

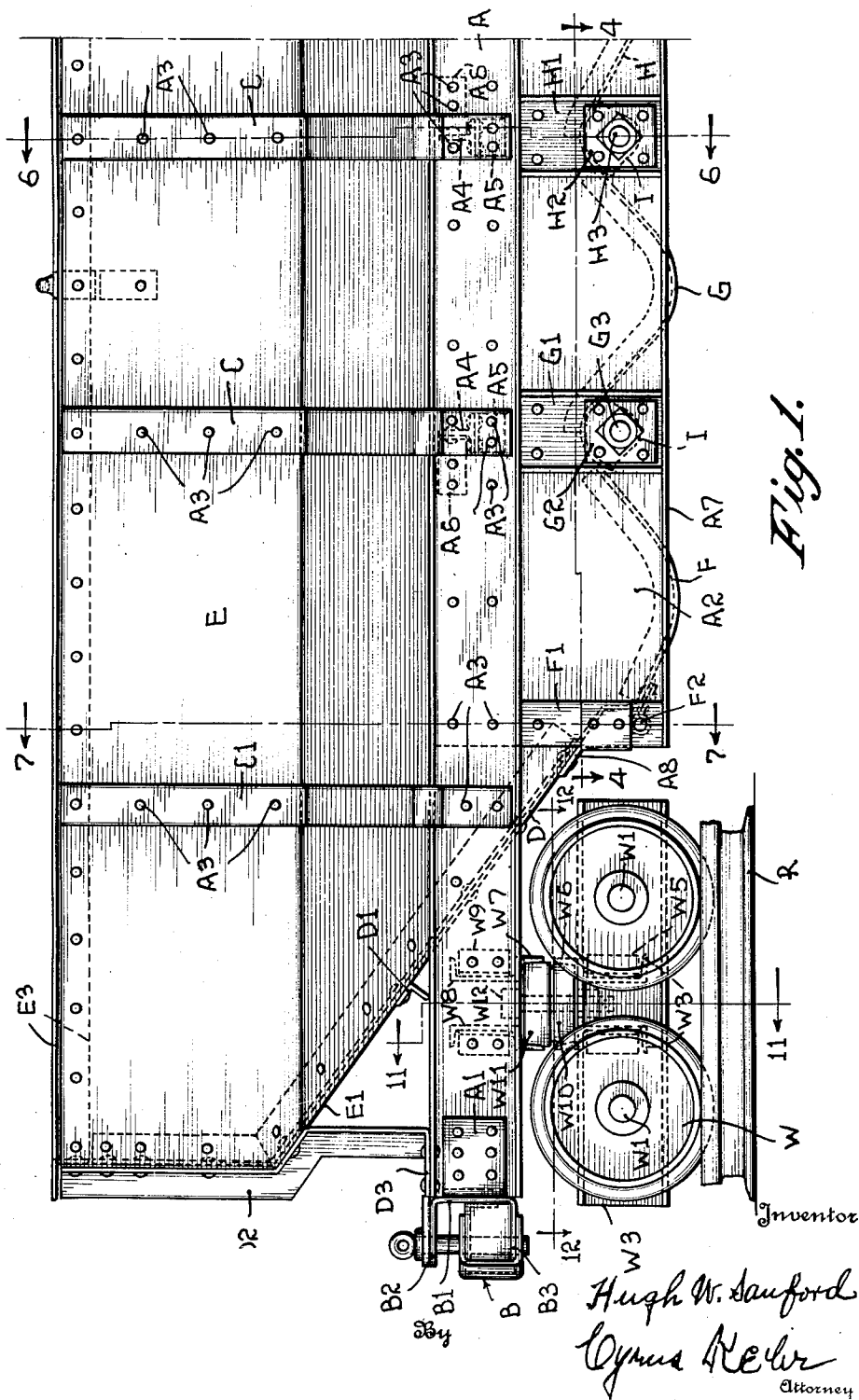
March 17, 1931.

H. W. SANFORD

1,796,347

MINE CAR

Original Filed Dec. 29, 1926 8 Sheets-Sheet 1



March 17, 1931.

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1,796,347

MINE CAR

Original Filed Dec. 29, 1926 8 Sheets-Sheet 2

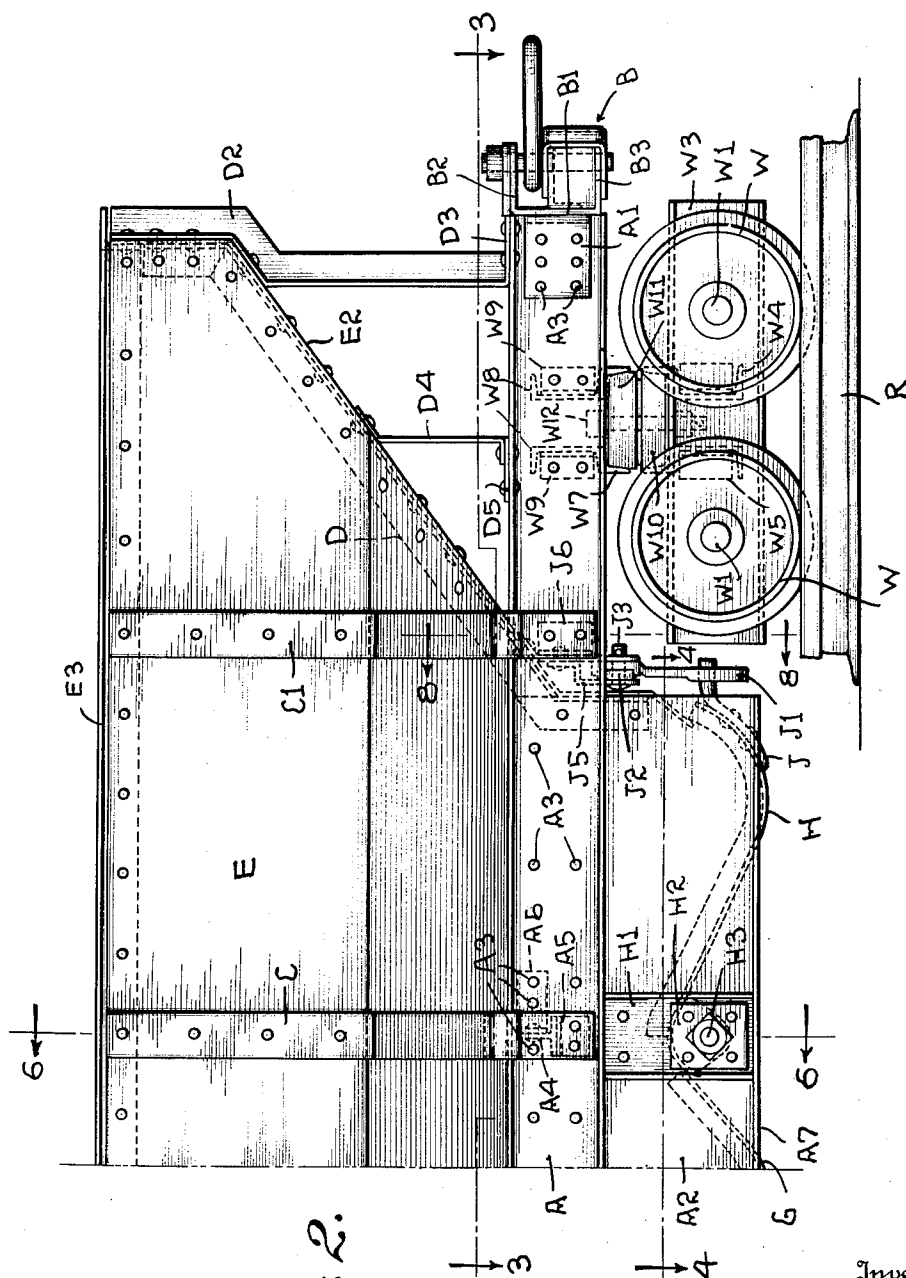


Fig. 2.

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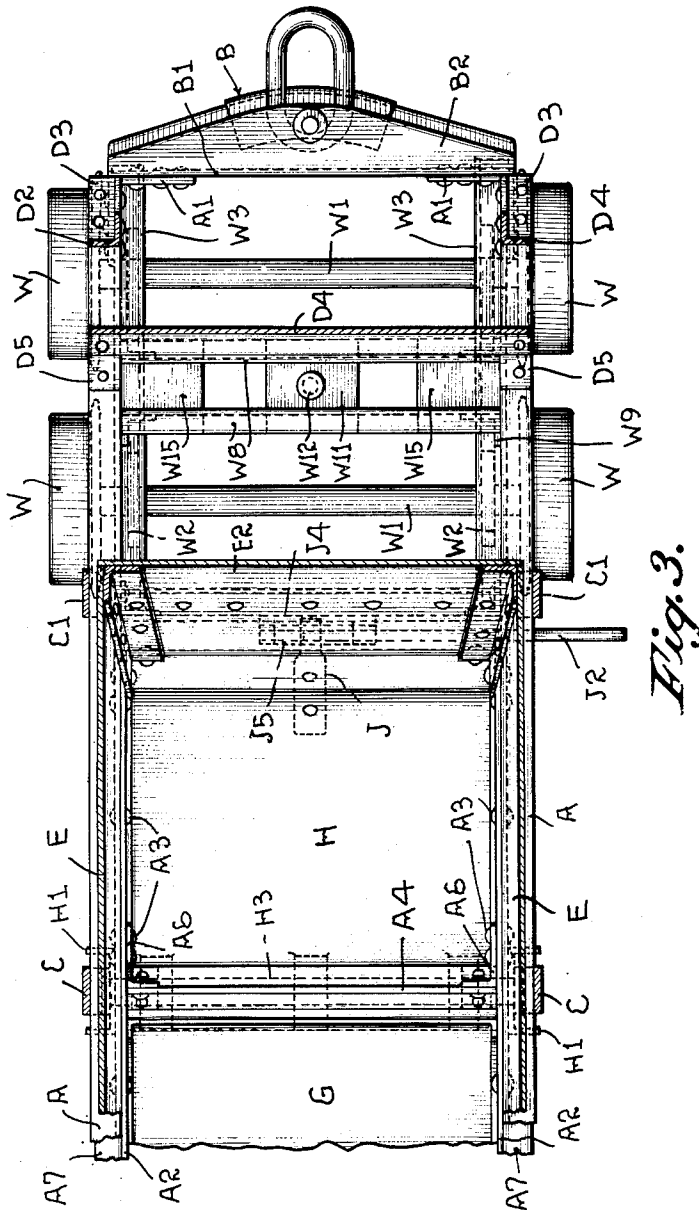
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MINE CAR

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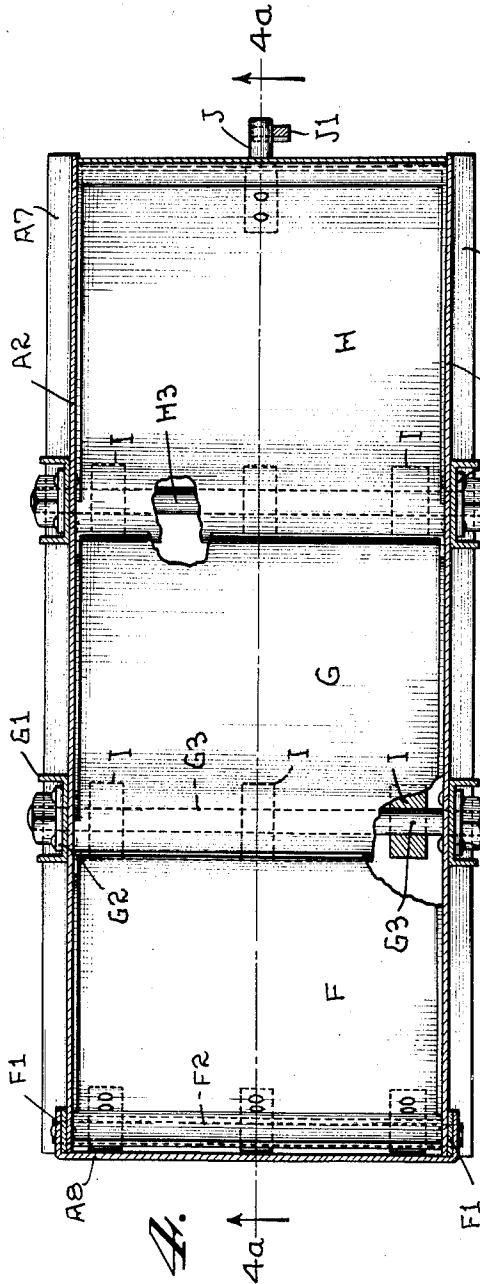


Fig. 4.

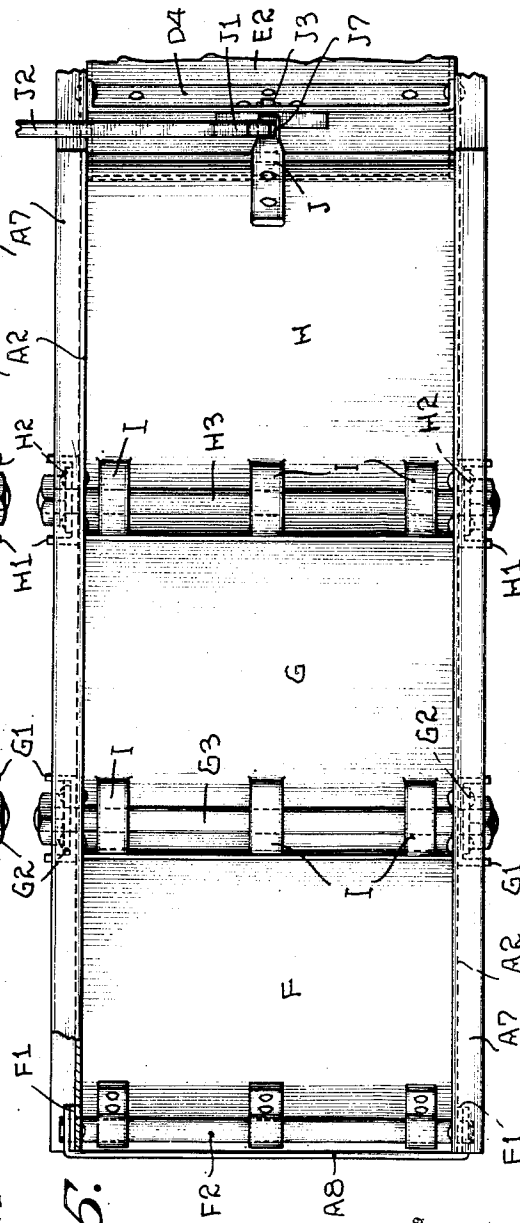


Fig. 5.

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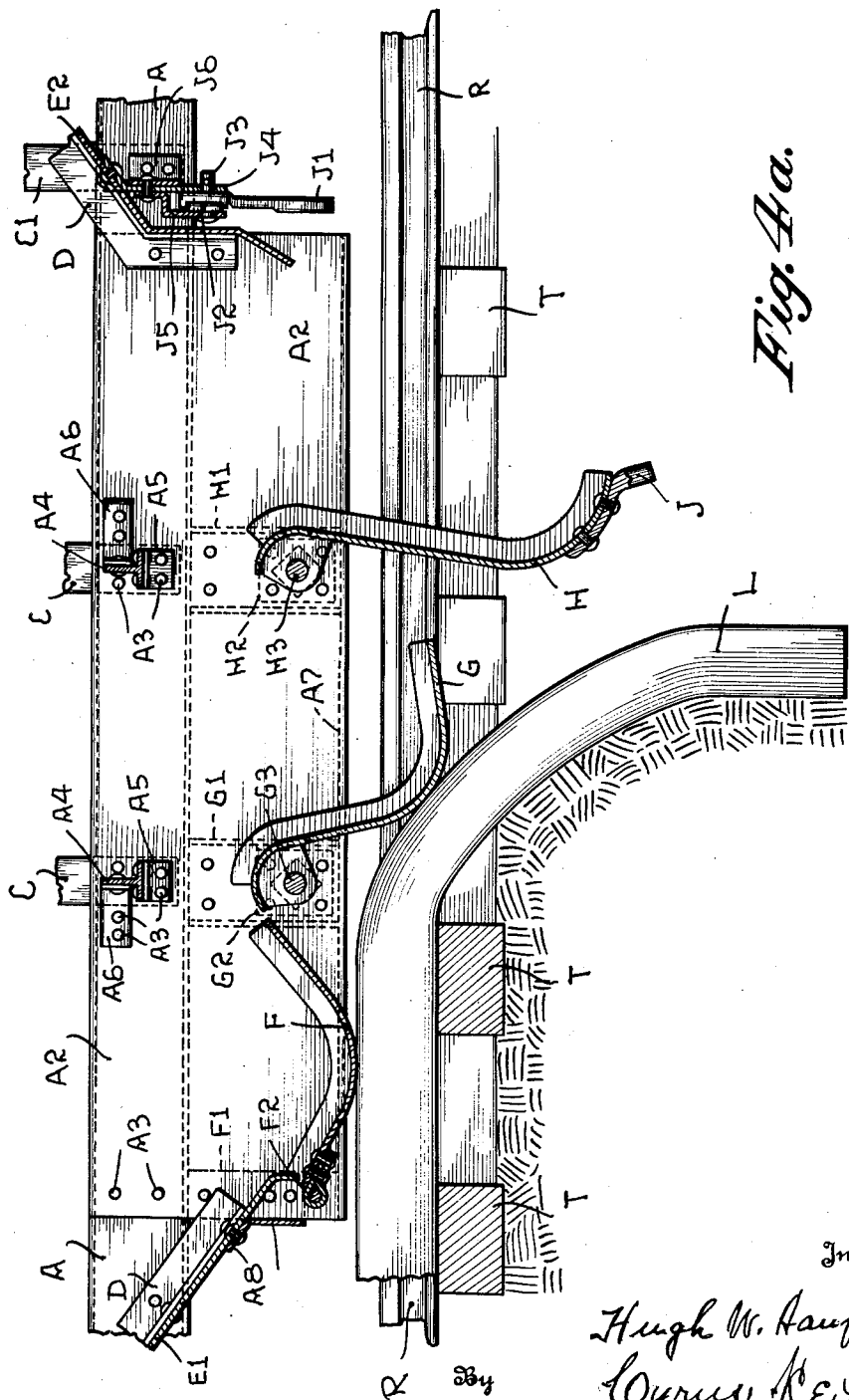


Fig. 4a.

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Fig. 8.

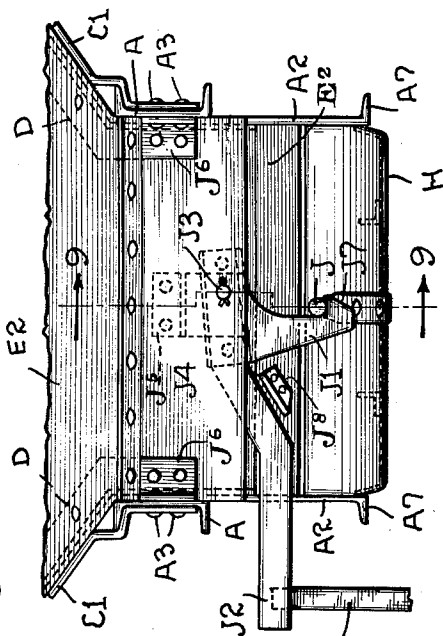


Fig. 9.

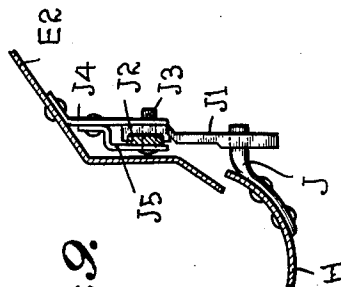


Fig. 7.

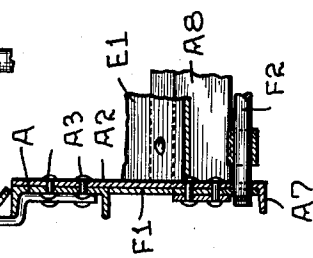
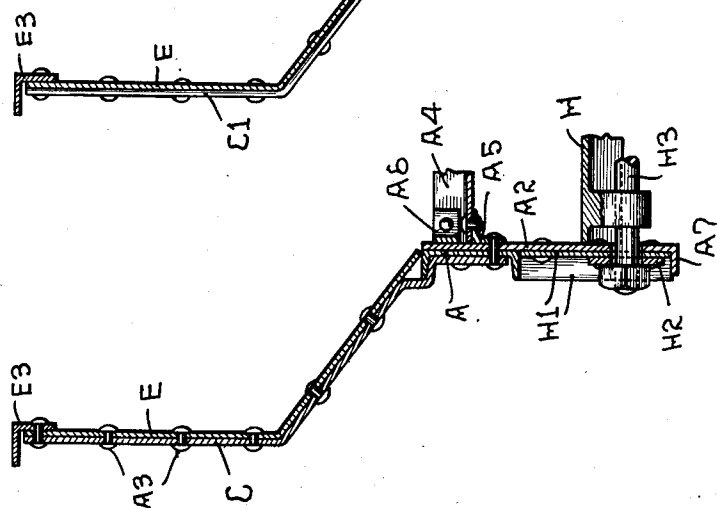


Fig. 6.



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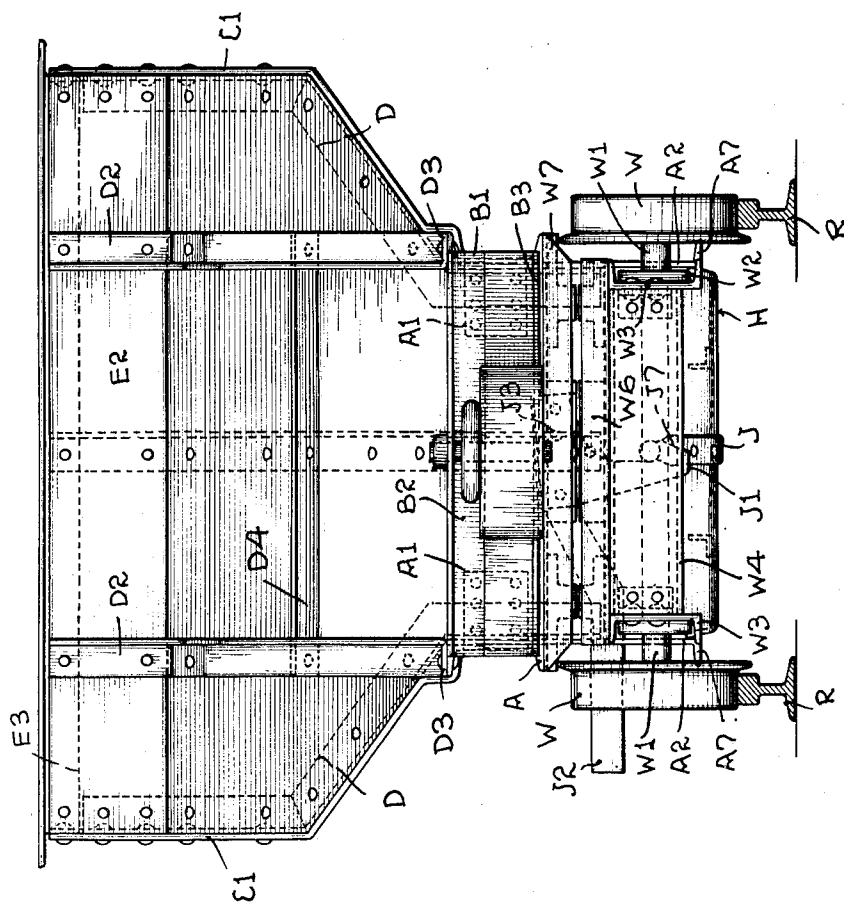
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MINE CAR

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*Fig. 10.*

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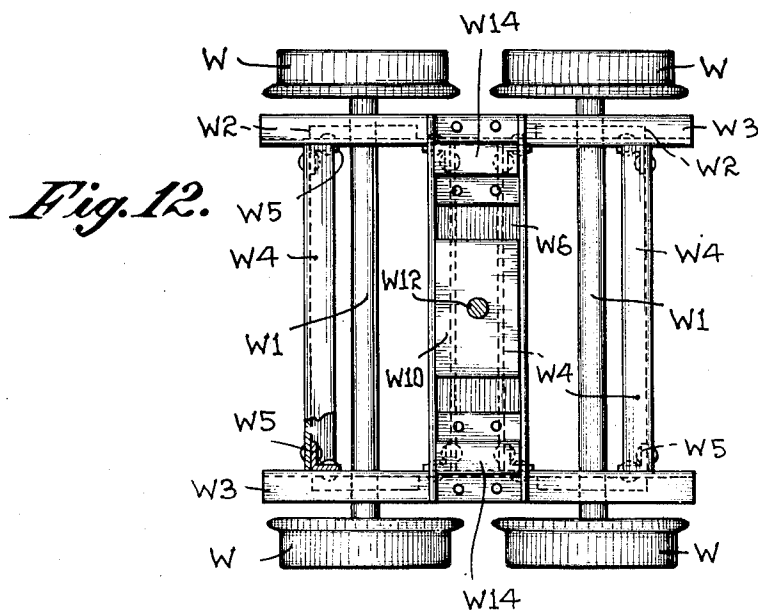
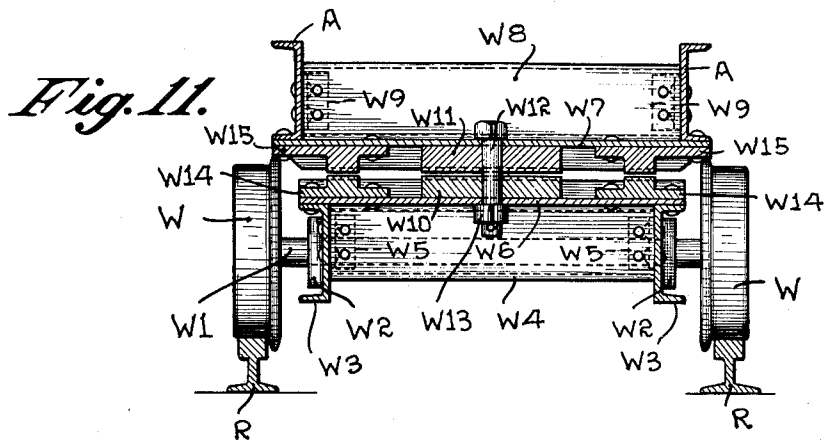
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MINE CAR

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## UNITED STATES PATENT OFFICE

HUGH W. SANFORD, OF KNOXVILLE, TENNESSEE

## MINE CAR

Application filed December 29, 1926, Serial No. 157,707. Renewed March 29, 1929.

This improvement relates particularly to mine cars which are intended to be brought out of the mine in a train or trip and moved over a track and across a tippie for discharge of the mineral through the bottoms of the cars while the cars are crossing the tippie, the object being to attain quick discharge of the loads from all the cars.

For an example of cars of this type, reference is made to United States Patent, No. 1,268,390, granted to me June 4, 1918.

The car of that patent has hinged doors which are adapted to engage each other and one of which is held by a latch which is to be released by a cam located beside the track at the tippie. Between the rails of the track is a cam which raises the doors progressively into the elevated position for engagement with each other and with the latch after the load has been discharged.

The car of that patent is small and adapted to carry only a small load. The bottom doors extend the full length of the car body, and the car is supported on the track by only four wheels, two being on each of two axles which are in fixed bearings, and the axles being near each other to form a short wheel base, as required because the axles are in fixed bearings—fixed relative to the body of the car.

The mining operation, particularly coal mining, is now entering a new phase, and the operation is becoming almost entirely mechanical. Many loading machines are being introduced to dispense with men. The problem, therefore, of obtaining a satisfactory car for mechanical loading has become acute. The machines can load the cars in a hurry but a great deal of time is lost in car shifting. The successful use of machines depends therefore, on using as large a mining car as possible. The head room being limited and the tracks being curved, the mine car capacity has been limited to short wheel base designs of preferably low height. The short wheel base requires short overall length.

Furthermore, the ordinary mine car is dumped by tilting and discharging material from the front end. There is a limit to the over-balanced load which can be handled

satisfactory in this manner. A second method consists in rotating the car sidewise and thus discharging its load. The equipment for thus turning the car up-side down becomes increasingly more expensive as the car unit is enlarged. Furthermore, by this method the wear and tear on the car increases proportionately with its size. In fact, the rotary car has proven very expensive to design and build.

Still another factor has influenced mine car design. All coal mining cars are today equipped with four wheels and two axles, as above described. For the desired flexibility in going around curves, it has been found necessary to use loose wheels on axles. There is a limit to the load that can be put on one bearing for loose fit. Particularly does this refer to the roller bearing type of wheel which is most always the easiest running. Most roller bearings are not case hardened or ground and there is a limit to the load they will stand. For example, the largest standard roller bearing equipment which can be economically supplied in mine cars has three inch axles. Two such axles will handle a load of five or six tons and no more. Hence, a car which is to haul a heavier load must have more axles.

The problem has thus arisen to provide a mine car large enough to hold as much as ten tons of coal, in order that the loading machine can be used most efficiently—load more coal without car shifting. The car has to be flexible for curves and flexible on the tracks—to adapt it to run on uneven tracks, and standard roller bearing mine wheel equipment is preferred. The large car can not be made of the end dump discharge type, because it can not be handled satisfactorily. The rotary car is expensive to operate. After working on this problem for some time, I have conceived using an eight-wheel car with two two-axle trucks and bottom discharge. This car can be made of any desired length—as long as permitted by the track curves, and the capacity can be brought up to a ten ton load. Thus the height can be kept within limits. For practical operation, it is almost an essential that such a large car have an automatic

bottom discharge operating while a train of the cars are in motion. With a practically operative car of this load capacity, the coal mining industry can be revolutionized and the cost of operation greatly reduced. By my improvement, then, the coal mining industry may be transformed. My improved car comprises a combination of inter-related mechanical elements through which this accomplishment is attained.

In the accompanying drawings,

Fig. 1 is a side elevation extending from the forward end to a little beyond the middle, upright, transverse plane of a car embodying my improvement;

Fig. 2 is a side elevation from the rear end of the same car forward nearly to said plane;

Fig. 3 is a horizontal section on the line, 3—3, of Fig. 2;

Fig. 4 is a horizontal section on the line, 4—4, of Figs. 1 and 2;

Fig. 4a is a longitudinal upright section on the line, 4a—4a of Fig. 4 showing the car in engagement with a means for raising the bottom doors;

Fig. 5 is a bottom view of the part of the car which is sectioned by Fig. 4;

Fig. 6 is an upright transverse section on the line, 6—6, of Figs. 1 and 2, looking toward the left;

Fig. 7 is an upright transverse section on the line, 7—7, of Fig. 1, looking toward the left;

Fig. 8 is an upright transverse section on the line, 8—8, of Fig. 2;

Fig. 9 is an upright section on the line, 9—9, of Fig. 8, looking toward the right;

Fig. 10 is a rear elevation;

Fig. 11 is an upright transverse section on the line, 11—11, of Fig. 1;

Fig. 12 is a horizontal section on the line, 12—12, of Fig. 1.

The foundation elements of the body of the car are two longitudinal parallel side sills, A, A, and two frame end structures, B. In the form shown in the drawings, the side sills are steel channels having their flanges directed outward. These frame end structures are similar to the frame end structures described in United States Patent, No. 1,486,547, granted to me March 11, 1924. This structure is formed of plate metal having an upright back, B1, and an upper outward-directed horizontal flange, B2, and a lower outward-directed horizontal flange, B3. The back, B1, extends across the ends of the side sills, A. At each corner of the frame, an angle piece, A1, has one wing riveted to the upright web of the side sill while the other wing of the angle piece overlaps and is riveted to the back, B1, of the end structure. An extension plate, A2, overlaps the inner face of each side sill and extends downward close to the level of the track rails, R, and from the middle upright plane of the

car body about half way to the end of said body. The lower edge of each of these plates is turned outward to form a flange, A7. Each of said plates is secured to the side sill by means of rivets, A3.

At opposite sides of and near the middle upright transverse plane of the car body, the side sills are joined to each other by transverse T-tie bars, A4. Each end of each such bar is seated on and riveted to an angle piece, A5, which is secured to the side sills by means of rivets, A3, which rivets also extend through the adjacent extension plate already described and through the adjacent strap or standard described further on. The ends of these tie bars are further secured by means of lateral angle pieces, A6, which are riveted to the tie bar and are also riveted to the web of the side sill by means of rivets, A3. These rivets, A3, also extend through another member as will be described further on.

In the upright plane of each of said tie bars a metal strap or standard, C, extends over the outer face of the web of the adjacent side sill and outward over the upper flange of the side sill and then upward to the upper edge of the car body. The part of these straps, C, which extends over the outer face of the side sill is secured to the side sill and extension plate by the rivets, A3, which, as above described, also extend through the angle piece, A5. Another rivet, A3, extends through the strap and the side sill near the upper flange of the side sill.

Between each of these straps, C, and the end of the car body a similar strap, C1, is similarly applied to each side sill and secured to the side sill by means of rivets, A3, extending only through the strap and the web of the side sill. These straps also extend obliquely upward and outward and then upward to the upper edge of the car body.

From the forward end of each extension plate, A2, an angle bar, D, extends obliquely forward and upward across the inner face of the adjacent side sill and extends thence laterally outward and upward to the end of the car body and thence upward along the end of the car body to approximately the upper edge of said body.

At each side of the car body a side plate, E, extends from the upper edge of the adjacent side sill and along the inner faces of the straps, C, C, and C1, C1, and along the angle bars, D, to the upper ends of said straps and angle bars. Each of these side plates is suitably bolted or riveted to said straps and angle bars.

An end plate, E1, has its side edges supported by and secured to the outer faces of the angle bars, D, by means of rivets or bolts. The lower edge of the plate, E1, extends downward between the extension plates,

A2, close to the forward bottom door, as will be described further on.

The upper edge of the plate, E1, extends upward even with the upper edges of the side plates, E. A cross bar, D1, rests on each of the side sills, A, and bears against the outer face of the end plate, E1, and is suitably secured to said plate. This is a means of reinforcing the end plate and the angle bars, D. The end plate, E1, and the angle bars, D, are further reinforced by standards, D2, one of which rests on each of the side sills, A, and bears against the outer face of the end plate and is suitably secured thereto as by riveting. On the lower end of each standard is a foot, D3, resting on and riveted to the sill.

At the rear end of the car body the rear end plate, E2, similar to the forward end plate, E1, is applied to the outer face of the lateral flanges of the angle bars, D, and secured to said flanges by riveting or otherwise. The lower edge of said end plate extends downward nearly to the rear bottom door, as will be described further on.

Standards, D2, are applied to the rear ends of the side sills, A, and the rear end plate, E2, as already described in connection with the forward part of the car body. Forward of these rear standards, D2, a reinforcing plate, D4, extends from one side sill to another and has its lower edge turned horizontally forward and has each end resting on a gusset plate, D5, which rests on the upper face of the side sill. The gusset plate and the plate, D4, are riveted to the side sills. The upper edge of the plate, D4, is riveted to the end plate, E2.

To the upper edges of the side plates, E, and the end plates, E1 and E2, is applied a reinforcing angle bar, E3, one flange lying against the inner faces of said plates and secured thereto by rivets or bolts. (Figs. 6 and 7).

To the outer face of the forward part of each extension plate, A2 is applied and riveted a reinforcing plate, F1. At the intersection of the forward end plate, E1, and the extension plates, A2, is an extension end plate, A8, having an oblique part which overlaps the outer face of the plate, E1, forward of the plates, A2, and which plate, A8, has an upright part extending from one extension plate to the other and across the forward edges of said plates and the plates, F1, and is folded to lie against the adjacent outer face of each reinforcing plate, F1. Each folded end is bolted or riveted to the adjacent plates. F1 and A2. The plate, A8, serves to connect the plate, E1, and the extension plates, A2, to each other, whereby this downward extension structure is made strong. To this extension structure are to be added the automatically controlled and actu-

ated plate metal doors, F, G and H, forming the bottom of the car body.

A horizontal shaft or pintle, F2, has its ends resting in bearings formed in the plates, A2 and F1. The forward edge of the forward door, F, is secured to said shaft.

Below the forward strap, C, a reinforcing plate, G1, is applied to the outer face of the extension plate. Said plate is channel form, its flanges being upright and directed outward. To the outer face of each of said plates, G1, is applied a bearing plate, G2. The plates, G1 and G2, are riveted to each other and to the extension plate, A2. A shaft or pintle, G3, has its ends resting in bearings formed in the bearing plates, G2. The forward edge of the middle door, G, is supported by said shaft, as will be described further on.

Below the rear strap, C, a reinforcing plate, H1, is applied to the outer face of the extension plate. Said plate is channel form, its flanges being upright and directed outward. To the outer face of each of said plates, H1, is applied a bearing plate, H2. The plates, H1 and H2, are riveted to each other and to the extension plate, A2. A shaft or pintle, H3, has its ends resting in bearings formed in the bearing plates, H2. The forward edge of the middle door, H, is supported by said shaft, as will be described further on.

Hinge blocks, I, are applied to the shafts, G3 and H3, to support the forward ends of the doors, G and H. The upper faces of these blocks are shown concentric to the adjacent shaft, and the adjacent part of the door is correspondingly curved and secured to the blocks. The doors, F and G, are curved downward. The rear edge of the door, F, rests on the forward edge of the door, G, when these doors are in the raised position. The rear edge of the door, G, rests on the forward edge of the door, H, when these doors are in the raised position. The hinge blocks, I, and the forward ends of the doors, G and H, extend forward beyond the shafts, G3 and H3, sufficiently to allow the doors, F and G, to be short enough to allow their rear edges to pass the adjacent shaft for downward turning of said doors. On the rear edge of the rear door, H, is a latch arm, J, which is positioned to be engaged by the latch hook, J1, when said door is in the raised position. The hook, J1, is extended downward from the transverse arm, J2, which is pivoted on the pintle, J3, which extends through the binding plate, J4, and the hanger, J5, and the arm, J2, and the upper part of the hook, J1, said part of said hook being channeled horizontally to receive the arm. Said arm and said hook are joined by bolts or rivets. The ends of the binding plate, J4, are secured to the side sills, A, by means of angle plates, J6, which are riveted to the binding plate and the adjacent

side sill. The upper edge of the binding plate, J4, is bent obliquely to bear flatwise against the outer face of the end plate, E2, of the car body, and said edge is riveted to said end plate. It is to be noted that the arm, J2, and the hook, J1, constitute a bell crank turning on the pintle, J3. The upward movement of the arm, J2, will cause the lateral movement of the hook, whereby the latch arm, J, is released. This leaves the rear part of the door, H, free to fall by reason of its own weight and the weight of the load of material resting on said door. This downward movement of the door by turning on the axial line of the shaft, H3, causes the forward end of said door to become disengaged from the rear edge of the next forward door, G. That door being now free, it falls by reason of its own weight and the weight of the material resting thereon. That movement of the door, G, by turning on the axial line of the shaft, G3, causes disengagement of the forward edge of the door, G, from the rear edge of the door, F. The door, F, being now free, it falls (turning on the pintle, F2) due to its own weight and the weight of the material resting on that door. When in their lower position, all the doors extend into the space between the track rails, R.

For such releasing of the door, H, a cam member, K, is placed beside the rail track in position to engage the lower edge of said arm, J2, when the car reaches the place at which the discharge of its load is to be made.

To limit the downward movement of the bell crank arm, J2, when the latch arm, J, has been released from the hook, a bracket, J8 (Fig. 8), is placed on the rear body plate, E2, in position to extend below the arm, J2, to engage the latter when it has descended far enough to bring the hook into the path of the latch arm, J. On the lower end of the hook, J1, is an oblique face, J7, which is normally held in the path of the latch arm, J. When the rear door is raised, said latch arm bears against said oblique edge and pushes the hook laterally until said arm is above the hook, whereupon the greater weight of the bell crank arm, J2, causes the tilting of the bell crank whereby the hook is pushed in the reverse direction and below the latch arm, J.

As already herein stated, the opening of these doors and the discharge of the material from the car body are to take place while the car is passing over the tippie or other structure through which the discharge is to be made. The continued forward movement of the car brings the lower face of the forward door into engagement with a stationary cam member, L, located between the track rails, R, and supported on the ties T and rising to a sufficient height to force the rear end of said door upward a little way above its normal or closed position. Said cam member is extended horizontally far enough to

maintain its engagement with the forward door until the door, G, has in the same manner been engaged by the inclined portion of said cam and has been forced upward thereby a little way above its normal or closed position. Next the rear door, H, is in the same manner forced upward until the latch arm, J, has moved upward and forced the hook, J1, sidewise and until said arm is above said hook and the hook has again resumed normal position. Then, with the passing of the door, F, out of engagement with the cam member, L, the rear part of said door descends by gravity and again rests on the forward part of the door, G. When the door, G, passes out of engagement with the cam member, L, said door descends and its rear edge again rests on the forward edge of the door, H. When the door, H, passes out of engagement with the cam member, L, it descends by gravity until the latch arm, J, engages the hook, J1. Thus all the doors are again in their normal or closed positions and the car body is again ready to receive a new load.

Each end of the frame formed by the side sills, A, A, and the end structures, B, B, and associated members is supported on the track rails, R, by means of a truck having two axles, W1, and two wheels, W, mounted on each axle. The axles rest in bearings, W2, supported on channel members, W3. The channel members are joined to each other by means of transverse members, W4, placed in upright planes and having their ends abutting against the channel members. Angle members, W5, are joined to the members, W4, and the channel members, W3. Above the truck and in the middle upright transverse plane of the truck is a lower channel member, W6, and an upper channel member, W7. The channel member, W6, rests on the channel members, W3, and the middle transverse members, W4, and has its flanges directed upward and is suitably secured to the members, W3. The upper channel member, W7, has its flanges directed downward and has its ends resting against the lower edges of the side sills, A, and is suitably secured to said sills. Above and bearing against the member, W7, are two transverse channel members, W8, extending from one side sill, A, to the other and secured to the side sills by means of angle members, W9. These members, W8, serve to give stability to the channel member, W7.

Midway between the channel members, W6 and W7, are filling blocks, W10 and W11, the lower block, W10, being seated in and secured to the channel member, W6, and the upper block, W11, being fitted into and secured to the channel member, W7. A king pin, W12, extends through the channel member, W7, and the two filling blocks and the channel member, W6. Below the chan-

nel member, W6, a nut, W13, is applied to the king pin. In each end of the lower channel member, W6, is placed and suitably secured a pillow block, W14; and above each of said blocks there is placed in and suitably secured to the channel member, W7, a corresponding pillow block, W15. The blocks of each of these two pairs are separated sufficiently to allow some sidewise rocking of the car body or tilting of the truck in passing over irregularities in the rail track.

It will be noted that the side plates, E, and the end plates, E1 and E2, and the parts directly associated with said plates constitute a hopper structure having a base approximately equal to the length of the extension plates. It is also to be noted that the hinged doors, F, G and H, constitute a bottom for the base of the hopper structure.

It will also be understood that the extension plates, A2, and the body side plates, E, and the body end plates, E1 and E2, are preferably metal, but may be wood.

I claim as my invention,

1. In a railway car of the kind described, the combination with a frame comprising side sills and end structures, of trucks supporting the side sills near the end structures, an extension plate extending downward from each side sill between the trucks, a plurality of inter-engaging bottom doors each located between the extension plates and having its forward end hinged to each extension plate on a horizontal axis which is transverse to the length of the car, means for holding the rear end of the rear of said doors in the closed position, and body side plates and end plates extending upward from the frame.

2. In a railway car of the kind described, the combination with a frame comprising side sills and end structures, of trucks supporting the side sills near the end structures, an extension plate extending downward from each side sill between the trucks, a plurality of bottom doors each located between the extension plates and having its forward end hinged to each extension plate on a horizontal axis which is transverse to the length of the car and the rear edge of one door being controlled by the forward part of the next rear door when said doors are in the closed position, latch mechanism supporting the rear part of the rear door when said doors are closed, and body side plates and end plates extending upward from the frame.

3. In a railway car of the kind described, the combination with a frame comprising side sills and end structures, of trucks supporting the side sills near the end structures, an extension plate extending downward from each side sill between the trucks, a plurality of bottom doors each located between the extension plates and having its forward end hinged on a horizontal axis which is transverse to the length of the car and the rear

edge of one door being controlled by the forward part of the next rear door when said doors are in the closed position, latch mechanism supported by the side sills and supporting the rear part of the rear door when said doors are closed, and body side plates and end plates extending upward from the frame.

4. In a railway car of the kind described, the combination with a frame comprising side sills and end structures, of trucks supporting the side sills near the end structures, an extension plate extending downward from each side sill between the trucks, a plurality of bottom doors each located between the extension plates and having its forward end hinged on a horizontal axis which is transverse to the length of the car, and the rear edge of one door being controlled by the forward part of the next rear door when said doors are in the closed position, a transverse member supported by the side sills near the rear ends of the extension plates, latch mechanism supported by said transverse member and supporting the rear part of the rear door when said doors are closed, and body side plates and end plates extending upward from the frame.

5. In a railway car of the kind described, the combination with a frame comprising side sills and end structures, of trucks supporting the side sills near the end structures, an extension plate extending downward from each side sill between the trucks, a plurality of bottom doors each reaching from one extension plate to the other and having its forward end hinged to each extension plate on a horizontal axis which is transverse to the length of the car and the rear edge of one door being held by the forward part of the next rear door when said doors are in the closed position, latch mechanism supporting the rear part of the rear door when said doors are closed, and body side plates and end plates extending upward from the side sills and forming a hopper structure having a base approximately equal to the length of the extension plates.

6. In a railway car of the kind described, the combination with a frame comprising side sills and end structures, of trucks supporting the side sills near the end structures, an extension plate extending downward from each side sill between the trucks, a plurality of bottom doors each reaching from one extension plate to the other and having its forward end hinged to each extension plate on a horizontal axis which is transverse to the length of the car and the rear edge of one door being held by the forward part of the next rear door when said doors are in the closed position, latch mechanism supporting the rear part of the rear door when said doors are closed, a body side plate meeting and supported on each side sill above the adjacent downward extension plate, its end edge ex-

tending thence obliquely upward and toward the ends of the side sill approximately to an upright plane cutting the side sills transversely at their ends, and end plates extending upward from the ends of the extension plates and along the end edges of the side plates and secured thereto.

7. In a railway car of the kind described, the combination with a frame comprising side sills and end structures, of trucks supporting the side sills near the end structures, an extension plate extending downward from each side sill between the trucks, a plurality of bottom doors located between the extension plates and each having its forward end hinged to each extension plate on a horizontal axis which is transverse to the length of the car and the rear edge of one door being controlled by the forward part of the next rear door when said doors are in the closed position, latch mechanism supporting the rear part of the rear door when said doors are closed, and body side plates and end plates extending upward from the frame and the end plates extending downward between the side sills and the extension plates.

8. In a railway car of the kind described, the combination with a frame comprising side sills and end structures, of trucks supporting the side sills near the end structures, an extension plate extending downward from each side sill between the trucks, plates overlapping the extension plates, shafts seated in said overlapping plates, a plurality of bottom doors located between the extension plates and each having its forward end hinged on one of said shafts, means for holding said doors in the closed position, and body side plates and body end plates extending upward from the frame.

9. In a railway car of the kind described, the combination with a frame comprising side sills and end structures, of trucks supporting the side sills near the end structures, an extension plate extending downward from each side sill between the trucks, a plurality of bottom doors located between the extension plates and each having its forward end hinged on a horizontal axis which is transverse to the length of the car and the rear edge of one door being controlled by the forward part of the next rear door when said doors are in the closed position, mechanism supporting the rear part of the rear door when said doors are closed, body side plates extending upward from the frame, a body end plate at the forward end of the car and having its edges joined to the adjacent edges of the body side plates and extending downward to the forward ends of the extension plates, and a transverse end plate extending across the forward ends of the extension plates and secured to said plates and extending upward over the adjacent part of the

outer face of the body end plate and secured to said plate.

10. In a railway car of the kind described, the combination with a frame comprising side sills and end structures, of trucks supporting the side sills near the end structures, an extension plate extending downward from each side sill between the trucks, a plurality of bottom doors located between the extension plates and each having its forward end hinged to each extension plate on a horizontal axis which is transverse to the length of the car, means for holding said doors in the closed position, and body side plates and end plates forming a hopper structure.

11. In a railway car of the kind described, the combination with a frame comprising side sills and end structures, of trucks supporting the side sills near the end structures, an extension plate extending downward from each side sill between the trucks, a plurality of bottom doors located between the extension plates and each having its forward end hinged to each extension plate on a horizontal axis which is transverse to the length of the car, means for holding said doors in the closed position, body side plates and end plates forming a hopper structure, the end plates extending into the space between the side sills, and a cross member resting on the side sills and bearing against the adjacent part of the hopper structure.

12. In a railway car of the kind described, the combination with a frame comprising side sills and end structures, of trucks supporting the side sills near the end structures, an extension plate extending downward from each side sill between the trucks, a plurality of bottom doors located between the extension plates and each having its forward end hinged to each extension plate on a horizontal axis which is transverse to the length of the car, means for holding said doors in the closed position, body side plates and end plates forming a hopper structure, the end plates extending into the space between the side sills, gusset plates resting on the side sills, and a cross member resting on said gusset plates and bearing against the adjacent part of the hopper structure.

13. In a railway car of the kind described, the combination with a frame comprising side sills and end structures, of trucks supporting the side sills near the end structures, an extension plate extending downward from each side sill between the trucks, a plurality of bottom doors located between the extension plates and each having its forward end hinged on a horizontal axis which is transverse to the side sills and the rear edge of one door being controlled by the forward part of the next rear door when said doors are in the closed position, a transverse member supported by the side sills, latch mechanism supported by said transverse member and adapt-

ed to make engagement with the rear end of the rear door, body side plates and body end plates forming a hopper structure, the rear end of said hopper structure extending upward at the ends of the extension plates and then rearward across said transverse member.

14. In a railway car of the kind described, the combination with a frame comprising side sills and end structures, of a hopper structure, bottom doors hinged on horizontal axes transverse to the length of the side sills, truck side members at each end of the car, axles extending through said side members, wheels on said axles, two transverse members one secured to the truck side members and the other secured to the adjacent parts of the side sills, a king pin extending through said two transverse members, means between and supported by the truck side members for reinforcing the lower transverse member, and means between and supported by the side sills for reinforcing said upper transverse member.

15. In a railway car of the kind described, the combination with a frame comprising side sills and end structures, of a hopper structure, bottom doors hinged on horizontal axes transverse to the length of the side sills, truck side members at each end of the car, axles extending through said side members, wheels on said axles, two transverse members one secured to the truck side members and the other secured to the adjacent parts of the side sills, a king pin extending through said two transverse members, a pair of members supported between and by the truck side members for reinforcing said lower transverse member, and a pair of members supported between and by the side sills for reinforcing said upper transverse member.

16. In a railway car of the kind described, the combination with a frame comprising side sills and end structures, of a hopper structure, bottom doors hinged on horizontal axes transverse to the length of the side sills, truck side members at each end of the car, axles extending through said side members, wheels on said axles, two channeled transverse members one secured to the truck side members and the other secured to the adjacent parts of the side sills, blocks between said transverse members, and a king pin extending through said two transverse members.

17. In a railway car of the kind described, the combination with a frame comprising side sills and end structures, of a hopper structure, bottom doors hinged on horizontal axes transverse to the length of the side sills, truck side members at each end of the car, axles extending through said side members, wheels on said axles, two channeled transverse members one secured to the truck side

members and the other secured to the adjacent parts of the side sills, blocks between said transverse members, a king pin extending through said two transverse members, means between and supported by the truck side members for reinforcing the lower transverse member, and means between and supported by the side sills for reinforcing said upper transverse member.

18. In a railway car of the kind described, the combination with a frame comprising side sills and end structures, of a hopper structure, bottom doors hinged on horizontal axes transverse to the length of the side sills, truck side members at each end of the car, axles extending through said side members, wheels on said axles, two channeled transverse members one secured to the truck side members and the other secured to the adjacent parts of the side sills, blocks between said transverse members, a king pin extending through said two transverse members, a pair of members supported between and by the truck side members for reinforcing said lower transverse member, and a pair of members supported between and by the side sills for reinforcing said upper transverse member.

19. In a railway car, the combination with a car body comprising side sills, of wheels and axles supporting the ends of said side sills, side walls supported by the side sills and extending downward below said sills, a plurality of inter-related bottom doors located between the sill end supports and said downward wall extensions and reaching from one of said extensions to the other and hinged to said extensions by their forward ends on lines which are horizontal and transverse to the car body, and means for holding one of said doors in the closed position.

20. In a railway car, the combination with a car body comprising side sills, of wheels and axles supporting the ends of said side sills, side walls supported by the side sills and extending downward below said sills, a plurality of bottom doors located between the sill end supports and said downward wall extensions and hinged to said extensions by their forward ends on lines which are horizontal and transverse to the car body, and latch mechanism for engaging the rear part of the rear door, the forward end of said door being in operative relation with the rear end of the next forward door for holding said next forward door in the closed position when the rear door is in the closed position.

21. In a railway car, the combination with a car body comprising side sills, of wheels and axles supporting the ends of said side sills, side walls supported by the side sills and extending downward below the side sills and between the longitudinal upright planes of the wheels, a plurality of inter-related bot-



tom doors located between the sill end supports and said downward wall extensions and reaching from one of said extensions to the other and hinged to said extensions by their forward ends on lines which are horizontal and transverse to the car body, and means for holding one of said doors in the closed position.

22. In a railway car, the combination with a hopper-form car body, of wheels and axles supporting the ends of the body, whereby the base of the hopper is between the body end supports, two bottom doors hinged by their forward ends on lines which are horizontal and transverse to the length of the car, door supporting means, said doors and the door supporting means together forming a bottom substantially co-extensive with the base of the hopper and the adjacent edges of said doors being in operative relation for sustaining the adjacent free edge through co-operation by the other door, and latch mechanism for holding said other door in the closed position.

23. In a railway car, the combination with a hopper-form car body, of wheels and axles supporting the ends of the body, whereby the base of the hopper is between the body end supports, two bottom doors hinged by their forward ends on lines which are horizontal and transverse to the length of the car, door supporting means, said doors and said door supporting means together forming a bottom substantially co-extensive with the base of the hopper and the free edge of one of said doors when closed resting on the hinge edge of the other door, and latch mechanism for holding said other door in the closed position.

24. In a railway car, the combination with a hopper-form car body, of wheels and axles supporting the ends of the body, whereby the base of the hopper is between the body end supports, two bottom doors hinged by their forward ends on lines which are horizontal and transverse to the length of the car, door supporting means, said doors and the door supporting means together forming a bottom substantially co-extensive with the base of the hopper, and the adjacent edges of said doors being in operative relation for sustaining the adjacent free edge through co-operation by the other door while the other door is in the closed position and said operative relation ceasing when said other door is turned downward out of its closed position, and latch mechanism for holding said other door in the closed position.

25. In a railway car, the combination with a car body, of wheels and axles supporting the ends of the body and said body extending downward in hopper-form between said body end supports, of a plurality of hinged bottom doors together forming a bottom for the hopper extension, each such door being, when

closed, extended downward between its hinge line and its free lip far enough to be below the highest point of the bottom edges of the transverse hopper walls, and latch mechanism for engaging one of the doors when the doors are in the closed position, whereby the doors are adapted to be engaged by external means traversed by the car.

26. In a railway car, the combination with a car body, of swiveled trucks supporting the ends of the body, a plurality of bottom doors located between the trucks and hinged by their forward ends on lines which are horizontal and transverse to the car body and adapted to engage means in the path of the doors when the doors are open, whereby the doors are automatically raised into the closed position by reason of the car passing said means, and releasable holding means associated with the doors for engaging and holding the doors after they have been raised.

27. In a railway car, the combination with a car body, of swiveled trucks supporting the ends of the body, a plurality of bottom doors located between the trucks and adapted to engage means in the path of the doors when the doors are open, whereby the doors are automatically moved into the closed position by reason of the car passing said means.

28. In a railway car, the combination with a car body, of swiveled trucks supporting the ends of the body, a plurality of bottom doors located between the trucks, door supporting means, said doors and the door supporting means together forming a lading bottom substantially co-extensive with the base of the body, the doors being hinged by their forward ends on lines which are horizontal and transverse to the car body and adapted to engage means in the path of the open doors, whereby the doors are automatically raised into the closed position by reason of the car passing said means, and releasable holding means associated with the doors for engaging and holding the doors after they have been raised.

29. In a railway car, the combination with a car body, of swiveled trucks supporting the ends of the body, a plurality of hinged bottom doors located between the trucks, door supporting means, said doors and the door supporting means together forming a lading bottom substantially co-extensive with the base of the body, said doors being adapted to engage means in the path of the open doors, whereby the doors are automatically raised into the closed position by reason of the car passing said means, and releasable holding means associated with the doors for engaging and holding the doors after they have been raised.

30. In a railway car, the combination with a car body, of swiveled trucks supporting the ends of the body, a plurality of bottom doors located between the trucks and hinged



by their forward ends on lines which are horizontal and transverse to the car body and adapted to engage means in the path of the doors when the doors are open, whereby the doors are automatically raised into the closed position by reason of the car passing said means, and automatic means associated with the doors for engaging and holding the doors after they have been raised.

other door, and latch mechanism for holding said other door in the closed position.

35. In a railway car, the combination with a hopper-form car body, of swiveled trucks supporting the ends of the body, whereby the base of the hopper is between the trucks, two bottom doors hinged by their forward ends on lines which are horizontal and transverse to the length of the car, door supporting means, said doors and the door supporting means together forming a bottom substantially co-extensive with the base of the hopper, and the adjacent edges of said doors being in operative relation for sustaining the adjacent free edge through co-operation by the other door while the other door is in the closed position and said operative relation ceasing when said other door is turned downward out of its closed position, and latch mechanism for holding said other door in the closed position.

36. In a railway car, the combination with a car body, of swiveled trucks supporting the ends of the body, a plurality of hinged bottom doors located between the trucks and adapted to be engaged by means extraneous to the car and in the path of the open doors for raising the doors into the closed position, and releasable holding means associated with the doors for engaging and holding the doors after they have been raised.

37. In a railway car, the combination with a car body, of swiveled trucks supporting the ends of the body, a plurality of hinged bottom doors located between the trucks, and latch mechanism for holding the doors in the closed position and the doors being adapted to be engaged, when open, by extraneous means in the path of the open doors for automatically closing the doors, and means whereby the travel of the car actuates the latch mechanism for unlatching the doors.

38. In a railway car, the combination with a car body, of swiveled trucks supporting the ends of the body, a plurality of hinged bottom doors located between the trucks and adapted to be engaged by means in the path of the open doors for raising the doors in chosen sequence preparatory to latching, and latch mechanism.

39. In a railway car, the combination with a car body, of swiveled trucks supporting the ends of the body, a plurality of hinged bottom doors located between the trucks, the said doors being adapted to be engaged, when open, by extraneous means in the path of the open doors for automatically closing the doors, and automatic latch mechanism for holding the doors when raised to their closed position.

40. In a railway car, the combination with a car body, of swiveled trucks supporting the ends of the body, a group of hinged bottom doors located between the trucks, and auto-

31. In a railway car, the combination with a car body, of swiveled trucks supporting the ends of the body, two bottom doors located between the trucks and hinged by their forward ends on lines which are horizontal and transverse to the car body and adapted to engage means in the path of the open doors whereby the doors are automatically raised into the closed position by reason of the car passing said means, the adjacent edges of the doors being inter-related for supporting the free edge of one of said doors, and latch mechanism for engaging the free edge of the other of said doors.

32. In a car of the kind described, the combination with a car body comprising side sills, of swiveled trucks supporting the ends of the body, a plurality of bottom doors located between the trucks and hinged by their forward ends on lines which are horizontal and transverse to the length of the car and adapted to engage door closing means located in the path of the open doors, whereby the doors are automatically raised into the closed position by reason of the car passing said means, and latch mechanism supported by the side sills and adapted to engage the free edge of one of said doors.

33. In a railway car, the combination with a hopper-form car body, of swiveled trucks supporting the ends of the body, whereby the base of the hopper is between the trucks, two bottom doors hinged by their forward ends on lines which are horizontal and transverse to the length of the car, door supporting means, said doors and the door supporting means together forming a bottom substantially co-extensive with the base of the hopper and the adjacent edges of said doors being in operative relation for sustaining the adjacent free edge through co-operation by the other door, and latch mechanism for holding said other door in the closed position.

34. In a railway car, the combination with a hopper-form car body, of swiveled trucks supporting the ends of the body whereby the base of the hopper is between the trucks, two bottom doors hinged by their forward ends on lines which are horizontal and transverse to the length of the car, door supporting means, said doors and said door supporting means together forming a bottom substantially co-extensive with the base of the hopper and the free edge of one of said doors when closed resting on the hinge edge of the

matic latching means in operative relation with the group of doors for holding the doors in the closed position, a member of said latch mechanism being adapted to engage means at the track and in the path of said latch member for releasing said latch mechanism during the travel of the car.

41. In a railway car, the combination with a car body, of swiveled trucks supporting the ends of the body and said body extending downward in hopper-form between said trucks, of a plurality of hinged bottom doors together forming a bottom for the hopper extension, each such door being, when closed, extended downward between its hinge line and its free lip far enough to be below the highest point of the bottom edges of the transverse hopper walls, and latch mechanism for engaging one of the doors when the doors are in the closed position, whereby the doors are adapted to be engaged by external means traversed by the car.

42. In a railway car, the combination with a car body, of swiveled trucks supporting the ends of the body, a plurality of bottom doors located between the trucks and hinged by their forward ends on lines which are horizontal and transverse to the length of the car body and a part of each of said doors which is rearward of its hinge extending, when the door is closed, downward below the highest point of the hinge end of the door, whereby said doors are adapted when open to be engaged by means in the path of said doors, when the doors are open, for causing the raising of said doors into the closed positions by reason of the car passing said means, and releasable holding means associated with the doors for engaging and holding the doors after they have been raised.

43. In a railway car, the combination of a swiveled truck support under each end of the car body, a plurality of hinged doors located between the trucks, the said doors being adapted to engage means in the path of the open doors whereby the doors are automatically raised into their closed positions and that part of each door structure which is in contact with the said door-closing means when the door has been raised into its closed position being closer to the horizontal plane of the track than the highest point of the hinge end of the same door.

44. In a railway car, the combination with a car body, of swiveled trucks supporting the ends of the body, a plurality of bottom doors located between the trucks and hinged by their forward ends on lines which are horizontal and transverse to the car body and adapted to engage mechanical means in the path of the open doors for raising the doors into the closed position, and releasable holding means associated with the doors for engaging and holding the doors after they have been raised.

45. In a railway car of the kind described, the combination with a body having sloping end walls, of wheel and axle supports under the sloping ends of said body, a plurality of inter-engaging doors, and means adapted for automatic actuation for holding the rear door in the closed position.

46. In a railway car of the kind described, the combination with a body, of trucks supporting the ends of said body, and the body having end walls and having side walls extending downward between the trucks, a plurality of inter-engaging bottom doors each located between the lower parts of the side wall extensions and having its forward end hinged to each such extension on a horizontal axis which is transverse to the length of the car, and means for holding the rear end of the rear of said doors in the closed position.

47. In a railway car, the combination with a hopper-form car body, of wheels and axles supporting the ends of the body, a plurality of automatic bottom door structures located between the body end supports and hinged on lines which are horizontal and transverse to the car body and adapted to engage extraneous means in the path of the open door structures whereby the doors are automatically raised into the closed position by reason of the car passing said means, and a releasable latch mechanism supported by attachments to a wall of the car hopper and to the longitudinal side members of the car-body and associated with the rear edge of one of the doors for engaging and holding said door after it has been raised.

48. In a railway car of the kind described, the combination with a body, of trucks supporting the ends of said body, and the body having end walls and having side walls extending downward between the trucks, a plurality of automatic bottom doors each located between the lower parts of the side wall extensions and having its forward end hinged to each such extension on a horizontal axis which is transverse to the length of the car, and means for holding the rear end of the rear of said doors in the closed position.

49. In a railway car, the combination with a car body comprising side sills, of wheels and axles supporting the ends of said side sills, side walls supported by the side sills and extending downward below said sills, a plurality of automatic bottom doors located between the sill end supports and said downward wall extensions and reaching from one of said extensions to the other and hinged to said extensions by their forward ends on lines which are horizontal and transverse to the car body, and means for holding one of said doors in the closed position.

50. In a railway car, the combination with a car body comprising side sills, of wheels and axles supporting the ends of said side sills, side walls supported by the side sills

and extending downward below the side sills and between the longitudinal upright planes of the wheels, a plurality of automatic bottom doors located between the sill end supports and said downward wall extensions and reaching from one of said extensions to the other and hinged to said extensions by their forward ends on lines which are horizontal and transverse to the car body, and means for holding one of said doors in the closed position.

51. In a railway car, the combination with a car body, of swiveled trucks supporting the ends of the body, a plurality of bottom doors located between the trucks and adapted to come into operative relation with means along the path of the doors when the doors are open, whereby the doors are automatically moved into the closed position by reason of the car passing said means.

52. In a railway car, the combination with a hopper-form body, of wheels and axles supporting the ends of the body, a plurality of inter-related bottom door structures located between the body end supports and hinged on lines which are horizontal and transverse to the car body and adapted to engage extraneous means along the path of the open door structures whereby the doors are automatically raised into the closed position by reason of the car passing said means, and a releasable latch mechanism supported by the car between the lower part of one end of the car body and the adjacent wheel axle for engaging and holding the adjacent door structure after it has been raised.

In testimony whereof I have signed my name, this 22nd day of December, in the year one thousand nine hundred and twenty-six.

HUGH W. SANFORD.