July 29, 1941. R. C. KEPNER ET AL 2,250,538

HIGH CAPACITY DROP BOTTOM CAR

Filed March 29, 1939 3 Sheets-Sheet 1

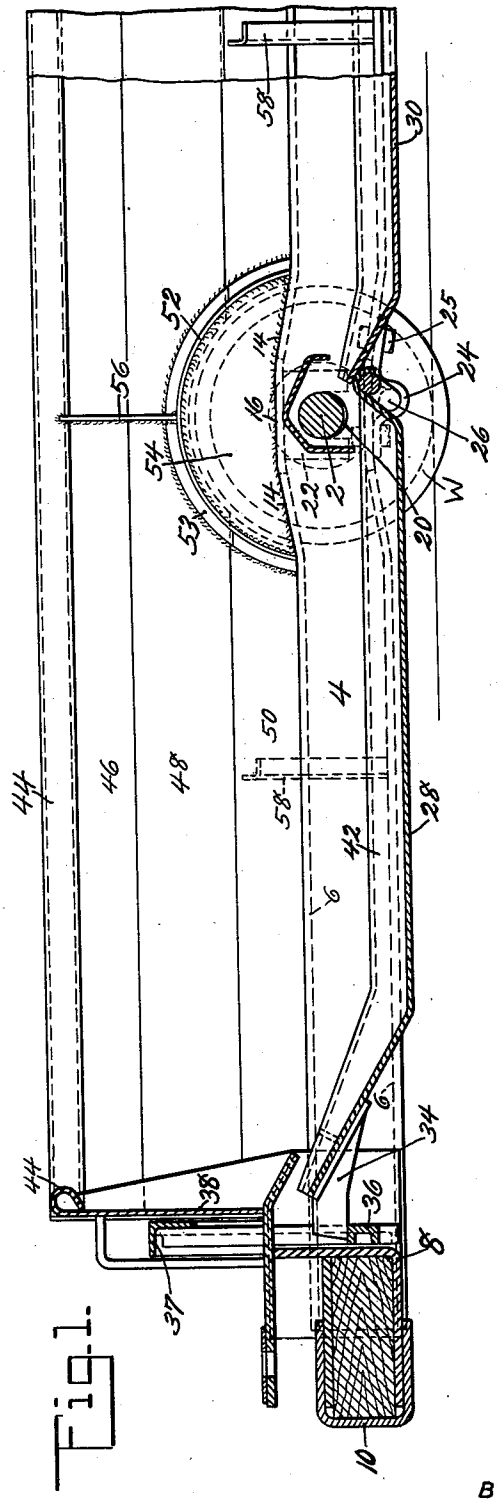


Fig. 1.

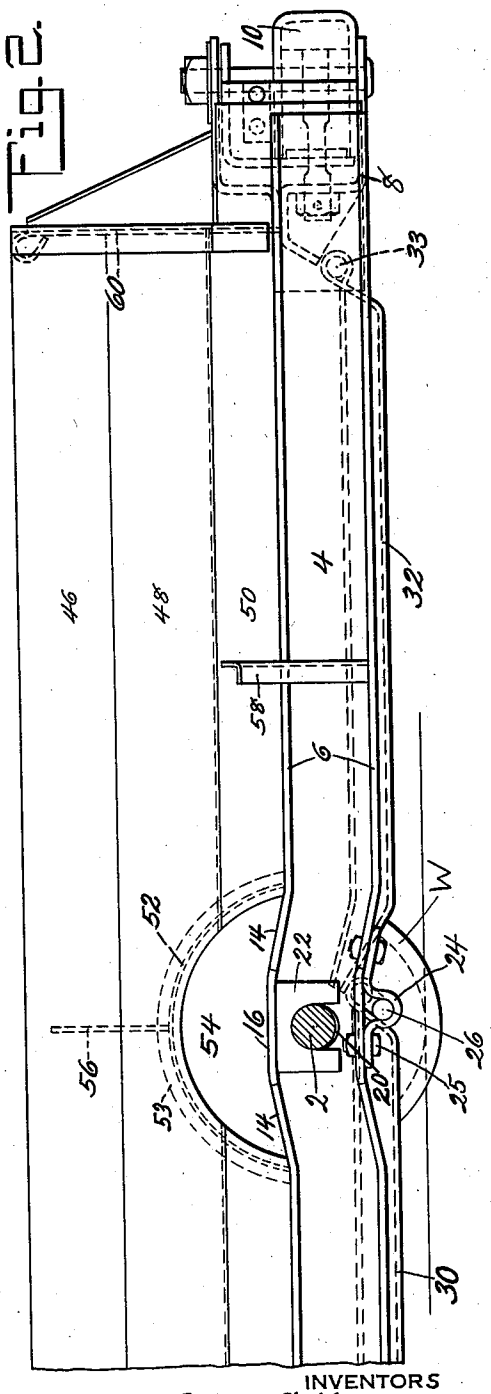


Fig. 2.

INVENTORS
Robert C. Kepner
Robert A. Shields
BY Donald U. Rich ATTORNEY

July 29, 1941. R. C. KEPNER ET AL 2,250,538

HIGH CAPACITY DROP BOTTOM CAR

Filed March 29, 1939 3 Sheets-Sheet 2

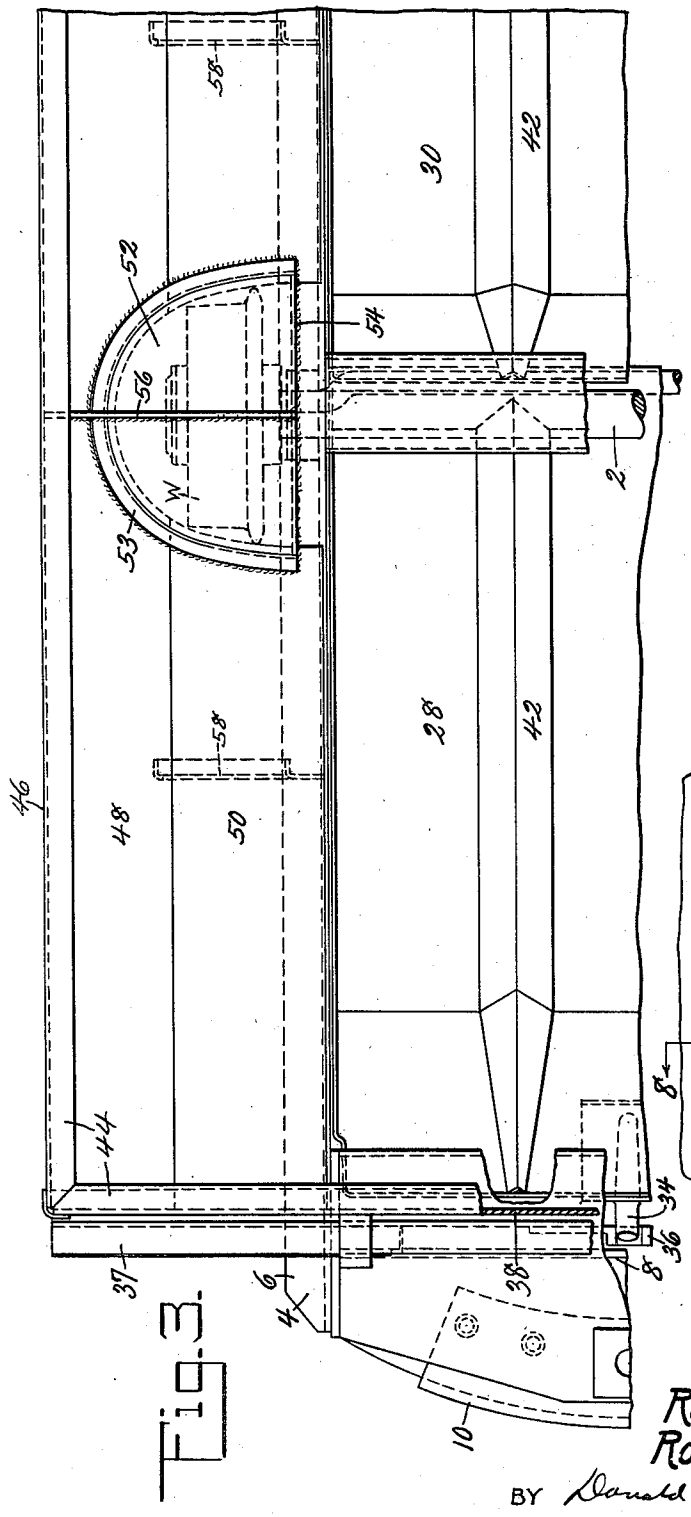


Fig. 3.

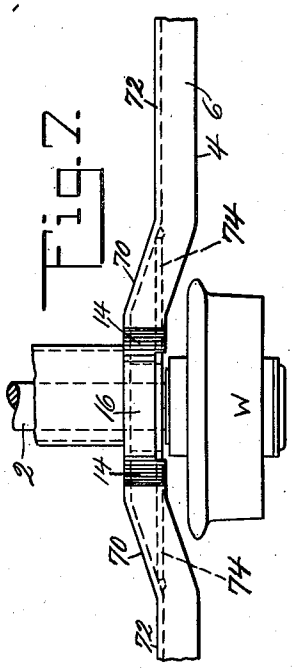


Fig. 7.

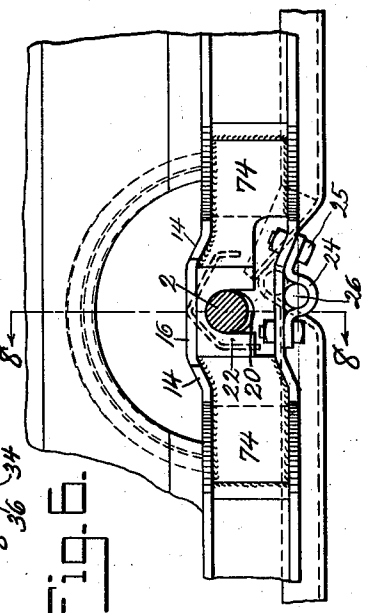


Fig. 6.

INVENTORS
Robert C. Kepner
Robert A. Shields
BY Donald U. Rich ATTORNEY

July 29, 1941. R. C. KEPNER ET AL 2,250,538

HIGH CAPACITY DROP BOTTOM CAR

Filed March 29, 1939 3 Sheets-Sheet 3

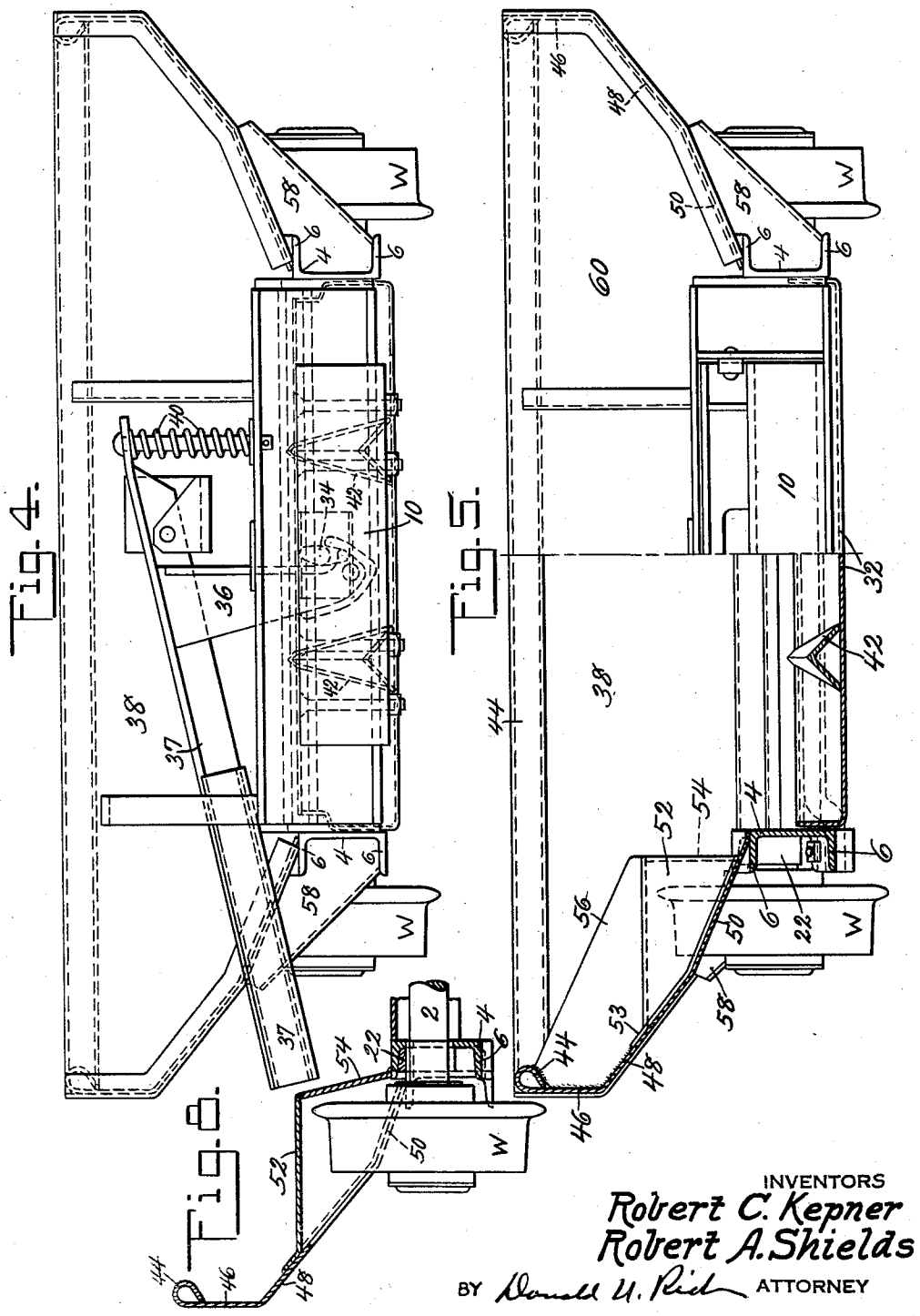


Fig. 4.

Fig. 5.

Fig. 6.

INVENTORS
Robert C. Kepner
Robert A. Shields
BY Donald U. Rich ATTORNEY

Patented July 29, 1941

2,250,538

UNITED STATES PATENT OFFICE

2,250,538

HIGH CAPACITY DROP BOTTOM CAR

Robert C. Kepner, Bloomsburg, and Robert A. Shields, Berwick, Pa., assignors to American Car and Foundry Company, New York, N. Y., a corporation of New Jersey

Application March 29, 1939, Serial No. 264,730

15 Claims. (Cl. 105—364)

This invention relates to mine and industrial cars in general and in particular to such cars of the drop bottom type intended to automatically discharge their load at a predetermined station.

Mine or other industrial cars of the drop bottom type have been built for a considerable number of years and during this period attempts have been made to increase the capacity of the cars as greatly as possible within clearance limits, but no valuable progress has been made along this line since attempts to increase the capacity have resulted in a weakening of the car structure. In drop bottom cars it is impossible to properly cross brace the car and as a result the side sills must be made exceptionally strong, but if the side sills are lowered in order to get the side lading wings down as low as possible, then the sills are so weakened at the axle area as to be almost useless. It is an object, therefore, of the present invention to provide a high capacity drop bottom car having strong side sills with the major portion thereof located as low as possible, while the areas adjacent the axles are humped upwardly permitting the axle to pierce the sill substantially on the neutral axis thereof.

A further object of the invention is the provision of a drop bottom mine car having strong side sills deformed in the area of the axles in order to give maximum capacity without weakening the sills and to permit the door hinge rods to be mounted beneath the sills for ready removal.

A still further object of the invention is the provision of a high capacity drop bottom car having sills deformed at certain points permitting the door axes to be carried beneath the sills for ready removal yet with the major portion thereof above the sill edge to prevent injury to the door axes.

A yet further object of the invention is the provision of a high capacity drop bottom car having the doors and major portion of the sills located close to the rail plane and with side lading portions lowered as much as possible and provided with portions sloped at different degrees in order to secure discharge of the lading through the doors, while maintaining maximum capacity.

These and other objects of the invention will be apparent to persons skilled in the art from a study of the following description and accompanying drawings, in which:

Figure 1 is a sectional view of substantially one-half the car;

Fig. 2 is a side view of substantially the other half of the car;

Fig. 3 is a plan view of substantially one-fourth of the car;

Fig. 4 is a rear end view disclosing the conventional latching arrangement and improved side wing construction;

Fig. 5 is a forward end view, one-half thereof being in section to better disclose the construction of the side wings;

Fig. 6 is a detail view disclosing a modification of the sill arrangement shown in Figure 1;

Fig. 7 is a plan view showing the sill arrangement of Fig. 6, and

Fig. 8 is a sectional view taken substantially on line 8—8 of Fig. 6.

Referring now to the drawings in detail, it will be seen that the drop bottom car disclosed is of the through axle type having the axle 2 supported by wheels W located outside the side sills 4. The side sills as clearly shown are of channel cross section having the flanges 6 thereof directed outwardly from the center line of the car and toward the wheels. These sills extend from end to end of the car and have end structures 8 attached to their ends and adapted to receive suitable bumping and draft members 10 either of the solid or spring type. These sills, together with the connected end structures, constitute a frame which must transmit all draft and buffing strains, while at the same time carry substantially all of the load and transmit it to the axles.

Spaced portions of the side sills are deflected upwardly as at 14 to provide a substantially horizontal portion 16 immediately adjacent the axle planes. The sills are deflected upwardly a sufficient amount to permit the end and intermediate portions of the sills being located as close as possible to the rails, while at the same time bringing the opening 20, through which the axle must pass, substantially on the neutral axis of the sill. Journal boxes 22 are welded or otherwise secured to the web of the side sills and to the upper flange thereof, thus providing a support for the sills upon the axle, while at the same time reinforcing the sills in the deformed portions and compensating for the metal cut out to receive the axle.

Hangers 24 are bolted as at 25 to the lower flange of the side sills in the deformed areas and carry the ends of door hinge rods 26 which in turn have rigidly secured thereto the forward edge of the rear and intermediate drop doors 28 and 30 respectively. The forward edge of the forward door 32 is carried by a hinge rod 33 extending through the side sills as has been the

customary practice. The free or rearward edges of the intermediate and forward doors **30** and **32** rest upon the forward edges of the next adjacent rearward door, while the rear door **28** has its free edges supported through lug **34** and latch hook **36**. The latch hook is rigidly attached to latch bar **37** pivotally mounted upon the rear end wall **38** of the car and is held in the latched position both by the weight of the latch arm and by spring **40**. Each of the doors is of pan formation having the front, rear and side edges directed upwardly as has been the customary practice while the central portions are stiffened by means of angles **42** inverted and welded to the door plate, thus providing in effect triangular hollow reinforcements for the central portions of the door.

The side wings are formed with a top roll **44** at the upper edge of a vertical portion **46** which is formed integral with an inclined portion **48** which in turn merges into an inclined portion **50** of a lesser degree of inclination to the horizontal and which has its free or lower edge welded or otherwise secured to the upper flange of the side sills immediately adjacent the juncture of the web and flange as clearly shown in Fig. 5. Spaced portions of the side wings are cut out in order to receive the wheels and these cut out portions straddle the upwardly directed portions **14** of the side sills, thus permitting the lower edge of the wings to be located in a plane for attachment to the side sills. The wheel receiving openings in the side wings are covered by wheel hoods **52** preferably of arcuate form as shown in Figs. 1 and 2 with one edge flanged as at **53** for attachment to the side wing floor portions. The inner edge of the wheel hoods is left plain and adapted to be attached to an inner closure plate **54** welded to the curved wheel hood plate and to the side sills at the deformed portions as clearly shown in Figure 1. It is, of course, obvious that if desirable the entire wheel hood, including the curved portion and the inner closure plate, may be made from a single pressing. The side wings are braced by means of internal gussets **56** located at the wheel hoods and by external gussets **58** located on either side of the wheels and supporting the wings from the side sills and assisting the rear end wall **38** and forward end wall **60** to prevent bulging or outward rotation of the side wings. In the present instance the side wings are shown as formed of a single plate of metal, but it is obvious that the wings may be made of separate plates preferably joined at the points where the degree of inclination changes. As shown in Figs. 1 to 5 and 8 the lower portion of the side wings is inclined at some angle approximating twenty degrees, while the intermediate or upper inclined portion **48** of the wings is inclined at a steeper angle approaching or exceeding forty degrees. Tests with various types of coals and similar materials from various sections of the country have shown that the angle of repose for these materials on a metal plate lies between thirty and forty degrees, while the angle of movement of these materials along a metal plate ranges between eighteen and twenty-two degrees. In other words, loose coal or a similar material, regardless of its condition or its origin, cannot of itself be kept upon a metal plate sloped at an angle of forty degrees and after movement has once started and the static friction has been overcome movement of the material will continue on the plate when sloped at an angle approximating twenty degrees. It is to be understood that the term angle of repose as used in the appended claims means the angle of repose of the lading when resting on the material of which the side lading bottoms are made and is not to be confused with the angle of repose of the lading itself. It will be seen that if the slope sheets extended from the side sills of Fig. 5 upwardly at an angle of approximately forty degrees a considerable area would be wasted, which area may be utilized for the carrying of coal when the slope sheets are formed as shown on the figure. The weight of the coal resting upon steeply inclined portion **48** will, together with the drag of the coal passing out of the central doors, cause the coal to start movement along the lesser inclined portion **50** and once movement has started along this incline it can not stop, particularly with the momentum of the coal coming along the steeply inclined portion **48**. It is thus seen that the wings are formed with a portion **50** which will not of itself cause free discharge of coal, but which will, in conjunction with the starting surface **48**, permit complete discharge of the car. By proper proportioning of the portion **50** and the starting portion **48** various increases in capacity may be obtained, all of which will materially exceed the capacity which could be obtained were the slope sheets located in a single plane as has been customary.

In certain operations the pit construction will permit widening of the doors and this may be accomplished as shown in Figs. 6, 7 and 8 without weakening the sills. As clearly shown by these figures in which like reference numerals have been used wherever possible the deformed portion of the sill is additionally deformed by offsetting the entire web and flanges of the sill as at **70** and in a direction at right angles to the direction of the deformation previously described. In other words, a portion of the sill is deflected upwardly, as previously described, then this entire portion is deflected inwardly. This additional deformation of the sills is of sufficient extent as to bring the major web area **72** substantially in alignment with the inner edge of the wheel hood and the journal box will be welded as before to the offset web and upper flange, while reinforcing plates **74** are provided on either side of the box substantially in alignment with its outer face and welded to the box and to the sill flanges and sill web. These plates as clearly shown in Fig. 7 are substantially in alignment with the major portion of the sill web and will assist in directly carrying the load to the journal box without causing any material eccentric loading on the sill. By deflecting the sill inwardly and upwardly the major portions thereof may be located very close to the rail line as shown in Fig. 8, with the result that the slope sheets may be pushed outwardly as well as the doors and the maximum capacity obtained which is possible with the car discharging completely between the track rails. It will, of course, be obvious that the edges of the doors will be offset in accordance with the offset in the sill as shown in Fig. 7. The double deformation of the side sill shown in Figs. 6 to 8, like that described in connection with Figs. 1 to 5, does not weaken the sill at the axle zone and permits the axle axis to be placed substantially on the neutral axis of the sill without materially weakening the same. Any weakening of the sill is more than compensated for by the journal box and this is particularly true in the double deformed sill where the plates

74 assist in carrying the web load directly to the axle box.

When a loaded car reaches the dumping station the latch will be released by a track side ramp causing the rear door 28, intermediate door 30 and forward door 32 to open in sequence, permitting the central portion of the load to drop directly and vertically through the openings between the side sills. The drag of this discharging load plus the weight of the load supported on the starting slope 48 will cause material to start movement on the supporting slope 50 and once started the load will keep moving from the side portion into the center opening for discharge through the open doors. The doors will, of course, be closed by a track ramp as is well known in the art and the car is then ready for return to the loading station for reception of lading.

While the improved car has been described more or less in detail with specific reference to two forms thereof, it is obvious that various other forms and rearrangements of parts will be possible, such as forming the side wings with a curve or semi-circular contour, without departing from the spirit of the invention as defined by the following claims.

What is claimed is:

1. A self clearing drop bottom car comprising in combination, spaced apart side sills, a plurality of drop bottom doors substantially closing the space between the side sills, and side lading bottoms located outwardly of the side sills and connected thereto, said side lading bottoms being formed of inner and outer longitudinally extending lading supporting bottom portions, the outer portion being located at an angle to the horizontal greater than the inner portion, said portions being so formed and arranged as to give the maximum lading capacity possible with complete gravity discharge through the space between the side sills when the drop bottom doors are opened.

2. A self clearing drop bottom car comprising in combination, spaced apart side sills, flanged wheels supporting the side sills, a plurality of drop bottom doors substantially closing the space between the side sills, side lading bottoms located outwardly of the side sills and being connected thereto and each formed of a lower and an upper longitudinally extending portion, the lowermost longitudinally extending portion of each side lading bottom extending outwardly beyond the wheel flanges and being positioned at an angle to the horizontal less than the angle of repose of the lading which the car carries, and the uppermost longitudinally extending portion of each side lading bottom being disposed at an angle greater than the angle of repose of the lading which the car carries, and a substantially vertically extending side wall extending upwardly from the upper edge of the uppermost longitudinally extending portion of each side lading bottom.

3. A self clearing drop bottom car comprising in combination, spaced apart side sills, flanged wheels supporting the side sills, a plurality of drop bottom doors substantially closing the space between the side sills, side lading bottoms located outwardly of the side sills and being connected thereto and each formed of a lower and an upper longitudinally extending portion, the lowermost longitudinally extending portion of each side lading bottom extending outwardly beyond the wheel flanges and being positioned at an angle to the horizontal less than the angle of repose of the lading which the car carries, and the uppermost longitudinally extending portion of each side lading bottom being disposed at an angle to the horizontal of less than ninety degrees but greater than the angle of repose for the lading which the car carries whereby the maximum lading capacity possible is obtained with complete gravity discharge through the space between the side sills.

4. A self clearing drop bottom car comprising in combination, spaced apart side sills, a plurality of drop bottom doors substantially closing the space between the side sills, side lading bottoms located outwardly of the side sills and being connected thereto and each formed of a lower and an upper longitudinally extending portion, the lowermost portion being positioned at an angle approximating twenty degrees, and the uppermost portion being positioned at an angle approximating forty degrees whereby the maximum lading capacity possible is obtained with complete gravity discharge through the space between the side sills.

5. A self clearing drop bottom car comprising in combination, spaced apart side sills, wheels and axles supporting the side sills, a plurality of drop bottom doors substantially closing the space between the side sills and having at least the major parts thereof beneath the plane of the axles, and side lading bottoms located at least in part above the side sills and connected thereto above the plane of the axles, said side lading bottoms being formed with a lower part positioned at an angle approximating twenty degrees to the horizontal and merging into an upper part positioned at an angle approximating forty degrees to the horizontal whereby the upper part will act as a starting surface for the lower part for complete gravity discharge of the lading through the space between the side sills when the bottom doors are opened.

6. A self clearing drop bottom car comprising in combination, spaced apart side sills, wheels and axles supporting the side sills, a plurality of drop bottom doors substantially closing the space between the side sills and having at least the major parts thereof beneath the plane of the axles, and side lading bottoms located at least in part above the side sills and connected thereto above the plane of the axles, said side lading bottoms being formed with a lower inner part positioned at an angle less than the angle of repose for the lading carried by the car but greater than the angle for sustaining movement of the lading and merging into an upper outer part positioned at an angle greater than the angle of repose for the lading carried by the car whereby the upper part will act as a starting surface for the lower part when the bottom doors are opened.

7. A self clearing drop bottom car comprising in combination, spaced apart side sills, wheels and axles supporting the side sills, a plurality of drop bottom doors substantially closing the space between the side sills and having at least the major parts thereof beneath the plane of the axles, and side lading bottoms located at least in part above the side sills and connected thereto above the plane of the axles, said side lading bottoms being formed with a lower inner part located between horizontal planes through the tops of the axles and through the top of the wheels and with an upper outer part joined to the lower inner part and extending upwardly and outwardly through the plane of the tops of

the wheels and at a greater angle to the horizontal than said lower inner part.

8. A self clearing drop bottom car comprising in combination, spaced apart side sills, a plurality of drop bottom doors substantially closing the space between the side sills, side lading bottoms located outwardly of the side sills and connected thereto and formed of an upper outer part and a lower inner part, said lower inner part being positioned at an angle less than the angle of repose for the lading carried by the car but greater than the angle for sustaining movement of the lading, and said upper outer part being positioned at an angle greater than the angle of repose for the lading whereby maximum capacity is obtained with complete discharge of the lading when the bottom doors are opened.

9. A self clearing drop bottom car comprising in combination, wheels and axles, spaced apart side sills supported by the axles with the major portions of the tops of the side sills located substantially in the plane of the tops of the axles, said sills being formed with minor portions thereof humped upwardly adjacent the axle and provided with axle receiving openings having their centers adjacent the neutral axis of the minor portions of said sills, and a plurality of drop bottom doors substantially closing the space between the side sills and located adjacent the lower edge of the sills, said doors being carried by hinge rods suspended beneath said sills at the humped up portions of the sills and closely adjacent the axles.

10. A self clearing drop bottom car comprising in combination, wheels and axles, spaced apart channel form side sills supported by the axles and having the major portions of the top surface of the top flanges of the sills located substantially in the plane of the tops of the axles, said sills being formed with minor portions thereof humped upwardly adjacent the axles and provided with axle receiving openings located a substantial distance beneath the sill top flange, and a plurality of drop bottom doors substantially closing the space between the channel side sills, said doors being carried by hinge rods suspended beneath the lower flanges of the sills at the humped up portions and having the hinge rod axis located above the lower flanges throughout the major portions of the sills.

11. A self clearing drop bottom car comprising in combination, wheels and axles, spaced apart side sills supported by the axles and formed with humped up portions adjacent the axles whereby the neutral axis of the humped up portions of the sills passes through the axles and is disposed beneath the plane of the axles on either side thereof, and a plurality of drop bottom doors hingedly carried by said sills, said doors being carried by rods attached to the sills at the humped up portions whereby the major portions of the ends of the rods will be partially protected by the sill on either side thereof.

12. A self clearing drop bottom car comprising in combination, wheels and axles, spaced apart side sills located between the wheels and supported by the axles with the neutral axis of the major portions of said sills located below the axle plane, said side sills being formed with minor portions humped upwardly and provided with axle receiving openings intersecting the neutral axis thereof, and said side sills being also formed with the major portions thereof pushed outwardly into the plane of the wheels on either side thereof whereby maximum capacity is obtained, and a plurality of drop bottom doors hingedly connected to the sills, said doors being formed with deformed side edges positioned closely adjacent the side sills.

13. A self clearing drop bottom car comprising in combination, wheels and axles, spaced apart side sills supported by the axles and having major and minor portions, the major portions of the sills being located closely adjacent the inner plane of the wheels with the neutral axis thereof located below the plane of the axles, and the minor portions of the sills being pushed inwardly to a position removed from the inner plane of the wheels and also upwardly to a position with the neutral axis of the minor portion intersecting the axle plane.

14. A self clearing drop bottom car comprising in combination, wheels and axles, spaced apart side sills supported by the axles and having major and minor portions, the major portions of the sills being located closely adjacent the inner plane of the wheels with the neutral axis thereof located below the plane of the axles, and the minor portions of the sills being pushed inwardly to a position removed from the inner plane of the wheels and also upwardly to a position with the neutral axis of the minor portion intersecting the axle plane, side lading bodies extending outwardly on either side of the sills and connected to the major portions thereof, and wheel hoods connected to said side lading bodies and to the minor portions of said sills.

15. A self clearing drop bottom car comprising in combination, wheels and axles, spaced apart side sills supported by the axles and having major and minor portions, the major portions of the sills being located closely adjacent the inner plane of the wheels with the neutral axis thereof located below the plane of the axles, and the minor portions of the sills being pushed inwardly to a position removed from the inner plane of the wheels and also upwardly to a position with the neutral axis of the minor portion intersecting the axle plane, side lading bodies extending outwardly on either side of the sills and connected to the major portions thereof, wheel hoods connected to said side lading bodies and to the minor portions of said sills, and a plurality of drop bottom doors hingedly carried by and substantially closing the space between said sills, said doors being formed with the side edges thereof substantially conforming to the side sills and being located closely adjacent thereto.

ROBERT C. KEPNER.
ROBERT A. SHIELDS.