Nov. 13, 1951 O. G. MYERS 2,575,287

COAL GATHERING AND LOADING APPARATUS FOR MINE CONVEYERS

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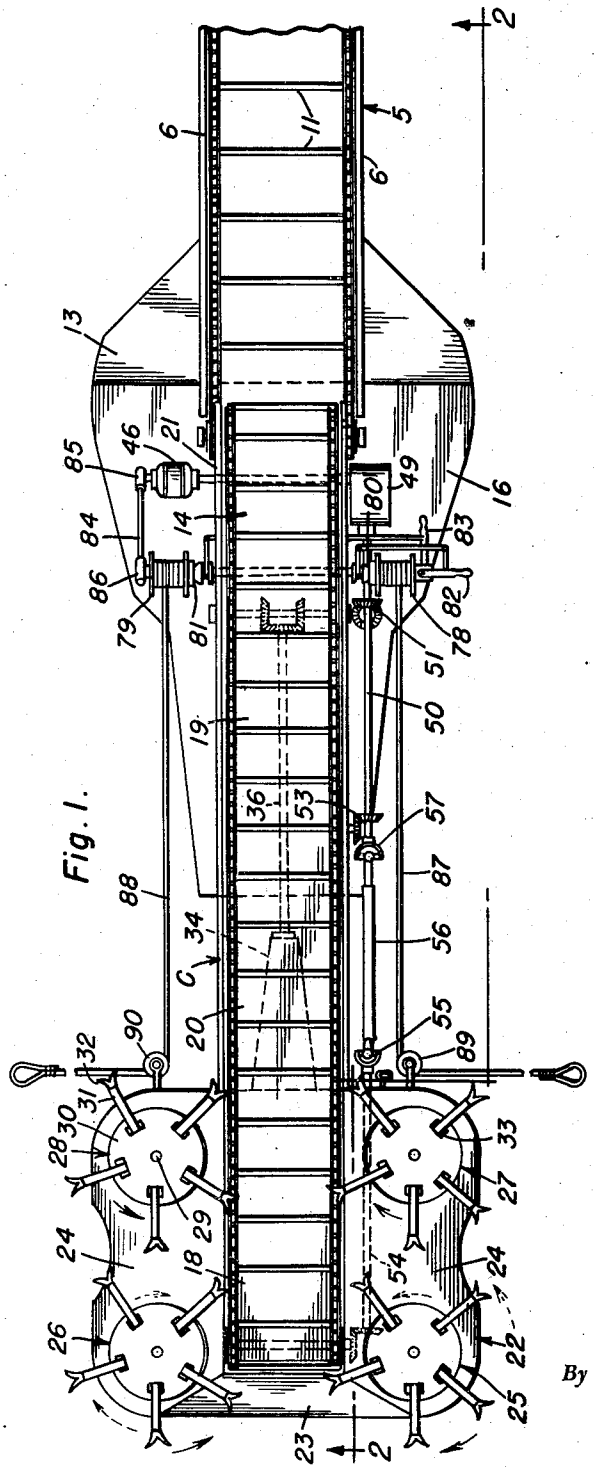

Fig. 1.

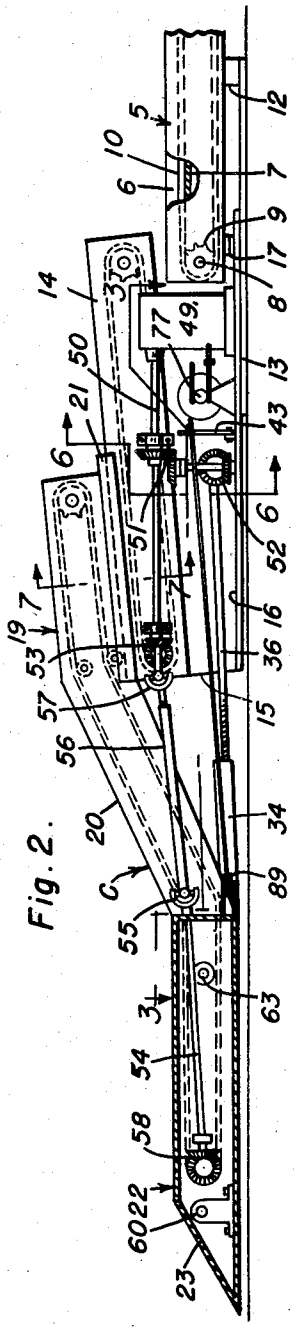

Fig. 2.

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COAL GATHERING AND LOADING APPARATUS FOR MINE CONVEYERS

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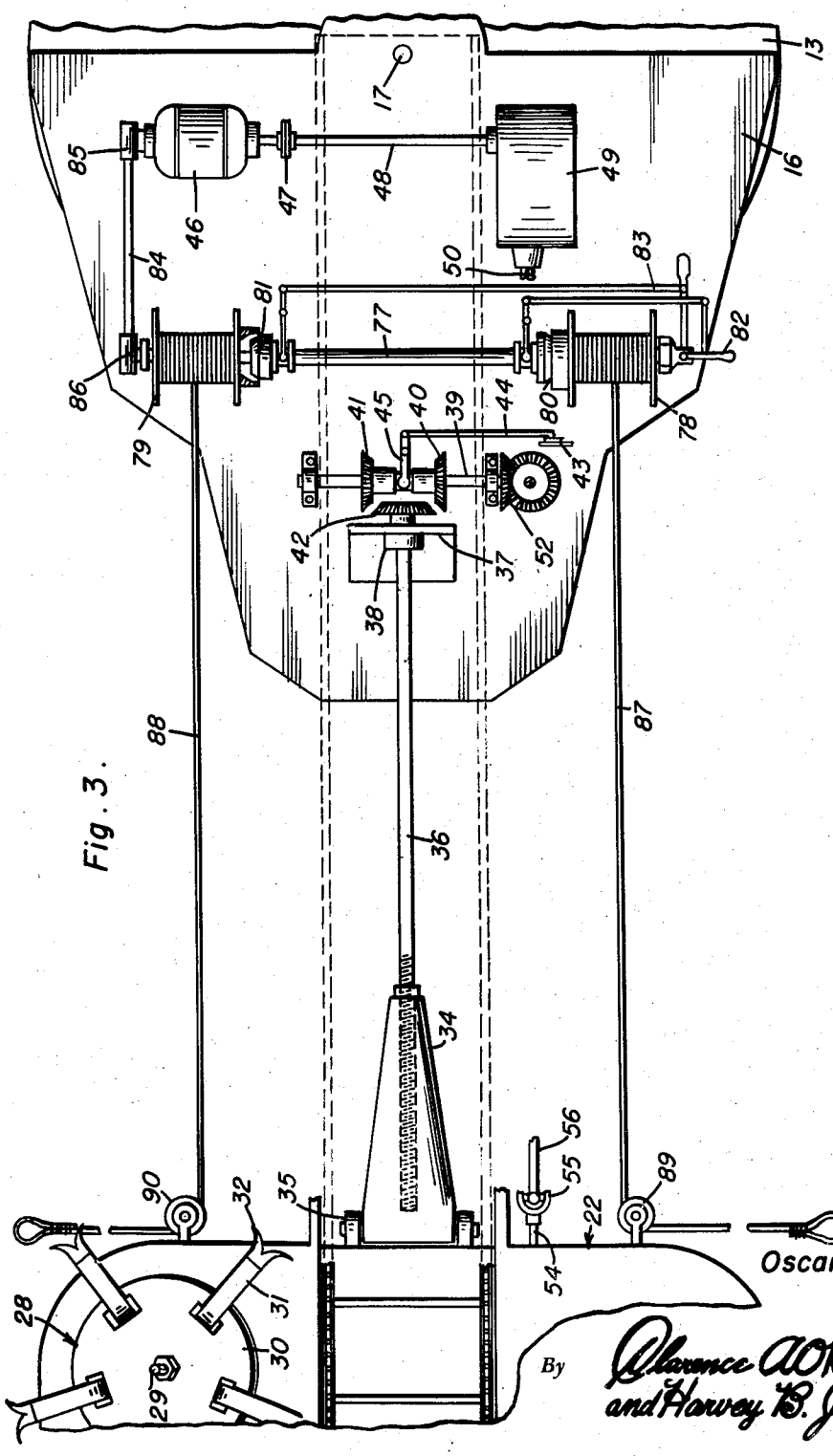

Fig. 3.

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COAL GATHERING AND LOADING APPARATUS FOR MINE CONVEYERS

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Fig. 4.

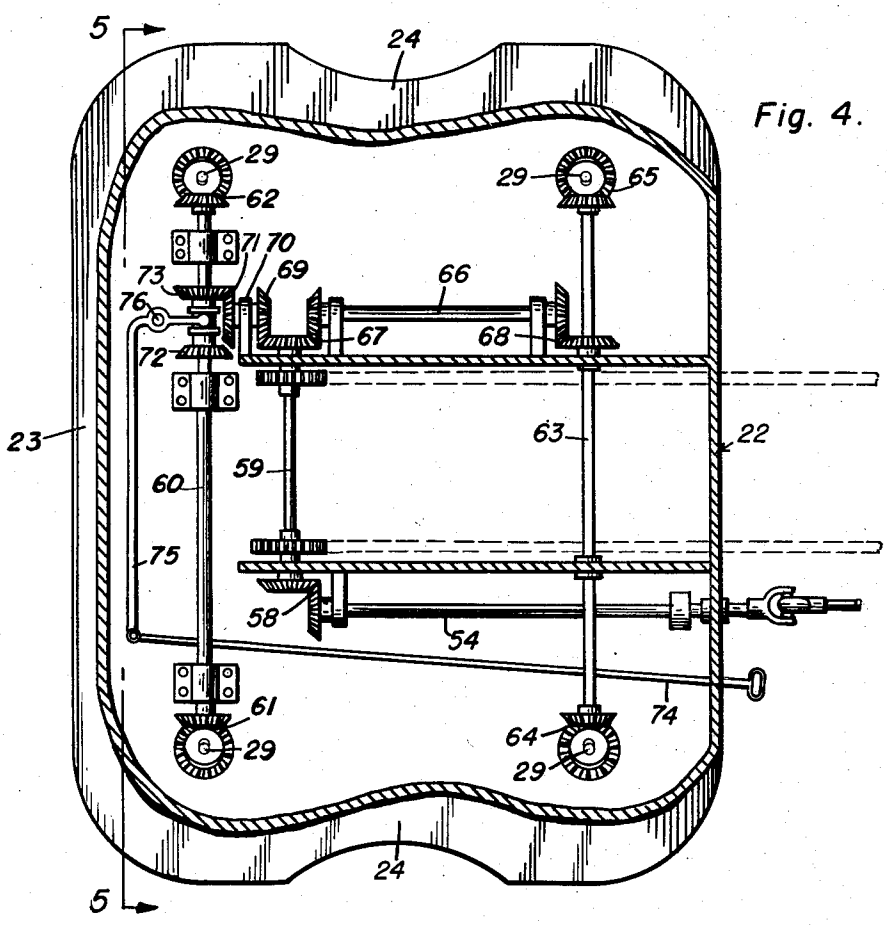
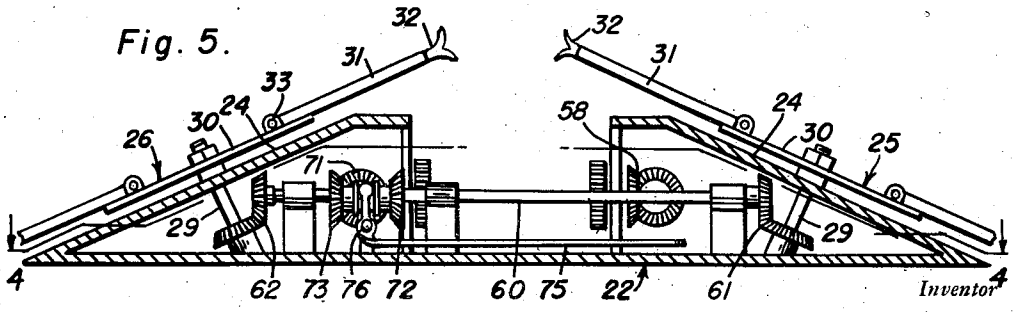


Fig. 5.



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COAL GATHERING AND LOADING APPARATUS FOR MINE CONVEYERS

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Fig. 6.

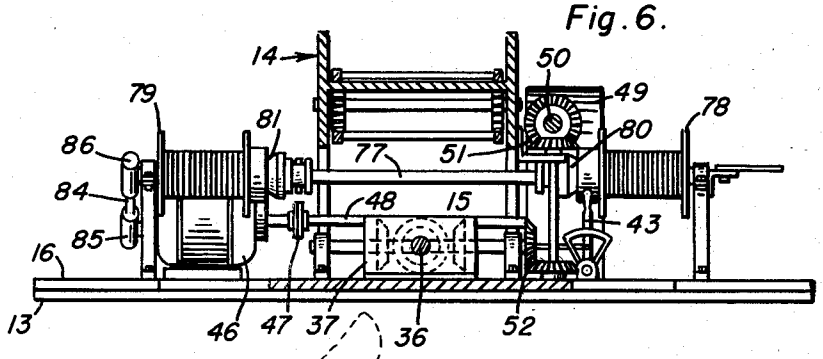


Fig. 8.

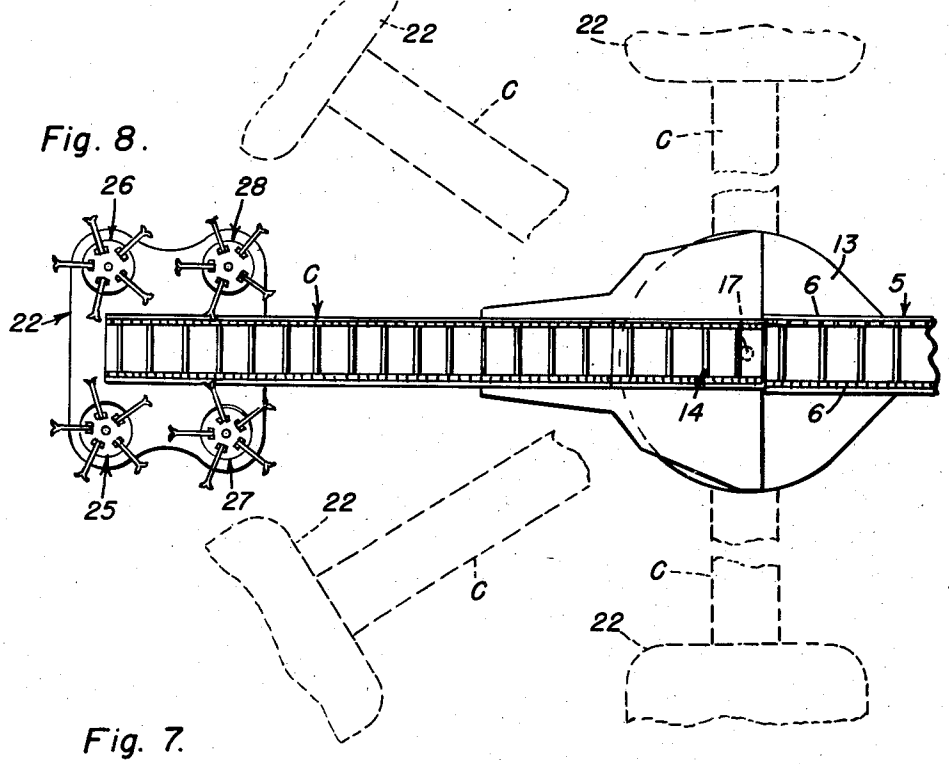
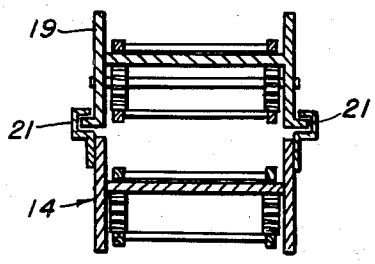


Fig. 7.



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COAL GATHERING AND LOADING APPARATUS FOR MINE CONVEYERS

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Application August 11, 1947, Serial No. 768,011

7 Claims. (Cl. 198—9)

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This invention relates to an apparatus for gathering loose or broken down coal from the floor of the mine and transferring it to a conveyor by means of which the coal is conveyed from the mine.

In the mining of coal in low vein mines, it is the common practice to blast and break the coal down in fragments from the face of the vein, and to then manually load the broken down coal onto a conveyor for delivery from the mine.

I am aware that machines have heretofore been provided to gather coal from the floor of a mine and to transfer it to cars for transportation from the mine. However, due to the fact that such machines and cars require a relatively large space vertically, their use has been restricted to high vein mines. It is my primary object, therefore, to provide a low built apparatus adapted for attachment to the mine conveyor ordinarily used to deliver coal from a low vein mine, whereby to convert said mine conveyor into a self-loading unit and to thereby eliminate hand loading of said conveyor.

Another object is to provide an apparatus of the above kind which is capable of gathering coal across the entire working face and transferring it to the mine conveyor while said mine conveyor occupies a fixed position.

A further object is to provide an apparatus of the above kind which is convenient to operate and thoroughly reliable and efficient in operation.

These and other objects and features of the present invention will become apparent from the following description when considered with the accompanying drawings, in which:

Figure 1 is a top plan view of a coal gathering and loading apparatus embodying the present invention;

Figure 2 is a view of the machine shown in Figure 1, partly in side elevation and partly in section, taken on line 2—2 of Figure 1;

Figure 3 is an enlarged fragmentary section taken on line 3—3 of Figure 2;

Figure 4 is a vertical sectional view of the gathering head taken on line 4—4 of Figure 5;

Figure 5 is a section taken on line 5—5 of Figure 4;

Figure 6 is an enlarged vertical transverse section taken on line 6—6 of Figure 2;

Figure 7 is an enlarged vertical transverse section taken on line 7—7 of Figure 2;

Figure 8 is a diagrammatic plan view of the apparatus illustrating the way in which the gathering head and loading conveyors may be

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swung horizontally relative to the mine conveyor.

Referring in detail to the drawings, 5 indicates a section of an ordinary chain and scraper conveyor commonly used in low vein lines to deliver coal from the working place to a point outside the mine. This section includes side members or walls 6 connected by a transverse partition 7. At its forward end, the section 5 has a transverse shaft 8 provided with sprocket wheels 9 around which the chains 10 of the endless conveying element of the mine conveyor are passed. As usual, the chains 10 are connected at intervals by transverse scraper bars or flights 11 which, in the upper run of the conveying element, move the coal rearwardly along the partition 7. The section 5 is suitably fixedly mounted at 12 upon a horizontal base plate 13 adapted to rest on the mine floor.

A chain and scraper conveyor 14 is rigidly mounted as at 15 in a forwardly inclined position upon a second base plate 16 disposed upon and projecting forwardly of the front portion of base plate 13 and pivoted centrally of its rear edge portion to the latter, as at 17, for horizontal swinging movement. The apparatus further includes a second chain and scraper conveyor C having a substantially horizontal lower forward portion 18, a slightly inclined upper rear portion 19, and a more abruptly inclined intermediate portion 20. The rear portion 19 of this conveyor extends over and is slidably mounted at 21 upon the conveyor 14 for longitudinal movement relative to the latter.

At its forward portion 18, the conveyor C is provided with a hollow gathering head 22 that extends across the front and along the sides of said conveyor portion 18 and whose top wall has outwardly inclined front and side marginal portions 23 and 24, respectively, upwardly along which the coal may be moved to the portion 18 of the conveyor C. For moving the coal from the mine floor in front of head 22 along the front wall portion 23 and onto the conveyor portion 18, laterally inclined coacting rotatable gathering elements 25 and 26 are provided on the forward ends of the side portions of head 22. Similar laterally inclined rotatable gathering elements 27 and 28 are provided on the rear ends of the side portions of head 22 and are adapted to co-act respectively with the elements 25 and 26 for moving the coal from the mine floor at the sides of head 22 along the side wall portions 24 and onto the conveyor portion 18. Each gathering element comprises an inclined driven shaft 29 projecting upwardly through the top

wall of head 22, a disk 30 centrally fixed on the projecting upper end of shaft 29, and a plurality of equally spaced gathering arms 31 projecting radially from the disk 30 and provided at their outer ends with cutting bits 32, said gathering arms being adapted to move outwardly beyond the edge of head 22 and being hinged at their inner ends, as at 33, upon and adjacent the periphery of disk 30 for vertical swinging movement so as to yield upwardly as they ride onto the mine floor. As the loading proceeds in front of the gathering head, the latter may be fed forwardly to the coal by moving the conveyor C forwardly relative to conveyor 14. For this purpose, a screw jack is interposed between the head 22 and base plate 16, said jack including a base member 34 hinged at 35 to the rear of head 22 and threadedly receiving an end of a jack screw 36 journaled in a bearing 37 fixed on base plate 16, said jack screw having a thrust collar 38 disposed against the front of said bearing 37. Means is provided for rotating the jack screw 36 in either direction to selectively retract or project the conveyor C. Such means includes a power driven shaft 39 having a gear unit embodying oppositely facing and rigidly connected bevel gears 40 and 41, slidably keyed thereon, said gears being disposed at opposite sides of the bevel gear 42 fixed on the rear end of jack screw 36. The arrangement is such that when gear 40 is meshed with gear 42, the jack screw is driven in one direction, and when gear 41 is meshed with gear 42, said jack screw is driven in the opposite direction. A hand lever 43 is connected by a link 44 and a lever 45 with the gear unit 40, 41 for manually shifting the latter.

Mounted on the base plate 16 is a motor 46 whose drive shaft is coupled at 47 to the transversely disposed drive shaft 48 of a reduction gearing 49 having a longitudinally disposed driven shaft 50. One end of transverse shaft 39 is operatively connected with the driven shaft 50 by means of gearings at 51 and 52. As shown in Figure 3, gears 40 and 41 may be simultaneously disengaged from gear 42 so as to discontinue rotation of jack screw 36 when desired.

Gearing is provided at 53 between the driven shaft 50 and the foot shaft of conveyor 14 for driving the latter.

Within the gathering head 22 at one side of the conveyor portion 18 is a longitudinally arranged shaft 54 whose rear end is connected by universal joint 55 to one section of an extensible shaft 56, the other section of which is connected by a universal joint 57 with the forward end of shaft 50. The extensible shaft 56 permits the longitudinal adjustment of conveyor C relative to conveyor 14 while maintaining the driving connection between shafts 50 and 54. The forward end of shaft 54 is geared at 58 to the foot shaft 59 of conveyor C for driving the endless conveying element of the latter.

Journaled within the front portion of head 22 is a transverse shaft 60 operatively connected at its opposite ends by means of gearings 61 and 62 with the shafts 29 of gathering elements 25 and 26. Another transverse shaft 63 is journaled in the rear portion of head 22 and is operatively connected at its opposite ends by means of gearings 64 and 65 with the shafts 29 of gathering elements 27 and 28. Journaled within the head 22 at the side of conveyor portion 18 opposite that at which shaft 54 is located is a longitudinal shaft 66 operatively connected at one end by gearing 67 with the adjacent end of foot shaft 59 and at its other end by a gearing 68 with the transverse shaft 63. That gear of gearing 67 which is carried by foot shaft 59 also meshes with a further gear 69 carried on the rear end of a short shaft journaled in a bracket 70 adjacent the shaft 60. The forward end of this short shaft is equipped with another gear 71 which may be selectively engaged by either gear 72 or 73 of a gear unit slidably keyed on shaft 60, the gears 72 and 73 being disposed at opposite sides of gear 71 as shown clearly in Figure 4. Thus, when gear 72 is engaged with gear 71, the gathering elements 25 and 26 may be rotated in a direction to gather coal from in front of head 22 onto conveyor portion 18. At this time, gathering element 25 will rotate in a clockwise direction and gathering element 26 in a counter-clockwise direction as viewed in Figure 1. The gathering element 27 always rotates in a clockwise direction and the gathering element 28 in an anti-clockwise direction as indicated in Figure 1. When gathering coal at the sides of the head 22, the directions of rotation of gathering element 25 and 26 are reversed by engaging gear 73 with gear 71. When this is done, gathering element 25 rotates in an anti-clockwise direction and gathering element 26 in a clockwise direction so as to respectively coact with gathering elements 27 and 28 for moving the coal from the floor at opposite sides of head 22 upwardly along the wall portions 24 and onto conveyor portion 18. This is found quite important because when the coal is blasted or broken down much of said coal accumulates at the sides of head 22. Moreover, as the conveyor C is fed forwardly to feed the head 22 into the coal at the front of the machine, additional coal is located at the sides of head 22 which must be loaded onto conveyor portion 18. For shifting the gear unit 72, 73, a pull and push bar 74 is slidably extended through the rear of head 22 to a point adjacent the front thereof, and the forward end of rod 74 is operatively connected to a shifting lever 75 pivoted at 76 within the head 22 in front of the unit 72, 73.

When loading coal onto the conveyor portion 18 from the mine floor at the sides of head 22, it is necessary to swing the conveyor C and head 22 laterally to feed the gathering elements 25 and 27 and 26 and 28 to the coal. This is permitted by the pivot at 17, and power operated means is provided to swing the conveyor laterally in either direction. For the latter purpose, a transverse shaft 77 is journaled on the base plate 16 and has winding drums 78 and 79 journaled on the opposite end portions thereof. Clutches are provided at 80 and 81 to selectively clutch either desired one of the drums 78 and 79 to shaft 77. Operating means, generally indicated at 82 and 83 are provided respectively for the clutches 80 and 81, such means being operable from the same side of the apparatus. One end of shaft 77 is operatively connected to motor 46 by a longitudinal shaft 84 and worm gearings provided at 85 and 86 respectively between the rear end of shaft 84 and the drive shaft of motor 46 and the forward end of shaft 84 and shaft 77. A cable 87 is wound on drum 78 and a similar cable 88 is wound on drum 79. These cables are respectively extended forwardly and around idler or guide pulleys 89 and 90 mounted on the head 22 at opposite sides of conveyor C. The free ends of these cables 87 and 88 are extended laterally outwardly in opposite directions from the pulleys 89 and 90 as sown for connection with the mine jacks anchored between the roof and the floor

of the mine at opposite sides of the apparatus. Obviously, therefore, when cable 87 is wound on drum 78 and anchored to a jack, the conveyor C will be swung laterally in one direction, and when cable 88 is wound on drum 79 and anchored to a jack the conveyor C will be swung laterally in the opposite direction. Generally speaking, this is a common expedient in connection with different types of mining machines and needs no further description herein.

Assuming that the apparatus has been operatively associated with the mine conveyor in the manner described, and that the gathering head 22 is located adjacent the working face, the coal is blasted and broken down in the usual way. Motor 46 is then suitably placed in operation so as to drive the conveyors 14 and C and the gathering elements 25 to 28 inclusive, the gear units 72 and 73 being positioned as shown in Figure 4 so as to drive the gathering elements 25 and 26 in the directions indicated by the full line arrows in Figure 1. At this time, the gathering elements 25 and 26 move the coal from the mine floor in front of the gathering head 22 rearwardly onto the conveyor portion 18, and the gathered coal is then transferred rearwardly to the mine conveyor by the conveyors C and 14 in an obvious manner. As the loading operation proceeds, the conveyor C may be moved forwardly to feed the gathering head into the coal by engaging the proper gear 40 or 41 with gear 42 and thereby driving the jack screw 36 in the proper direction. When the coal has been gathered in front of the gathering head, the conveyor C may be swung laterally first in one direction and then in the other direction to gather the coal from opposite sides of the head 22 onto conveyor portion 18. At the latter time, the directions of rotation of gathering elements 25 and 26 is reversed as indicated by the dotted arrows in Figure 1, such reversal being effected by engaging gear 72 with gear 71 and disengaging gear 73 therefrom. The manner in which the conveyor C is swung laterally for this purpose has been previously described. From time to time, the apparatus may be bodily advanced as the mining operation proceeds, the mine conveyor being suitably extended by the insertion of additional conveyor sections therein. By proper location of jacks in front of the apparatus, the drums 78 and 79 and cables 87 and 88 may be utilized to bodily advance the apparatus. Of course, at the start of each new loading operation, the conveyor C may be retracted relative to conveyor 14 by operation of the jack 34, 36, the jack screw 36 being rotated or driven in a direction reverse to that in which it is driven to advance the gathering head during a loading operation. If found necessary, a suitable pan or hopper may be provided on the conveyor section 5 so as to insure that the latter will receive the coal from conveyor 14 regardless of the angle at which said conveyor 14 is swung relative to conveyor 5.

From the foregoing description, it is believed that the construction, operation and advantages of the present apparatus will be readily understood and appreciated by those skilled in the art. Modifications and changes in details of construction are contemplated, such as fall within the spirit and scope of the invention as claimed.

Having described the invention, what is claimed as new is:

1. In combination with the receiving end of an endless low-vein mine conveyor adapted to convey coal from a working place into a point outside the mine, of a low-built gathering and loading apparatus for said mine conveyor comprising a first base plate adapted to rest on the mine floor and having said receiving end of the mine conveyor fixedly mounted on the rear portion thereof, a second base plate pivoted on and projecting forwardly of the front portion of said first base plate for horizontal swinging movement, and apparatus for gathering coal from the mine floor and transferring it rearwardly onto said receiving end of the mine conveyor, said apparatus including an endless rear conveyor rigidly mounted on said second base plate and extending over the receiving end of the mine conveyor, an endless front elevating conveyor provided at its front end with a gathering head and having its rear portion extending over and slidably mounted on the forward portion of said rear conveyor for longitudinal movement relative to the latter, gathering mechanism carried by said gathering head for gathering coal onto the forward portion of said front conveyor from the front and sides thereof, power operated means to move said front conveyor forwardly and rearwardly relative to said rear conveyor at will, and driving mechanism for said front and rear conveyors and said gathering mechanism including a motor mounted on said second base plate.

2. In a loading apparatus, an elevating conveyor mounted for horizontal swinging movement, a gathering head carried by and extending across the front and along the sides of the forward portion of said conveyor, front and rear rotatable gathering elements mounted on each side of said gathering head, means for driving said gathering elements and for reversing the direction of rotation of the front gathering elements whereby coal may be selectively moved thereby from the mine floor onto said forward portion of the conveyor either at the front or at either side of the gathering head, and means to swing said conveyor horizontally in either direction at will.

3. In a loading apparatus, an elevating conveyor, a gathering head carried by and extending across the front and along the sides of the forward portion of said conveyor, front and rear rotatable gathering elements mounted on each side of said gathering head, means for driving said gathering elements and for reversing the direction of rotation of the front gathering elements whereby coal may be selectively moved thereby from the mine floor onto said forward portion of the conveyor either at the front or at either side of the gathering head.

4. The construction defined in claim 3, wherein each gathering element comprises a rotatable disk, and a plurality of gathering arms projecting radially from and pivoted on the disk for vertical swinging movement.

5. The construction defined in claim 3, wherein said gathering head is of hollow construction and includes a top wall having outwardly inclined front and side portions, each gathering element including a laterally inclined rotatable disk and a plurality of equally spaced gathering arms projecting from the disk and pivoted at their inner ends upon the latter for vertical swinging movement, the driving means for the gathering elements being operatively geared to the latter within said gathering head.

6. The construction defined in claim 1, wherein said means to move the front conveyor forwardly and rearwardly comprises a screw jack interposed between the gathering head and said second base

plate and including a rotatable jack screw, and driving connections between said motor and said jack screw including mechanism for reversing the direction of rotation of said jack screw.

7. The construction defined in claim 1, in combination with a transverse shaft journaled on said second base plate and operatively connected to said motor, winding drums journaled on opposite ends of said transverse shaft and located at opposite sides of the rear conveyor, means to selectively clutch either desired winding drum to said transverse shaft, guide pulleys mounted at opposite sides of and adjacent the forward portion of said front conveyor, and cables wound on said drums and extended forwardly therefrom around said guide pulleys and then laterally outwardly from the latter for attachment to fixed jacks, whereby winding of the cables on said drums may

be utilized to selectively swing said front and rear conveyors laterally in either desired direction relative to the first base plate.

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