Oct. 10, 1944. R. S. BIGELOW 2,359,889

COAL MINE HAULAGE VEHICLE

Filed July 31, 1943 3 Sheets-Sheet 1

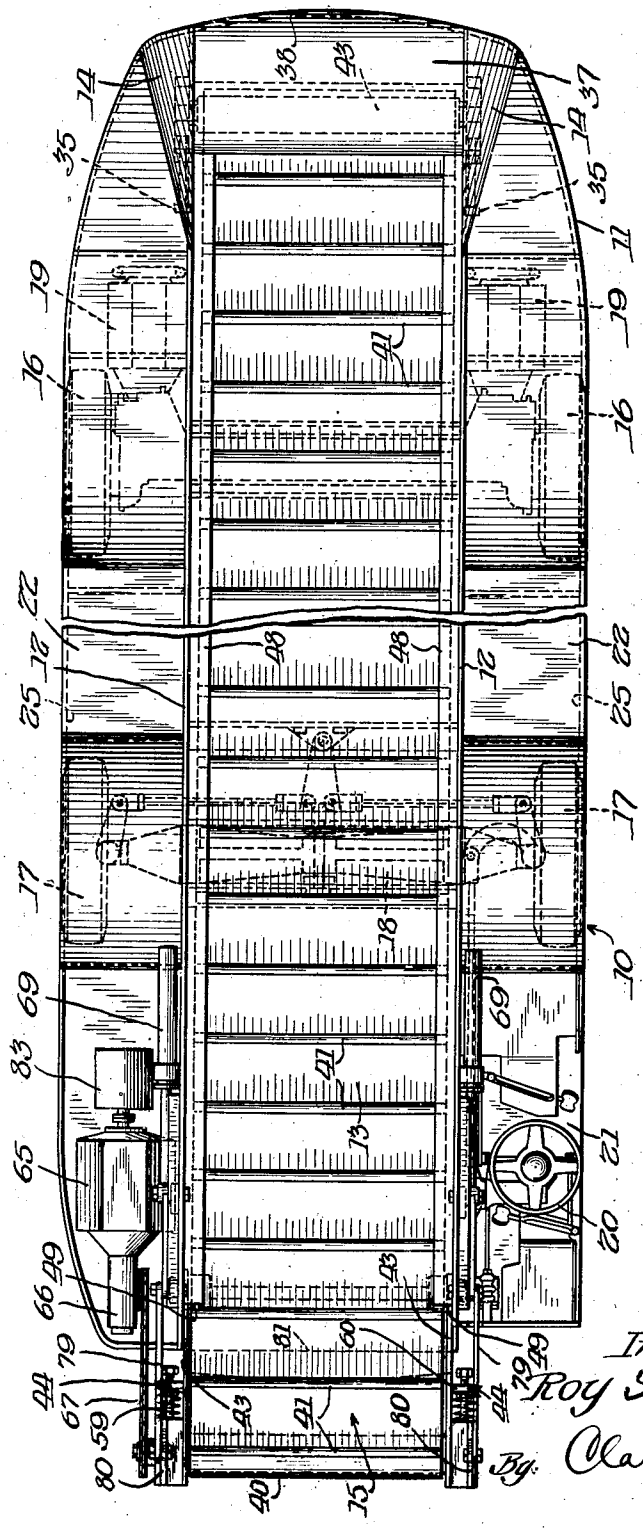

Fig. 1

Inventor:
Roy S. Bigelow.
By Clarence F. Poole
Atty.

Oct. 10, 1944. R. S. BIGELOW 2,359,889

COAL MINE HAULAGE VEHICLE

Filed July 31, 1943 3 Sheets-Sheet 2

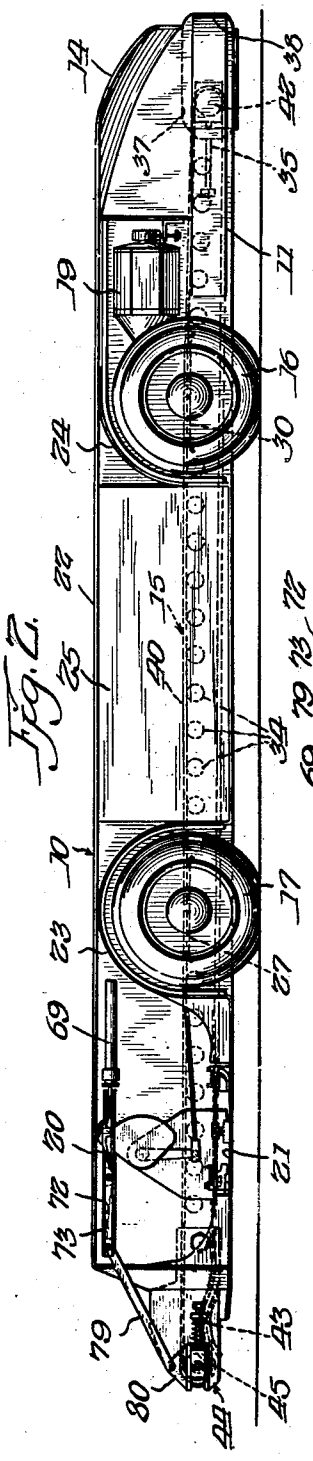

Fig. 2.

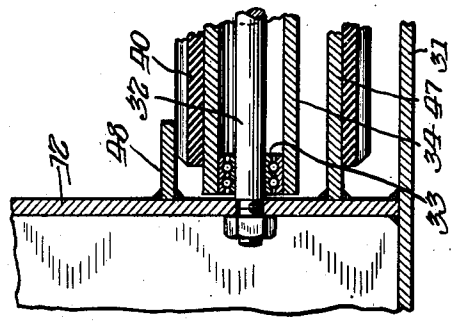

Fig. 7.

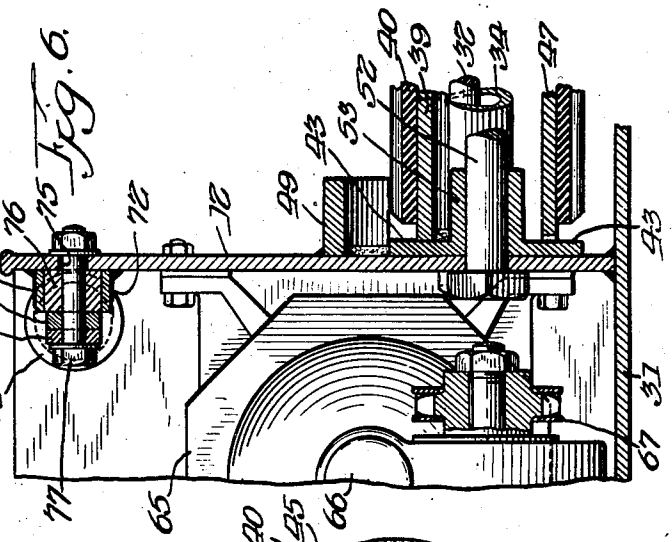

Fig. 6.

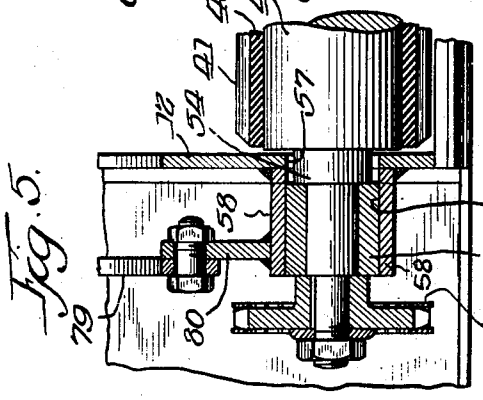

Fig. 5.

Inventor:
Roy S. Bigelow:
By: Clarence F. Poole
Atty.

Oct. 10, 1944. R. S. BIGELOW 2,359,889

COAL MINE HAULAGE VEHICLE

Filed July 31, 1943 3 Sheets-Sheet 3

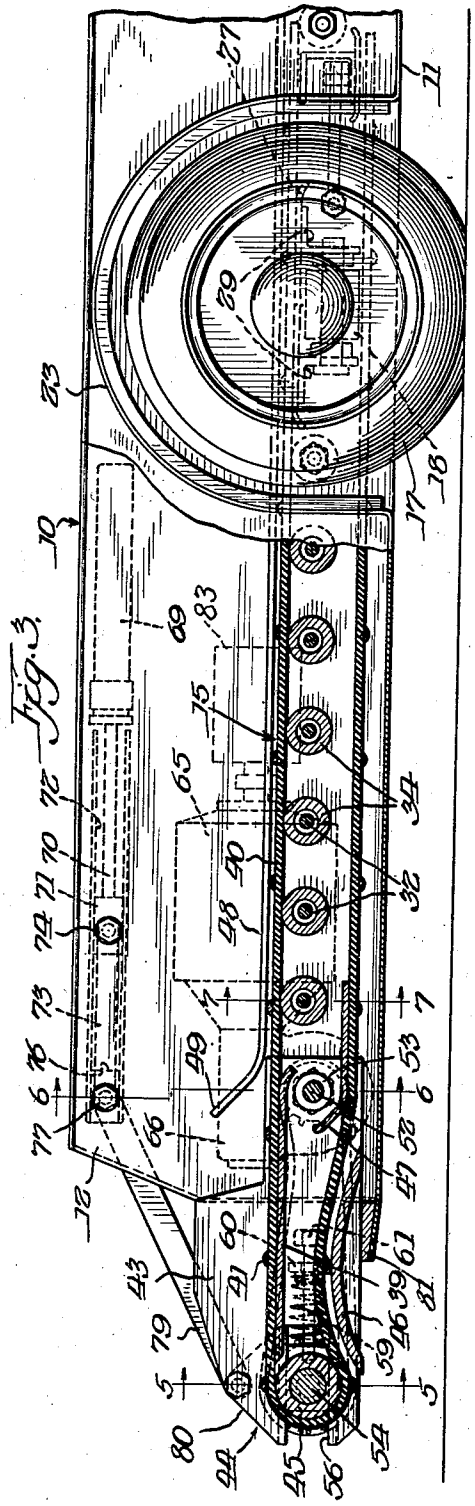

Fig. 3.

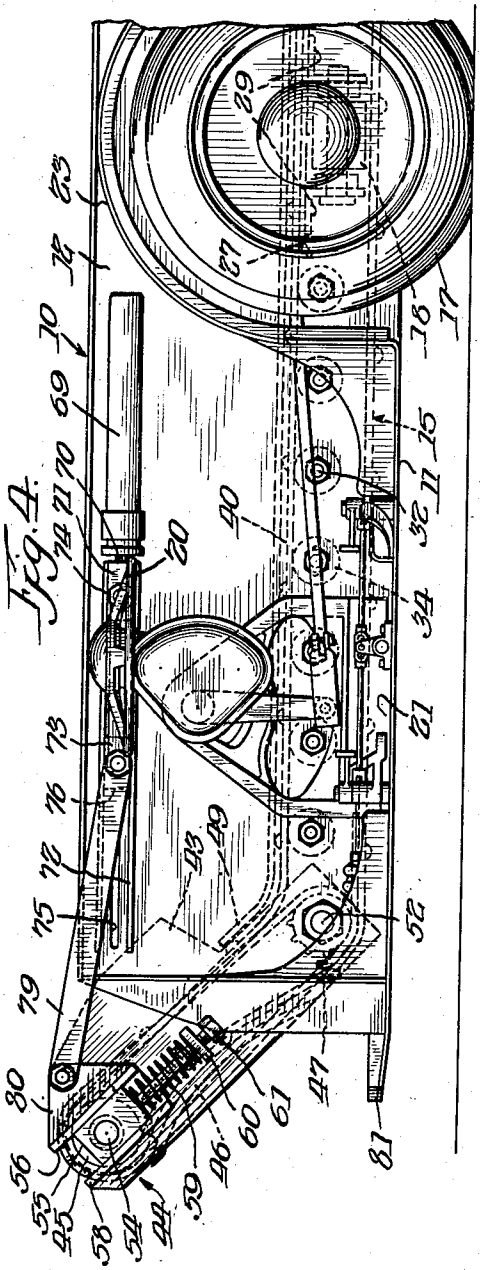

Fig. 4.

Inventor:
Roy S. Bigelow:
By: Clarence F. Poole
Atty.

Patented Oct. 10, 1944 2,359,889

# UNITED STATES PATENT OFFICE

2,359,889

## COAL MINE HAULAGE VEHICLE

Roy S. Bigelow, Chicago, Ill., assignor to Goodman Manufacturing Company, Chicago, Ill., a corporation of Illinois

Application July 31, 1943, Serial No. 496,861

11 Claims. (Cl. 214—83)

This invention relates to improvements in coal mine haulage vehicles commonly known as shuttle cars, adapted to transport coal or other material from the working places of mines underground.

Shuttle cars are usually mounted on rubber tired driving and steering wheels and are propelled by electric motors, by power derived from storage batteries carried by the car. These cars usually consist of an open end frame having a conveyer forming the bottom of the material carrying compartment of the car, which serves to progress the material towards the front end of the car during loading and to discharge the material beyond the front end of the car during unloading. Heretofore, the conveyor has been of the chain and flight type, requiring considerable power to move the coal along the stationary bottom plate of the car, and due to the restricted working conditions underground it has been difficult to provide sufficient battery capacity to propel the car and operate the conveyer for an entire working shift.

The device of my present invention has as its principal objects to remedy these difficulties by increasing the efficiency of the conveying medium of the car, by providing a continuous belt conveyer supported on a plurality of spaced antifriction idlers, in place of the usual chain and flight conveyer riding along a stationary bottom plate.

Another object of my invention is to provide a shuttle car of the class described wherein a continuous belt conveyer forms the bottom of the load carrying compartment of the car, and wherein the discharge end of this belt conveyer is so arranged that it forms a closure member for the front end of the car, so as to prevent material from spilling from the end of the car, during traveling of the car about a mine.

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

Figure 1 is a fragmentary top plan view of a conveyer car constructed in accordance with my invention;

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

Figure 3 is an enlarged view in side elevation of the front part of the car, with certain parts shown in longitudinal section, in order to more clearly illustrate certain details of my invention;

Figure 4 is a view in side elevation drawn to substantially the same scale as Figure 3, with the discharge end of the conveyer tilted upwardly, to form a closure member for the front end of the car;

Figure 5 is a sectional view taken substantially along line 5—5 of Figure 3;

Figure 6 is a sectional view taken substantially along line 6—6 of Figure 3; and

Figure 7 is a sectional view taken substantially along line 7—7 of Figure 3.

Referring now to the embodiment of my invention illustrated in the drawings, a coal haulage vehicle or shuttle car is indicated generally at 10. Said vehicle consists of an elongated chassis 11 including a pair of vertically extending laterally spaced side walls 12, 12 extending the full length of the vehicle and forming the side walls of a coal carrying compartment 13 thereof. The receiving end of the car is flared outwardly as indicated by reference characters 14, 14, to facilitate loading by the boom of a loading machine, and the bottom of the material carrying compartment of the car is defined by a conveyer indicated by reference character 15.

The chassis also includes two rubber tired drive wheels 16, 16, suitably mounted on the side walls 12, 12, near the rear of the machine, and two rubber tired steering wheels 17, 17 near the front end of the machine, mounted on an equalizing axle structure 18. Said drive wheels 16, 16 are mounted on the outer sides of the side walls 12, 12 and are driven by electric drive motors 19, 19 in a manner which is clearly shown and described in application Serial No. 456,165 filed by William R. Beck, August 26, 1942, now Patent No. 2,336,386, dated December 7, 1943, and forms no part of my present invention, so not herein shown or described in detail. The steering wheels 17, 17 mounted on the equalizing axle structure 18 are steered by means of a hand steering wheel 20 mounted in an operator's compartment 21, disposed to one side of one side wall 12, in a well known manner, which is no part of my present invention.

The side walls 12, 12 have deck plates 22, 22 extending laterally from their upper edges along opposite sides of the vehicle, which merge with curved fenders 23 and 24, which form individual wells for the front and rear wheels respectively. Suitable compartments 25, 25 are provided along the outer sides of the side walls 12, 12 between the wheel wells and below the deck plates 22, 22, to provide spaces for storage batteries and electrical control equipment of the usual kind.

The side walls 12, 12 are cross connected, adja-

cent the front axle structure 18 by means of a top plate 27 forming a shoe along which the upper run of the conveyer rides, and by means of a pair of longitudinally spaced angles 29, 29 forming a support for the cross axle structure 18. A top plate or shoe 30 disposed adjacent the rear wheels also serves to connect said side walls together, and a bottom plate 31 connecting the bottom margins of the side walls together, below the lower run of the conveyer, serves to stiffen the chassis structure. A plurality of relatively closely longitudinally spaced tie rods 32, 32 extend between said side walls and also serve as a cross connecting means therefor. Said tie rods have ball bearings 33, 33 mounted thereon, which have idler rollers 34, 34 mounted thereon, for supporting the upper run of the conveyer.

A shield 37 extends horizontally across the rear of the material carrying compartment 13 between the side walls 12, 12. Said shield is arched upwardly at a level somewhat above the level of the conveyer and terminates into a rear bumper 38. This shield and bumper serve to protect the conveyer from the loading boom of a loading machine when said loading boom is extended directly into the rear end of the car during loading, besides serving as a reinforcing and cross connecting means for the frame of the vehicle.

Referring now in particular to the conveyer 15, an endless belt 40 having transverse flights 41, 41 mounted on the outer side thereof, forms the bottom of the material carrying compartment 13. Said belt is supported on the idler rollers 34, 34 and the top plates 27 and 30 and is trained around an idler roller 42 at the receiving end of the car. Said idler roller is rotatably mounted beneath the shield 37 for longitudinal adjustment, to take up slack in the conveyer, and is so adjusted and held in adjusted position by means of threaded bolts 35, 35. Said belt extends from said idler roller over the idler rollers 34, 34 and shoes 27 and 30, and over a plate 39 at the discharge end of the car. Said plate connects the sides 43, 43 of a hinged end discharged frame 44 together. Said end frame extends beyond the front end of the car when the conveyer is positioned for discharging its load and will hereinafter be more fully described as this specification proceeds. From said last mentioned plate said belt passes to and around a drive roller 45 at the forward or discharge end of the car and over an arched shoe 46, mounted between the sides 43, 43 and serving to increase the wrap of the belt as it passes around said drive roller. From thence said belt passes under a transverse guide shoe 47, connected between the side walls 12, 12, which has an upwardly curved forward end which serves to guide and to place an even curve on the lower run of the belt, when said hinged end frame 44 is swung to an upwardly inclined position.

Retaining plates 48, 48 extend inwardly from the side walls 12, 12 for a greater part of the length of the car and are engaged by the upper sides of the flights 41, 41 and serve as a guide therefor, and also serve to prevent material from lodging between the edges of the belt 40 and said side walls. The forward ends of said retaining plates are bared upwardly as indicated by reference character 49, to bend the belt and to cause it to conform to the form of the hinged end frame 44 when said hinged end frame and the discharge end of the belt are pivoted upwardly, to form a closure member for the forward end of the car.

The hinged end frame 4 is mounted on a transversely extending tie rod 52 mounted between the side walls 12, 12. Said tie rod is encircled by sleeves 53, 53 extending inwardly of and formed integrally with the sides 43, 43 of said closure member.

The drive roller 45 is mounted at the forward end of the sides 43, 43 on a transverse shaft 54 journaled on bearing blocks 55, 55 slidably mounted in guides 56, 56 extending longitudinally of said sides and opening at the forward ends thereof. Said guides are formed by slots 57, 57 cut in said sides and by parallel spaced plates 58, 58, secured to the outer sides of said sides and extending outwardly therefrom in alignment with the upper and lower margins of said sides.

The drive roller 45 is urged in a position towards the forward ends of said slots, to maintain the tension of the belt uniform in all positions of adjustment of the end frame 44, by means of compression springs 59, 59. Said compression springs abut the bearing blocks 55, 55 at one of their ends and abut lugs 60, 60, projecting laterally from the outer sides of said hinged end frame, at their opposite ends. Said compression springs encircled threaded rods 61, 61 slidably guided in the lugs 60, 60 and threaded in said bearing blocks 55, 55.

The transverse shaft 54 is suitably driven from an electric motor 65, herein mounted on the outer side of the side wall 12, opposite from the operator's platform 21. Said motor is suitably connected to said drive shaft through a worm and worm gear reduction, in a casing indicated generally at 66, and a chain and sprocket drive 67, driven by the worm of said worm and worm gear reduction, the driving sprocket of which chain and sprocket drive is coaxial with the pivotal axis of the end frame 44.

A plurality of fluid pressure cylinders 69, 69, mounted on the outer sides of the side frame members 12, 12, are provided to elevate the hinged end frame 44 and the forward end of the conveyer 15 about the axis of the tie rod 52, so as to close the forward end of the car when travelling about the mine. Said fluid pressure cylinders, as herein shown, are suitably mounted on the outer sides of the side walls 12, 12 and have piston rods 70, 70 extensible therefrom and connected at their forward ends to blocks 71, 71, slidably mounted in longitudinal guides 72, 72 extending along the outer sides of said side frame members. Each of said blocks, as herein shown, has the rear end of a piston rod 70 and the rear end of a link 73 connected thereto on a bolt 74. Said bolt extends through said link, piston rod, and block, and through a slot 75 extending longitudinally of said side wall. The opposite end of said link is pivotally connected to a block 76, which is slidably guided in the guide 72 by means of a bolt 77, extending through said link and block and through the slot 75. Said bolt also has a link 79 pivotally connected thereto, the opposite end of which link is pivotally connected to the upper end of an ear 80, secured to and projecting upwardly from the upper plate 58 of the guide 56. A cross frame member 81 extending across the forward end of the frame 11 is provided to limit downward movement of said hinged end frame. A fluid pump 83 driven from the motor 65 is provided to supply fluid under pressure to said cylinders and to the brakes of the car. Suitable fluid control valves (not shown) are provided to control the admission and release of fluid to and from said cylinders.

When fluid under pressure enters the piston rod ends of the cylinders 69, 69, the closure members and discharge end of the belt will be elevated about the axis of the tie rod 52, to close the discharge or forward end of the material receiving compartment of the car and to prevent the loss of material therefrom while the car is travelling about the mine, and the holding of fluid in said cylinder will hold the discharge end of the car in a closed position. The release of fluid from the piston rod ends of said cylinders and the application of fluid under pressure to the head ends of said cylinders will lower the discharge end of the belt and place it in position to discharge material onto the car.

It should here be noted that the belt may be driven when in a position to close the discharge end of the car, so as to progress material from the receiving to discharge end of the car during the loading operation, but that the belt is usually in a horizontally extended position during loading of the car, until material has been progressed to the forward end of the car, at which time the discharge end of the belt is pivoted upwardly, to close this end of the car, for driving of the car about the mine.

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 mine haulage vehicle of the character described, a frame open at its ends and having a pair of laterally spaced side walls defining the sides of the material carrying compartment of the vehicle, and means forming a bottom for the material carrying compartment of said vehicle and adapted to progress material from the receiving to discharge end of said frame during loading, and to unload said vehicle by power including a plurality of closely spaced idler rollers spaced along said frame and an endless conveyer belt supported on said idler rollers.

2. In a mine haulage vehicle of the character described, a frame open at its ends and having a pair of laterally spaced side walls defining the sides of the material carrying compartment of the vehicle, and means for progressing material from the receiving to discharge end of said frame during loading and for unloading said vehicle by power including a plurality of closely spaced idler rollers extending transversely along said frame for substantially the full length thereof, and a conveyer belt having flights on the upper side thereof extending beyond the forward end of said frame and supported on said idler rollers for substantially the full length of said frame and forming a bottom for the material carrying compartment of said vehicle.

3. In a mine haulage vehicle of the character described, a frame open at its ends and having a pair of laterally spaced side walls defining the sides of the material carrying compartment of the vehicle, and means forming a bottom for the material carrying compartment of said vehicle and adapted to progress material from the receiving to the discharge end of said frame during loading and to unload said vehicle by power including a plurality of tie rods extending across said side walls for substantially the full length of said frame and forming a connecting and stiffening structure therefor, closely spaced antifriction idler rollers mounted on said tie rods, and a conveyer belt having flights on the upper side thereof supported on said idler rollers.

4. In a mine haulage vehicle of the character described, a frame open at its ends and having a pair of laterally spaced side walls defining the sides of the material carrying compartment of the vehicle, a plurality of idler rollers extending along said frame for substantially the full length thereof, a tilting frame transversely pivoted between said side walls and extending beyond the forward end thereof, drive means on the forward end of said tilting frame including a power driven roller, a conveyer belt having flights on the upper side thereof supported on said idler rollers and extending around and driven from said drive roller at the forward end of said tilting frame and adapted to close the forward end of said frame by upward tilting movement of said tilting frame, an upwardly arched shoe extending across the lower portion of said tilting frame and adapted to engage the lower run of the belt as it passes around said drive roller to maintain a predetermined wrap thereof around said drive roller, and a bending shoe mounted between the side walls of said frame and having an upturned end projecting beyond the transverse pivot of said tilting frame to place a predetermined bend on said belt as said tilting frame is moved into an upwardly tilted position.

5. In a mine haulage vehicle of the character described, a frame open at its ends and having a pair of laterally spaced side walls defining the sides of the material carrying compartment of the vehicle, a plurality of idler rollers extending along said frame for substantially its entire length, a conveyer belt having flights on the outer side thereof supported on said idlers and forming a bottom for the material carrying compartment of said frame, a tilting frame transversely pivoted between the side walls of said frame and extending beyond the forward end thereof and forming a support for said belt beyond the forward end of said frame, a power driven drive roller at the forward end of said tilting frame, forming a drive means for said belt, means for moving said tilting frame in an upward direction to cause said conveyer belt to form a closure means for the forward end of said frame, and means for causing said conveyer belt to conform to the form of said tilting frame when in an upwardly tilted position and to be driven by said drive roller in all positions of adjustment of said tilting frame including retaining plates extending inwardly from the side walls of said frame, for engagement with the ends of the upper sides of said flights, said retaining plates having upwardly curved forward ends inclined at the maximum angle of inclination of said tilting frame, said curved forward ends extending over the pivotal axis of said tilting frame and being adapted to engage said flights as said tilting frame is moved to a position to close the forward end of said vehicle.

6. In a mine haulage vehicle of the character described, a frame open at its ends and having a pair of laterally spaced side walls defining the sides of the material carrying compartment of the vehicle, a plurality of idler rollers extending along said frame for substantially its entire length, a conveyer belt having flights on the

outer sides thereof supported on said idlers and forming a bottom for the material carrying compartment of said frame, a tilting frame transversely pivoted between the side walls of said frame and extending beyond the forward end thereof and forming a support for said belt beyond the forward end of said frame, a power driven drive roller at the forward end of said tilting frame, forming a drive means for said belt, means for moving said tilting frame in an upward direction to cause said conveyer belt to form a closure means for the forward end of said frame, and means for causing said conveyer belt to conform to the form of said tilting frame when in an upwardly tilted position and to be driven by said drive roller in all positions of adjustment of said drive roller including retaining plates extending inwardly from the side walls of said frame, for engagement with the ends of the upper sides of said flights, said retaining plates having upwardly curved forward ends inclined at substantially the maximum angle of inclination of said tilting frame, said curved forward ends extending over the pivotal axis of said tilting frame and being adapted to engage the upper run of said belt, and a bending shoe mounted between the side walls of said frame and having an upturned end projecting beyond the transverse pivot of said tilting frame and adapted to engage the inside of the lower run of the belt to place a predetermined bend thereon as said belt is moved into an upwardly tilted position.

7. In a mine haulage vehicle of the character described, a frame open at its ends and having a pair of laterally spaced side walls defining the sides of the material carrying compartment of the vehicle, a plurality of idler rollers extending along said frame for substantially its entire length, a conveyer belt having flights on the outer side thereof supported on said idlers and forming a bottom for the material carrying compartment of said frame, a tilting frame transversely pivoted between the side walls of said frame and extending beyond the forward end thereof and forming a support for said belt beyond the forward end of said frame, a power driven drive roller mounted on said tilting frame for slidable movement with respect thereto and forming a drive means for said belt, means for moving said tilting frame in an upward direction, to cause said conveyor belt to form a closure means for the forward end of said frame, means for causing said conveyer belt to conform to the form of said tilting frame and to be driven by said drive roller in all positions of adjustment thereof including retaining plates extending inwardly from the side walls of said frame and adapted to engage the upper sides of the ends of said flights and having upwardly curved forward ends inclined at the maximum angle of inclination of said tilting frame, a bending shoe mounted between the side walls of said frame and having an upturned end projecting beyond the transverse pivot of said tilting frame and adapted to engage the inside of the lower run of the belt, and yieldable means for yieldably maintaining said drive roller in an outwardly extended position with respect to said tilting frame, to maintain substantially the same tension on said belt in all positions of adjustment of said tilting frame.

8. In a mine haulage vehicle of the character described, a frame open at its ends and having a pair of laterally spaced side walls defining the sides of the material carrying compartment of the vehicle, a conveyer extending along said frame for substantially its entire length and including an endless belt forming a bottom for the material carrying compartment of said vehicle, a tilting frame transversely pivoted between the side walls of said frame and extending in advance of the forward end of said frame and forming a support for said belt beyond the forward end of said frame, and means for placing a bend in said belt to cause said belt to conform to the form of said tilting frame when in an upwardly tilted position including retaining plates extending inwardly from the side walls of said frame, for engagement with the upper run of said belt, said retaining plates having upwardly curved forward ends inclined at the maximum angle of inclination of said tilting frame, said curved forward ends extending over the pivot point of said tilting frame and being positioned to engage and bend said belt as said tilting frame is moved to a position to close the forward end of said vehicle.

9. In a mine haulage vehicle of the character described, a frame open at its ends and having a pair of laterally spaced side walls defining the sides of the material carrying compartment of the vehicle, a conveyer extending along said frame for substantially its entire length and including an endless belt forming a bottom for the material carrying compartment of said vehicle, a tilting frame transversely pivoted between the side walls of said frame and extending in advance of the forward end of said frame and forming a support for said belt beyond the forward end of said frame, a power driven drive roller at the forward end of said tilting frame, forming a drive means for said belt, means for swinging said tilting frame in an upward direction to cause said belt to form a closure for the forward end of said frame, and means for causing said belt to conform to the form of said tilting frame when in an upwardly tilted position and to be driven by said drive roller in all positions of said tilting frame including retaining plates extending inwardly from the side walls of said frame, for engagement with the upper run of said belt, said retaining plates having upwardly curved forward ends inclined at substantially the maximum angle of inclination of said tilting frame, said curved forward ends extending over the pivotal axis of said tilting frame and being adapted to engage and bend said belt as said tilting frame is moved to a position to close the forward end of said vehicle.

10. In a mine haulage vehicle of the character described, a frame open at its ends and having a pair of laterally spaced side walls defining the sides of the material carrying compartment of the vehicle, a conveyer extending along said frame for substantially its entire length and including an endless belt forming a bottom for the material carrying compartment of said vehicle, a tilting frame transversely pivoted between the side walls of said frame and extending in advance of the forward end of said frame and forming a support for said belt beyond the forward end of said frame, and means for causing said belt to conform to the form of said tilting frame when in an upwardly tilted position including retaining plates extending inwardly from the side walls of said frame, for engagement with the upper run of said belt, said retaining plates having upwardly curved forward ends extending over the pivot point of said tilting frame

and being positioned to engage and bend said belt as said tilting frame is moved to a position to close the forward end of said vehicle, and a bending shoe mounted between the side walls of said frame and having an upturned end projecting beyond the transverse pivot of said tilting frame and adapted to engage the inside of the lower run of the belt and bend said lower run of the belt upon upward pivotal movement of said tilting frame.

11. In a mine haulage vehicle of the character described, a frame open at its ends and having a pair of laterally spaced side walls defining the sides of the material carrying compartment of the vehicle, a conveyer extending along said frame for substantially its entire length and including an endless belt forming a bottom for the material carrying compartment of said vehicle, a tilting frame transversely pivoted between the side walls of said frame and extending in advance of the forward end of said frame and forming a support for said belt beyond the forward end of said frame, a power driven drive roller at the forward end of said tilting frame, forming a drive means for said belt, means for swinging said tilting frame in an upward direction to cause said belt to form a closure for the forward end of said frame, and means for causing said belt to conform to the form of said tilting frame when in an upwardly tilted position and to be driven by said drive roller in all positions of said tilting frame, including retaining plates extending inwardly from the side walls of said frame, for engagement with the upper run of said belt, said retaining plates having upwardly curved forward ends extending over the pivotal axis of said tilting frame and being adapted to engage said belt as said tilting frame is moved to a position to close the forward end of said vehicle, yieldable means for yieldably maintaining said drive roller in an outwardly extended position with respect to said tilting frame, to maintain substantially the same tension on said belt in all positions of adjustment of said tilting frame, and a bending shoe mounted between the side walls of said frame and having an upturned end projecting beyond the transverse pivot of said tilting frame and adapted to engage the inside of the lower run of said belt during upward tilting movement of said tilting frame.

ROY S. BIGELOW.