April 21, 1953 P. A. SMITH 2,635,735

CONVEYING AND UNLOADING DEVICE

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Fig. 1

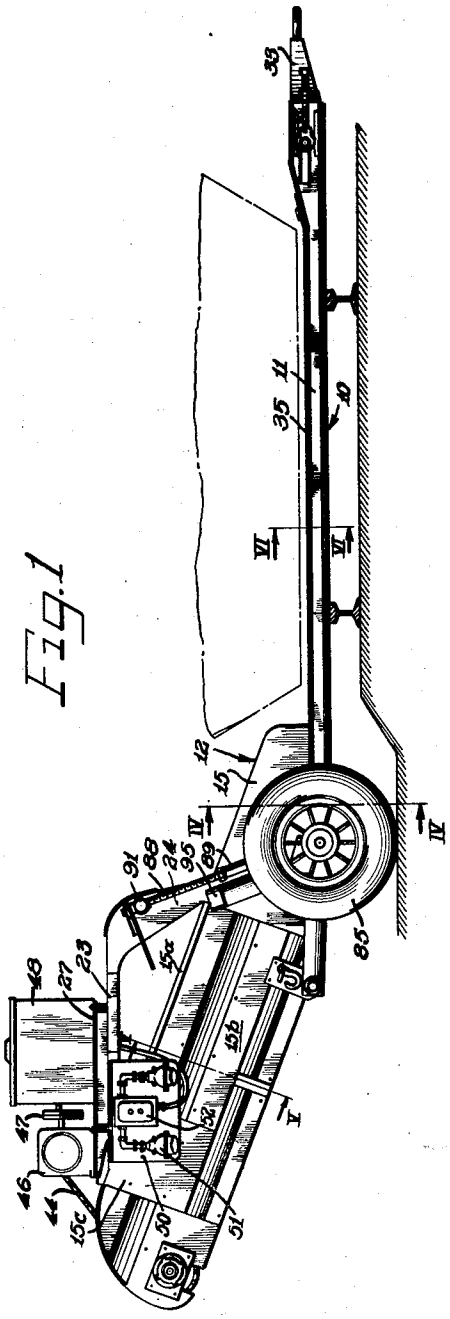
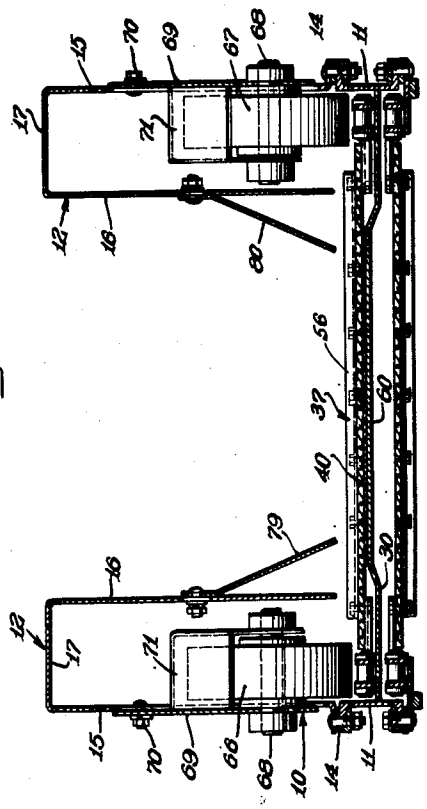


Fig. 4



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CONVEYING AND UNLOADING DEVICE

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Fig. 2

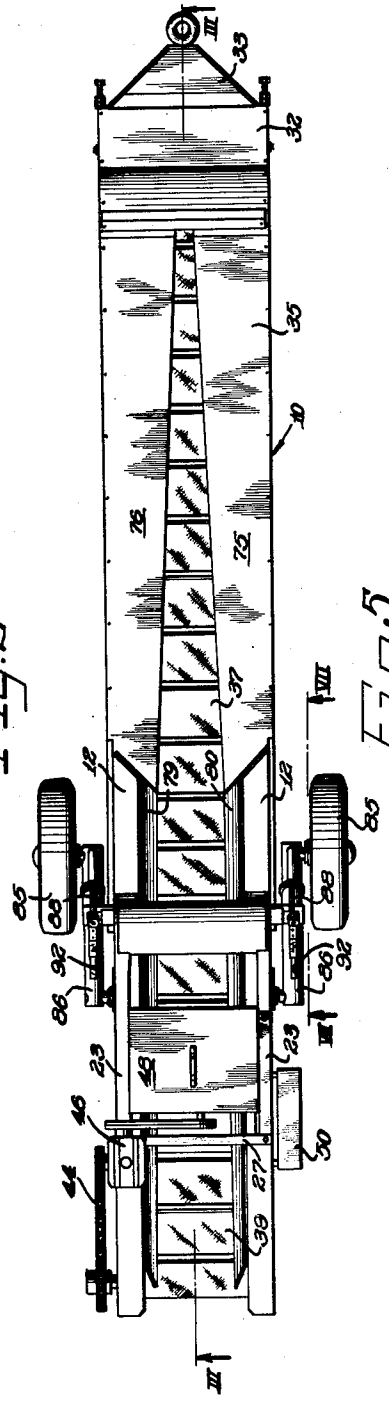
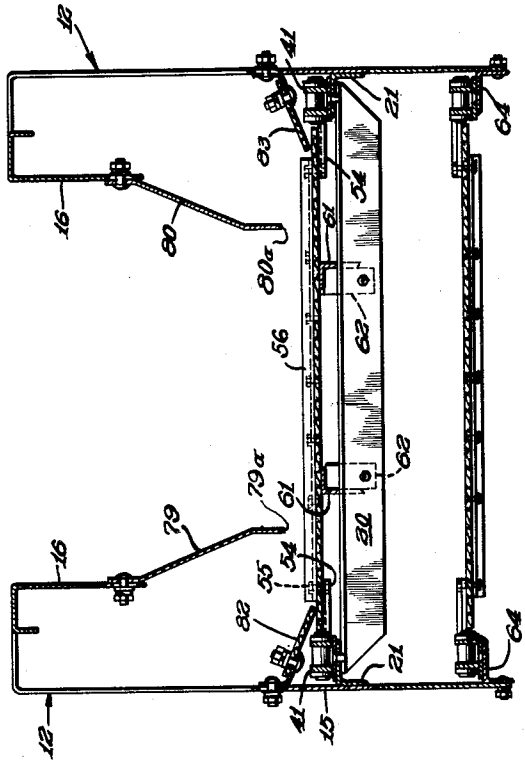


Fig. 5



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Fig. 10

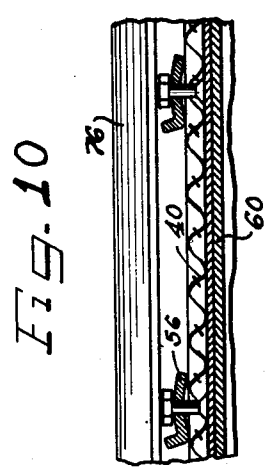
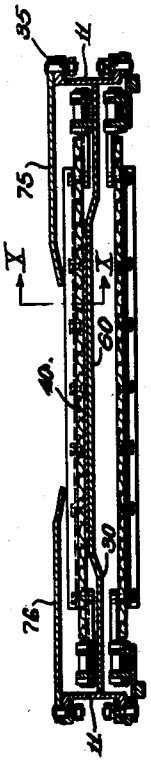


Fig. 3

Fig. 6



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Fig. 7

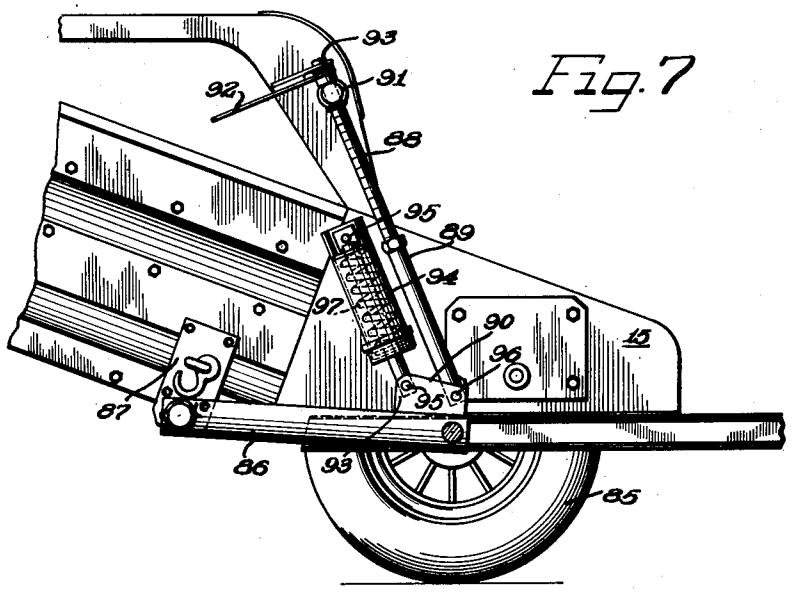


Fig. 8

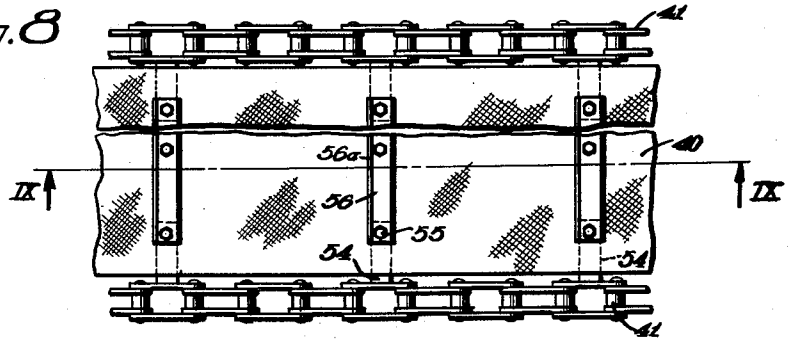
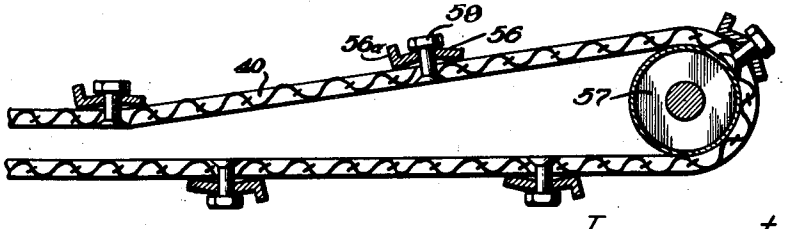


Fig. 9



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UNITED STATES PATENT OFFICE

2,635,735

CONVEYING AND UNLOADING DEVICE

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Application September 14, 1948, Serial No. 49,168

5 Claims. (Cl. 198—204)

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This invention relates to improvements in portable conveyors and more particularly, to improvements in that type of conveyor known as a car unloader which conveys materials from under railroad cars equipped with bottom discharge doors. The unloader is placed beneath the door to receive the material therefrom and convey it beyond the side of the railroad car where it usually is discharged into another conveyor that elevates the material into trunks, bins or storage piles.

This type of unloader has to be of relatively thin construction through the section that extends beneath the railroad car since the clearance between the rails and the car door structure is restricted. It is desirable that the discharge end of the unloader be elevated so that it can discharge into the second conveyor without requiring the digging of a pit to accommodate the second conveyor.

Unloaders of this general character have been devised using the so-called "drag" type conveyor, that is, where the material is dragged along a fixed horizontal plate and up an inclined plate by bars suspended between two chains. Others utilize a flexible belt type conveyor to accomplish the same result.

The drag type of conveyor is restricted to bituminous coals and the like and is subjected to excessive wear if used on abrasive materials such as sand, gravel, rock, etc.

The belt type overcomes some of the restricted use of the drag type, but introduces some disadvantages peculiar to belt usage in this application. Namely, they are, lack of a positive drive such as the drag type utilizes, high friction resistance at the point of changing from the horizontal to the inclined position, and filling up of the conveyor between the confines of the carrying portion of the belt and the return belt, causing excessive wear on the belt and causing complete stoppage of the unloading operation with attendant frequent cleanouts.

The universal use of a belt type conveyor makes it the logical choice of a car unloader, providing the above mentioned disadvantages could be eliminated, and it has been used in the past but with only partial success.

It is, therefore, an important object of this invention to provide a car unloader of the belt type which will combine the advantages of both the belt and the drag types and overcome the objections of each individual type, as are now currently built.

An important object of the present invention is to provide a flexible belt having improved means for positively moving material.

Another object of this invention is to provide improved means for making abrupt bends in the belt at the junction of the horizontal and the inclined portions of the conveyor.

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A further object of this invention is to provide improved means for sealing the belt to prevent excessive piling up of material thereon and thus minimize belt wear due to abrasive material such as sand, gravel, rock or the like being carried thereon.

A still further object of the present invention is to provide sealing means for preventing material from working its way off the belt and becoming deposited on the lower belt.

A still further object of this invention is to provide an improved flight and an improved mounting for the belt of a flexible belt type conveyor.

According to the general features of this invention there is provided a car unloader comprising a frame structure having a substantially horizontal material receiving section and an inclined discharge section with a flexible belt extending over both sections for conveying material thereon. Plate members supported from the frame extend laterally partway across the flexible belt from either side along the entire length of the belt and define a channel on this conveyor with a width increasing toward the discharge end thereof. Cleats or flights having upstanding arms are secured laterally across the belt at spaced intervals. Each flight has an arcuate configuration in a direction longitudinally of the conveyor to facilitate bending of the flexible belt around the guide rollers at the opposite ends of the conveyor.

A special feature of this invention is the provision of guide rollers disposed substantially at the junction of the horizontal and inclined portions of the conveyor which ride on the upper surface of the chains causing a minimum amount of frictional loss at this point.

Other and further objects, features and advantages of this invention will be apparent to those skilled in the art from the following detail description of the annexed sheets of drawings, which illustrate one embodiment of the invention.

On the drawings:

Figure 1 is a side elevational view of a car unloader constructed according to the teachings of the present invention and shown in position with the material receiving section disposed between the open bottom of the hopper of a railroad car and the rails of the track.

Figure 2 is a plan view view of the car unloader of Figure 1;

Figure 3 is a vertical sectional view taken on line III—III of Figure 2;

Figure 4 is a vertical sectional view taken on line IV—IV of Figure 1 looking in the direction indicated by the arrows;

Figure 5 is a vertical sectional view taken on line V—V of Figure 1;

Figure 6 is a vertical sectional view taken on line VI—VI of Figure 1;

Figure 7 is a fragmentary vertical sectional view taken on line VII—VII of Figure 2;

Figure 8 is a fragmentary plan view illustrating the flexible belt of the conveyor and the chain which features novel means for supporting the belt;

Figure 9 is a vertical sectional view taken substantially on line IX—IX of Figure 8; and

Figure 10 is a vertical sectional view taken on line X—X of Figure 6.

As shown on the drawings:

In Figures 1, 2 and 4 the reference numeral 10 indicates the frame of the car unloader of the present invention and includes longitudinal channel members 11 extending in spaced relation along either side, and an upright box-like body member 12 secured to the channel member 11 as by a plurality of bolts 14. The member 12 includes outer side plates 15, inner plates 16 and upper cross plates 17. As best seen in Figures 3 and 5, the inner plates 16 of each member 12 extend substantially the entire length of the structure, while, as seen in Figure 1, the outer side plate 15 has an open construction for a portion of its length between an upper flange 15*a* and a lower plate 15*b*, both of which are secured near their end portion to a plate 15*c*.

To rigidify the frame structure a plurality of lateral arm members 20, Figure 5, are secured between the outer side plates 15 on longitudinal angle brackets 21 suitably secured, as by welding, to the inner side of the plates 15 and 15*b*. A support structure is provided for the driving mechanism of the car unloader by substantially horizontal longitudinal straps 23 which are spaced above the side plates 15 and are connected thereto by means of the end plates 15*c* and slanted braces 24 which extend downwardly to the right, as seen in Figure 1, for securement to the plate 15. The drive machinery, which will be described in detail hereinafter, is mounted on cross braces which may conveniently be angle members 27 adjustably secured between the longitudinal straps 23.

The channel members 11 are connected in spaced relation for a portion of their length by a cross panel 30, Figures 3 and 6, which may be secured, as by welding, to the web of each channel. At the extreme forward end, or right end in Figure 3, the depth of each channel is increased and cross plates 32 and a towing cross piece 33 are secured therebetween to rigidify the forward end of the frame.

Thus, the frame of this car unloader is made up substantially of longitudinal side units suitably secured at essential points by cross braces to provide a rigid frame structure. It will be understood, of course, that any other combination of structural elements may be used which is adapted for supporting and journaling the various mechanisms of the car unloader of the invention.

As illustrated in Figure 1, a substantially horizontal material receiving portion 35 of the unloader is defined by the horizontal channel members 11. This portion is adapted to be inserted under the hopper of a material car between the railroad track and the car or, if desired, it may be positioned in a pit dug under the tracks. A conveyor 37 of the flexible belt type is supported between the side members of the frame and is arranged to receive material from the hopper of the car and convey it along the upper inclined portion 39 for discharging it into a suitable car or receptacle.

The conveyor 37, Figure 8, includes a flexible belt 40 and a chain 41 at either side thereof which is trained over sprockets 42 and 43 at either end of the unloader. Sprocket 43 at the head or discharge end is driven by a chain 44 disposed about a sprocket 45 which is driven from a gear reducer 46 connected by a coupling 47 to a source of power 48. The source of power 48 may be an internal combustion engine, such as a small diesel or gasoline engine, or it may be an electric motor. A control panel 50, Figure 1, is mounted on the side of the unloader and carries an electrical connector 51 and a control box 52 for use with the electric motor installation.

As a means of supporting and driving the belt 40, arm members 54 are secured, as by welding, to the side of every fifth link, as illustrated in Figure 8. These arms project laterally from the link and underlie the edges of the belt to which they are secured by rivets 55 which also secure a novel flight member 56 in position laterally across the belt.

It will be noted, in Figure 5, that the axis of the chain 41 is substantially on the centerline of the belt thickness. Thus the chain and the belt are of substantially the same length.

The flight member 56 has a curved or arcuate cross-section, Figure 9, which permits the belt to pass around the tail pulley 57 and the head pulley 58, Figure 3, at the end of the conveyor without the leading edge of the flight leaving the surface of the belt. Thus, material is prevented from building up under the flight at the turn and causing it to be torn from the belt. An upstanding portion 56*a* of the flight 56 extends laterally across the belt and provides a positive means for propelling material along with the belt. The upper surface of the portion 56*a* provides a narrow edge particularly designed to prevent material from being wedged between this portion and the cover plates to be described hereinafter.

As best seen in Figures 4 and 6, the cross panel 30 has an upwardly indented portion 60 which provides further support for the belt after it has been loaded and is traveling in the substantial horizontal material receiving portion 35 of the unloader. When the conveyor belt 40 starts up the inclined material discharge portion 39 of the unloader, longitudinally extending angle members 61, Figure 5, secured by insert tab portions 62 to the lateral angle member 20 provide a support surface for the belt.

The angle brackets 21 which are used to connect the lateral angle members 20 to the side plates 15, also serve as supports along which the chain 41 slides in its movement toward the discharge end of the unloader. Longitudinal angle member 64, secured to the frame of the unloader below the angle brackets 21, serve as supports for the chain on its return movement toward the material receiving end of the unloader.

It will, of course, be understood that as many flights 56 may be secured to the belt as is necessary to positively propel the load therealong and as many inwardly extending arms 54 secured to the chain may be used as is necessary to support and propel the belt.

A special feature of the present invention is the provision of stationary, rubber tired wheels 66 and 67, Figure 4, which are rotatably mounted on an axle 68 journaled in a plate 69 removably secured by set screws 70 to the side plate 15 and in the side wall of a hood structure 71, secured

as by welding to the plate 69. The wheels 66 and 67 ride on the upper surface of the chains 41 at the junction of the horizontal and inclined sections causing a minimum loss due to the friction at this point even when an abrupt change from the horizontal to the inclined portion is utilized.

Another special feature of the present invention is the novel arrangement of the plates for sealing the material against passage to the underside of the belt. The horizontal material receiving portion 35 of the belt is covered partially with two divergent plates 75 and 76, fairly close together at the tail end, which is the right end as shown in Figure 2, and widens gradually to the junction of the horizontal and inclined sections. The tail pulley 57 is completely covered.

The inclined discharge portion 39 has a plate 79 and 80 on either side, Figures 4 and 5, forming the sides of a trough, said trough having a width at the junction of the horizontal and inclined portions approximately equal to the width of the opening between the divergent cover plates 75 and 76 at that point. The trough gradually increases in width as it approaches the discharge end of the conveyor. At the same time, the clearance between the belt and the bottom edges, or sealing edges 79*a* and 80*a* of the trough plates, is progressively increased. Thus, the sealing edges flare outwardly and upwardly relative to the belt surface.

The sealing edges 79*a* and 80*a* are, at the junction of the horizontal and inclined portions of the belt, the same distance above the belt as are the horizontal plates 75 and 76. Therefore, since the entrance of the trough is of the same width as the effective conveyor width at this junction point, and since the belt clearance is the same, there is no permissible wedging of the material at this critical zone.

This sealing arrangement allows materials that are constantly tending to flow under the plates to relieve themselves of a wedging action and yet form an effective barrier to material flowing out to the edges of the belt. The belt width is selected to give ample room to accommodate the angle of repose of material as it flows under the sealing edges of the side plates on the inclined section of the unloader.

As a further precautionary measure, a belt flashing, 82 and 83, is placed over the side chain and rides approximately flatwise on a portion of the belt itself, the belt being designed to accommodate this feature. It will be noted in Figure 5 that the flight 56 is stopped short of the edge of the belt to accommodate the belt flashings 82 and 83.

It is to be noted, in connection with this novel material sealing arrangement, that the leading upper edge of the upstanding flange 56*a* of each flight 56 is a relatively narrow surface permitting material passing thereover to be quickly passed without causing wedging.

The unloader is mounted on a pair of pneumatic tired wheels 85 which are pivotally suspended by arms 86 from a plate 87 secured to the main frame of the unloader. Adjustment screw 88 is threaded into a tubular member 89 pivotally connected to an upstanding flange 90 which is secured to the arm 86. Near its upper end the screw 87 is guided in a sleeve 91 extending outwardly from the frame. A handle 92 is attached to the screw through a ratchet mechanism 93 for rotating the screw and causing the wheel to be pivoted on the arm 86 and thus change its position relative to the frame. This screw permits the unloader to be adjusted for disposition under the hopper of the railroad car.

In transporting the car unloader from one location to the other by pulling it along the highway behind a truck, it is desirable that a shock absorber be utilized between the axle of the wheel and the frame. To accomplish this there is provided a shock absorber 94 which is pivotally secured by a pin 95 to the upstanding flange 90 which is secured to the pivoting arm 86 of each wheel support. At its other end the shock absorber 94 is pivotally mounted on a pin 95*a* to the side plates 15 of the unloader. When a pin 96, by which the adjustment screw 88 is pivotally mounted on the flange 90, is removed the load of the unloader will be borne on a spring 97 disposed internally of the shock absorber 94. It will be seen of course, that when the car loader is being operated under the railroad car for unloading material therefrom, a shock absorber is not necessary and it may be rendered inoperative by removing the pin 95 and allowing the shock absorber to pivot downwardly and rest on the arm 86.

From the foregoing description it is seen that there is provided in this invention a compact car unloader which employs a novel flexible belt which attains positive movement of the material therealong and yet is constructed so that it will pivot about the head and tail pulleys without damage to the belt and will not cause wedging of material between the sealing plates and the conveyor flight. Also there is provided means at the junction of the horizontal and inclined portions of the car unloader for guiding the chain of the conveyor along this critical zone with a minimum amount of frictional loss. Further, a novel belt sealing arrangement of cover plates and guide plates is provided which effectively prevents wedging action of material while also preventing it from working its way off the belt and being deposited on the lower belt.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose of limiting the patent granted hereon otherwise than necessitated by the scope of the appended claims.

I claim as my invention:

1. In a car unloader, a frame structure, a flexible belt conveyor having a horizontal section and an inclined section, a chain connected to said belt in driving relation therewith, flights positively secured laterally on said belt, flat cover plates partially overlying the horizontal section of said conveyor, the inner margins of which define a conveying passageway diverging toward discharge end of the conveyor and disposed close to the upper edges of said flights and second plate members spaced inwardly from the outer margins of the inclined section of the frame structure in a substantially upright position along the inclined section of said conveyor and secured to and depending from the upper margins of the frame structure of the inclined section and defining a trough with an entrance width at the junction of the horizontal and inclined portions of the conveyor at least as wide as said conveying passageway at that point, said trough increasing in width toward the discharge end of the conveyor and having sealing lower edges adjacent the surface of the belt which are spaced the same distance from said belt at said junction point as the inner margins of said flat

cover plates and which progressively move away from the surface of the belt toward the discharge end of the conveyor.

2. In a car unloader a frame structure, a head and a tail roller mounted in said frame, a flexible belt conveying surface having a horizontal and an inclined section, cleats secured laterally across said flexible belt being curved in a direction longitudinally of said belt to accommodate passage of the cleats around said head and tail rollers, flat cover plates partially overlying the horizontal section of said conveyor, the inner margins of which define a conveying passageway diverging toward the discharge end of the conveyor and disposed close to the upper edges of said flights, the inclined section having upright side frame members and second plate members spaced inwardly from said side frame members and secured thereto at their upper ends and depending therefrom in a substantially upright position along the inclined portion of said conveyor and defining a trough with an entrance width at the junction of the horizontal and inclined portions of the conveyor at least as wide as said conveying passageway at that point, said trough increasing in width toward the discharge end of the conveyor and having sealing lower edges adjacent the surface of the belt spaced the same distance from said belt at said junction point as said flat cover plates and progressively diverging from the surface of the belt toward the discharge end of the conveyor.

3. In a car unloader, a frame having a horizontal material receiving portion adapted to extend under the hopper of a car and having a support plate extending therealong and also having an inclined portion extending therefrom having vertical side walls extending along the outsides thereof and support means extending therebetween and forming an open inclined support, a pair of laterally spaced endless chains guided for movement along said plate and inclined support means from one end of said frame to the other, an endless conveyor belt within the margin of said chains and secured thereto and driven therefrom and supported on said bottom plate along the horizontal portion of said frame, and means protecting said chains and sealing the edges of said belt to prevent the falling of material on the lower run thereof, comprising deflecting plates secured to the horizontal portion of said frame and extending over said chains and belt into close proximity with respect to said belt, upright plates extending along said inclined portion of said frame and spaced inwardly of said side walls of said frame and forming continuations of the inner margins of said first mentioned plates, inside of the limits of said endless chains, and flashings secured to the insides of said side walls of said inclined portion of said frame, within limits of said upright plates and extending over said endless chains and the edge of the belt, and having wiping engagement therewith.

4. In a car unloader, an elongated frame having parallel sided walls extending therealong and a relatively thin elongated horizontal material receiving portion adapted to extend beneath the hopper of a car and an inclined discharge portion forming a continuation thereof, an endless conveyor belt extending along said frame from one end thereof to the other, a plate extending beneath said side walls along the horizontal portion of said frame and forming a support for said belt, spaced inclined support rails extending upwardly from said plate and supporting the inclined portion of said belt, and means sealing said belt to prevent the falling of material on the lower run thereof comprising deflecting plates extending inwardly of the sides of the horizontal portion of said frame over said belt and terminating at their inner ends closely adjacent said belt, vertical side plates extending along the inclined portion of said frame and spaced inwardly of the side walls thereof and secured thereto at the upper ends thereof and depending therefrom in close proximity to said belt and forming a trough continuing from the inner margins of said deflecting plates and flaring outwardly toward the discharge end of said inclined section, and inclined flashings secured to the insides of the side walls of said frame within the margins of said vertical plates into wiping engagement with opposite sides of the belt.

5. In a car unloader, a frame having parallel side walls extending substantially the length thereof and having an elongated relatively thin flat horizontal material receiving section adapted to extend beneath the hopper of a car and also having an inclined discharge section extending upwardly therefrom, an endless conveyor belt having parallel spaced flights thereon extending along said frame from one end thereof to another, a plate extending along the horizontal portion of said frame between said side walls and forming a support for the material receiving portion of said belt, spaced inclined support rails extending from said plate to support the inclined portion of said belt, endless chains guided along said plate and support rails inwardly of said side walls and having drive connection with opposite sides of said belt, and means protecting said chains and sealing said belt, to prevent the accumulation of material on the lower run thereof, comprising relatively flat deflecting plates extending along the horizontal portion of said frame inwardly of the horizontal portion thereof over said chains into close proximity to said flights, vertical plates spaced inwardly of the side walls of said frame and extending along the inclined portion thereof and secured at their upper ends to inwardly extending projections of the side walls of said frame and depending therefrom into close proximity to said flights and forming a trough continuing from the inner margins of said deflecting plates and flaring outwardly toward the discharge end of said conveyor, and inclined flashings secured to the side walls of said frame along the inclined portion of said conveyor and extending inwardly thereof over said chains into wiping engagement with said belt outside of the margins of said flights.

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