April 27, 1943. J. D. RUSSELL 2,317,644

SHUTTLE CAR

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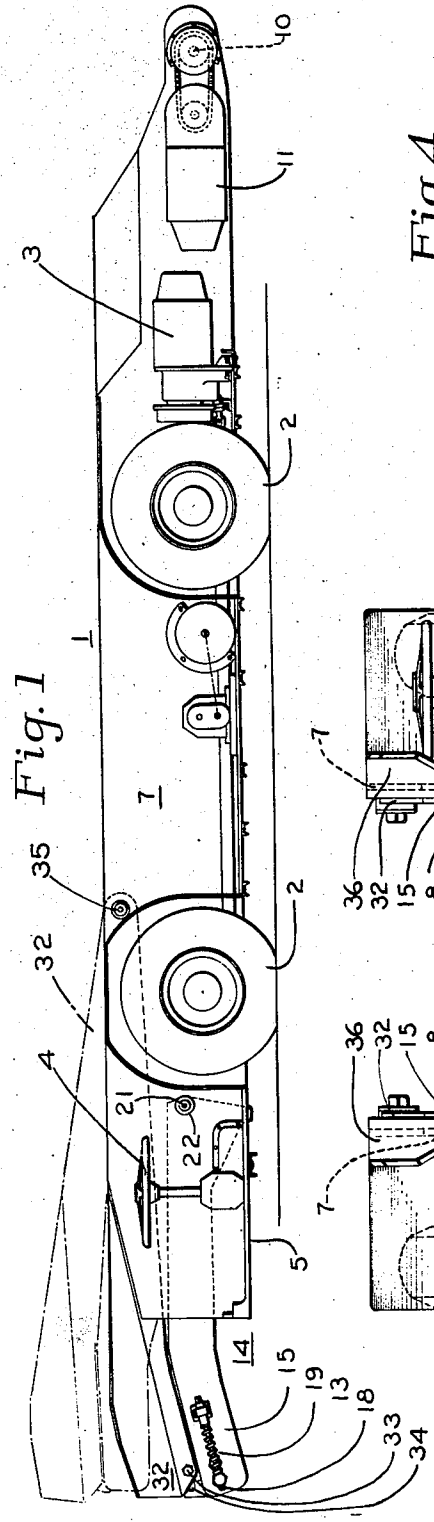


Fig. 1

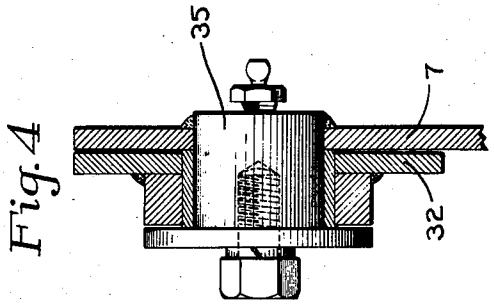


Fig. 4

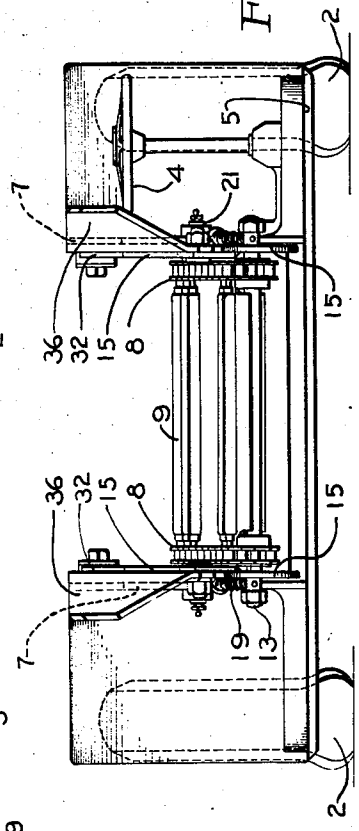


Fig. 2

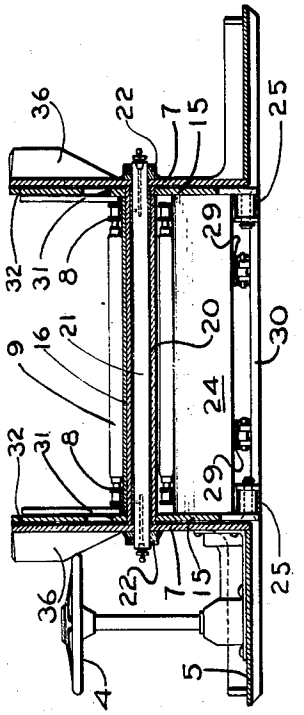


Fig. 3

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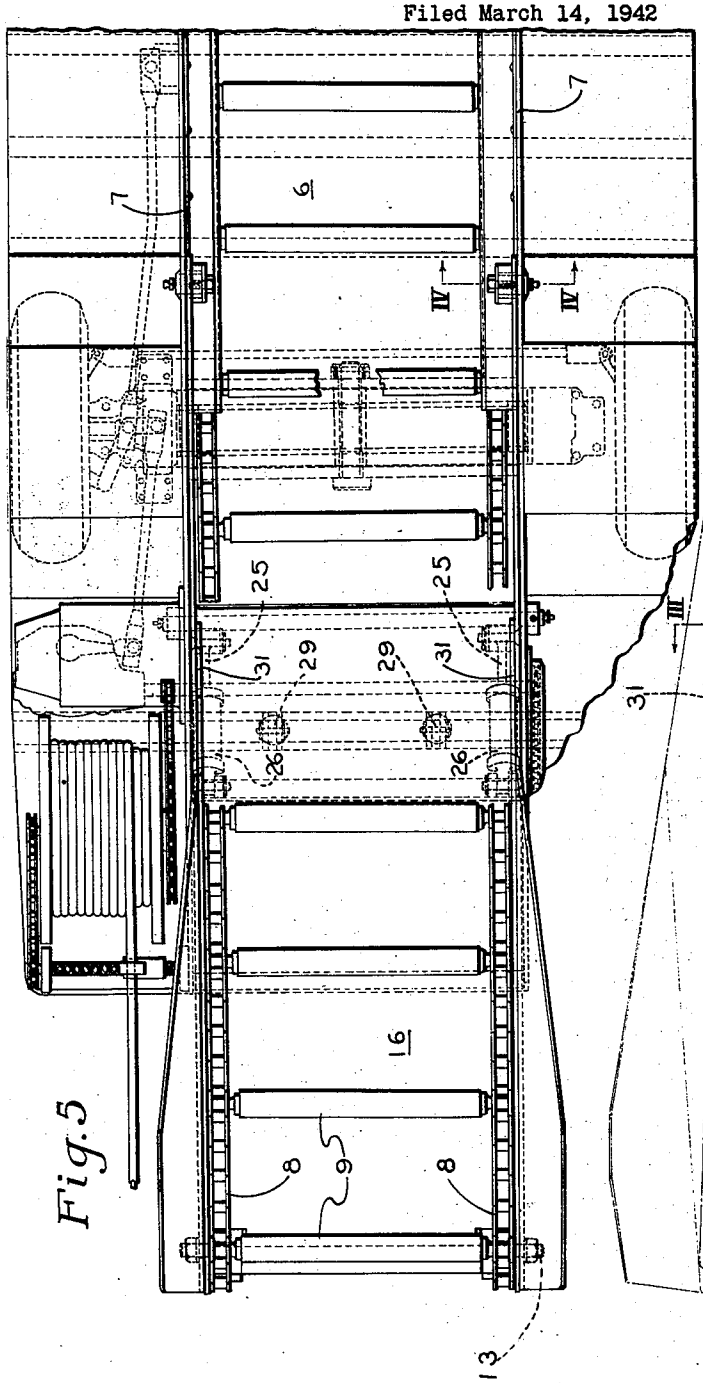


Fig. 5

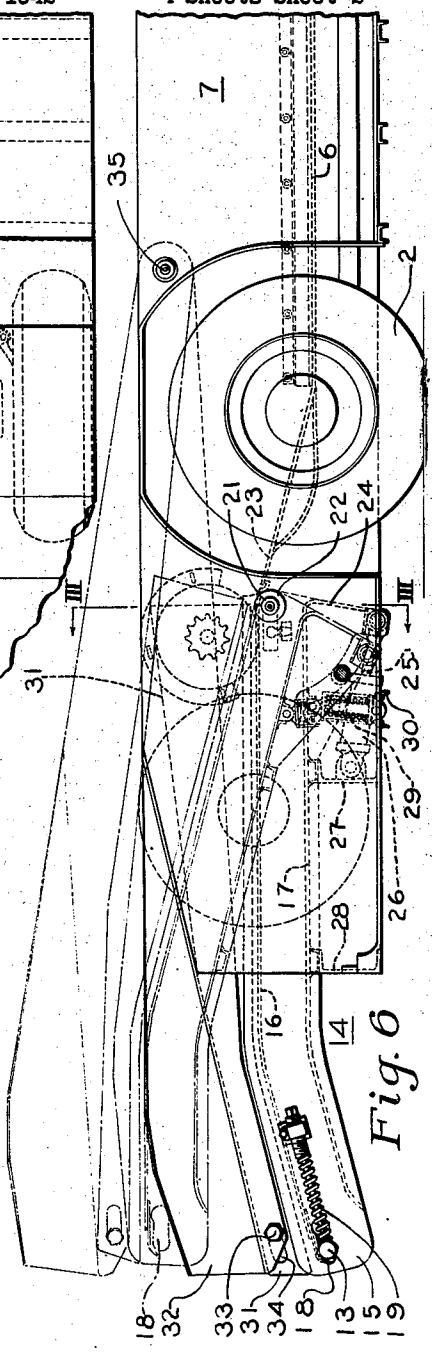


Fig. 6

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SHUTTLE CAR

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Fig. 7

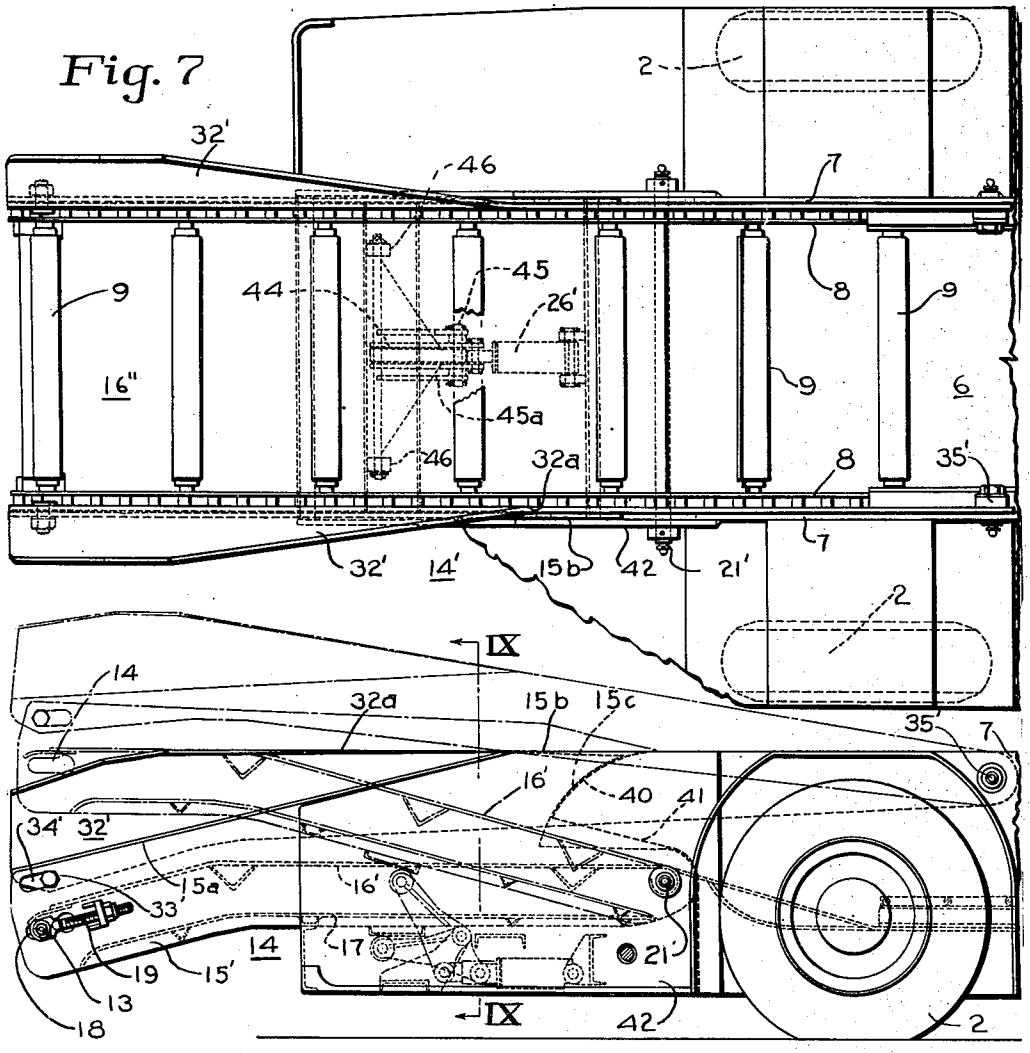


Fig. 8

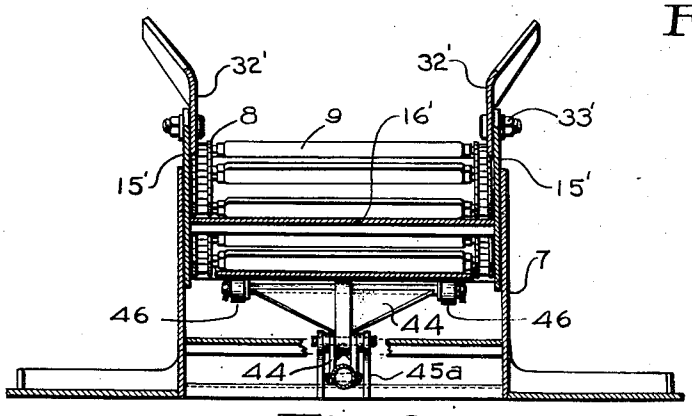


Fig. 9

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SHUTTLE CAR

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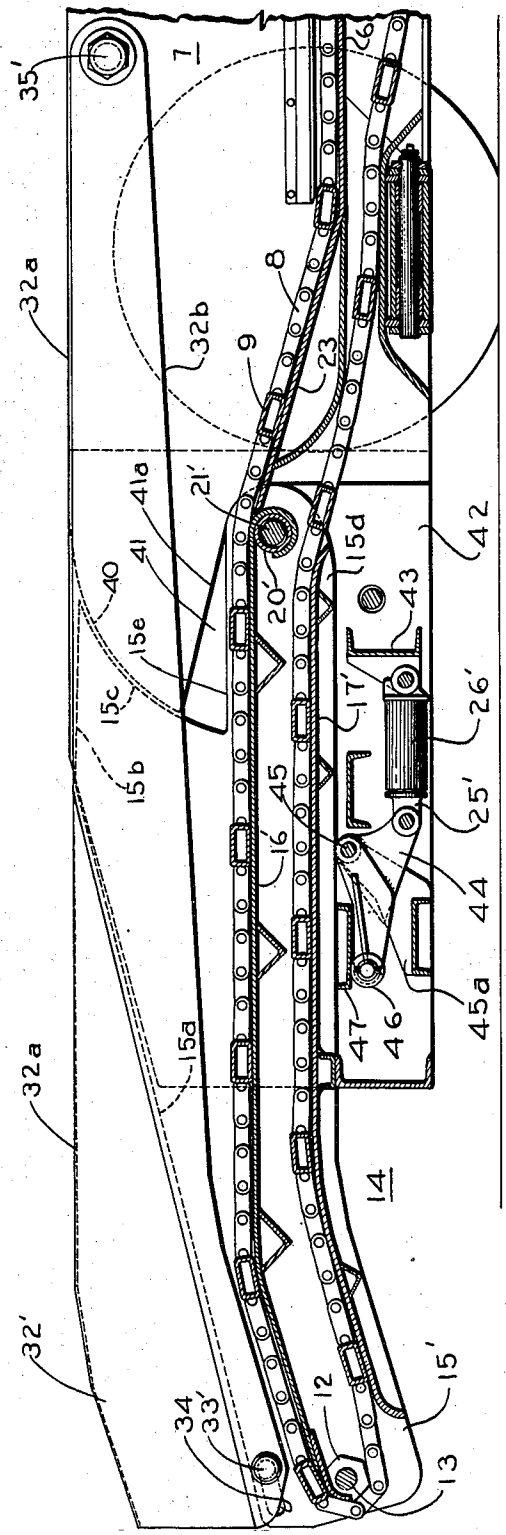


Fig. 10

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Patented Apr. 27, 1943 2,317,644

UNITED STATES PATENT OFFICE

2,317,644

SHUTTLE CAR

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Application March 14, 1942, Serial No. 434,711

11 Claims. (Cl. 214—83)

This invention relates to vehicles of the self-unloading type having a conveyor bottom and more particularly to improvements in the construction of such a vehicle whereby the discharge end of the conveyor can be elevated to deliver the material in the vehicle at various heights.

Self-propelled, self-unloading vehicles commonly known as "shuttle cars" are used extensively in underground mining operations to transport the mineral being mined from the working face or producing area of the mine to a transfer station where the car is unloaded and the mineral being delivered is discharged into an elevating conveyor which in turn delivers it onto a belt conveyor or into a train of mine cars or the like forming the primary haulage system of the mine.

The primary object of this invention is to provide a vehicle for use in mine chambers having a single unloading conveyor passing over the bottom thereof, the discharge end of which is capable of being readily raised and lowered whereby the vehicle can unload directly into a mine car or onto a belt conveyor or whatever transporting medium forms the primary haulage of the mine.

Another object is to provide a self-unloading vehicle capable of discharging its load directly onto a belt conveyor, a train of mine cars, or the like and thereby eliminate the necessity for an intermediate conveyor between the vehicle and the main transporting device being loaded therefrom.

Another object is to provide a shuttle car having a single unloading conveyor provided with an adjustable discharge section which forms a part of the load-carrying body during the loading and transporting functions of the car and consequently will not reduce the load carrying capacity of the car.

A further object is to provide an adjustable discharge section for the conveyor of a shuttle car in which means are provided for preventing the spillage of material from the conveyor during unloading of the car regardless of the vertical adjustment of the conveyor.

A further object is to provide a shuttle car having an unloading conveyor provided with an adjustable discharge section which is not only sturdily constructed, simple to manufacture, but easily and readily operated and adjusted.

A further object is to provide novel means for adjusting and varying the elevation of the discharge end of a single conveyor of a shuttle car.

A still further object is to provide load retaining side boards for the vertically adjustable discharge end of the conveyor of a shuttle car which will lay within the over-all height of the car while the car is traveling but will project a considerable distance above the side walls during the unloading thereof.

These and other objects which will hereinafter be made apparent to those skilled in this particular art, are accomplished by means of this invention, which is described in the following specification and illustrated in the accompanying drawings, wherein:

Fig. 1 is a view in side elevation of a shuttle car made in accordance with my invention;

Fig. 2 is an enlarged front elevation of the shuttle car shown in Fig. 1;

Fig. 3 is a section taken on line III—III of Fig. 6;

Fig. 4 is an enlarged sectional view taken on line IV—IV of Fig. 5;

Fig. 5 is an enlarged plan view of the front or discharge end of a shuttle car shown in Fig. 1;

Fig. 6 is a view in side elevation of the forward or discharge end of the shuttle car showing, in broken lines, the adjustable section of the conveyor in its raised position;

Fig. 7 is a plan view of the forward end of a shuttle car illustrating a modified form of spill board for the adjustable discharge section of the conveyor;

Fig. 8 is a view in side elevation of the discharge end of the shuttle car shown in Fig. 7;

Fig. 9 is a sectional view taken on line IX—IX of Fig. 8; and

Fig. 10 is an enlarged longitudinal sectional view of the discharge end of the shuttle car shown in Fig. 7.

Referring now to the drawings in detail, 1 represents a shuttle car of the type commonly used to perform the secondary haulage in underground mine chambers to transport the mineral being mined from the working area of the mine to the primary haulage system. The car 1 travels on pneumatic tired wheels 2, the rear set of which are driven by suitable electric motors 3, and the front set are connected for steering to a steering wheel 4 mounted on an operator's platform 5 which is located on one side of the car at the forward or discharge end thereof.

Wheels 2 support a box-like load-carrying body having a floor 6 and side walls 7 extending upwardly from the floor on each side thereof which are substantially vertical at the forward or discharge end of the car. At the forward or dis-

charge end of the car, the side walls 7 extend a substantial distance beyond the forward end of the floor 6, the purpose of which will be hereinafter more fully explained.

An endless conveyor, composed of chains 8 and flights 9, connected between the chains at regular intervals along their lengths, passes over the floor 6. At the rear end of the car 1, the chains 8 pass around suitable drive sprockets (not shown) carried by a shaft 10 which is driven by an electric motor 11 mounted on the side of the car to drive the conveyor which unloads or discharges the material from the car 1.

At the front or discharge end of the car, the chains 8 pass around suitable chain guide rollers 12 (Fig. 10) on a shaft 13 carried by a vertically adjustable conveyor section 14 which is pivoted between the extended ends of the side walls and forms a continuation of the floor 6 of the car.

In the exemplification of my invention illustrated in Figs. 1 to 6, inclusive, the conveyor section or frame 14 is of fabricated construction and comprises a pair of side plates 15 which are tied together by vertically spaced upper and lower decks 16 and 17 forming, respectively, the supports for the active and return reaches of the chains 8.

Each of the side plates 15 has a slot 18 in the forward end thereof for receiving the idler shaft 13 and to provide the desired tension at all times in the chains 8, regardless of the vertical adjustment of the conveyor frame 14, a take-up mechanism 19 of usual construction is associated with each end of the shaft 13 which permits the shaft to move back and forth in the slots 18.

In order to mount the frame 14 on the car 1, the rear end of the top deck plate 16 is connected to a tubular or cylindrical member 20 which extends transversely between, and has its ends secured to, the side plates 15. The member 20 is journaled on a cross shaft 21 mounted in bearings 22 which are carried by the side walls 7 of the car and are located somewhat above the general level of the floor 6 at the front or forward end thereof so that an uninterrupted floor will be provided throughout the entire length of the car and the conveyor frame 14. The forward end of the floor 6 is sloped upwardly as at 23 and the front edge thereof rests on the rear end of the top deck 16.

In order that the frame 14 may be readily and easily adjusted to vary the height of the discharge end thereof and thus permit the car to unload directly onto a belt conveyor or into a train of mine cars or other transporting media of varying heights, the rear end of the bottom deck 17 has an integral flange 24 depending therefrom which is pivotally connected, adjacent each side plate 15, to the piston rod 25 of a normally extended hydraulic jack 26, hinged to a transversely extending frame member 27 of the car 1.

From this construction it is apparent that when the jacks 26 are collapsed, the piston rod 25 and the flange 24 connected thereto will be moved toward the frame member 27 causing the frame 14 to swing about the shaft 20 to raise the discharge end thereof and by controlling the admission of actuating fluid to the jacks 26, the discharge end of the frame 14 can be adjusted to any desired height within the limits of the vertical movement of the frame.

Conversely when the jacks 26 are expanded, the frame 14 will be swung in the opposite direction and the discharge end thereof will be lowered until the bottom of the frame comes in contact with a transverse frame member 28 which connects the ends of the side walls 7 and limits the downward movement of the frame.

Compression springs 29 are interposed between the bottom of the frame 14 and a cross frame member 30 of the car 1 to cushion the descent of the frame 14 toward the cross member 28.

In order to prevent spillage of material from the car during unloading thereof, a plate 31 is secured by welding, or any other suitable manner, to the inner and upper edge of each of the side plates 15 for substantially the full length thereof. The plates 31 are relatively narrow at their outer ends and taper upwardly toward the rear end of the frame to a height slightly lower than the top of the side walls 7.

A side board 32 rests on each of the side plates 15 of the conveyor frame 14 and is slidably, at its forward end, connected to the adjacent plate 31 by a pin 33 slidable in a slot 34 in the plate 31. Spillage boards 32 are so designed that when the frame 14 is in its lowermost position, the tops thereof lay in substantially the same plane as, and form a continuation of, the tops of the side walls 7. The rear ends of the spillage boards 32 are pivoted at 35 to the inner surface of the side walls 7 at a point considerably to the rear of shaft 21 and somewhat to the rear of the point where the floor 6 commences to slope upwardly to join with the top deck 16 of the conveyor frame. The outer ends 36 of the spillage boards 32 are flared outwardly as clearly shown in Figs. 2, 3, and 5.

From the foregoing description, it is apparent that when the frame 14 is raised, the side plates 15 will carry upwardly the spillage boards 32 resting thereon. As the frame is elevated, the boards 32 move forwardly relative to the side plates 31 through the pin and slot connection 33—34. Thus the plates 15, 31 and 32 form a continuous side wall for the conveyor frame 14 and since the spill boards 32 are pivoted to the side walls 7 rearwardly of the point where floor 6 starts to slope upwardly, the side walls of the conveyor frame are of substantially constant height above the conveyor chains 8, regardless of the position of the discharge end thereof and since the top of the side boards 32 lay in the same plane as side walls 7, a continuous side wall of uniform height is maintained throughout the entire length of the body and swinging conveyor section 14 which permits the material to be moved forward in the car as a column or unit without danger of spilling over the sides regardless of the elevation of the conveyor frame 14.

Figs. 7 to 10, inclusive, illustrate another exemplification of my invention in which a spillage board of different design is provided and other means are employed for raising and lowering the conveyor frame. In this modification, the upper edge 15a of side walls 15' of the conveyor frame 14' slope upwardly from the forward end thereof and terminates in an edge 15b which lies in substantially the same horizontal plane as the top of the side wall 7 of the car. The rear end of each of the side plates 15' has a curved edge 15c adapted to abut against a similarly curved edge 40 on the forward end of the side wall 7 and a relatively narrow section 15d which projects rearwardly beyond the bottom of the curved edge 15c and is received in an angular slot 41 cut in the forward end of the wall 7.

The sections 15d of the side plates 15' are connected together by a tubular member 20' which

is journaled on a shaft 21' extending transversely of the car and having its ends mounted in plates 42 secured to the outer surface of the side walls 7 and extending some distance forwardly of the curved edge 40 thereof.

The upper edge 15e of the section 15d of each of the side plates 15' lies in substantially a horizontal plane, when the frame is in its lowered position, and the angular space between this edge and the edge 41a of the slot 41 define the angle through which the frame may be swung. Connected to the outer end of each of the side plates 15', by a pin and slot connection 33'—34', is a spill board 32', the rear end of which is pivoted at 35' to the side wall 7 at a point rearwardly of the shaft 21' above the point where the floor 6 starts to slope upwardly.

When the frame 14 is in its lowermost position, the upper edge 32a of the spill board 32' lies in a plane somewhat below but parallel to the upper edge of the plate 7. The lower edge 32b of the spill board 32' tapers downwardly from the pivot 35' to its outer end parallel to the edge 15a thereof.

In order to swing the conveyor frame 14' about the shaft 21' and raise and lower the discharge end thereof, a hydraulic jack 26' is hinged to a channel frame member 43 extending transversely of the car which has its piston connected by a piston rod 25' to one leg of a bell crank lever 44 pivoted on a pin 45 journaled in a bracket 45a which is supported by the frame of the car. The other leg of the bell crank 44 is bifurcated and each leg is provided with a roller 46 which bears against a track 47 secured to the bottom of the conveyor frame 14.

From this construction, it is apparent that when the jack 26' is expanded, the piston rod 25' is moved outwardly turning the bell crank 44 about the pin 45 and raising the rollers 46 and the conveyor frame 14' supported thereon. As the conveyor frame moves upwardly, the edge 15c of the side plates 15' travel along the curved edge 40 on the side wall 7 until the edge 15e comes in contact with the angularly extending edge 41a of the notch 41 which limits further upward movement of the conveyor frame 14'.

It is also apparent from the foregoing description that as the conveyor frame 14' moves upwardly, the spill boards 32' are carried upwardly and since the pivot 35' is to the rear of the point where the floor 6 starts to slope upwardly, the height of the spill boards remains substantially the same regardless of the vertical position of the conveyor frame 14', and spillage of the material being unloaded is, therefore, prevented.

While two illustrated embodiments of my invention have been described, it is not my intention to limit the scope of the invention to any particular embodiment or otherwise than by the terms of the appended claims.

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

1. In a shuttle car, the combination comprising a load-carrying body having a floor and a side wall on each side thereof, a frame pivoted between the side walls of said body for turning movement about a horizontal axis and projecting beyond the ends of said side walls, said frame having a floor forming a continuation of the floor of said body and a relatively low side member on each side thereof, an endless conveyor passing over the floors of said body and frame, means for turning said frame about its pivot and a side board resting on the top of each side member of said frame and having at its forward end a slip connection therewith, the rear end of each side board being pivoted to the side wall of said body rearwardly of the frame pivot whereby the height of the side walls of said body throughout the length of said frame is maintained throughout the entire range of vertical movement of said frame.

2. In a shuttle car, the combination comprising a load-carrying body having a floor and a side wall along each side thereof, a frame pivoted between the side walls of said body above the top of said floor, said frame having a floor and a side member on each side thereof, the floor of said body extending upwardly adjacent said frame and resting on the floor of said frame, an endless conveyor passing over the floors of said body and frame, a side board resting on each of the side members of said frame and having its forward end loosely connected thereto, the rear end of each of said side boards being pivoted to the side walls of said body rearwardly of the frame pivot and having its upper edge normally lying in substantially the same plane as the upper edge of the side wall to which it is attached and means for raising and lowering said frame, the connection between said side boards and the side members of said frame permitting said side boards to move longitudinally relative to the said side members as said frame is raised and lowered.

3. In a shuttle car, the combination comprising a body having a floor and a side wall along each side thereof and projecting therebeyond at one end of said body, a frame pivoted between the projecting ends of said side walls for turning movement about a horizontal axis, said frame having a floor forming a continuation of the floor of said body and a member along each side thereof, a spill board pivoted to each of said side walls adjacent the upper edge thereof and having its forward end resting on and slidably connected to one of the side members of the frame, the upper edge of each of said spill boards lying in substantially the same plane as the top of the side walls, and means for turning said frame about its pivot.

4. In a vehicle of the character described, the combination comprising a load-carrying body having a floor and a side wall on each side thereof, said side walls extending beyond the floor at one end of said vehicle, a frame pivotally mounted between the extended ends of said side walls for swinging in a vertical plane, said frame projecting beyond the ends of said side walls and having a floor forming a continuation of the floor of said body and side members adjacent the side walls of said body, an endless conveyor passing over the floors of said body and frame, and a pair of load-retaining side boards, one for each of the side members of said frame, slidably connected at their forward ends to said side members and having their rear ends pivoted to the side walls of said body rearwardly of the frame pivot, and means for raising and lowering said frame.

5. In a vehicle of the character described, the combination comprising a load-carrying body having a floor and a side wall along each side thereof, a frame pivoted between said side walls at a point somewhat above the level of said floor for turning about a horizontal axis, said frame having a floor and a side member along each side thereof, the end of the floor of said body being sloped upwardly and overlapping and resting on the floor of said frame, and load retaining side

boards, one for each of the side members of said frame, loosely connected at their forward ends to said side members to permit longitudinal sliding movement therebetween and having their opposite ends pivoted to the side walls of said body at a point substantially in vertical alignment with the place where the floor of said body starts to extend upwardly.

6. In a shuttle car, the combination comprising a load-carrying body having a floor and a side wall along each side thereof, a frame between the side walls of said body and pivoted thereto for vertically swinging movement, said frame having a floor forming a continuation of the floor of said body and a side member along each side thereof, means for swinging said frame and means for retaining material on said frame, including a side board for each of the side members of said frame having its lower edge resting on and slidably connected to the forward end of said side member and its upper edge lying in substantially the same plane as the top of said body when said frame is in its lowermost position, the rear end of each of said side boards being pivoted to the side wall adjacent thereto rearwardly of the frame pivot.

7. In a shuttle car, the combination comprising a load-carrying body having a floor and a side wall along each side thereof, a frame extending between said side walls and pivoted thereto for vertically swinging movement, said frame having a floor forming a continuation of the floor of said body and side members along the side thereof, the inner ends of which are adjacent said side walls, means for raising and lowering said frame and load retaining means associated with each of said side members adapted to lie in the plane of the side walls when said frame is in its lowermost position and to rise above said side walls and form an upwardly extending continuation thereof when said frame is raised.

8. In a shuttle car, the combination comprising a load-carrying body having a floor and side walls along each side thereof, a frame pivotally mounted between said side walls at one end of said body for swinging movement in a vertical plane, said frame having a floor forming a continuation of the floor of said body and side members along the sides thereof adjacent the side walls of the body, an endless conveyor passing over the floors of said body and frame, load retaining means associated with each of the said side members adapted to lie in the plane of the side walls when said frame is in its lowermost position and to raise above said side walls and form an upwardly extending continuation thereof when said frame is raised, and means for raising and lowering said frame including a bell crank pivoted underneath said frame, and means for turning said bell crank to swing said frame about its pivot.

9. In a shuttle car of the character set forth in claim 8, the combination in which side members of the frame project into angular slots in the side walls and have curved rear ends adapted to abut similarly curved edges on the forward ends of the side walls.

10. In a shuttle car the combination of the character set forth in claim 8, in which a bell crank is pivoted underneath the frame and has one leg in engagement with the underside thereof and the other leg connected to a suitable actuating means for swinging said bell crank about its pivot to raise and lower said frame.

11. In a shuttle car the combination of the character set forth in claim 8 in which the frame is pivotally mounted on side plates secured to the outer surfaces of the side walls of the body and the side members of the frame project into angular slots in the side walls and have curved rear ends abutting against similarly curved edges on the forward ends of the side walls.

JOHN D. RUSSELL.