Oct. 6, 1931. H. W. SANFORD 1,826,367

RAILWAY CAR

Filed May 8, 1928 8 Sheets-Sheet 1

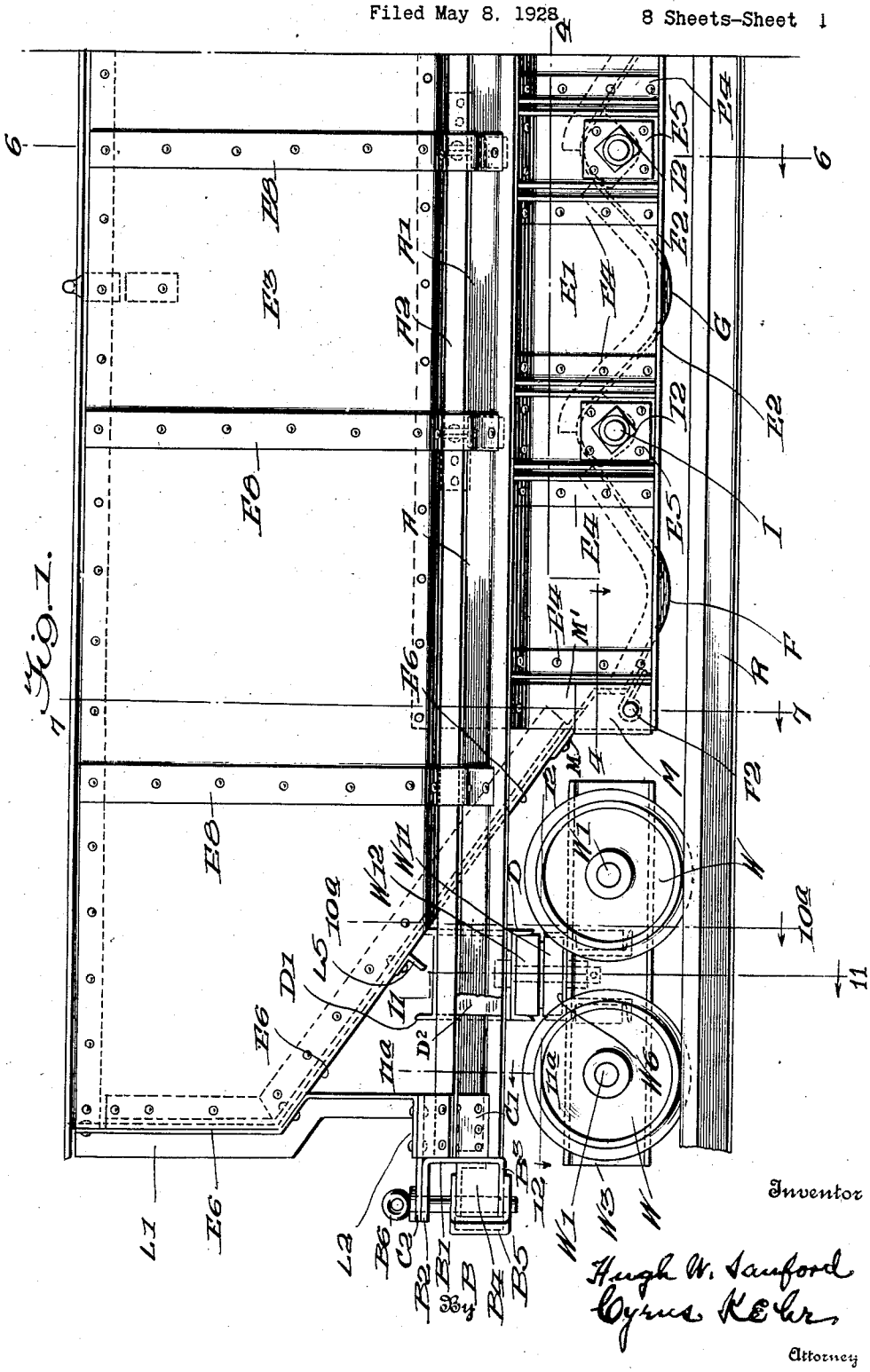


Fig. 1.

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RAILWAY CAR

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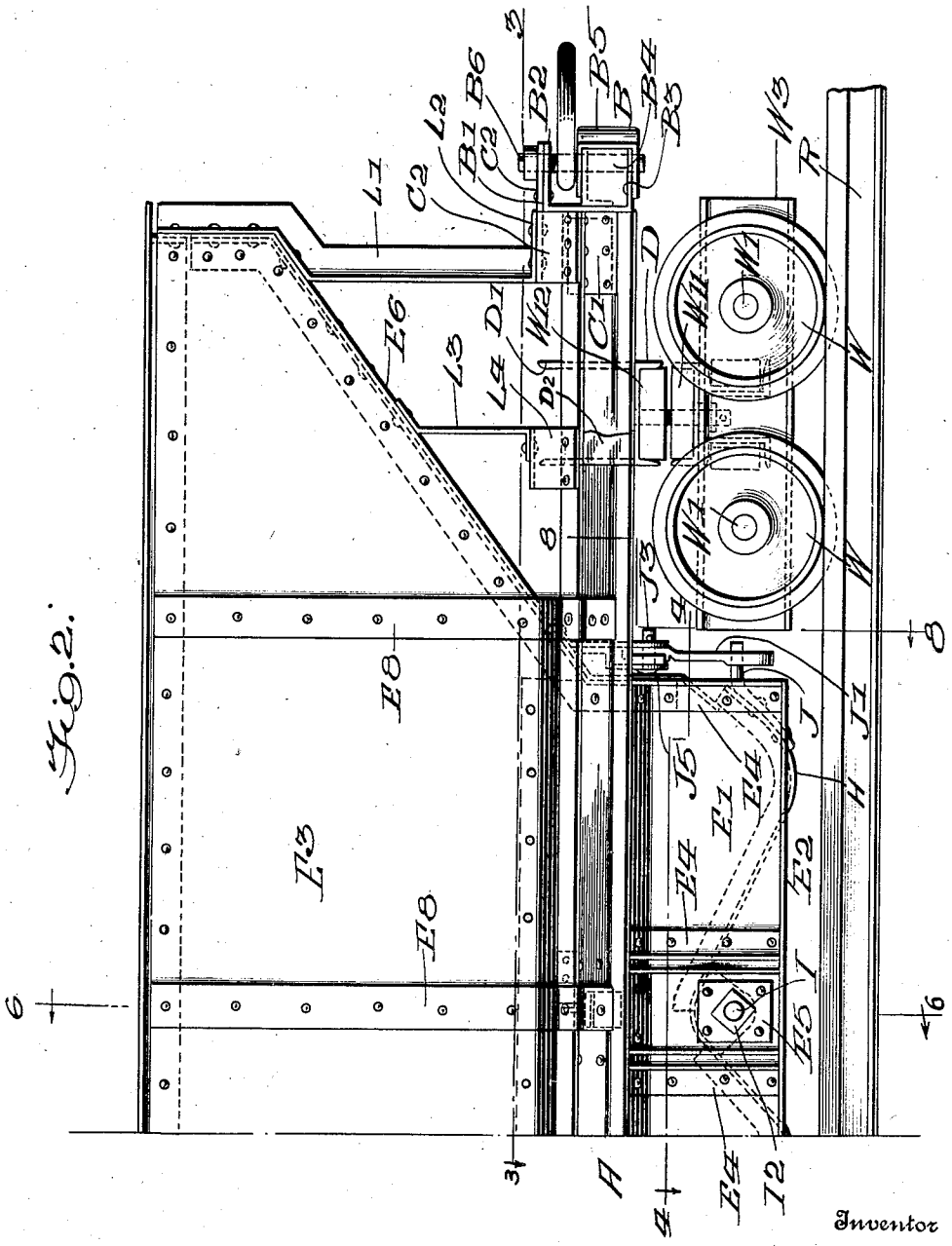


Fig. 2.

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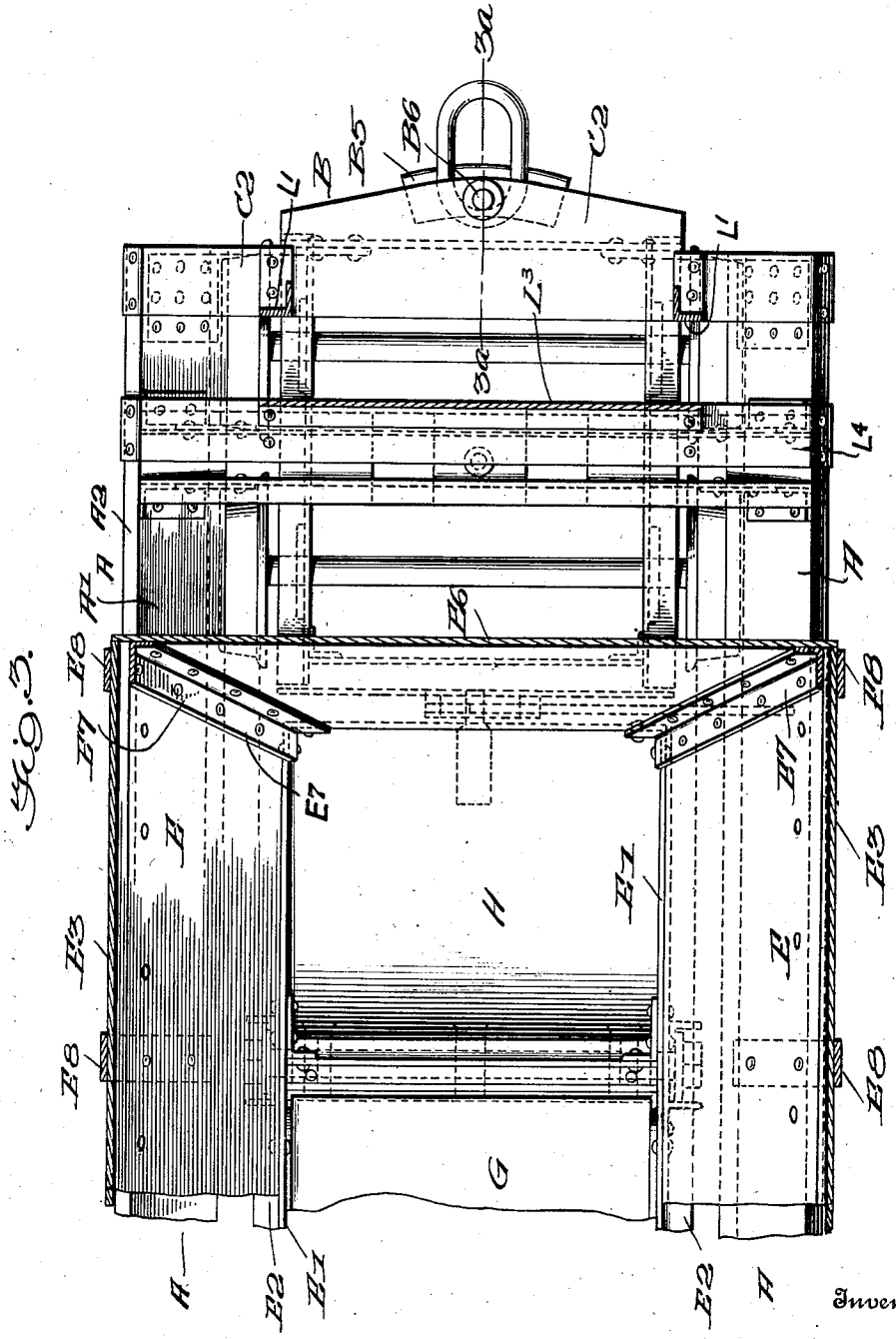
Attorney

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RAILWAY CAR

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Fig. 3.



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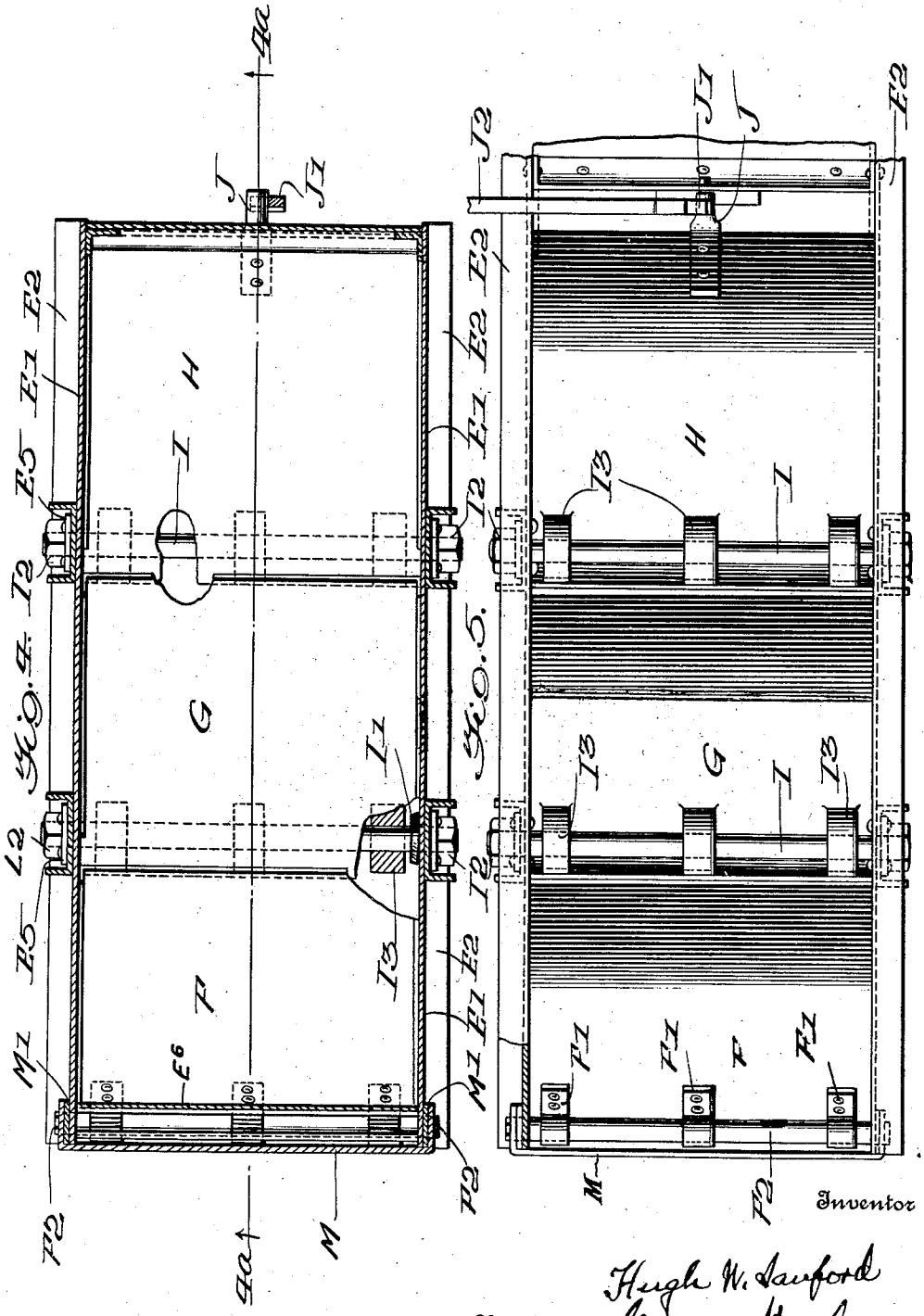
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Oct. 6, 1931. H. W. SANFORD 1,826,367

RAILWAY CAR

Filed May 8, 1928 8 Sheets-Sheet 4



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RAILWAY CAR

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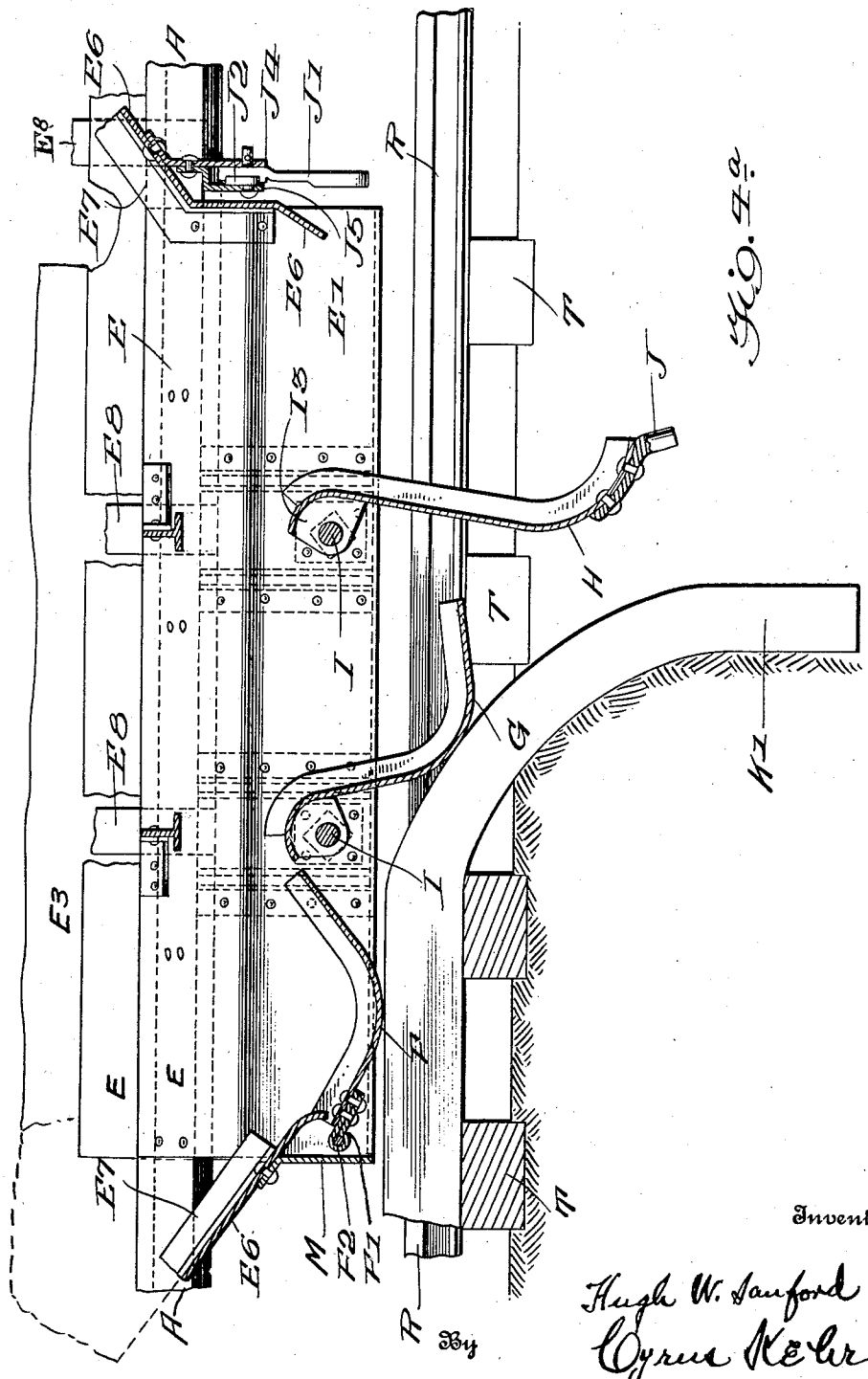


Fig. 4a.

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RAILWAY CAR

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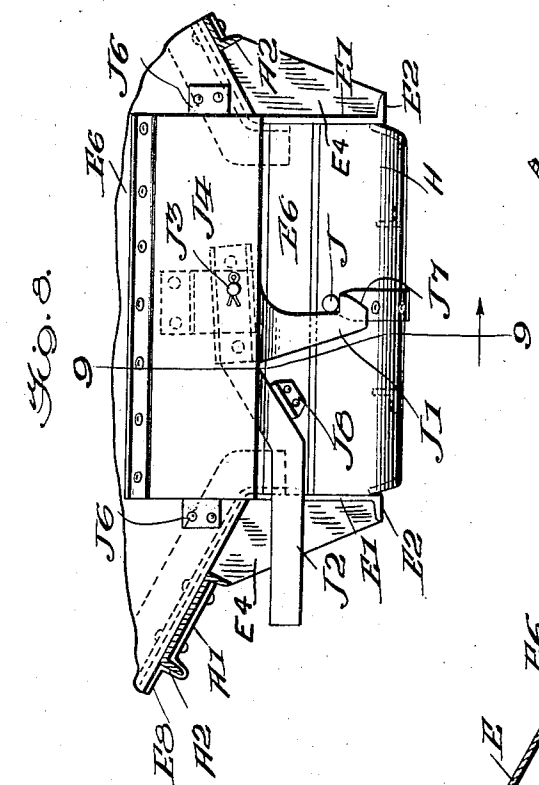


Fig. 8.

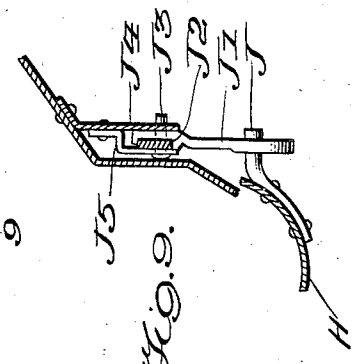


Fig. 9.

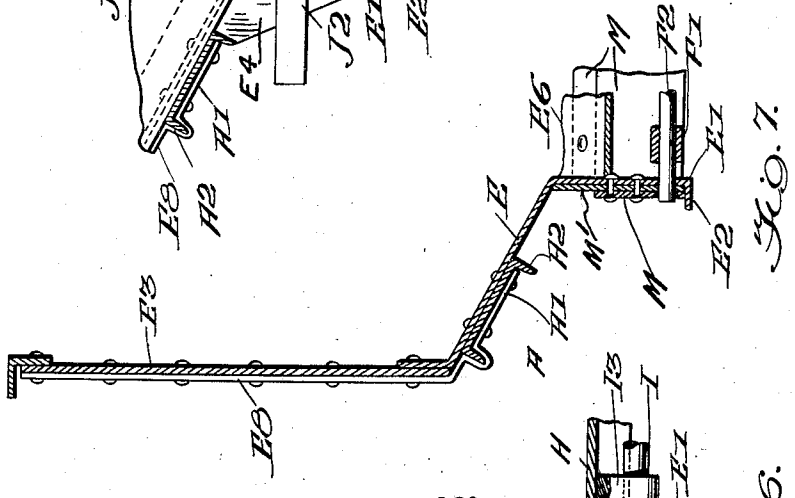


Fig. 7.

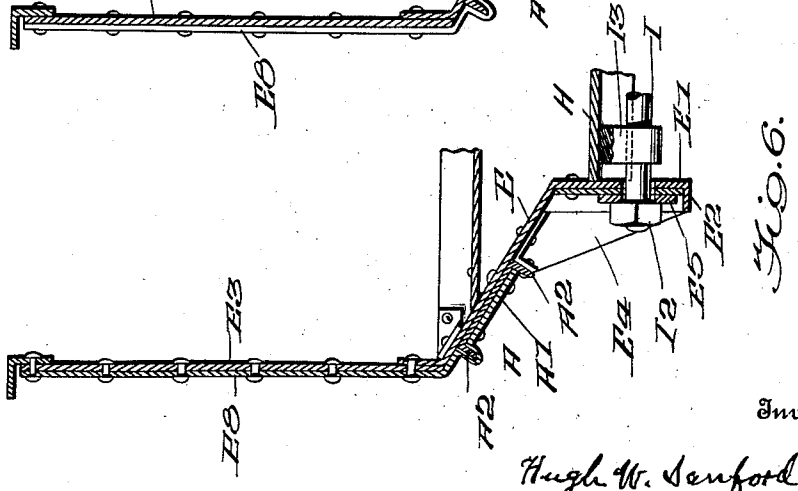


Fig. 6.

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RAILWAY CAR

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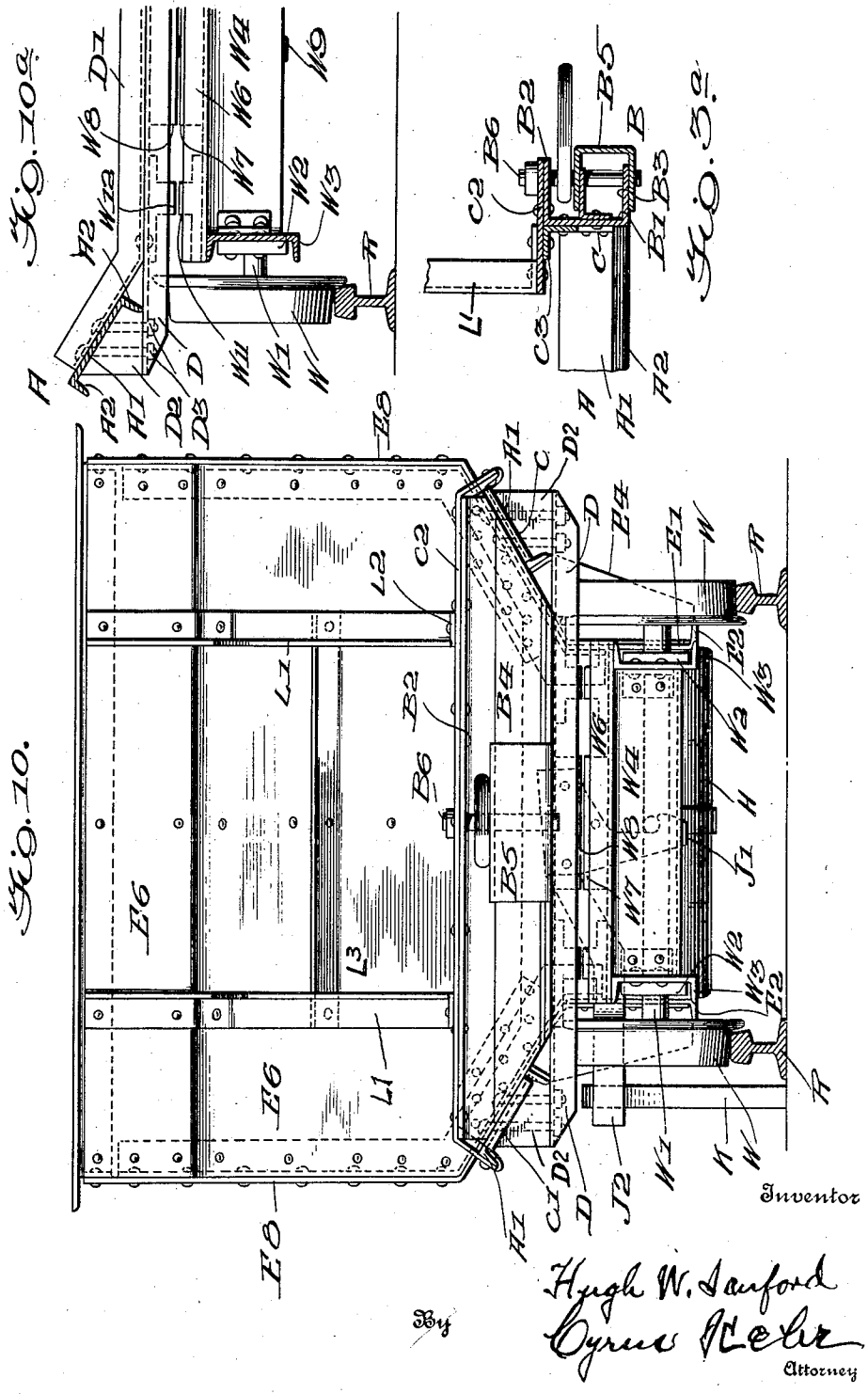


Fig. 10.

Fig. 10a.

Fig. 5a.

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RAILWAY CAR

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Fig. 11.

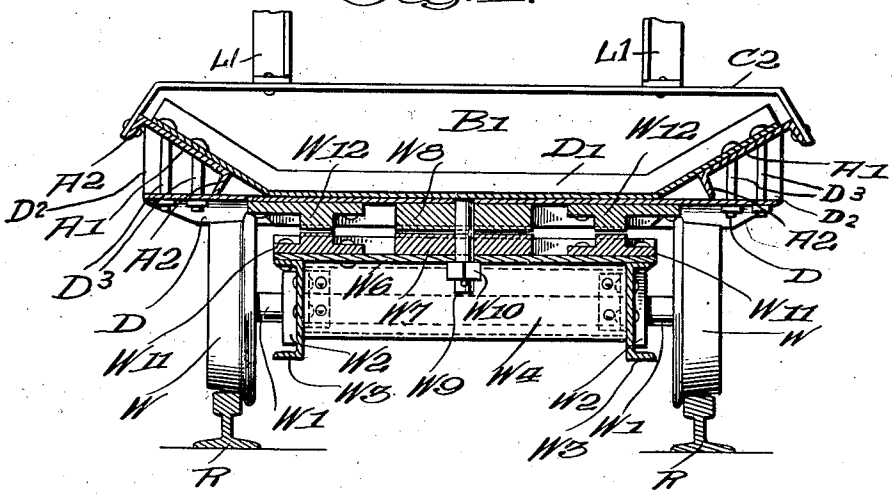


Fig. 12.

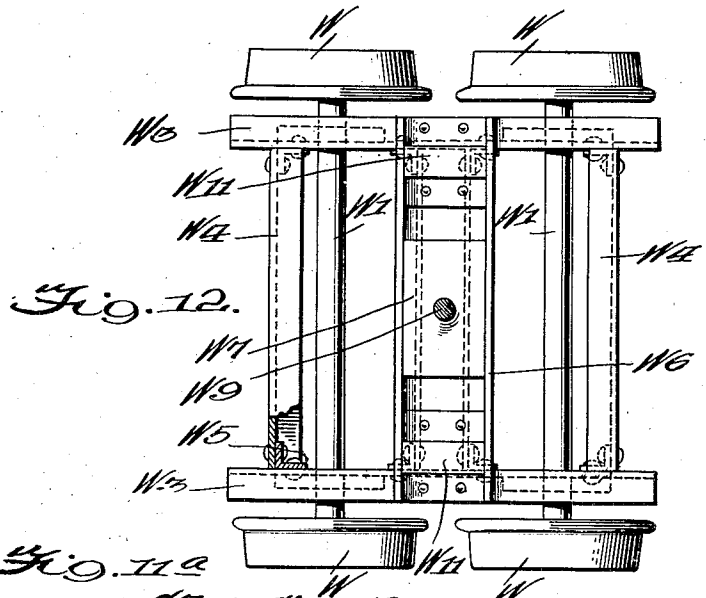


Fig. 11b

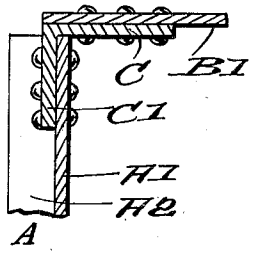
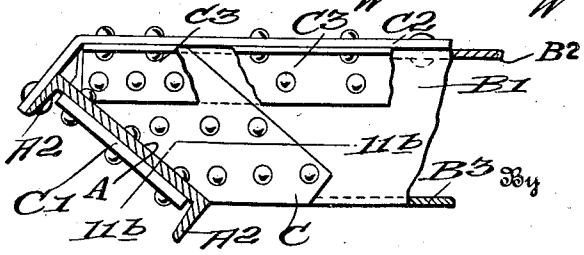


Fig. 11a



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Patented Oct. 6, 1931

1,826,367

UNITED STATES PATENT OFFICE

HUGH W. SANFORD, OF KNOXVILLE, TENNESSEE

RAILWAY CAR

Application filed May 3, 1928. Serial No. 276,016.

This improvement relates particularly to mine cars which are intended to be loaded in the mine and brought out of the mine in a train or trip and moved over a track and across a tipple for discharge of the mineral through the bottoms of the cars while the cars are crossing the tipple, 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. In the car of that patent there is a main frame composed of two relatively long side sills and end structures connecting the ends of the side sills. The side sills are shown as consisting of metal channels, the webs of the channels being upright and the flanges being turned outward horizontally and the two single axles extending through fixed bearings in the webs of the side sills.

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

Some mine cars are dumped by tilting and discharging material from the front end. A second method consists in rotating the car sidewise and thus discharging its load. These methods are not suited to use with large cars carrying heavy loads. The wear and tear on the cars and on the tipple structure is excessive.

Coal mining cars equipped with four wheels and two axles need flexibility in going around curves. For that 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. The largest standard roller bearing equipment which can economically be 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 cutting machine and the loading machine can be used most efficiently—cut and 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. Accordingly my present invention is described as including a body having its main part extended downward farther than in similar cars and preferably having two trucks each of which has two axles and four wheels and is swiveled. This car can be made 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. But, using the trucks has heretofore necessitated placing the side sills high enough to be above the trucks, and so placing the structure parts supported by the side sills as to avoid extending any of those parts downward over the outer faces of the wheels. The bottom discharge or dumping being between the rails on which the car wheels run, the discharge opening has necessarily been as narrow as the space between the rack rails. And heretofore the side sills in these truck cars have been spaced from each other a distance approximately equalling the width of the discharge opening. Thus the side sills have been placed in upright planes which extended downward near the inner faces of the car wheels. The side walls of the car body have been supported on the side sills and extended obliquely outward and upward from the upper edges of the side sills. From the upper line

of this slanting part of the wall, another part extended upward in an upright plane to the height of the car. The portion of the body wall extending outward needed to be slanting (not horizontal) in order to cause the coal in the side parts of the car body to slide to the discharge opening when the bottom doors were opened. Placing the side sills at such height and that near each other resulted in placing the lower edges of the slanting parts of the body walls high above the track.

By lowering the slanting parts of the car body walls, more space is provided in the lower part of the car body. That is desirable, because it has become desirable to increase the load capacity of these cars. Such slanting parts can be lowered by moving the side sills bodily outward horizontally or approximately horizontally, the slanting body walls then resting on the side sills and extending obliquely downward toward the middle of the car. If the side sills are of channel-form, it is preferable to tilt them outward sidewise to the slant of the slanting walls and place the web of the sill flatwise against the outer face of the slanting walls and join the web and the wall by riveting. By thus tilting the sills the slanting walls can be placed still lower while the sills remain at the same elevation. When the side sills are thus moved bodily outward, opportunity is given for varying the height of the sills above the track. For then the side sills are out of the range of the car wheels, and the sills may be supported on a cross member which is supported on the wheels, the support of the cross member on the wheels being, if desired, at an elevation different from the elevation of the sills.

The principal object of this invention is to effect such tilting and outward removal of the side sills and thereby effect such lowering of the slanting parts of the body side walls. As will be described further on, each side sill is given a new position against the lower or outer face of the slanting part of the body side wall.

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. 3*a* is an upright section on the line, 3*a*—3*a*, of Fig. 3, the filling member being omitted; (Sheet 7)

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

Fig. 4*a* is a longitudinal upright section on the line, 4*a*—4*a*, of Fig. 4, and showing the dumping operation;

Fig. 5 is a bottom view of the part of the car which is shown by Fig. 4, the gussets shown on Figs. 1 and 2 being omitted;

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. 10*a* is an upright section on the line, 10*a*—10*a*, of Fig. 1, looking toward the left;

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

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

Fig. 11*b* is a section on the line, 11*b*—11*b*, of Fig. 11*a*;

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

As above stated, the main part of the body structure in my improved car is the frame consisting of side sills and end structures or end sills. In that frame are two side sills, A, A, and two end structures or end sills, B, B. In the form shown in the drawings, the side sills are metal channels separated from each other farther than the width of the discharge opening in the finished car body structure and each sill having a web, A1, and flanges, A2. In other similar cars as heretofore built, that width has usually been equal to the distance between the track rails on which the car is to run. In my present car, the side sills are parallel to each other and they are shown extending lengthwise as far as the side walls of the upper part of the car body extend. In lieu of being placed to bring the webs, A1, of the sills into the upright position, these sills are turned or tilted outward sidewise to bring the webs to the slant that is given to the adjacent parts of the body side walls, the flanges, A2, being turned obliquely outward and downward.

At each end of the car, the adjacent ends of the sills, A, A, are joined by an end sill, B, which extends horizontally from one side sill to the other. The chief element of this end sill is a member formed by bending plate metal to produce an upright web, B1, and an upper horizontal flange, B2, and a lower horizontal flange, B3, similar to the main element of the end sill structure described and illustrated in my Letters Patent of the United States, No. 1,486,547, granted to me March 11, 1924. On the lower flange, B3, rests a filling member, B4. A buffer member, B5, extends over the outer part of said filling member and over the upper face and the lower face of said member. A coupling pin, B6,

of ordinary form extends downward through the flange, B2, and the buffer member, B5, the filling member, B4, and the lower flange, B3.

The meeting ends of the side sills and the end sill are joined by corner angle members. (Figs 11*a*, 11*b* and 3*a*.) Each such member has a wing, C, lying against and riveted to the web, B1, of the end sill. Another inclined wing, C1, extends across the adjacent end of the side sill and along the outer inclined face of the web, A1, of the side sill and is riveted to said web.

The side sill and the end sill are further joined by means of a metal top plate, C2, which extends across the upper face of the upper flange, B2, and is riveted thereto and also receives the coupling pin, B6. At each end said plate extends obliquely downward over the upper flange, A2, of each side sill and is riveted to said flange. At the back of the end sill, B1, an angle bar, C3, has its horizontal web bearing against the under face of the top plate, C2, and is riveted thereto and has its upright flange resting against the adjacent web, B1, of the end structure and riveted to said web. (Fig. 3*a*).

Above each truck is a lower transverse frame member, D, and an upper transverse frame member, D1. The member, D, is straight and crosses each side sill immediately below said sill. Said member, D, is shown in the form of a horizontal channel having its flanges turned downward. The member, D1, is also shown as a metal channel. It has its flanges turned upward, its web resting upon the web of the member, D, and secured thereto by rivets. Each end of the member, D1, is turned upward obliquely and made to rest on the upper face of the adjacent side sill. A cast iron filling block, D2, is shaped to rest on the web of the transverse member, D, and to bear against the lower face of the web of the side sill. Binding bolts, D3, extend through the web of the transverse member, D1, the web of the side sill, the filling block, and the web of the lower transverse member, D. Thus the side sill and the transverse members, D and D1, are firmly bound to each other. The transverse members, D and D1, are auxiliary to the end sills in the car body frame.

Each transverse channel member, D, is supported by one of the trucks, as next described.

Each end of the frame formed by the side sills and the end structures and the transverse members, D and D1, 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 and below the transverse member, D, already described, is a lower channel member, W6, which 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. As above described, the transverse channel member, D, has its flanges directed downward.

Midway between the ends of the channel members, W6 and D, are turntable blocks, W7 and W8, the lower block, W7, being seated in and secured to the channel member, W6, and the upper block, W8, being fitted into and secured to the channel member, D. A king pin, W9, extends through the channel member, D, and the blocks, W7 and W8, and the channel member, W6. Below the channel member, W6, a nut, W10, is applied to the king pin. In each end of the lower channel member, W6, is placed and suitably secured a pillow block, W11; and above each of said blocks there is placed in and suitably secured to the channel member, D, a corresponding pillow block, W12. The blocks, W11, are separated from the blocks, W12, sufficiently to allow some sidewise rocking of the car body or tilting of the truck in passing over irregularities in the rail track.

At each side of the car body a lower side plate, E, extends obliquely across the upper face of the adjacent side sill, A, and is secured to the side sill by rivets or bolts. Between the trucks, each lower side plate, E, extends obliquely downward a little beyond the inner plane of the adjacent truck wheels, W, and then downward to form an upright part, E1, which extends nearly to the level of the top of the track rails, R. The end edges of the parts, E1, are upright. The lower edge of said part, E1, is bent outward to form a flange, E2. Upright gusset plates, E4, are inserted between that flange and the lower flange of the adjacent side sill and have flanges bearing against the side sill lower flange, A2 and against the flange, E2, and against the adjacent face of the side plate, E, and the part, E1, of the side plate and said gusset plate flanges are riveted to the side sill lower flange and to the side plate, E, and the part, E1, and the flange, E2, of the side plate. Thus all of the side plate, E, which extends below the side sill is given stability. (See Figs. 1, 2 and 6. The gusset plates are omitted from Figs. 3, 4 and 5.)

Near and at opposite sides of the middle transverse, upright plane of the car, a bearing plate, E5, is riveted to the outer face of

each part, E1, of the lower side plate immediately above the flange, E2. Thus two pairs of bearing plates are formed for horizontal door hinge rods, I. These rods extend from one side plate part, E1, to the other and through said parts and the bearing plates, E5. Each projecting end of each rod receives a nut, I2. At the inner face of the adjacent side plate part, E1, each rod has an annnular shoulder, I1. (Fig. 4.) The bottom doors are supported by these hinge rods, as will be described further on.

Each side plate, E, extends obliquely upward beyond the side sill, A, until it meets the lower edge of the upper side plate, E3. Above the part, E1, the end edges of the plate, E, extend obliquely upward toward the ends of the car. The horizontal edges of the plate, E, and the plate, E3, are suitably secured to each other, as by overlapping and riveting. The upper plate, E3, extends upward to the upper edge of the car body.

Each end of each upper side plate, E3, extends obliquely endwise and upward to the end of the car body and thence upward along the end of the car body.

At each end of the car body, an end plate, E6, extends from one upper side plate and the adjacent lower side plate to the other side plates and has its edges secured to the adjacent edges of said other plates by means of angle bars, E7, bolts or rivets joining the angle bars to the plates. The lower edge of each end plate, E6, extends downward between the other plates close to the adjacent bottom door, as will be described further on.

At the forward end of the car a cross bar, L5, bears against the outer face of the adjacent end plate, E6, and is suitably secured to said plate. This is a means of reinforcing the end plate and the angle bars used for joining the end plate to the side plates.

Binding straps, E8, extend over the outer face of the upper part of each side wall, E3, and are folded over the outer or upper flange, A2, of each inclined side sill and extend over the outer or lower face of the web, A1, of the side sill, and said straps are riveted to the adjacent walls and side sills. Thus the walls are reinforced and are firmly bound to the side sills, whereby greater firmness is given to the body of the car.

This part of the car body is further reinforced by two standards, L1, which rest on the top plate, C2, and bear against the outer face of the end plate and are suitably secured thereto as by riveting. On the lower end of each standard is a foot, L2, turned away from the body of the car and resting on and riveted to the top plate, C2. At the rear end of the car body, standards, L1, are applied as at the forward end of the car. Forward of these rear standards, a reinforcing plate, L3, has its lower edge turned horizontally forward and has each end resting on a foot plate, L4, which rests on the upper face of the adjacent side sill. The foot plates and the plate, L3, are riveted to the side sills and to each other. The upper edge of the plate, L3, is riveted to the end plate, E6.

At the forward ends of the parts, E1, of the side plates, E, an extension end plate, M, reaches horizontally from one of said plates, E, to the other and across the ends of said plates and has an upper oblique part which overlaps the under face of the end plate, E6, and is riveted thereto. The ends of the extension plate, M, are extended and folded to lie against the adjacent outer face of a reinforcing plate, M1, lying against the outer face of each part, E1, of the side plates, E, and each folded end is suitably secured to the adjacent reinforcing plate, M1, and the plate, E1. This extension plate, M, serves to connect the end plate, E6, and the plates, E1, to each other, whereby this downward extension structure is made stronger. To the downward extension structure are to be added the automatically-controlled plate metal doors, F, G and H.

A horizontal door hinge rod, F2, has its ends resting in bearings formed in the plates, E1 and M1, and the folded ends of the extension end plates, M. Hinge members, F1, are applied to the rod, F2, to support the door, F.

Hinge blocks, I3, are applied to the hinge rods, I, to support the forward ends of the doors, G and H. The upper faces of these blocks, I3, are shown concentric with the shafts on which they are supported, and the adjacent part of each door is correspondingly curved and secured to the blocks. The forward door, F, and the middle door, G, are curved downward between their ends. The rear edge of the front door, F, rests on the forward edge of the door, G, when these doors are in the raised or closed position. The rear edge of the door, G, rests on the forward edge of the door, H, when these doors are in the raised or closed position. The hinge blocks, I3, and the forward ends of the doors, G and H, extend forward beyond the hinge rods, I, sufficiently to allow the doors, F and G, 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. (Figs. 2, 3, 4, 4*a*, 5, 8, 9 and 10). Said arm and said hook are joined by bolts or rivets. The ends of the binding plate, J4, are secured to the end wall, E6, by means of ears, J6,

which extend from the ends of the binding plate. The upper edge of the binding plate, J4, is bent obliquely to bear flatwise against the outer face of the end plate, E6, 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. 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 adjacent shaft, I, 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 adjacent shaft, I, 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 hinge rod, 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 stationary cam member, K, (Fig. 10) 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, J1, a bracket, J8, 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 edge, J7, which is normally held in the path of the latch arm, J. (Fig. 8.) 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 tipple 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, F, into engagement with a stationary cam member, K1, 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 member and has been forced upward thereby a little way above its normal or closed position and until the rear door, H, has been 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 forward door, F, out of engagement with the cam member, K1, the rear part of said door descends by gravity and again rests on the forward part of the middle door, G. When the door, G, passes out of engagement with the cam member, K1, said door descends and its rear edge again rests on the forward edge of the rear door, H. When the door, H, passes out of engagement with the cam member, K1, 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.

I claim as my invention:

1. In a car of the kind described, the combination of sidewise tilted side sills, end structures joining the ends of the side sills, slanting body plates supported by the side sills, and automatic hinged bottom doors.

2. In a car of the kind described, the combination of sidewise tilted side sills, end structures joining the ends of the side sills, slanting body plates supported by the side sills, transverse members connecting the side sills, wheels and axles supporting the transverse members, and automatic hinged bottom doors.

3. In a car of the kind described, the combination of side sills located outside of the upright planes of the car wheels, slanting body plates secured to and extending beyond the side sills toward the opposite side of the car, and automatic hinged bottom doors.

4. In a car of the kind described, the combination of sidewise tilted side sills located outside of the upright planes of the car wheels, a slanting body plate resting on and secured to and extending beyond each side sill toward the opposite side of the car, and automatic hinged bottom doors.

5. In a car of the kind described, the combination of obliquely outward and upward directed body side walls, sidewise tilted side sills applied to said walls, end structures joining the side sills, transverse members and filling blocks supporting the side sills, wheels and axles supporting the transverse members, and a plurality of hinged bottom doors.

6. In a car of the kind described, the combination of obliquely outward and upward directed body side walls, sidewise tilted side sills applied to said walls, end structures including a top plate joining the side sills, wheels and axles supporting the side sills, and a bottom hinged transversely to the length of the car.

7. In a car of the kind described, the combination of obliquely outward and upward directed body side walls, sidewise tilted side sills applied to said walls, end structures including a top plate, the plate being joined to the side sills, angle members joining the end structures to the side sills, wheels and axles supporting the side sills, and a plurality of bottom doors hinged transversely to the length of the car.

8. In a car of the kind described, the combination of obliquely outward and upward directed body side walls, side sills applied to said walls, end structures including a top plate and an angle bar and joining the side sills, wheels and axles supporting the side sills, and bottom doors hinged transversely to the length of the car.

9. In a car of the kind described, the combination of obliquely outward and upward directed body side walls, end walls, side sills applied to said walls, end structures including a top plate joining the side sills, body standards joined to the end walls and to said top plates, wheels and axles supporting the side sills, and hinged bottom doors.

10. In a car of the kind described, the combination of obliquely outward and upward directed body side sills applied to said walls between the longitudinal borders of said walls, transverse members and filling blocks supporting the side sills, wheels and axles supporting the transverse members, and a plurality of hinged bottom doors.

11. In a car of the kind described, the combination of a hinged bottom, body side walls extending outward from a line which is parallel to the length of the car and adjacent said bottom, side sills applied to said walls, and wheels and axles supporting the side sills.

12. In a car of the kind described, the combination of a middle bottom, body side walls extending outward from a line which is parallel to the length of the car and adjacent said bottom, side sills applied to said walls, and wheels and axles supporting the side sills.

13. In a car of the kind described, the combination of a middle bottom, body side walls extending obliquely outward and upward from a line which is parallel to the length of the car and adjacent said bottom, side sills applied to said walls, and wheels and axles supporting the side sills.

14. In a car of the kind described, the combination of a middle bottom, body side walls extending outward from a line which is parallel to the length of the car and adjacent said bottom, side sills applied to said walls, end structures between and secured to said side sills, and wheels and axles supporting the side sills.

15. In a car of the kind described, the combination of a plurality of hinged bottom doors, body side walls extending obliquely outward and upward from a line which is parallel to the length of the car and adjacent said bottom, side sills applied to said walls, and wheels and axles supporting the side sills.

16. In a car of the kind described, the combination of a hinged bottom, body side walls extending outward from a line which is parallel to the length of the car and adjacent said bottom, side sills applied to said walls an upright wall rising from the outer part of said side walls, and wheels and axles supporting the side sills.

17. In a car of the kind described, the combination of a hinged bottom, a body side wall extending outward in the plane of two lines which are parallel to each other and to the length of the car and one of which lines is adjacent said bottom, side sills applied to said wall between said lines, and wheels and axles supporting the side sills.

18. In a car of the kind described, the combination of a hinged bottom, a body side wall extending obliquely outward and upward in the plane of two lines which are parallel to each other and to the length of the car and one of which lines is adjacent said bottom, side sills applied to said wall between said lines, and wheels and axles supporting the side sills.

19. In a car of the kind described, the combination of a middle bottom, a body side wall extending outward in the plane of two lines which are parallel to each other and to the length of the car and one of which lines is adjacent said bottom, side sills applied to said wall between said lines, and wheels and axles supporting the side sills.

20. In a car of the kind described, the combination of a hinged bottom, a body side wall extending outward in the plane of two lines which are parallel to each other and to the length of the car and one of which lines is adjacent said bottom, side sills applied to said wall between said lines, and wheels and axles supporting the side sills.

21. In a car of the kind described, the combination of obliquely outward and upward directed body side walls having their lower and their upper parts parallel to the length of the car, oblique side sills applied to said walls, wheels and axles supporting the side sills, and a hinged bottom.

22. In a car of the kind described, the combination of end plates, a middle bottom, body side walls extending outward from adjacent said bottom and from end plate to end plate, side sills applied to said side walls between

the longitudinal borders of said walls, and wheels and axles supporting the side sills.

23. In a car of the kind described, the combination of end plates, a hinged middle bottom, body side walls extending obliquely outward and upward from adjacent said bottom and from end plate to end plate, side sills applied to said side walls between the longitudinal borders of said walls and wheels and axles supporting the side sills.

24. In a car of the kind described, the combination of end plates, a plurality of hinged bottom doors, body side walls extending obliquely outward and upward from adjacent said bottom and from end plate to end plate, side sills applied to said side walls between the longitudinal borders of said walls and wheels and axles supporting the side sills.

25. In a car of the kind described, the combination of end plates, a plurality of bottom doors hinged transversely to the length of the car, body side walls extending outward from adjacent said bottom doors and from end plate to end plate, side sills applied to said side walls between the longitudinal borders of said walls, and wheels and axles supporting the side sills.

26. In a car of the kind described, the combination of end plates, a plurality of bottom doors hinged transversely to the length of the car, body side walls extending obliquely outward and upward from adjacent said bottom doors and from end plate to end plate, side sills applied to said side walls between the longitudinal borders of said walls and wheels and axles supporting the side sills.

27. In a car of the kind described, the combination of end plates, a hinged bottom, body side walls extending outward from adjacent said bottom and from end plate to end plate, sidewise-tilted side sills lying flatwise against and secured to said side walls between the longitudinal borders of said walls, and wheels and axles supporting said sills.

28. In a car of the kind described, the combination of end plates, a plurality of automatic hinged bottom doors, body side walls extending outward from adjacent said bottom doors and from end plate to end plate, sidewise-tilted side sills lying flatwise against and secured to said side walls between the longitudinal borders of said walls, and wheels and axles supporting said sills.

29. In a car of the kind described, the combination of end plates, a middle bottom, body side walls extending outward from adjacent said bottom and from end plate to end plate, sidewise-tilted side sills lying flatwise against and secured to said side walls between the longitudinal borders of said walls, end structures located between and joined to the side sills, and wheels and axles supporting said sills.

30. In a car of the kind described, the combination of end plates and side walls meeting the end plates and said plates and walls enclosing a discharge space, the side walls extending outward from said discharge space, oblique side sills applied to said side walls between the longitudinal borders of said side walls, and wheels and axles supporting said sills.

31. In a car of the kind described, the combination of end plates and side walls meeting the end plates and said plates and walls enclosing a discharge space, said side walls extending obliquely outward and upward from said discharge space, oblique side sills applied to said walls, and wheels and axles supporting said sills.

32. In a car of the kind described, the combination of end plates, a middle bottom, body side walls extending outward adjacent said bottom and from end plate to end plate, channel-form sidewise-tilted side sills having their webs placed flatwise against and secured to said side walls between the longitudinal borders of said walls, and wheels and axles supporting said sills.

33. In a car of the kind described, the combination of end plates, a middle bottom, body side walls extending outward from adjacent said bottom and from end plate to end plate, side sills applied to said side walls between the longitudinal borders of said walls, a cross member at each end of the car and supporting the side sills, axles in operative relation with said cross members, and wheels on said axles.

34. In a car of the kind described, the combination of end plates, a middle bottom, body side walls extending outward from adjacent said bottom and from end plate to end plate, side sills applied to said side walls between the longitudinal borders of said walls, a cross member at each end of the car and supporting the side sills, and trucks in operative relation with said cross members.

35. In a car of the kind described, the combination of a middle bottom, outward-directed body side walls extending between two lines which are parallel to each other and to the length of the car, oblique side sills applied to said walls between said lines, and wheels and axles supporting the side sills.

36. In a car of the kind described, the combination of a middle bottom, outward-directed body side walls extending between two lines which are parallel to each other and to the length of the car, side sills applied to said walls between said lines, wheels and axles supporting the side sills, and gussets placed for supporting said side walls.

In testimony whereof I have signed my name, this 5th day of May, in the year one thousand nine hundred and twenty-eight.

HUGH W. SANFORD.