie them and support them slightly above the mine floor when the clean-up mechanism is in lowered position. The peripheries of the discs **66** and of the underlying plates **68** are suitably beveled as at **69** and **70** respectively. The top surfaces of the discs may be ribbed, serrated or otherwise roughened, for increasing the effectiveness of the conveyor discs.

The casings **50, 50** have lug portions secured to a cross bar **71** which connects the casings **50** together to provide a rigid, unitary structure. Pivotally connected at **72** to the ends of the cross bar **71** are the forward ends **73** of link devices **74**, whose other ends are pivotally connected to pins **75** carried by the forward ends of the side plates **40**. The link devices **74** include cylinder elements **76** having rear heads **77** through which the pins **75** extend, and contain heads **78** engaged by springs **79** whose forward ends press against front heads **80** of the cylinder elements **76**, and a link rod **81** connects each head **78** with the associated pivotal connection **72**. Thus the link devices can be elongated, but not contracted, permitting the discs to tilt downwardly at their rear sides when their forward sides ride upwardly over a roll or the like of the floor. Deflecting ribs **82** formed on the bottoms of the discs are arranged at retreating angles with respect to the direction of rotation of the discs and serve to throw out any loose material from beneath the discs to prevent riding up of the discs on the material on the floor as the apparatus is advanced.

The pivotal connections between the plate portions **41** and the side plates **40** are provided by members **85** recessed as at **86** in the forward ends of the side plates **40**, and the pivot pins **75** are provided at the outer ends of brackets **87** which are formed on the members **85**. For purposes of reference it may be considered that the axis of the pins **75** is designated A, the axis of the connection between the plate portions **41** and the side plates **40** is designated B, the pivot axis of the connections of the side plates **40** with the casings **50, 50** is designated C, and the axes of the pivots **72** is designated D. The distances B—C and A—D are unequal, as will be noted, and since the length A—D is shorter than the distance B—C the motion of the discs **66** will be such that their forward edges will tilt down as the forward end of the front loading conveyor is depressed and tilt up as such front end is elevated. The link devices **74** and the pivoted frame elements **41**, normally provide a "floating" support for the conveyor discs, so that as the latter move over the mine floor, they tend to follow the undulations of the floor, rising as humps are encountered and falling as they move into depressions. As above mentioned, the springs of the link devices **74** yield to permit the discs to tilt downwardly at their rear sides, as their front sides tilt upwardly, tending to maintain the discs against the floor.

The discs **66** are rotated, as will be observed, by power transmitted through the chains **28**, and they are rotated in mutually opposite directions and with their forward edges turning towards each other. Accordingly, they are adapted to move the material beneath which they work their way, towards the center of the front loading conveyor **10**, and, by bringing the material which is carried inwardly by their upper surfaces into the path of movement of the flights of the front pick up or loading conveyor **29**, they bring about a very effective cleaning up of any loose material from the mine bottom. It is to be observed that the discs are cumulatively much wider than the width of the front end of the front gathering conveyor and they are, in fact, also distinctly wider than the width of the disintegrating mechanism, and they are reciprocated with the disintegrating mechanism, and, because the distance between their most remote points is greater than the width of the disintegrating mechanism, there is a distinct overlap between the paths of movement of the clean-up mechanism as the disintegrating mechanism is caused to perform successive sumping, upswinging and withdrawing cycles. When there is a rise in the bottom and it is desired slightly to raise the discs, this may be done by admitting fluid to the rear end of the cylinder and piston mechanism **45**, and the forward edges of the discs will then raise more than the rearward edges, thereby making it easier for the discs to pass up a slope. It will be appreciated that the discs constitute means providing surfaces moving transversely of the front loading

conveyor for moving material into the path of movement of the flights of the latter and due to their design they move the material toward the conveyor as they are moved laterally or rearwardly as well as forwardly. Thus the discs will effectively clean up the mine bottom in such a manner as to enable the avoidance of the various disadvantages which a failure adequately to clean the mine bottom would involve.

It will be noted that the lower, forward edge of the lower flight conveyor guiding plate 43 extends nearly down to the upper surfaces of the discs 66 and that it effectively prevents substantial quantities of material being carried by the discs beneath the conveyor 10.

As a result of this invention an improved floor clean-up mechanism is provided, for effectively moving any loose material on the floor toward the receiving end of the conveying means of the apparatus. By the provision of the novel pivotal mounting for the conveyor discs the latter tend to follow the undulations of an uneven floor or rolling bottom. The yieldable link connections are adapted to yield to maintain the rear sides of the discs against the floor as the front edges of the discs ride upwardly over an obstacle in their paths. The novel arrangement of the discs enables movement of the loose material on the floor toward the receiving end of the conveyor irrespective of the direction of horizontal movement of the discs, so that floor clean-up is effected in an efficient manner. The clean-up mechanism is relatively compact and sturdy in design, well adapted for the purpose for which it is intended. 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 purposes of illustration, and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In an apparatus for handling material from a mine floor, a base movable over a mine floor, a conveyor supported on said base for forward and rearward movement and having its forward end adjustable about a horizontal axis relative to the remainder thereof and positionable at least substantially at the mine floor, and means forwardly and rearwardly movable with said conveyor for moving material transversely of and into the path of forward movement of said conveyor, said means pivotally mounted for change in position about a horizontal transverse axis at the forward end of said forward end and having a pivotal link connection with said conveyor rearwardly of said first horizontal axis, the effective length of said pivotal link connection being less than the distance between said two horizontal axes.

2. The combination of claim 1 in which said link connection is yieldable to extend its length and includes portions relatively movable to increase its length and resilient means exerting on said portions forces in a direction to decrease the length of said link connection.

3. In a loading mechanism, a conveyor having a front receiving end disposed at the level of the floor over which the mechanism operates, and a gathering mechanism pivotally mounted to tilt in a vertical direction relative to the receiving end of the conveyor and including a pivoted frame, a pair of coacting gathering devices arranged at the opposite sides of the longitudinal center of said conveyor, gear housings arranged at the opposite sides of said pivoted frame and in which said devices are mounted, a cross bar extending transversely beneath said conveyor rigidly connecting said housings together to provide a rigid, unitary structure, hydraulic cylinder and piston arrangements associated one with each end of said bar and connected with the latter to control the angle of said gathering devices, and driving means for said gathering devices including drive gearings contained in said housings and each drive gearing operatively connected to a gathering device.

4. A loading mechanism as defined in claim 3 in which each gearing includes a worm wheel rotating on a vertical axis to the rear of the forward end of said conveyor and having a driving worm driven by the front end of the conveyor and disposed forwardly of said worm wheel.

5. In an apparatus for handling material from a mine floor, a base movable over a mine floor, a conveyor supported on said base for forward and rearward movement with respect to said base and having its forward end positionable adjacent the mine floor, means forwardly and rearwardly movable with said conveyor for moving material transversely to the path of forward movement of said conveyor and into the path of advance thereof, said last mentioned means including casings pivotally supported on horizontal axes at the forward end of said conveyor and rotatably supporting, upon upright axes to the rear of the pivotal support of said casings, material-engaging discs, and links pivotally connected with said conveyor and also pivotally connected with said casings at points at opposite sides of said upright axes from the pivotal supports of said casings upon said conveyor.

6. In a loading mechanism, a conveyor having a rearward portion and a vertically tiltable forward portion pivotally connected with said rearward portion on a horizontal axis and extending downwardly into adjacency to the level of a floor over which the mechanism operates, gathering devices operating at the floor level at opposite sides of the longitudinal center of said conveyor for moving loose material on the floor toward the front end of the forward portion of said conveyor, means for pivotally mounting said gathering devices for tilting movement about a second, spaced horizontal axis to vary the elevation of the forward portions of said gathering devices with respect to the mine floor, and means including links each shorter than the distance between said horizontal axes and pivotally connected with said conveyor for effecting tilting of said devices about said second horizontal axis upon pivotal movement of said forward portion upon said first horizontal axis.

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