April 24, 1951 C. A. PRATT 2,549,852

COAL MINE HAULING VEHICLE

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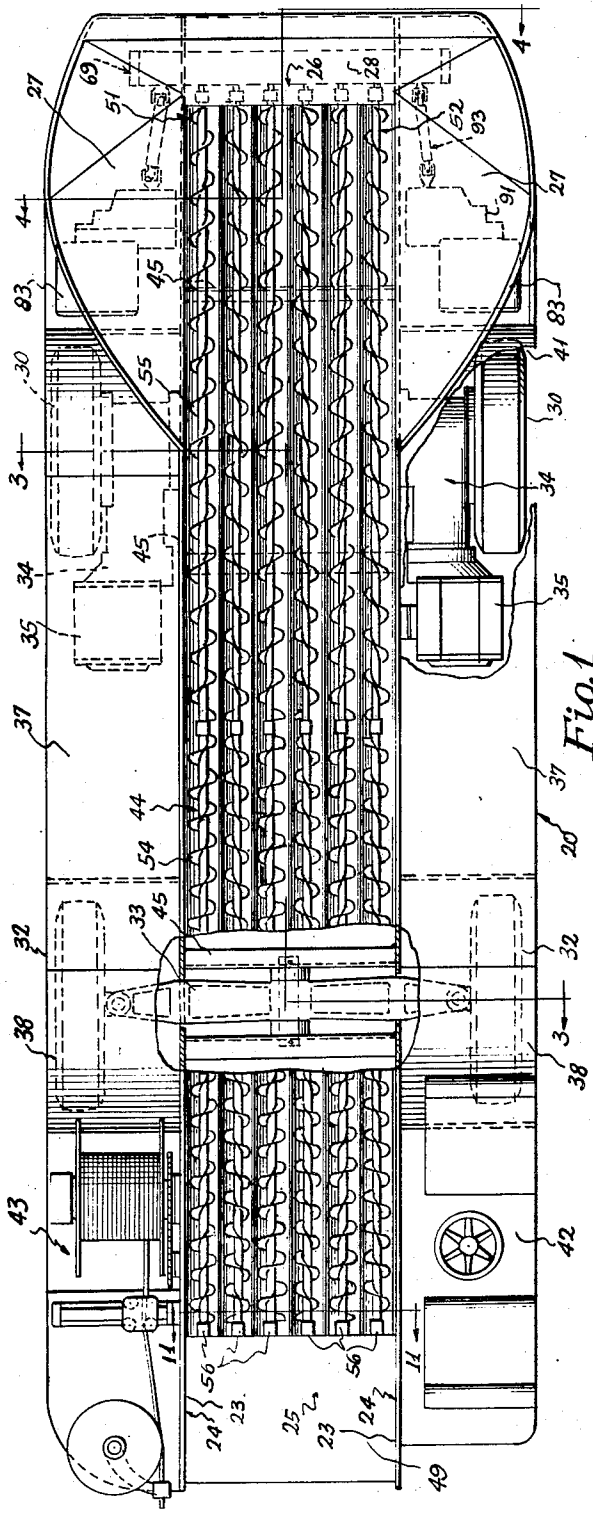


Fig. 1

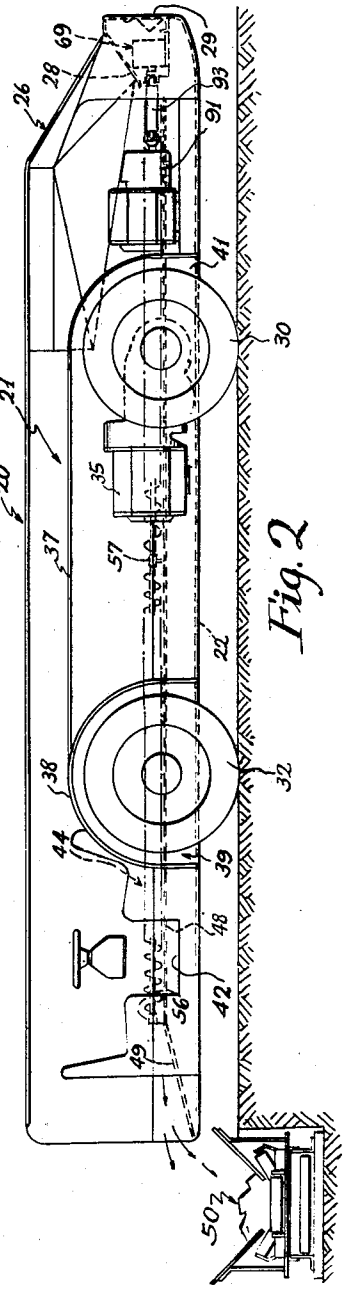


Fig. 2

INVENTOR.
Charles A. Pratt
BY
Clarence F. Poole
ATTORNEY

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Fig. 3

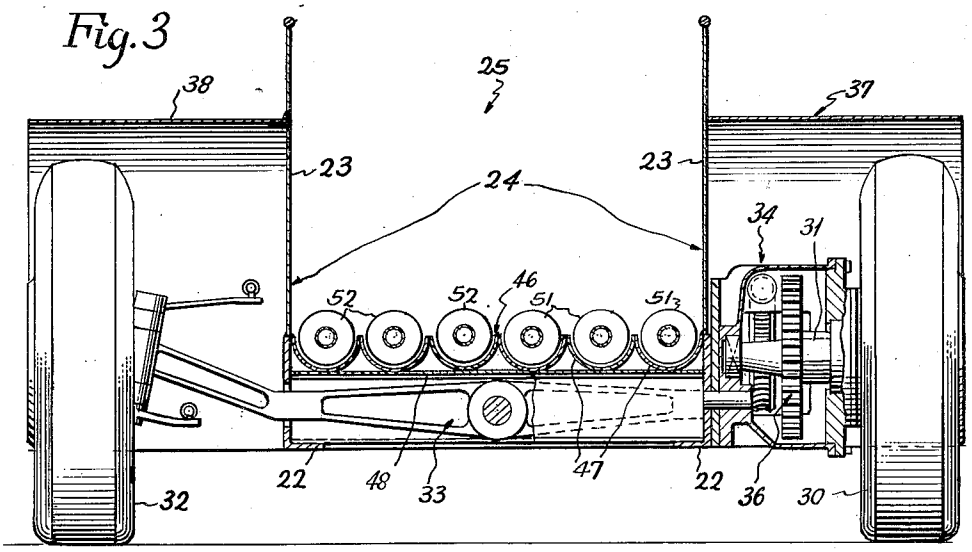


Fig. 4

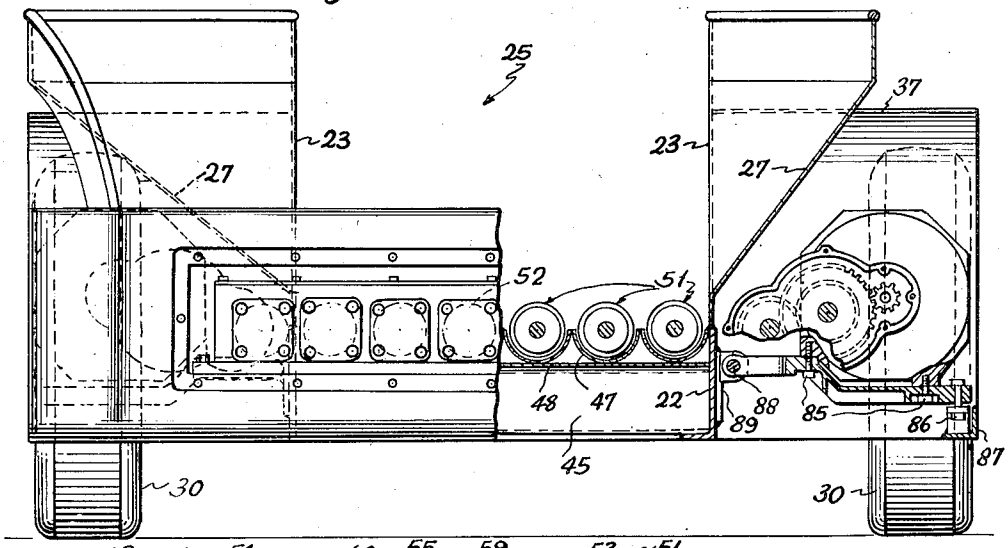


Fig. 9

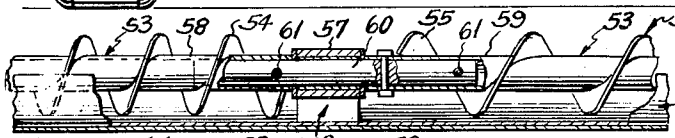


Fig. 10



INVENTOR.
Charles A. Pratt
BY
Clarence A. Poole
ATTORNEY

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COAL MINE HAULING VEHICLE

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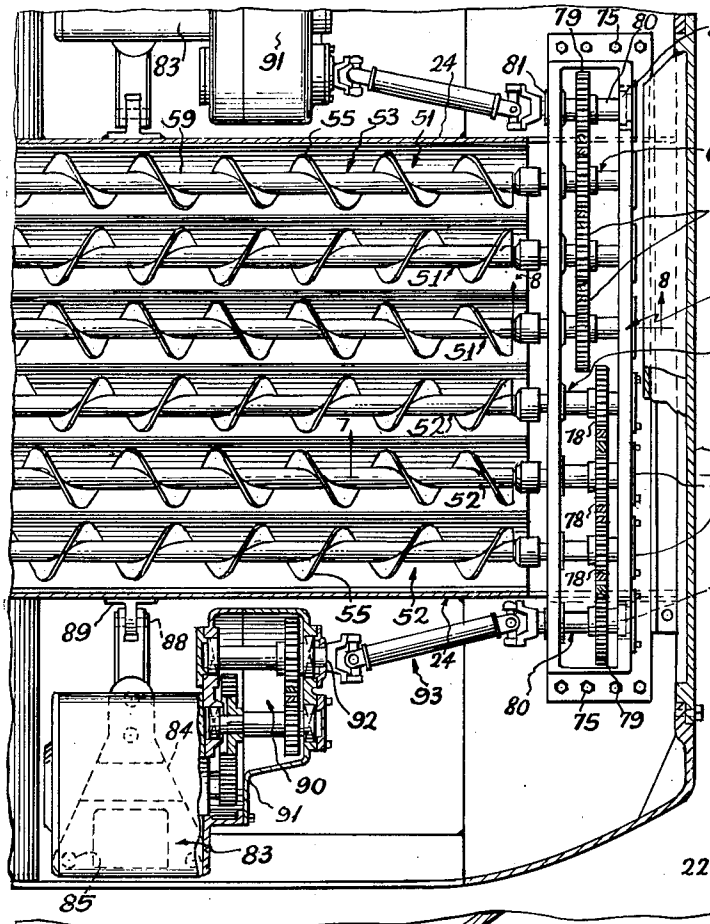


Fig. 5

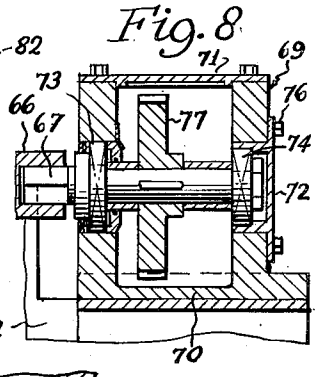


Fig. 8

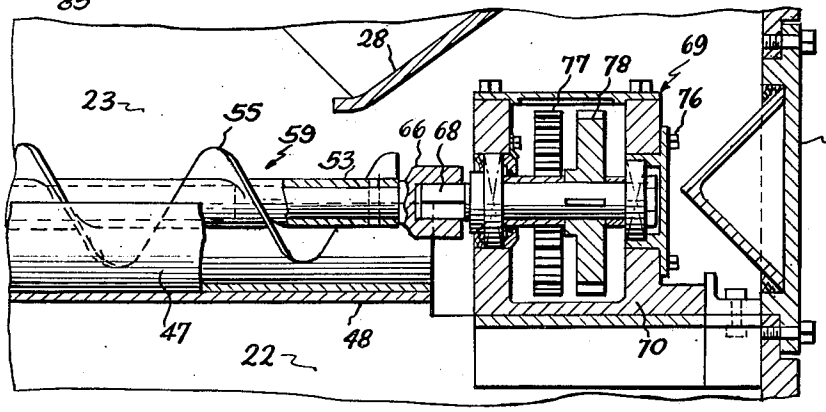


Fig. 7

INVENTOR.
Charles A. Pratt
BY
Clarence F. Poole
ATTORNEY

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Fig. 6

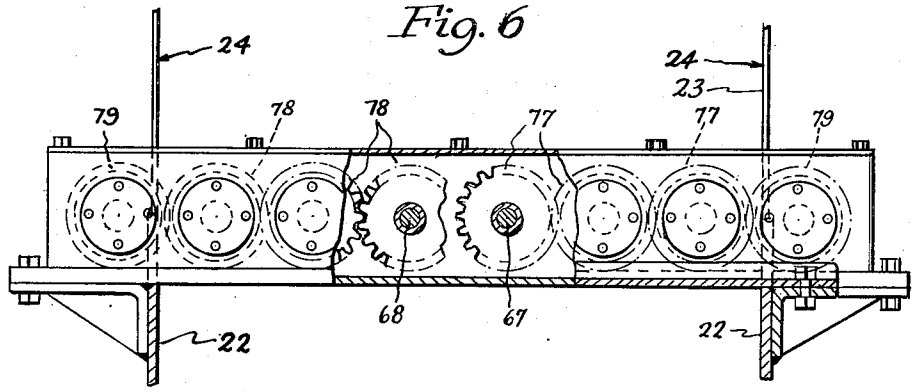
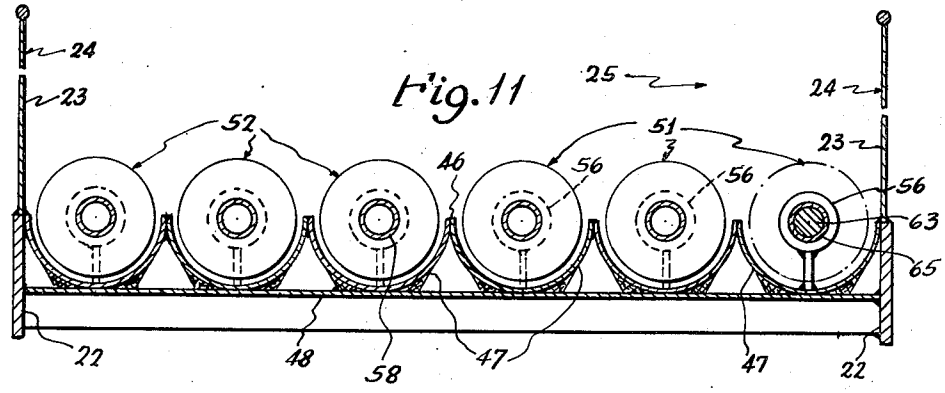


Fig. 11



INVENTOR.
Charles A. Pratt
BY
Clarence A. Poole
ATTORNEY

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UNITED STATES PATENT OFFICE

2,549,852

COAL MINE HAULING VEHICLE

Charles A. Pratt, Chicago, Ill., assignor to Goodman Manufacturing Company, Chicago, Ill., a corporation of Illinois

Application January 29, 1949, Serial No. 73,460

7 Claims. (Cl. 214—83.32)

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This invention relates to improvements in coal mine haulage vehicles commonly known in the art as shuttle cars or coal buggies, of the type used for transporting coal or other like materials from a working face to a main haulage system of a mine.

Heretofore the art has been directed to a shuttle car employing either a conventional endless chain flight or a belt conveyor for moving the material along the bottom of a coal carrying compartment of the vehicle. The employment of the endless type conveyors results in a reduction of the coal carrying capacity of the vehicle in that space must be provided for the return path of the endless type conveyor, while the overall dimensions of the vehicle are limited by the consideration of surrounding mining conditions, such as the height or thickness of the coal seam.

One of the objects of my invention is to provide a greater coal carrying capacity without appreciably increasing the outside dimensions of the vehicle, by the use of a novel combination for a shuttle car conveyor consisting of a plurality of screw conveyors located in the bottom of the coal carrying compartment, the axes of which lie in a horizontal, parallel, and closely adjacent relation to each other and extend along the path of movement of the body of coal, thus forming a movable conveying bed for such coal. Further, because of their close parallel relation, the individual screws work in conjunction with one another whereby proximate screws will engage the same lump of coal simultaneously, thus moving it along the conveyor bed. It will readily be seen that this construction will allow more coal to be loaded in the coal carrying compartment in that the coal will be free to fill in the spaces left around the screw flights of the conveyors, and at the same time no change in the overall height of the shuttle car is required.

A further object of my invention is to provide a new, improved and simplified conveyor structure for shuttle cars that will result in piling up the coal, due to a change of pitch of the conveyor flights in the coal carrying compartment, so as to more uniformly fill the compartment than is possible with the endless type conveyors presently employed in shuttle cars.

A further object of my invention is to provide a new, improved and simplified conveyor structure for shuttle cars that will reduce maintenance time and costs in that by the elimination of the return path necessary in an endless type conveyor, the carrying back of slack material on the return motion, which tends to jam up the driving mechanisms and parts, is disposed of. The breakage of conveyor parts prevalent in an endless chain flight or belt conveyor is incidently eliminated.

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A still further object of my invention is to provide a new, improved and simplified means for driving the shuttle car conveyor structure by the use of a multiplicity of intermeshing driving gears, completely immersed in oil in a dirt free housing, thus providing a reliable and positive driving means free from abrasion by foreign matter such as coal dust.

Other objects of my invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings in which:

Figure 1 is an enlarged top plan view of a vehicle constructed in accordance with my invention;

Figure 2 is a view in side elevation of the vehicle, drawn to a smaller scale than Figure 1;

Figure 3 is an enlarged transverse section taken along line 3—3 of Figure 1;

Figure 4 is an enlarged rear view of the loading end with parts shown in section, taken along line 4—4 of Figure 1;

Figure 5 is an enlarged fragmentary top plan view of the loading end shown in Figure 1, with parts shown in section;

Figure 6 is a detail section taken along line 6—6 of Figure 5;

Figure 7 is an enlarged detail section taken along line 7—7 of Figure 5;

Figure 8 is an enlarged detail section taken along line 8—8 of Figure 5;

Figure 9 is an enlarged detail of a screw conveyor as seen in Figure 1, showing details of the intermediate bearing construction and parts in broken away section;

Figure 10 is a detail section of an individual screw conveyor as seen in Figure 1, showing details of the end bearing construction;

Figure 11 is a detail section taken along line 11—11 of Figure 1.

Referring now to details of the embodiment of my invention illustrated in the drawings:

A self-propelled vehicle, indicated generally at 20, consist of an elongated chassis 21, including a pair of vertically disposed laterally spaced L-shaped beams 22, 22 extending the full length thereof, and two vertical, laterally spaced side plates 23—23 forming side walls 24—24 along the discharge and central portions of a coal carrying compartment indicated generally at 25. For convenience the lower edges of the side plates 23

may be welded to the upper edges of the L-shaped beam 22.

The vertical side walls 24 merge into a widened hopper portion 26 of the coal carrying compartment 25, at the loading end thereof, formed by a pair of laterally spaced, inwardly inclined plates 27 which connect to and constitute a continuous part of the side walls 24. These inclined plates 27 are suitably cross-connected at the extreme loading end of the vehicle by a downwardly inclined end plate 28 and a vertical bumper plate 29, both disposed transversely of the vehicle.

The chassis 21 may be supported by any suitable rubber-tired wheel structure. In the form shown two rear drive wheels 30—30 located near the rear or loading end of the vehicle are mounted on stub axle structures 31—31 which are substantially as described in detail in the Patent No. 2,405,636 of William R. Beck, so need not be described more fully herein. Two front steering wheels 32—32, located near the front or discharge end of the vehicle, are mounted at the ends of a suitable transverse equalizing bar structure shown generally at 33 in Figures 1 and 3.

Two suitable rear drive wheel mechanisms are indicated generally at 34, each consisting of a drive motor 35, transmission wheel driving means 36, and a stub axle structure 31 substantially as disclosed in the patent of William R. Beck, No. 2,405,636, and so will not be described herein. Said mechanisms are generally disposed longitudinally of the vehicle between the rear drive wheels 30 and below protective deck plates 37—37.

A curved deck plate 38 extends laterally outward from near the upper edge of each side wall 24 and curves downward to form an individual guard well 39 for each front wheel 32. Attached to the upper portion of each deck plate 38, and attached to and extending laterally from each side wall 24, is an additional horizontal deck plate 37 reaching rearwardly in a horizontal plane toward the loading end of the vehicle and curving downwardly behind the rear driving wheels 30—30 to form wheel guards 41—41 therefor. (See Figs. 1, 2, and 3.)

An operator's platform 42 bearing the usual vehicle control devices may be disposed as shown at a forward corner of the vehicle outside of one of the coal carrying compartment vertical side walls 24 and forward of an adjacent front wheel 32, as shown in Figures 1 and 2.

A cable reel structure and spooler indicated generally at 43 of Figure 1 may be disposed near the front end of the vehicle outwardly of the side wall 24 substantially opposite the operator's platform 42.

A bed of screw conveyors, indicated generally at 44, extends along and forms the bottom of the coal carrying compartment 25. The side walls 24 of the coal carrying compartment 25, with attached deck plates 37 and 38 are adequately cross connected and held in position by a plurality of cross beam frame members 45 attached to the L-shaped beams 22 and extending beneath the bed of screw conveyors 44. The bottom of the coal carrying compartment 25 is defined by a horizontal welded plate structure 46 extending the length of the bed of screw conveyors 44, including a plurality of half-circular trough sections 47—47 joined together at their upper reaches to form individual troughs for each conveyor screw in the bed of screw conveyors 44 (see Figs. 3, 4, and 11). The lower reaches of the trough sections 47 are suitably attached, as by welding, to a reinforcing horizontal connecting plate 48. The bed of screws 44 is terminated at the discharge end thereof by an adjacent discharge plate 49 extending forwardly of the bed of screw conveyors to form the final discharge portion of the bottom of the coal carrying compartment 25. With this arrangement the coal passes over the discharge plate 49 as it is moved from the bed of screw conveyors 44 and finally discharged from the vehicle, as for instance, into a mother conveyor system 50 as shown in Figure 2.

Coming now to the main feature of my invention:

In the form shown, for convenience of power drive by two separate drive motors as will hereinafter be more fully described, the bed of screw conveyors 44 is composed of a right hand bank of individual helical screws 51—51, herein shown as the upper three screws in Figures 1 and 5, and a similar left hand bank of individual helical screws 52—52, herein shown as the lower three screws in the same figures, provided for the purpose of receiving and unloading the material carried in the coal carrying compartment 25. Since the construction and operation of the individual helical screws for both the right and left hand banks is the same, a description of one screw will suffice for all. For convenience a helical screw and associated parts of the right hand bank will be described.

Referring for instance to the outside screw 51 of the right hand or uppermost bank in Figures 1 and 5, said screw is composed generally of a hollow shafting member 53, a front helical flight member 54, and a rear helical flight member 55. The helical flight members are fixed to the hollow center shafting member 53 and it will be seen that the two helical flight members terminate at an intermediate bearing point as will be described later. Each individual screw may be supported at its discharge end by a sleeve-type end bearing 56 and likewise supported intermediate its loading and discharge ends by an intermediate sleeve-type bearing 57. The detailed embodiment of these features may be seen in Figures 9 and 10.

Means for mounting an individual screw 51 in an intermediate bearing 57 may be provided by making each individual screw 51 of separated shaft portions; that is, the hollow center shafting member 53 may be cut into front and rear sectional portions 58 and 59, respectively, the two cooperating front and rear helical flight members 54 and 55, respectively, being separated in assembly on their respective sectional lengths, leaving a bare section of the hollow shafting member 53 exposed at the intermediate bearing point. A short solid-center shaft 60, journaled in the intermediate bearing 57, is slipped into adjacent ends of aligned hollow center shaft front and back sectional portions 58 and 59, respectively. The solid center shaft 60 may be pinned by a plurality of retaining bolts 61, herein shown as two in number, to the front and back sectional portions mounted thereon, as described above, to make a rigid structure of the individual screw 51 throughout its length. (See Figure 9.) The intermediate sleeve bearing 57 for the hollow shafting member 53 may be suitably mounted in a retaining bushing structure 62 which in turn may be welded, as shown herein, to an adjacent half-circular trough section 47 of the welded plate structure 46.

End bearing-means for mounting an individual helical screw 51, is provided at the discharge end of the bed of screw conveyors 44. For this pur-

pose a solid center terminal portion 63 is provided for each screw. Such solid terminal portion 63 is fitted into the adjacent hollow shafting member 53 of the front sectional portion 58 and pinned thereto by retaining bolts 64, herein shown as two in number. The solid terminal portion 63 is journaled in the end bearing 56 and such end bearing may be held in place by a suitable bushing and bearing housing assembly 65 which, as shown herein, may be welded to an adjacent half-circular trough section 47. (See Figure 10.)

Connecting means for driving the individual screws 51 and 52, of the right and left hand banks, respectively, is provided at the loading end of the vehicle as shown in Figures 7 and 8. A solid terminal shaft and connector 66 is provided to fit into the hollow center shaft member 53 of the rear sectional portion 59, that is to say, a reduced end portion thereof is fitted into the hollow center shaft member 53 and an outer enlarged connector end is provided with a rearwardly opening socket. This socket is suitably formed to connect to and receive a squared end of a right hand bank transmission shaft 67 (see Figure 8). A similar construction is employed in connecting a transmission shaft 68 with an individual screw 52 of the left hand bank (see Figure 7).

In the particular embodiment of my invention as disclosed in the accompanying drawings, the discharge end or front sectional portion 58 of each helical screw is of lesser lineal flight pitch than the loading end or rear sectional portion 59 so as to cause coal to move more rapidly at the loading end of the conveyor and to pile up at the discharge end thereof. In addition, each rear helical flight member 55 of each rear sectional portion 59 is constructed with a smaller outside diameter at the extreme loading end thereof, gradually increasing toward the intermediate bearing point where its outside diameter equals that of a front flight member 54 which has a constant outside diameter. The rearwardly tapering effect so created aids in overcoming the initial inertia of the coal as it is loaded into the coal carrying compartment 25, which is especially desirable in handling lumps of coal. A conveyor assembly of this type affords a ready and convenient means for field repair and an opportunity for substituting screw conveyor sections of various lineal pitches to meet the numerous conditions and requirements encountered in individual mines.

An elongated gear housing 69 comprised generally of a bottom casing 70, a top cover plate 71, and individual rear cover plates 72—72 is mounted in a transverse horizontal position at the loading end of the vehicle near the bottom of the coal carrying compartment 25 directly beneath the inclined plate 28, so as to afford proper connecting alignment of right and left hand bank transmission shafts 67 and 68 respectively, journaled in this housing, with the individual screws 51 and 52 of the right and left hand banks respectively.

Means for driving each individual screw 51 of the right hand bank of screw conveyors are provided near the loading end of the vehicle. Each aforementioned transmission shaft 67, having socketed connection with its respective individual screw 51, as described above, extends into the gear housing 69 and is journaled in front and rear bearings 73 and 74, respectively, supported by said housing. A similar construction is employed for driving an individual screw 52 of the left hand bank of screw conveyors by a transmission shaft 68.

Each end of the gear housing 69 is attached to the vehicle by a suitable plurality of connection bolts 76, herein shown as four in number. The outer race of each aforementioned rear bearing 74 may be immediately journaled in the adjacent cover plate 72 which may be suitably connected to the housing bottom casing 70 by cap screws 76—76. (See Figures 7 and 8.)

A series of successively intermeshed driven spur gears 77, herein shown as three in number, individually keyed to the transmission shafts 67, are employed to drive said individual transmission shafts for imparting rotary motion to the individual screws 51 of the right hand banks of screw conveyors as shown in Figures 5 and 8. A similar series of successively intermeshed driven spur gears 78 is used for the same purpose in connection with the left hand bank of individual screws 52.

The separate trains of driven spur gears thus formed are each driven by a driving spur gear 79 keyed to a driving stub shaft 80, journaled in front and rear bearings 81 and 82, respectively, similar to those employed in connection with the transmission shafts 67 and 68 of the right and left hand banks respectively. Said driving gears 79 are disposed one at each end of the gear housing in a conjunctive and intermeshing driving relation with adjacent driven spur gears related to the left and right hand banks of individual screws as set forth above.

Two conveyor drive motors 83—83 may be disposed as shown in Figure 5, one on each side of the vehicle near the rear or loading end of the shuttle car, outside the side walls 24 and beneath the outer portion of the loading hopper 26. Each of the drive motors 83 may be suitably mounted on a triangular-shaped motor bracket 84 by stud bolts 85—85 herein shown as three in number. Each motor bracket in turn is fastened to the vehicle and may be mounted at its outer end, as shown in Figures 4 and 5, by suitable bolts 86, herein two in number, to a longitudinally extending bar 87 located outwardly of the loading hopper 26 near the bottom of the vehicle chassis 21. Each motor bracket may be fastened to the main frame of the vehicle by a hinged pin 88 fitted through a hinged bracket 89 suitably fastened, as by welding, to the outer side of the adjacent L-shaped beam 22.

Suitable transmission means are provided to transmit driving power from each of the conveyor driving motors 83 to its respective driving stub shaft and driving gear and thus ultimately to the individual screws. Such means may be comprised of a conventional gear reduction indicated generally at 90, housed in a combined transmission housing and motor end plate 91. The driven shaft 92 of the gear reduction mechanism 90 may be connected to the driving stub shaft 80 by a conventional shaft and universal coupling arrangement indicated generally at 93.

The use and operation of my invention is as follows:

The vehicle is capable of being steered and driven in a similar manner to shuttle cars commonly used in mines. The bed of screws forms the bottom of the coal carrying compartment of the vehicle. The loading hopper is suitably positioned to receive coal from a convenient loading means such as the discharge boom of a coal loading machine. Each screw of the bed of screw conveyors 44 rotates in an opposite direction to

immediate neighboring screws. For instance, looking from the loading end of the vehicle at the right hand bank of screws, the screw 51 located adjacent to the right hand side wall 24 will rotate inwardly toward a central vertical reference plane of the coal carrying compartment 25 in a counter-clockwise direction. The individual screw next adjacent the above positioned screw will rotate in an opposite or clockwise direction therefrom, and the third or remaining individual screw will rotate in a counter-clockwise direction, the same as the first above described screw 51. The same or a similar pattern of arrangement is applied as regards the individual screws 52 related to the left hand bank of screws with the individual screws rotating in alternate clockwise and counter-clockwise directions. It should be noted that the individual screws are disposed in near proximity for cooperative relation with one another in such a manner that neighboring screws may simultaneously engage a lump of coal in moving the coal along the bottom of the coal carrying compartment, especially where large lumps of coal are to be handled, as is usual with shuttle cars. A means for rapidly removing the coal from the loading hopper is provided to avoid excessive piling up of coal at that location when coal is first loaded into loading hopper. This desired result is accomplished by constructing the flight members of the rear sectional portions of the individual helical screws with a greater lineal flight pitch than that employed on the front sectional portions. This not only aids in emptying the loading hopper rapidly, but also tends to pile the coal up adjacent and beyond the intermediate bearing point by forcing the coal onto the front sectional portions which move the coal at a lower lineal velocity than the rear sectional portions because of the smaller lineal flight pitch. The discharge plate 49 also cooperates in this piling up function by holding the coal back, due to the surface friction developed as the coal is discharged onto its upper surface by the screws. The plate, however, is not of such a length as to seriously impede the final discharge of the coal from the coal carrying compartment.

After loading the coal carrying compartment the vehicle may be moved along the mine floor to an unloading station located along the main conveyor system of the mine where the coal may be discharged from the shuttle car and carried to the outside in the usual manner.

While I have herein shown and described one form in which my invention may be embodied, it should be understood that the construction and the arrangement of the various parts may be altered without departing from the spirit and scope thereof. Furthermore, I do not wish to be construed as limiting my invention to the specific embodiment illustrated excepting as it may be limited in the appended claims.

I claim as my invention:

1. In a vehicle for transporting loose material; a main frame having a longitudinally extending material carrying compartment defined by a pair of laterally spaced vertical walls open at one end thereof for discharge of material; a conveyor bed in the bottom of said compartment for receiving and unloading said material, including a plurality of individual trough formations having open discharge ends disposed in a horizontal, parallel and closely adjacent relation with each other, and extending longitudinally of said compartment; a helical screw for each trough formation and extending substantially thereabove, said screws being alternately right and left hand; and means for simultaneously rotating said screws in alternately opposite directions whereby lumps of said loose material may be conveyed atop said screws by the cooperative rotation of adjacent screws and whereby further fines may be conveyed by the lower portions of said screws within their respective troughs and whereby further material is caused to move more rapidly at the loading end to cause it to pile up at the discharge end during loading.

2. In a self propelled mine vehicle for transporting coal and the like, having wheeled steering and driving means; a main frame having a longitudinally extending material carrying compartment defined by a pair of laterally spaced vertical walls open at one end thereof for discharge of material; a conveyor bed in the bottom of said compartment for receiving and unloading said material, including a plurality of individual tangentially-abutting semi-circular cross-section trough formations each having an open discharge end disposed in a horizontal, parallel and adjacent relation with each other, and extending longitudinally of said compartment; a helical screw closely fitting each trough formation and having an upper portion extending thereabove; and means for rotating said screws in alternately opposite directions, and said screws being sufficiently close to each other so that proximate oppositely rotating screws engage and propel the same lump of coal therebetween.

3. In a vehicle for transporting loose material; a main frame having a longitudinally extending material carrying compartment defined by a pair of laterally spaced vertical walls open at one end thereof for discharge of material, and a loading hopper at the other end thereof for receiving material; a conveyor bed in the bottom of said compartment for receiving and unloading said material, including a plurality of semi-circular cross-section, tangentially-abutting trough formations having open discharge ends disposed in a horizontal, parallel and closely adjacent relation with each other, and extending longitudinally of said compartment; a screw member closely fitting each of said trough formations and having substantially the upper half thereof extending above the upper plane of said trough; each of said screw members consisting of discharge and loading end portions, having helical flights thereon, the loading end flights being of greater lineal pitch than the discharge end flights; and driving means for imparting rotary motion to said screws whereby lumps may be conveyed by the upper portions of said screw members and fines may be conveyed by the lower portions thereof in the trough formations, and whereby further material is caused to move more rapidly at the loading end to cause it to pile up at the discharge end during loading.

4. In a self propelled vehicle for transporting loose material, having wheeled steering and driving means; a main frame having a longitudinally extending material carrying compartment defined by a pair of laterally spaced vertical walls open at one end thereof for discharge of material; a conveyor bed in the bottom of said compartment for receiving and unloading said material, including a plurality of individual helical screws disposed in a horizontal, parallel and closely adjacent relation with each other, and extending longitudinally of said compartment; and driv-

ing means for imparting rotary motion to said screws; and a substantially horizontal plate forming a continuation of said bed and positioned in the bottom of said compartment at the discharge end thereof, forwardly of the ends of said screws.

5. In a self propelled vehicle for transporting loose material, having wheeled steering and driving means; a main frame having a longitudinally extending material carrying compartment defined by a pair of laterally spaced vertical walls open at one end thereof for discharge of material; a conveyor bed in the bottom of said compartment for receiving and unloading said material, including a plurality of individlal helical screws disposed in an horizontal, parallel and closely adjacent relation with each other, and extending longitudinally of said compartment; and means for simultaneously rotating said adjacent individual helical screws in alternately opposite directions; and a substantially horizontal plate forming a continuation of said bed and positioned in the bottom of said compartment at the discharge end thereof forwardly of the ends of said screws, said plate being of sufficient length to frictionally retard the material before it is finally discharged from said compartment.

6. In a vehicle for transporting loose material, a main frame having a longitudinally extending material carrying compartment defined by a pair of laterally spaced vertical walls open at one end thereof for discharge of material; a conveyor bed in the bottom of said compartment for receiving and unloading said material, including a plurality of individual helical screws disposed in a horizontal, parallel and closely adjacent relation with each other, and extending longitudinally of said compartment and driving means for imparting rotary motion to said screws, said bed also including a plurality of adjacent trough sections having open discharge ends and a height less than said screws and closely embracing the respective

lower peripheral surfaces thereof whereby fines may be carried in said troughs and lumps may be carried atop said screws.

7. In a vehicle for transporting loose material; a main frame having a longitudinally extending material carrying compartment defined by a pair of laterally spaced vertical walls open at one end thereof for discharge of material, and a loading hopper at the other end thereof for receiving material; a conveyor bed in the bottom of said compartment for receiving and unloading said material, including a plurality of trough formations having open discharge ends disposed in a horizontal, parallel and closely adjacent relation with each other, and extending longitudinally of said compartment, a plurality of helical screw members disposed respectively in said trough formations and extending thereabove, said screw members having helical flights thereon of varying pitches which decrease toward the discharge end, and driving means for imparting rotary motion to said screws whereby lumps of said loose material may be conveyed atop said screw members and fines may be conveyed in said trough formations.

CHARLES A. PRATT.

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