Sept. 25, 1951 C. A. PRATT 2,569,336

COAL MINE HAULAGE VEHICLE

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Fig. 2

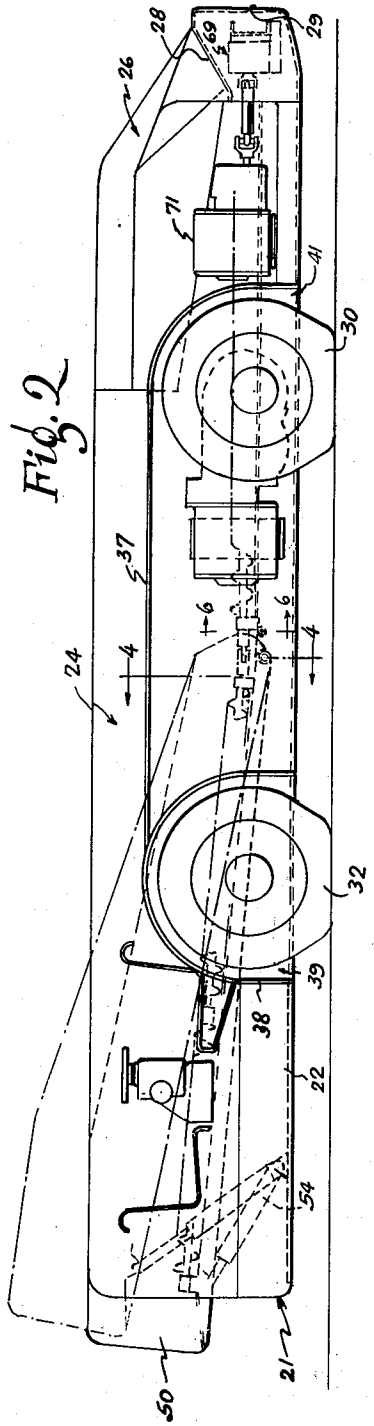
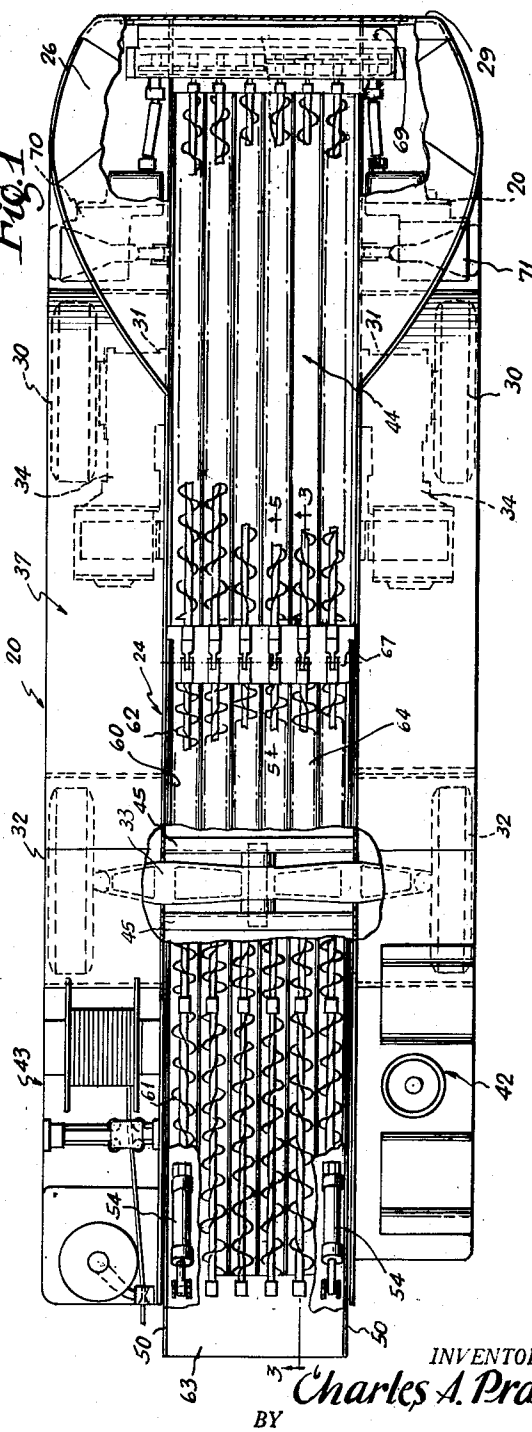


Fig. 1



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Fig. 3.

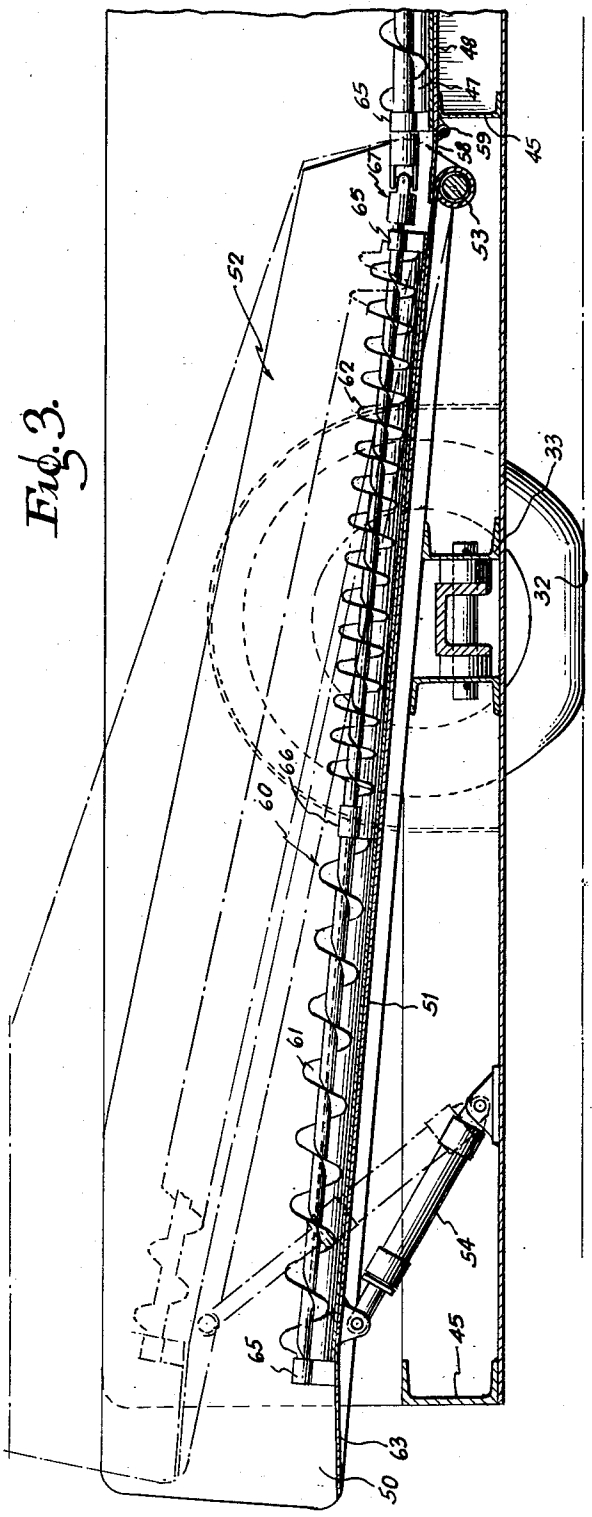
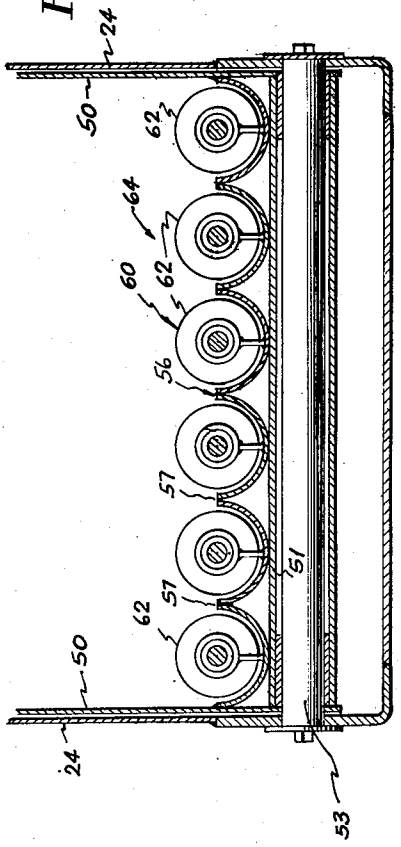


Fig. 4



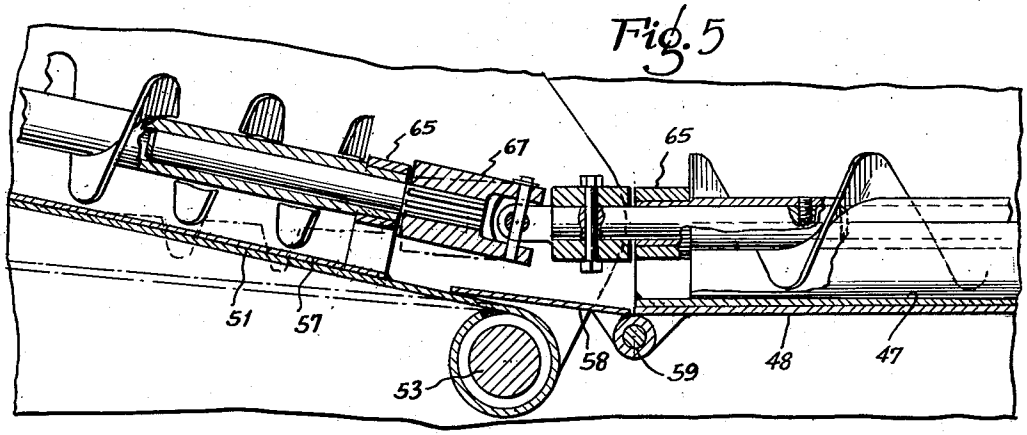
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Fig. 5



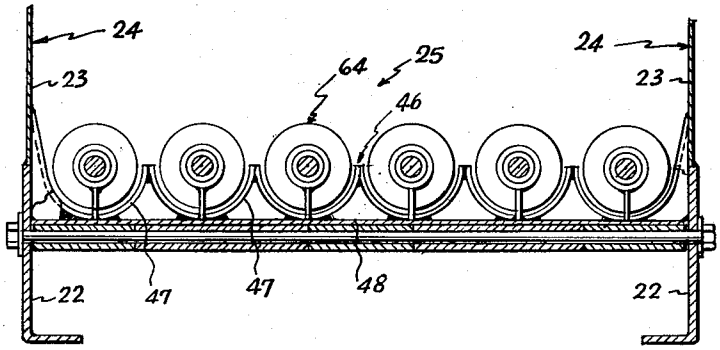
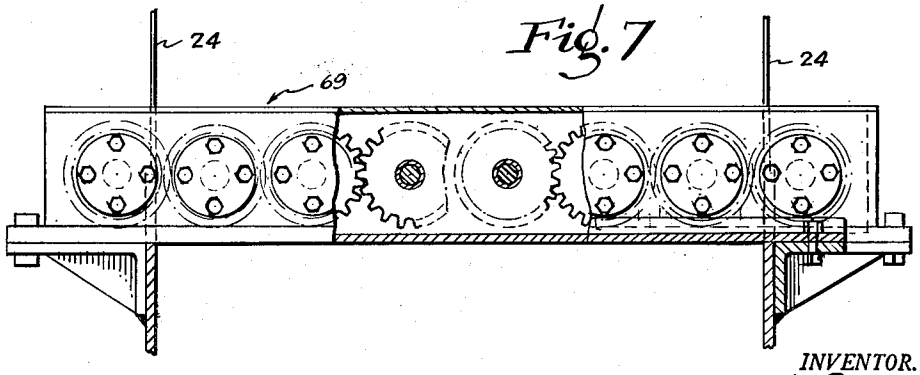


Fig. 6

Fig. 7



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COAL MINE HAULAGE VEHICLE

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Application July 2, 1949, Serial No. 102,899

6 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, of the type used for transporting coal or other like materials from a working place to a main haulage system of a mine.

More particularly this invention is directed to a new and improved elevating discharge end adapted for use in the type of vehicle disclosed in my prior application Ser. No. 73,460, filed on January 29, 1949, and now Patent No. 2,549,852 granted April 24, 1951.

One of the objects of this invention is to provide a new and improved conveyor structure for carrying the material along the bottom of the material carrying compartment of the shuttle car.

A further object is to provide means for elevating the discharge end of the conveyor structure whereby the material may be discharged at levels above the level of the main conveyor bed of the shuttle car, thus eliminating the necessity of a built-up ramp for raising the shuttle car to the desired level during discharge.

These and other objects will appear from time to time as the following specification proceeds and with reference to the accompanying drawings in which like numerals are employed to designate like parts and wherein:

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

Figure 2 is a side elevation view of the vehicle shown in Figure 1, showing the elevating discharge end in normal and raised positions;

Figure 3 is an enlarged detail side elevation of the discharge end of the vehicle in cross section taken substantially along line 3—3 of Figure 1;

Figure 4 is an enlarged cross sectional end view of the elevating end taken along line 4—4 of Figure 2, showing the arrangement of the conveyors and the pivotal connection of the elevating discharge end to the vehicle;

Figure 5 is an enlarged detail sectional view taken along line 5—5 of Figure 1, showing the connecting means between the fixed and elevating discharge portions of the conveyor bed;

Figure 6 is an enlarged cross sectional end view showing the arrangement of the screw conveyors in the horizontal conveyor bed portion taken along line 6—6 of Figure 2; and

Figure 7 is an enlarged partial end view of the loading end of the vehicle with parts broken away to show the arrangement of the means for rotating the individual screw conveyors of the bed of screw conveyors.

Referring now to the details of the embodiment of my invention illustrated in the drawings, the vehicle illustrated herein has many features in common with that disclosed in my prior application referred to above, the principal improvements thereover relating to the adjustable elevating end of the conveyor mechanism, as will presently appear.

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A self-propelled vehicle 20 is characterized generally by an elongated chassis 21, including a pair of vertically disposed laterally spaced L-shaped beams 22, 22 and two vertically disposed plates 23, 23 attached to said beams to form side walls 24, 24 inclosing a central coal or material carrying compartment 25 extending the length of the vehicle. At one end of the vehicle the side walls 24 flare outwardly to form a widened hopper portion 26 adapted to accommodate the loading boom of a suitable loading device or machine. An end plate 28 is cross connected between the side walls 24 along with a bumper 29 to form the extreme loading end of the vehicle.

The chassis 21 may be supported by suitable rubber-tired wheels. In the form shown herein two drive wheels 30, 30 are provided near the rear or loading end of the vehicle mounted on stub axle structures 31, 31 substantially as described in U. S. Patent No. 2,405,636 of W. R. Beck, so need not be described more fully herein. Two front wheels 32, 32 are adapted for steering the vehicle, and are mounted at opposite ends of a suitable equalizing bar structure 33, near the front or discharge end of the vehicle. Two driving mechanisms 34, provided for driving the rear wheels 31, are positioned one at each side of the vehicle between the rear drive wheels 30. Protective deck plates 37 extend along the outside of the side walls 24 curving downwardly behind the rear wheels 30, to form guard wells 41 therefor. A deck plate 38, adjacent the forward end of plate 37, extends outwardly from near the upper edge of each side wall 24, curving downwardly to form guard wells 39 for the front wheels 32. An operator's platform 42, bearing the usual control devices, may be disposed at a forward corner of the vehicle outside a side wall 24, as usual, while a cable reel structure and spooling device 43 may be located substantially opposite the operator's platform 42, as convenience may dictate (see Figure 1).

Suitable cross beam frame members 45, 45 are transversely fixed between the L-shaped beams 22, thereby cross connecting the side wall 24 attached to the upper sides of said beams to form support for the bottom of the material carrying compartment. A horizontal bed of screw con-

veyors 44 extends along the bottom of the material carrying compartment 25 from the rear or loading end to a point about midway the length of the vehicle 20. A horizontal plate structure 46 positioned above the cross beams 45, and beneath the bed of screw conveyors 44, is characterized by a plurality of half circular trough sections 47 in which the individual screw conveyors nest. The structure 47 in turn may be rigidly supported by a reinforcing horizontal plate 48 secured directly to the cross beams 45.

Referring now to the principal features of my present invention and what are considered as the improvements in the structure disclosed in my proir application Ser. No. 73,460:

Whereas in application Ser. No. 73,460 the bottom of the coal carrying compartment 25 extends its full length of the vehicle in a single horizontal plane, my present invention is characterized by a coal carrying compartment with an adjustable discharge conveyor portion for elevating the material before discharging it from one end of the vehicle, such as would be desirable when discharging into a mine car with sides higher than the ordinary shuttle car bottom level.

The elevating conveyor structure shown herein comprises a pair of vertical side plates 50, 50 disposed in upright position at the outer lateral edges of a supporting bottom plate 51. The elements just described form a discharge chute 52 in the form of an open ended three-sided box adapted to fit between the side walls 24, resting in an upwardly inclined position near the discharge end of the material carrying compartment 25. The chute 52 is pivotally connected at its inner end for vertical arcuate movement about a transverse pivot bar and hinge 53 attached to the bottom plate 51 and extending transversely between the L-shaped beams 22 where the plates 51 and 48 meet near the middle of the vehicle. A pair of hydraulic rams or jacks 54, 54, actuated by suitable hydraulic pump and fluid connections, not shown, may be disposed beneath the plate 51 near its outer end and secured between one of the supporting cross beams 45 and plate 51 for elevating the discharge chute 52. A supporting trough plate structure 56 similar in construction to the plate structure 46 is positioned on the upper side of the plate 51, to form a series of nesting troughs 57 for a conveyor structure mounted therein. A sliding bottom plate member 58 may be pivotally connected to the supporting plate 48 by pivot bar and hinge 59 similar to the pivot bar 53, to provide a sliding joint in the bottom of the coal carrying compartment 25 between bottom plate 51 of the discharge chute 52 and plate 48 so as to insure an inclosed bottom during the elevation of the discharge end of the coal carrying compartment to the position shown in broken lines in Figures 2 and 3.

A plurality of individual screw conveyors 60, 60 are mounted over the plate structure 56 in such a manner that each individual screw is partially surrounded on its under side by one individual trough section 57 of the plate structure 56, similar to the construction employed in the bed of screw conveyors 44 at the loading end of the vehicle (see Figure 4). In the particular form shown herein, six individual screw conveyors 60 are employed to make up a screw conveyor bed 64, which differs from the bed of conveyors 44 in that each individual screw conveyor 60 is composed of two longitudinal sections or lengths of conveyor, with differing lineal flight pitches. For example, looking at Figure 1, the uppermost screw conveyor of the discharge conveyor bed 64 is shown as consisting of a discharge length 61 and an intermediate length 62 connected end to end to form a single screw conveyor in the manner shown in Figure 9 of my prior application Ser. No. 73,460. The length 61 utilizes a flight member of greater lineal pitch than that used on the intermediate length 62. The reason for such a variation of flight pitch will be more fully explained hereafter under the description of the vehicle's operation. Also, the discharge length 61 is shown terminated a short distance from the outer end of the bottom plate 51, leaving a portion of discharge plate 63 over which the coal is finally discharged. For ease of discharge the plate portion 63 of plate 51 may be inclined downwardly.

Each individual screw conveyor of both the horizontal bed of screw conveyors 44 and the elevating discharge bed of conveyors 64 is suitably housed for rotational movement on its respective plate structure 46 or 56 by means of sleeve type end bearing structures 65 and an intermediate bearing structure 66 similar in construction to those described in my application Ser. No. 73,460 referred to above, so will not be described further herein.

The individual screw conveyors of the loading end bed of conveyors 44 are positively connected for transmission of rotational movement to the individual screw conveyors 60 of the elevating bed of conveyors 64 by a universal joint connection 67 which may be of any conventional type (see Figure 5). Thus connected the individual screw conveyor sections of each of the conveyor beds 44 and 64 form continuous screw conveyors, reaching substantially the full length of the material carrying compartment 25, which are adapted to be elevated near their discharge end. The construction of the individual screw conveyors is the same as disclosed in my prior application Ser. No. 73,460 of reference herein.

Means for driving the screw conveyors are provided at the loading end of the vehicle, substantially as described in my prior application Ser. No. 73,460 of reference ante. A gear housing 69 (see Figure 7) contains intermeshing spur gears, and suitable shafting and connectors for imparting rotary motion to the screw conveyors. The gears are driven through connecting shafting from a suitable transmission 70 by two separate drive motors 71, 71 located one on each side of the vehicle below the overhanging hopper 26. As in the construction revealed in my prior application Ser. No. 73,460, the individual screw conveyors herein rotate alternately clockwise and counterclockwise, the three uppermost screw conveyors as seen in Figure 1 being rotated by a separate gear train and driving motor 71 from the lower three conveyors of that figure. However, it should be understood that several rotational combinations of the individual screw conveyors may be employed, such as having the upper three screw conveyors of Figure 1 rotate counterclockwise, and the lower three rotate clockwise as viewed from the loading end, without departing from the spirit and scope of my invention.

Use and operation

The normal cycle of operation of a vehicle of the type disclosed herein commences with the loading of the vehicle at the face of the mine seam being worked. Coal is introduced into the hopper portion from a suitable loading machine,

the screw conveyors are started up and the coal distributed throughout the coal carrying compartment 25. When loaded the vehicle moves along the mine floor under its own propulsive power to a central loading station where the coal is unloaded into waiting mine cars or other means for carrying the coal to the outside. When emptying the material carrying compartment the discharge end is raised so as to elevate the coal to a higher level, as desired. After unloading, the car will be returned to the working face where the cycle will be repeated.

The elevating discharge conveyor section adapts the vehicle to situations where it is necessary or desirable to elevate the material being conveyed to some level above the horizontal bottom of the material carrying compartment of the vehicle. This is accomplished by raising the elevating discharge chute 52 by means of hydraulic rams 54 as previously explained. While in the present disclosure, the screw conveyors forming the conveyor structure along the bottom of the coal carrying compartment are assembled in three sections of varying lineal pitch, mining conditions may dictate other variations in number and arrangements of screw conveyors of varying lineal pitches.

In the arrangement disclosed herein, the coal or other loose material is moved fairly rapidly when first introduced into the material carrying compartment 25; it moves slower over the intermediate section, thereby causing the material to pile up to aid in filling the material carrying compartment, and then moves rapidly again at the discharge section to aid in quickly emptying the material carrying compartment. To accomplish this result the horizontal sections of screw conveyors in the loading bed of conveyors 44 and the discharge sections 61 are shown herein as being of greater lineal flight pitch than the intermediate sections 62. The coal will thus tend to pile up over the intermediate section of screw conveyors 62 since its lineal velocity along that portion of the coal carrying compartment will be slowed down, while the piling up function will be further enhanced by the rapid discharge of coal from the conveyors in the loading bed 44. Still further piling up will result due to added resistance to lineal movement of the coal caused by the upward inclined plane of the discharge chute portion 52 in its normal housed position. The combined effect of these operational features will help to more fully load the material carrying compartment 25 to near capacity than is possible under normal operation of conventional type shuttle cars presently employed in mines, wherein a continuous belt or chain conveyor is used to load and empty the coal carrying compartment.

While I have herein shown and described one form in which my invention may be embodied, it will be understood that the construction thereof 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 self-propelled vehicle for transporting loose material, having wheeled steering and driving means, a main frame having a centrally disposed longitudinally extending material carrying compartment, an elevating discharge chute at one end of said compartment, the combination therewith of a conveyor structure disposed along the bottom of said compartment and said chute including a plurality of aligned conveyor sections, each consisting of individual helical screws disposed in a parallel and closely adjacent relation with one another, for moving said material continuously along the bottom of said compartment and said chute.

2. In a self-propelled vehicle for transporting loose material, having wheeled steering and driving means, a main frame having a centrally disposed longitudinally extending material carrying compartment, an elevating discharge chute at one end of said compartment, a material receiving hopper at the other end of said compartment, the combination therewith of a conveyor structure disposed along the bottom of said compartment and said chute including a plurality of aligned conveyor sections, each consisting of individual helical screw conveyors disposed in a parallel and closely adjacent relation with one another, and common driving means for imparting rotary motion to a plurality of said individual screws for moving said material continuously along the bottom of said compartment and said chute.

3. In a self-propelled vehicle for transporting loose material, having wheeled steering and driving means, a main frame having a centrally disposed longitudinally extending material carrying compartment, an elevating discharge chute at one end of said compartment, the combination therewith of a conveyor structure along the bottom of said compartment and said chute including a plurality of aligned conveyor sections, each consisting of individual helical screws disposed in a parallel and closely adjacent relation with one another, and means for simultaneously rotating said screws in alternately clockwise and counterclockwise directions for moving said material along the bottom of said compartment and said chute.

4. In a self-propelled 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 for discharging said material, a discharge chute supported between said walls at one end of said compartment and hinged at its inner end for vertical arcuate movement, means for elevating and lowering the outer end of said discharge chute, the combination therewith of a material conveyor structure extending substantially the full length of said compartment and chute including a plurality of aligned conveyor sections, each consisting of individual helical screws disposed in parallel and closely adjacent relation with one another, the helical screws of one section being connected by universal joints to the screws of the proximate section to permit pivotal movement of their respective conveyor sections.

5. In a self-propelled 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 for discharging said material, a discharge chute supported between said walls at one end of said compartment and hinged at its inner end for vertical arcuate movement, means for elevating and lowering the outer end of said discharge chute, the combination therewith of a material conveyor structure extending substantially the full length of said compartment and

chute including a plurality of aligned conveyor sections, each consisting of individual helical screws disposed in parallel and closely adjacent relation with one another, the helical screws of one section being connected by universal joints to the screws of the proximate section to permit pivotal movement of their respective conveyor sections and the screws of one of said conveyor sections being of greater lineal flight pitch than the screws of the proximate section.

6. In a self-propelled vehicle for transporting loose material, having wheeled steering and driving means, a main frame having a centrally disposed longitudinally extending material carrying compartment, an elevating discharge chute at one end of said compartment, a material receiving hopper at the other end of said compartment, a conveyor structure disposed along the bottom of said compartment and chute including a plurality of aligned and interconnected conveyor sections, each section consisting of a plurality of individual helical screw conveyors disposed in a parallel and closely adjacent relation with one another, the loading section of said conveyor sections having individual helical screws of greater lineal flight pitch than the screws of the next proximate section whereby said material will pile up over said proximate section due to minimize lineal velocity of said material over that section and the rapid discharge velocity of the loading section, and common driving means for imparting rotary motion to said individual screws of said sections for moving said material continuously along the botton of said compartment and chute.

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