Dec. 8, 1936. H. F. FLOWERS 2,063,544

UNDERGROUND MINE CAR

Original Filed Dec. 7, 1931 10 Sheets-Sheet 1

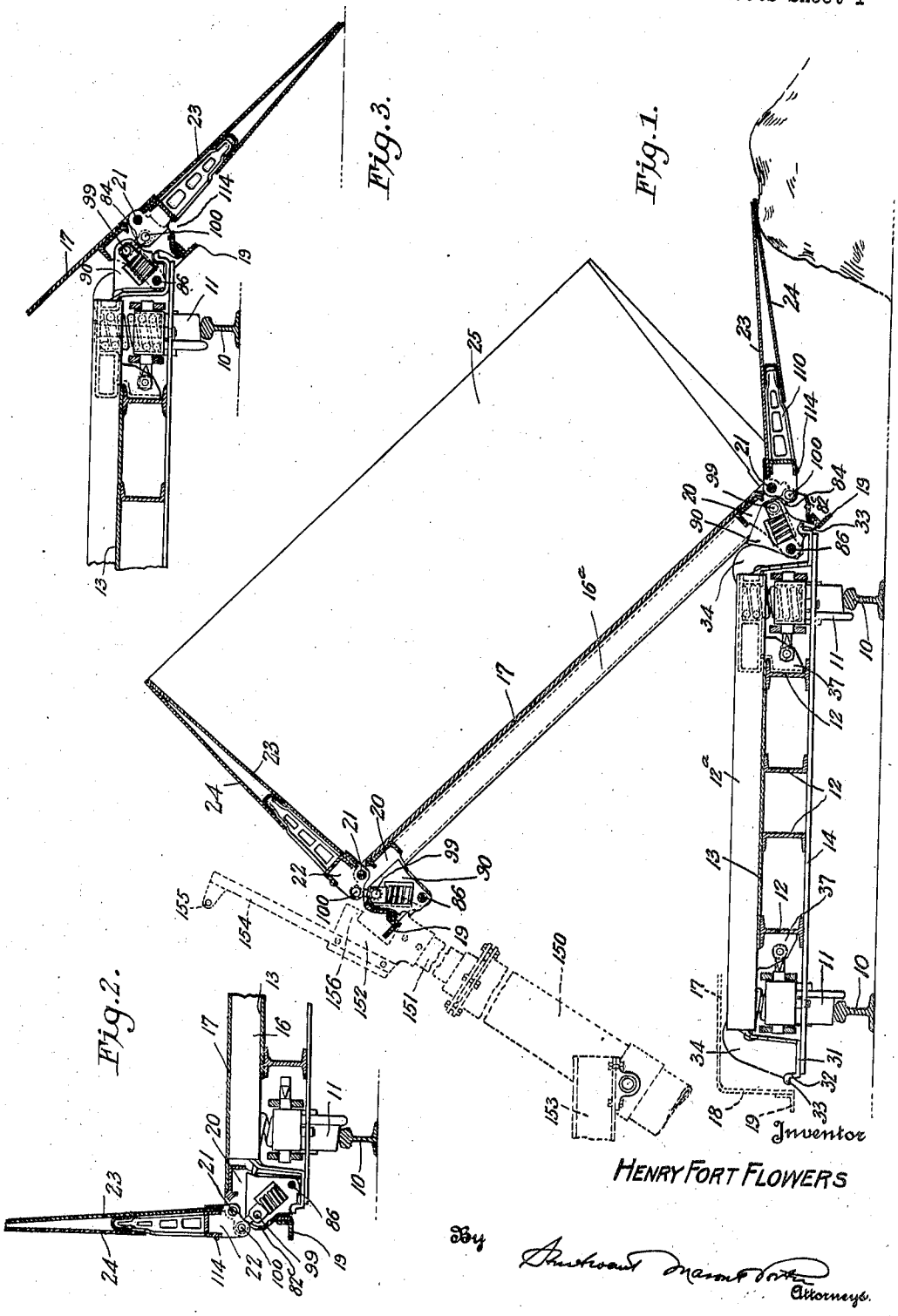


Fig. 3.

Fig. 1.

Fig. 2.

Inventor

HENRY FORT FLOWERS

By Attorneys.

Dec. 8, 1936. H. F. FLOWERS 2,063,544

UNDERGROUND MINE CAR

Original Filed Dec. 7, 1931 10 Sheets-Sheet 2

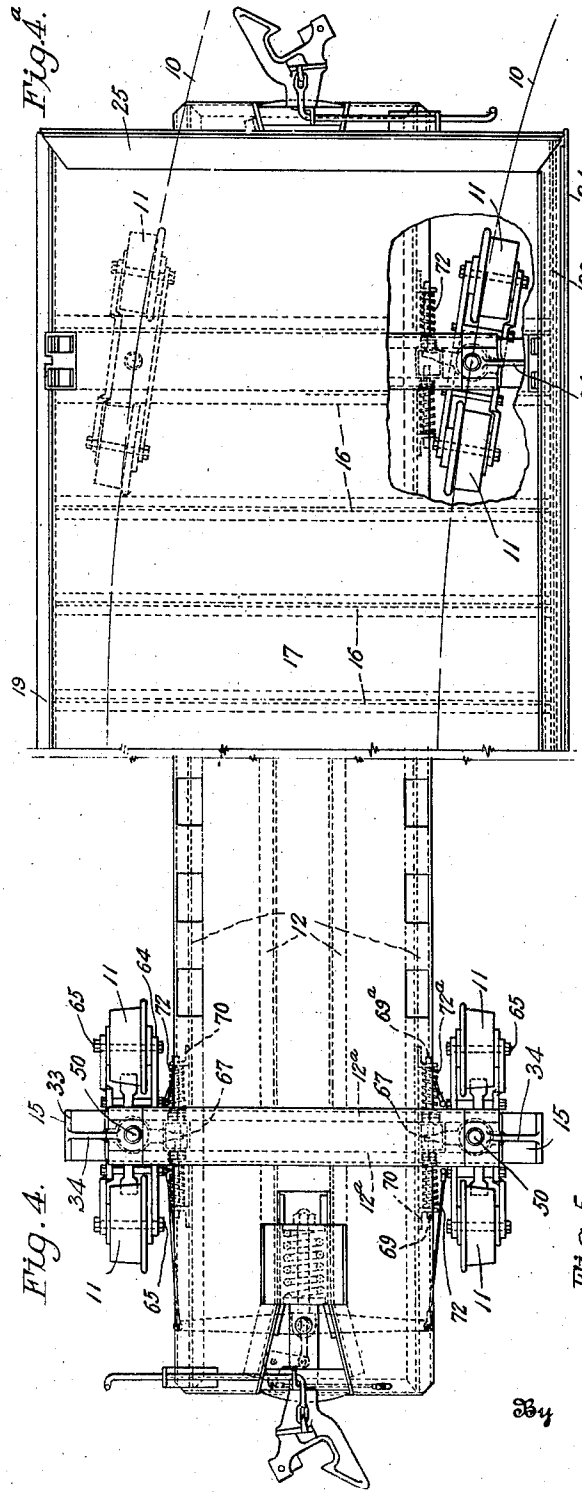


Fig. 4.

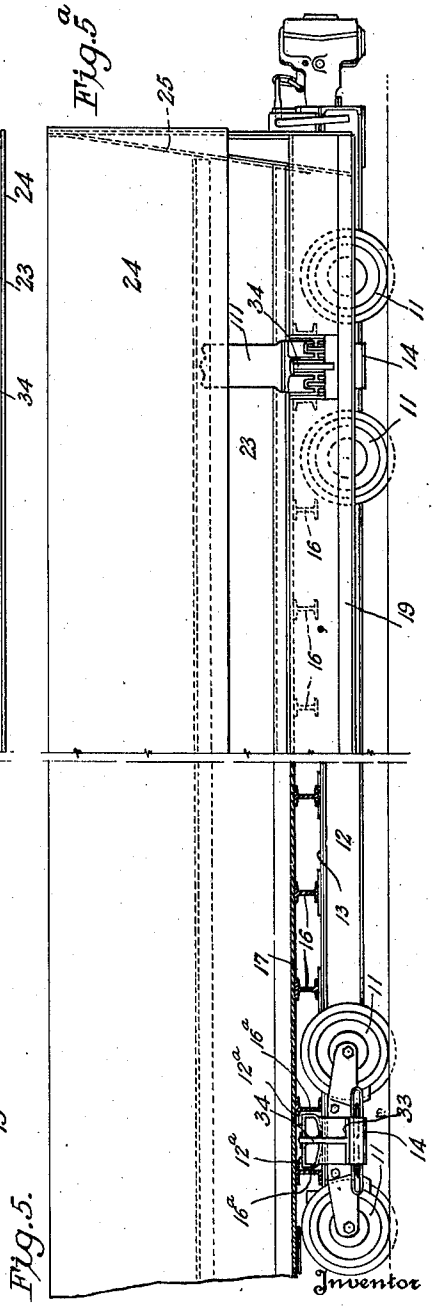


Fig. 5.

Inventor

HENRY FORT FLOWERS

By Shumway, Mason & Porter

Attorneys.

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UNDERGROUND MINE CAR

Original Filed Dec. 7, 1931 10 Sheets-Sheet 3

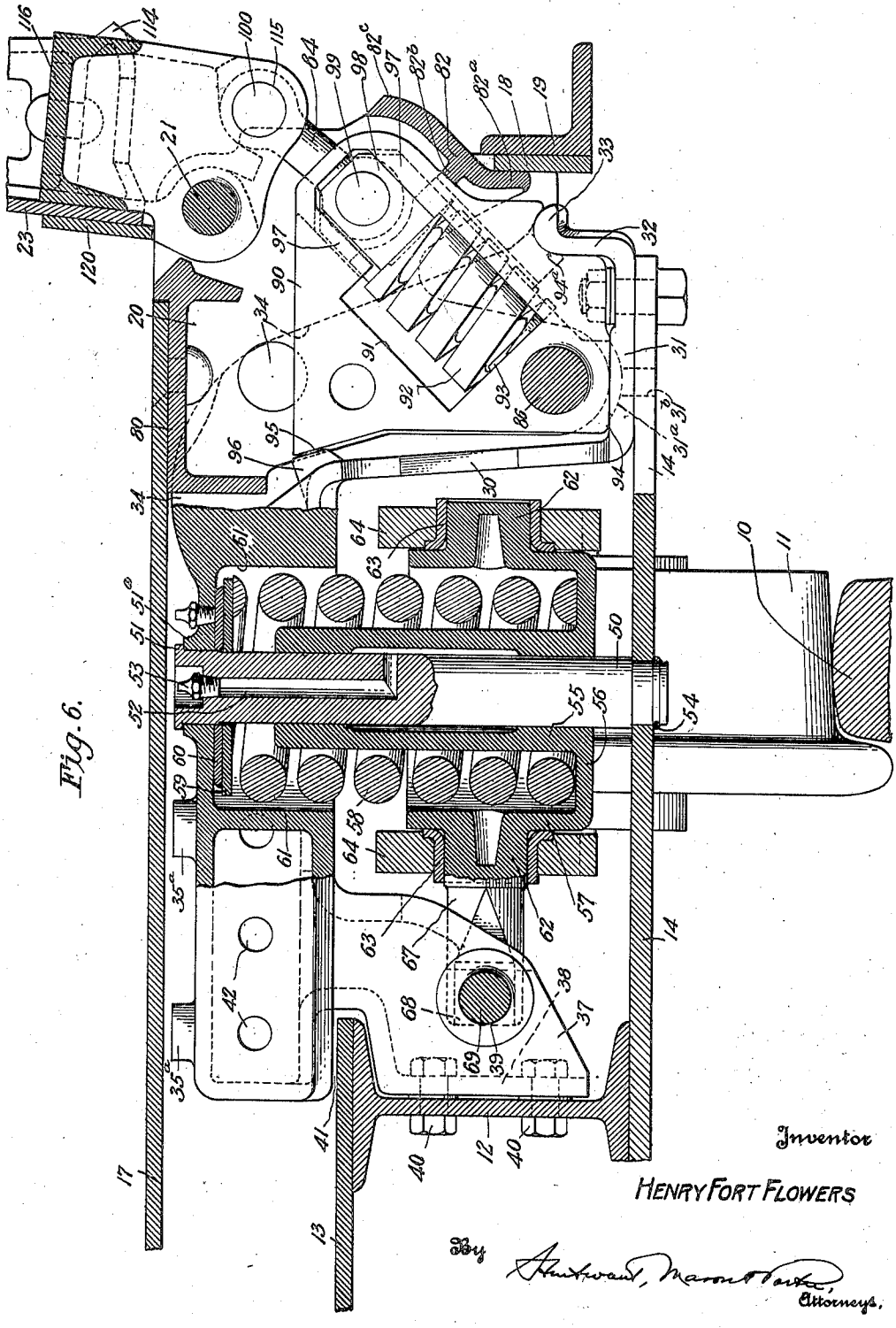


Fig. 6.

Inventor

HENRY FORT FLOWERS

By Attorneys.

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UNDERGROUND MINE CAR

Original Filed Dec. 7, 1931 10 Sheets-Sheet 4

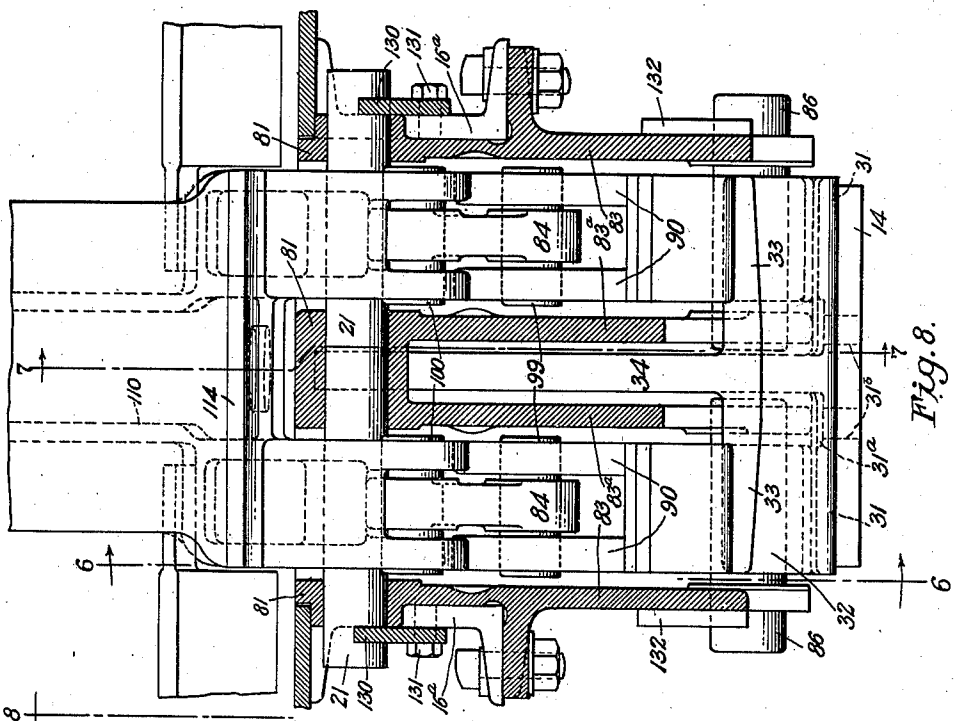


Fig. 8.

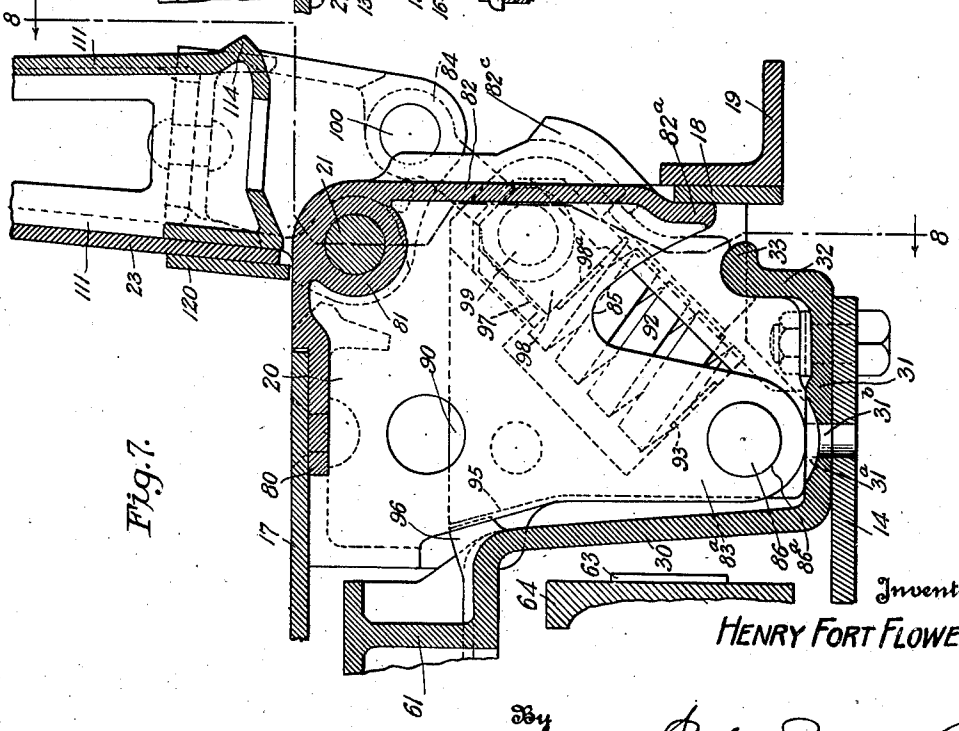


Fig. 7.

Inventor
HENRY FORT FLOWERS

By

Attorneys

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UNDERGROUND MINE CAR

Original Filed Dec. 7, 1931 10 Sheets-Sheet 5

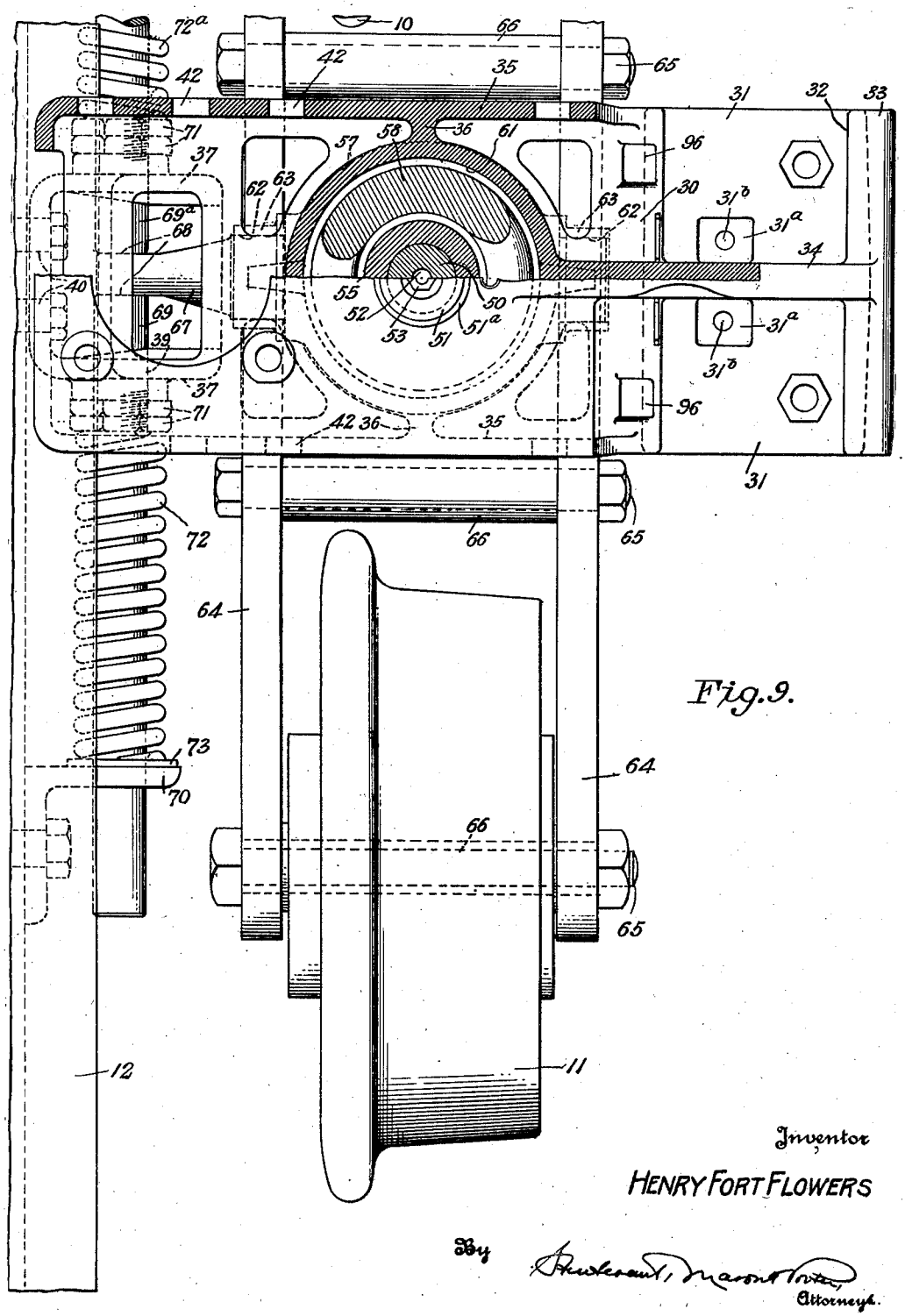


Fig. 9.

Inventor

HENRY FORT FLOWERS

By Rowland, Mason & Foster

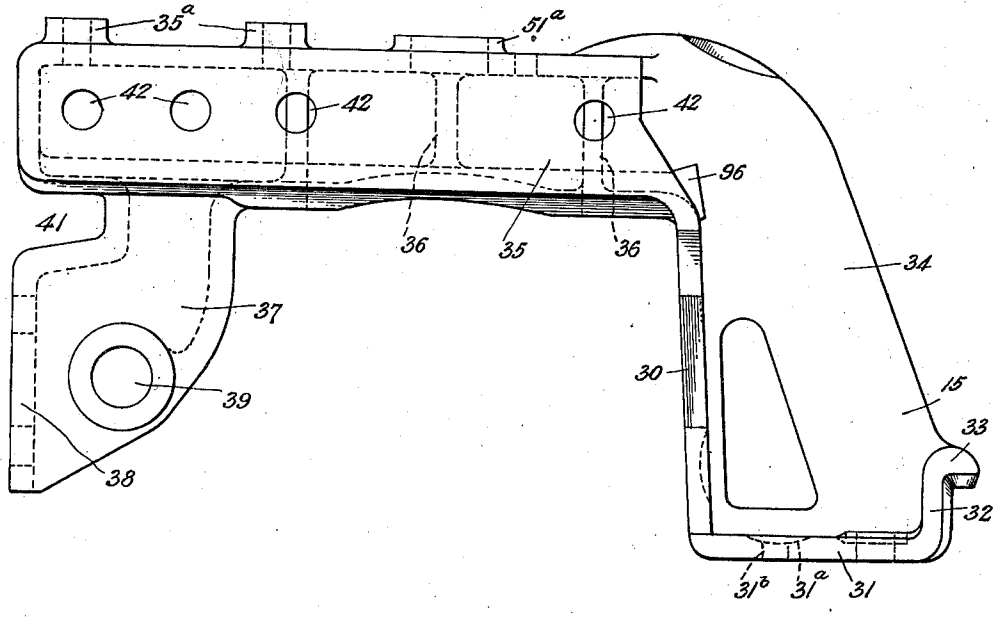
Attorneys.

Dec. 8, 1936. H. F. FLOWERS 2,063,544

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Fig. 10.



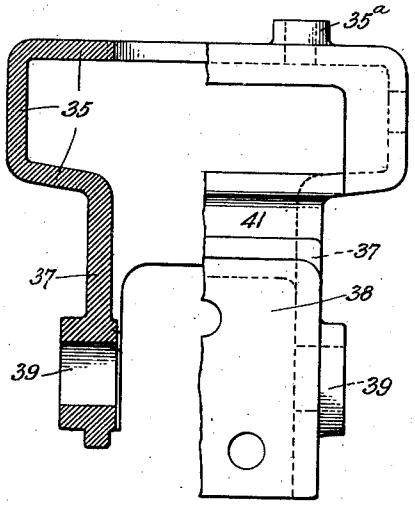


Fig. 11.

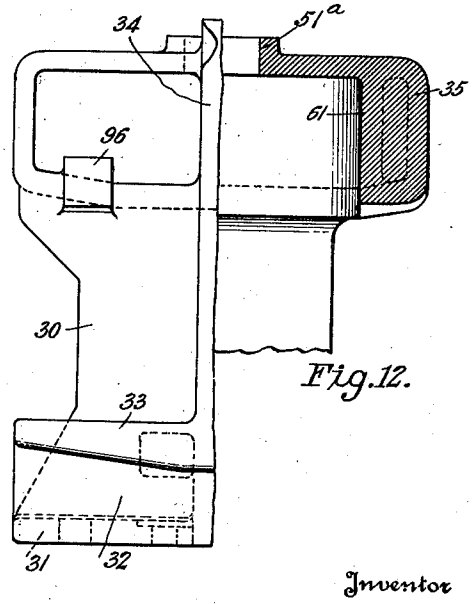


Fig. 12.

Inventor

HENRY FORT FLOWERS

By Stewart, Marrow & Coates,

Attorneys

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UNDERGROUND MINE CAR

Original Filed Dec. 7, 1931 10 Sheets-Sheet 7

Fig. 17.

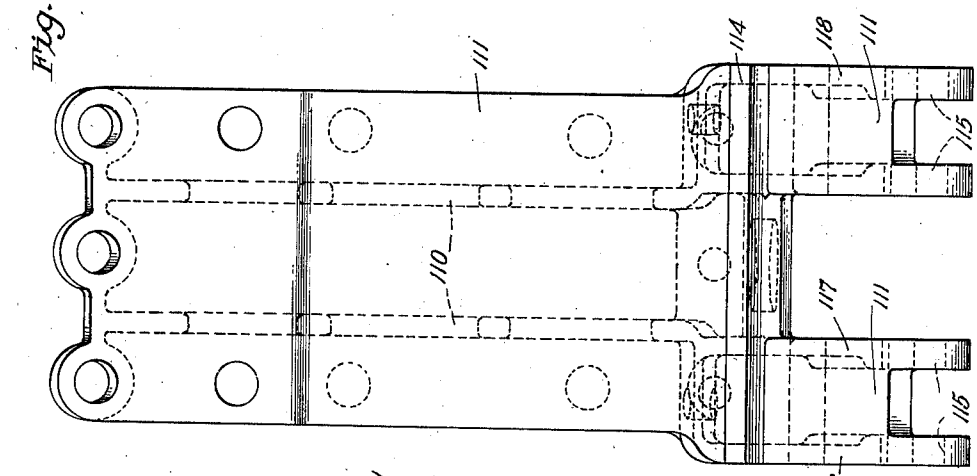


Fig. 16.

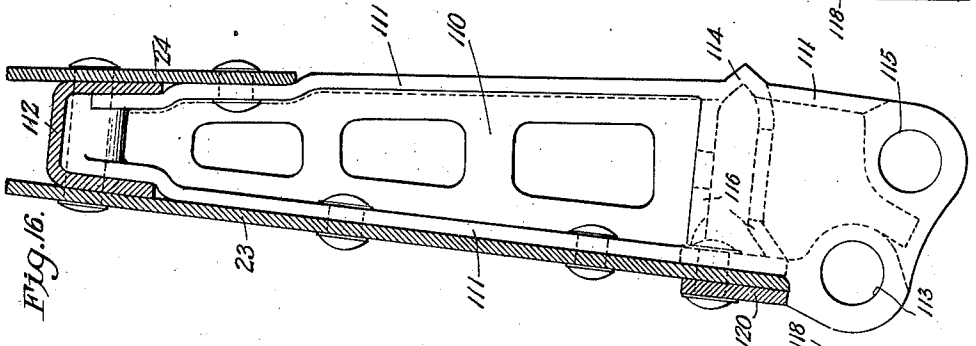


Fig. 13.

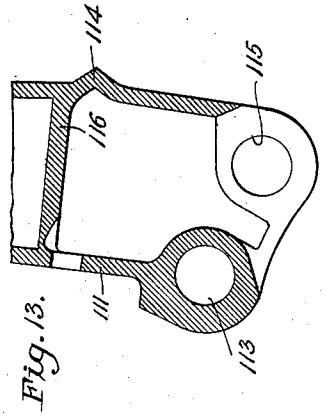


Fig. 14.

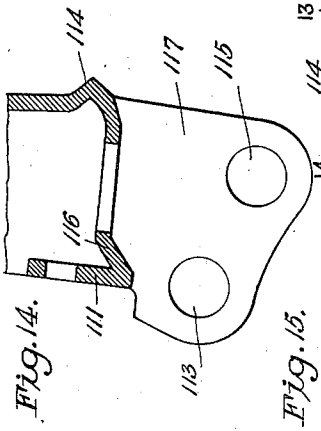
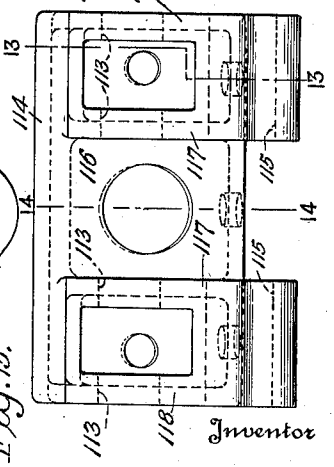


Fig. 15.



Inventor

HENRY FORT FLOWERS

By Attorneys

Dec. 8, 1936. H. F. FLOWERS 2,063,544

UNDERGROUND MINE CAR

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Fig. 19.

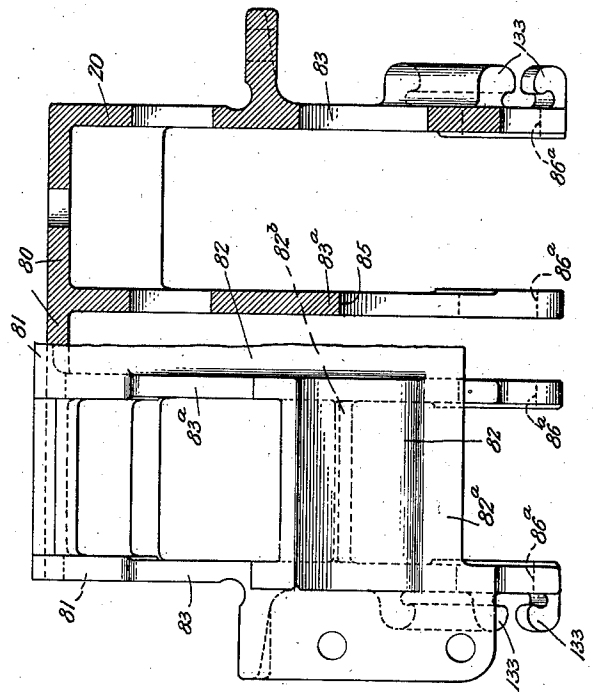
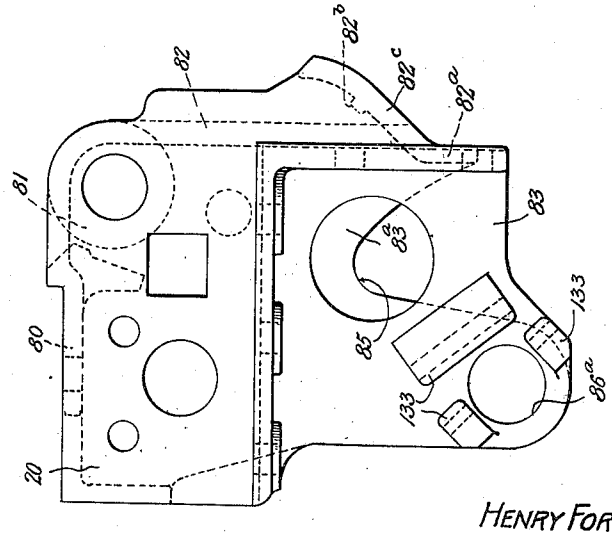


Fig. 18.



Inventor

HENRY FORT FLOWERS.

By Attorneys

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UNDERGROUND MINE CAR

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Fig. 20.

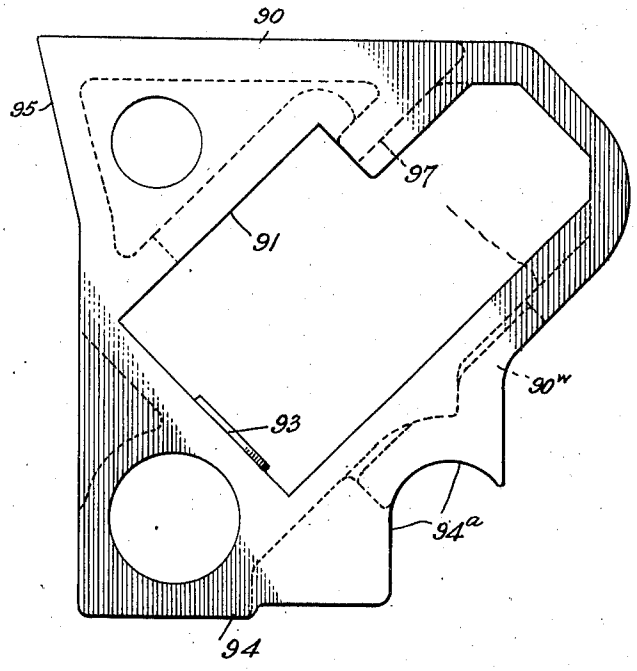
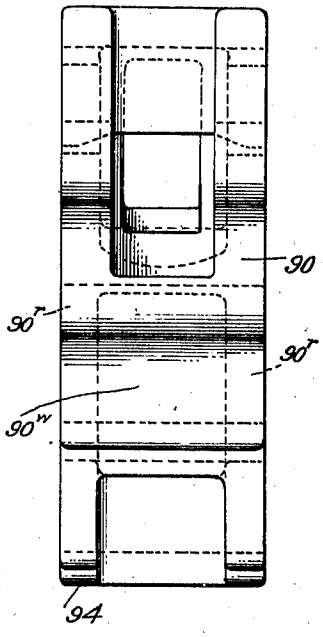


Fig. 21.



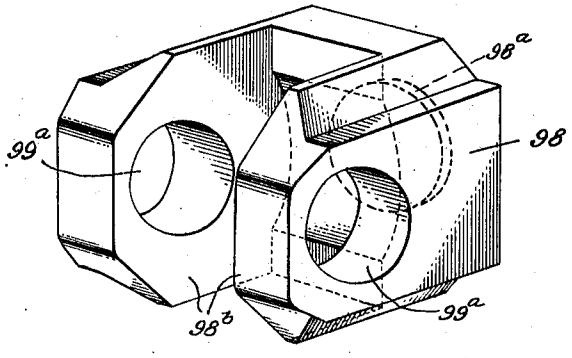


Fig. 22.

Inventor

HENRY FORT FLOWERS

By Attorneys.

Dec. 8, 1936. H. F. FLOWERS 2,063,544

UNDERGROUND MINE CAR

Original Filed Dec. 7, 1931 10 Sheets-Sheet 10

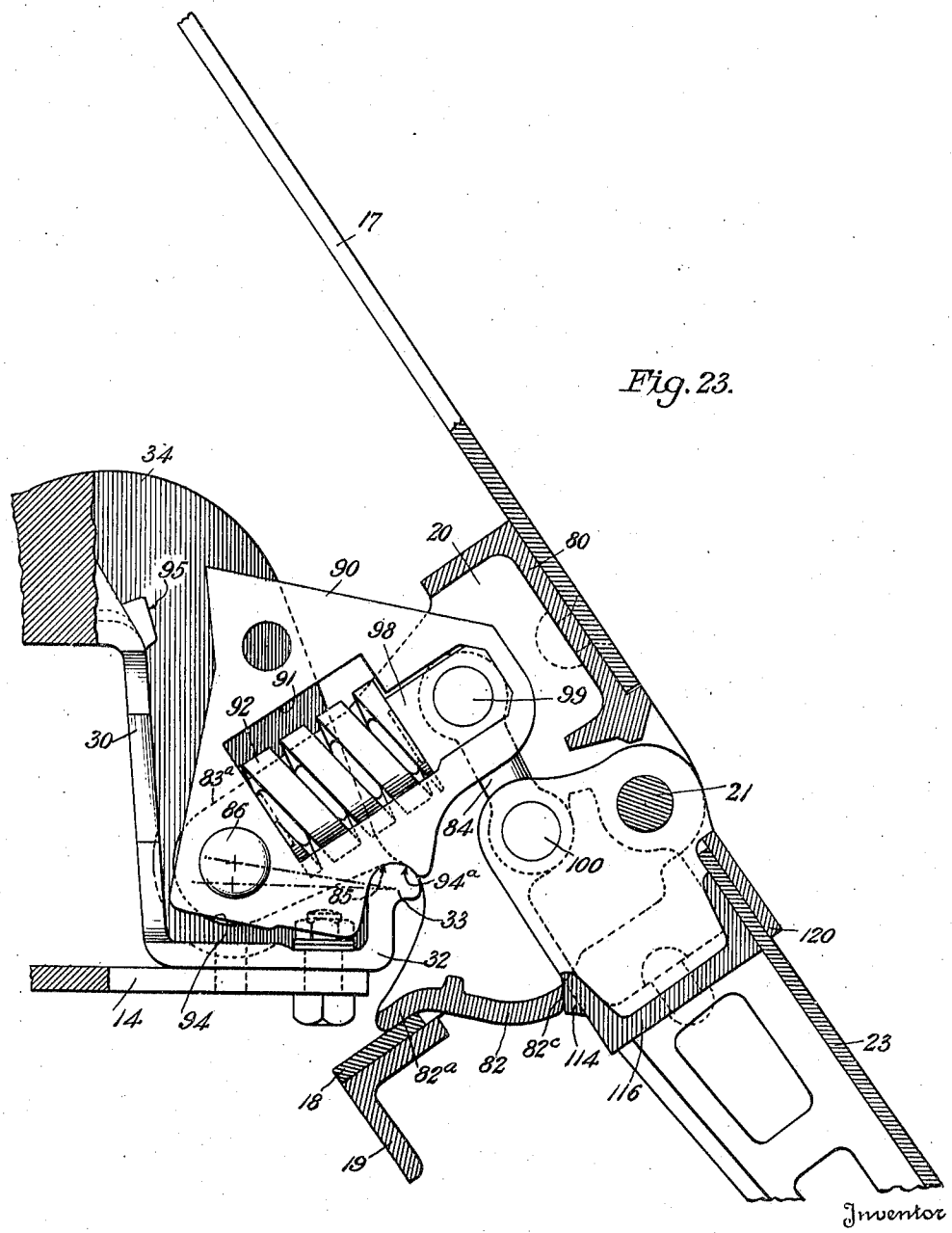


Fig. 23.

Inventor

HENRY FORT FLOWERS

By

Attorneys.

Patented Dec. 8, 1936 2,063,544

UNITED STATES PATENT OFFICE

2,063,544

UNDERGROUND MINE CAR

Henry Fort Flowers, Findlay, Ohio

Application December 7, 1931, Serial No. 579,540
Renewed May 18, 1936

24 Claims. (Cl. 105—276)

This invention relates to improvements in dump vehicles and more particularly concerns a dump vehicle in which the running gear is compact and of low height so that the maximum load capacity is assured for a given height and width of vehicle, and hence the invention is particularly applicable to cars for use in mine tunnels, and in service where a low center of gravity is desirable.

One of the features of the present invention is the provision of a simple and compact door control mechanism which is normally operated to hold the doors closed during transport, and which is operated by a tilting movement of the car about the fulcrum at the dumping side; to permit a relative closing of the door with respect to the body without breakage of parts; and to produce a positive closing of the door during the return of the body from tilted position, while permitting the door to remain without complete closure in the event that an obstacle is present to prevent such closures, without breakage of parts. Further, the door control device maintains the door at the raised side of the car closed.

Another feature of the present invention is the provision of a door control structure comprising frame and body members and an intermediate toggle member resting on the frame member and pivotally supporting the body member, this toggle member normally remaining stationary with the frame during tilting toward the adjacent side, and being tiltable with respect to the frame when the door on the adjacent side is blocked against opening.

The many other features of construction which form parts of the present invention are set forth in the course of the following specification and claims. An illustrative form of the invention is set forth in the accompanying drawings.

In the drawings:

Figure 1 is a transverse vertical sectional view through the underframe, body, doors and controlling elements with a door obstructed against opening while the body is being tilted.

Figure 2 is a fragmentary corresponding view with the body and door in transport position.

Figure 3 is a corresponding view with the body and door in fully opened position.

Figure 4 is a fragmentary plan view of the underframe.

Figure 4a is a fragmentary plan view of the car, with a portion broken away to show the position of one truck as the car travels a curve.

Figure 5 is a fragmentary vertical longitudinal section through the body and showing the frame in elevation.

Figure 5a is a fragmentary side elevation of the body and frame.

Figure 6 is a vertical transverse section, on line 6—6 of Figure 8 with a central portion broken away to show the spindle bolt, on a larger scale through one of the truck pivots and the door operating mechanism.

Figure 7 is a similar section, substantially on line 7—7 of Figure 8, showing a different portion of the door controlling elements.

Figure 8 is a longitudinal sectional view substantially on line 8—8 of Figure 7.

Figure 9 is a plan view, with parts broken away, corresponding to Figure 6.

Figure 10 is an end view of one of the door and truck castings.

Figure 11 is a view of the casting of Figure 10, showing the left hand end thereof with parts broken away.

Figure 12 is a similar view of the right hand end of the casting of Figure 10.

Figures 13 and 14 are sectional views of the door hinge casting substantially on lines 13—13 and 14—14 of Figure 15.

Figure 15 is a bottom view of the door hinge casting.

Figure 16 is an elevation of a door hinge casting, showing door sheets in section and secured thereto.

Figure 17 is a side elevation of the door hinge casting.

Figure 18 is an axial elevation of a body casting.

Figure 19 is a side elevation of the same, with parts broken away to show the individual walls.

Figure 20 is an axial elevation of a toggle plate member.

Figure 21 is a side elevation of the same.

Figure 22 is a perspective view on a larger scale of a toggle slide piece.

Figure 23 is a sectional view corresponding to Figure 6 but indicating a tilted position beyond that shown in Figure 3.

In these drawings, the mine car is illustrated as adapted to travel on rails 10 by means of flanged wheels 11. A frame assembly comprises longitudinal channel and I-beams 12 on top of which is secured a stiffening plate 13 and to the bottom of which are secured the transverse stiffening straps 14 which are located between the pairs of wheels 11 in each truck and project beyond the rails and are secured to the bottoms of the buckets 15 of the door and body supports,

which will be described in detail hereinafter, and serve to brace these buckets. The body comprises the transverse reinforcing beams 16, and the bottom sheet 17 is secured on top of these members 16 and is bent downwardly at the sides to provide the skirts 18 which enclose the buckets 15 while the car is in transport condition, being reinforced by angle irons 19 welded to their lower edges.

The skirts 18 are illustrated as being cut away in the transverse vertical plane of the stiffening straps 14 for the reception of body hinge castings 20 which will be described in greater detail hereinafter, and which support the hinge pins 21 of the door castings 22 to which are secured the inner door sheet 23 and the outer door sheet 24. The body bottom sheet 17 is joined by the end sheets 25 for completing the body box. The body reinforcing beams 16*a* above the straps 14 are illustrated as channels with their flanges directed away from one another so that, in the transport position, they closely fit the parallel channel members 12*a* secured on top of the frame plate 13.

Four of the body support members (Figures 10, 11 and 12) are connected to the car frame, and are illustrated as integral castings and as of inverted U-shaped with an externally and downwardly projecting web 30 extending in the longitudinal direction of the car and merging into the bottom web 31 which in turn merges with the upwardly extending web 32 having a rounded lip 33 at its upper edge. The webs 30, 31 and 32 provide the buckets 15 hereinbefore described, two of these buckets being provided by each casting, the two buckets being separated by a vertical transverse stiffening and guiding web 34. The webs 30 and 34 pass into a hollow box portion 35 of the casting having a central vertical aperture therein for the reception of the truck pivot as will be described hereinafter. Internal stiffening walls 36 are preferably provided for this box portion 35 for strengthening the annular wall 61. At the inner end, the box portion 35 has the downwardly depending leg comprising the two spaced transverse webs 37 and the longitudinal connecting web 38. In webs 37 are provided openings 39 for the truck spring rods 69, 69*a* as will be described hereinafter.

The upper portions of walls 37 and the box portion 35 are shaped externally to fit in the grooves of the channels 12*a*, to which they are secured by rivets passing through holes 42. As shown in Figure 6, each body support casting is also attached by bolts 40, passing through the web 38 to the adjacent I-beam 12 of the frame, a recess 41 (Figures 10 and 11) being provided to receive the upper angle of the I-beam and the plate 13. A strong and rigid assembly is thus produced.

Received within the vertical aperture in the box portion 35 is a king-pin 50 having a flange 51 at its upper end resting on a boss 51*a* of the casting (Figures 6 and 10). This king-pin has a passage 52 therein for lubrication, and a conventional attachment 53 for the insertion of lubricant is shown. The lower end of the king-pin is supported in the tie strap 14, a split ring 54 engages in a peripheral groove of the king-pin 50 to prevent upward movement of the pin.

Surounding the king-pin and rotatable thereon is a hollow sleeve 55 having formed integrally therewith a bottom plate 56 and a cylindrical spaced wall 57. Sleeve 55, plate 56 and wall 57 form an annular cup for the reception of the lower end of the truck spring 58 whose upper end rests against a disc 59 loosely surrounding king-pin 50. A wear disc 60 is provided between disc 59 and the inner surface of the box portion 35 of the body support casing, the upper end of the spring being guided by the inner surface of the cylindrical internal wall 61 of the body support casting. The wall 57 of the spring cup has trunnions 62 formed integrally therewith and extending co-axially in a transverse direction with respect to the vehicle. These trunnions support the bushings 63 of the truck side plates 64 which extend longitudinally of the vehicle and are held in proper spaced relationship by bolts 65 extending through the spacing collars 66. The end collars 66 may likewise provide bearing supports for the wheels 11. The truck assembly just described is not claimed herein, but is shown, described and claimed in my co-pending application Serial No. 615,735, filed June 6, 1932. The inner trunnion 62 has an extension 67 which is flattened down to provide spring plunger abutment surfaces 68 having substantially vertical walls transversely of the car and being received between the ends of spring plungers 69, 69*a* which are loosely guided in the apertures 39 of the body support casting at their adjacent ends and by the angle brackets 70 at their distant ends. The plungers 69, 69*a* are threaded near their adjacent ends to receive the nuts 71 which permit adjustment of the positions of the plungers with respect to one another, and also engage with the adjacent ends of the truck guiding springs 72, 72*a* which at their other ends rest against washers 73 held by the angle brackets 70. It will be noted that the springs tend to move the plungers 69, 69*a* toward one another so that with nuts 71 adjusted against boss on 37, the extension 67 is held centrally. Thus the axis of the trunnions 62 tends to remain transverse of the vehicle: but the truck is permitted to rotate about king-pin 50 when the car is on curved track.

The door hinge castings 20 (Figures 7, 8, 18 and 19) have upper walls 80 to which the body bottom 17 is riveted; the bearing portions 81 for the door hinge pins 21; the downwardly extending front web wall 82 which at its lower end is offset inwardly at 82*a* to fit within the skirt 18 (Figure 7). Four separate transverse walls 83, 83*a*, 83*a*, 83 are provided in this casting (Figures 8 and 19), which are located in pairs for the reception between each pair of a door control link 84, to be described hereinafter. Each of the walls 83*a* is provided with a deep upwardly extending notch 85 (Figures 7, 18 and 19) between the offset 82*a* and the hole 86*a* for the pivot pins 86. Between the inner walls 83*a* is received the vertical transverse web 34 of the body support casting, so that this will cooperates therewith as a guide and prevents relative longitudinal movements of the frame and body during the tilting for dumping. Each casting 20 has a pair of pivot pins 86 which are coaxial but are separated from one another by a sufficient distance for the reception of the web 34 (Figure 8).

Between the walls 83*a*, 83, of each pair is provided a pair of toggle plates 90 (Figures 6, 7, 8, 20 and 21) which are connected together in pairs. These plates 90 are cut away to provide a cavity 91 for the reception of the toggle spring 92 which is guided by the boss 93 at the bottom of cavity 91. These plates have feet 94 resting on the upper surface of the webs 31 of the

buckets 15, and have walls 94a which conform closely to the shape of the web 32 and the upper lip 33 thereof, so that the plates may rock around the rounded lip 33 as on a pivot. The upper rear walls 95 of plates 90 rest against bosses 96 on the body support casting (Figures 6 and 10) so that the plates 90 are held in position against movement transverse to the car, when lowered, and are returned from pivotal tilting about lip 33 into the predetermined position.

The toggle plates 90 likewise provide guides 97 for a slide piece 98 having a boss 98a entering the upper end of the toggle spring 92. As shown in Figure 22, this slide piece is bifurcated to provide the spaced apertured members 98b having the apertures 99a therein to receive the pivot pins 99, the link 84 being accommodated between the spaced members 98b. The links 84 therefore occur in pairs (Figure 8) at each hinge connection, and are joined by independent pivot pins 100 to the door castings. These links project through slots in the wall 82 of the body castings 20 (Figure 6), and the hinge pin 21 of the door likewise passes across these slots (Figures 6 and 8).

When the body is in normal transport position, the pivot pins 99 are slightly below the plane containing the axes of pivot pins 86 and door hinge pins 100 (Figure 6). The front wall which connects the lateral walls 90r (Figure 21) of each member 90, rests on the stop 82b projecting inwardly from the outwardly extending portion 82a of wall 82, so that a toggle lock is formed by the toggle plates 90 and the links 84 to hold the doors closed, being assisted by the pressure of the toggle springs 92 which hold the central pivot 99 in its end position.

The door castings comprise the webs 110 which are apertured for lightness and have the flanges 111 integral therewith for receiving the door plates 23 and 24, which are riveted thereto. The upper end of this casting is preferably riveted to a channel 112. Channel 112 forms a stiffening member which extends longitudinally along the door and is connected to the door plates 23 and 24 to complete a triangular box section. The plates 23 and 24 are preferably riveted together at the top edge whereby to form a door of maximum strength with minimum thickness so that the dump body has a maximum cubical capacity for any given overall width. The door hinge flanges 111 are also riveted directly to outer door plate 24 to form a rigid door structure. The inner flange 111 is thickened at its bottom to provide a wall around the opening 113 which receives the door hinge pin 21. The outer flange 111 has an angular ridge 114 projecting therefrom to engage the edge of wall 82c when the door reaches its fully open position, and at its bottom is likewise thickened to provide surrounding walls for the apertures 115 through which the toggle pivot pins 100 pass. Reinforcing walls 116 are provided, and the web walls 110 (Figure 8) merge into downwardly extending spaced walls 117 between which is received the knuckle 81 of the body casting 20 (Figures 7 and 8). Spaced outer walls 118 serve in conjunction with the walls 117 to stiffen the walls 111. A dust or sealing strip 120 is riveted at the bottom of the door plate 23.

The door hinge pin 21 (Figure 8) extends beyond the walls 83 and has notches therein to receive the plates 130 which are secured by cap screws 131 to these walls and channels 16a, and thus serve to prevent endwise or rotative movement of the hinge pins 21. Likewise, the pivot pins 86 extend beyond the outer walls 83 and are engaged by the wedge blocks 132 which hold them against axial movement and are themselves guided by projections 133 on plates 83 (Figures 18 and 19).

The operation of the vehicle is as follows:

The body being in the positions shown in Figures 2, 4, and 4a, it may be loaded in any suitable manner. It will be noted that the bottom 17 is very close to the road bed and hence the end wheels and doors may be high without danger of striking a tunnel roof, for example. A maximum capacity is thus afforded. The vehicle may now be towed to a discharge point. The doors or wheels on each truck, with their flanges also on opposite sides of the respective king-pins 50, cause the vehicle to follow the rails properly even on curves. Further, the centering springs 72, 72a operate constantly to hold the trucks in their proper central position for straight-away travel.

On arriving at the discharge point, a suitable means is employed for lifting one side of the car. In Figure 1, a fluid pressure cylinder 150 having a plunger piston 151 and a head 152 for engagement with the angle iron 19 is shown in dotted lines. The piston 150 is mounted on a fixed structure 153, and it will be noted that this structure and the piston are normally located below the rails 10, although illustratively shown as broken away to indicate the parts employed. The head 152 has extension arms 154 and a handle 155 by which an operator may swing the device and direct it to and away from the edge of body 19. The cylinder head 152 has a hook extension 156 to limit the tilting of the body and/or to retard the tilting movement at the end of the stroke of the piston.

As the head 152 raises the angle iron 19 and the skirt 18, the body is tilted about its opposite edge. Normally, the feet 94 remain on the upper walls of the webs 31 and the body castings 20 rock freely about the pivots 86. The walls 83 of the body casting lie outside the edges of the web walls 31 of the buckets, so that there is no interference to the free tilting movement of the body. The inner walls 83a are cut away with the top notches 85 so that the entire body casting may turn freely regardless of the presence of lip 33.

During this tilting movement of the body casting 20, each toggle plate 90 remains in position in the bucket, and the wall 82 moves in a clockwise direction (Figure 6) away from the corresponding toggle plate 90. The toggle door pivots 100 likewise move downwardly in a clockwise direction so that the ultimate effect is to slightly compress the toggle spring 92 at first until the central toggle pivot 99 is in line with the pivots 86 and 100 and thereafter for this spring to expand. During the continued tilting movement of the body castings 20, therefore, the links 84 act to exert pulls upon the toggle door pivots 100 and thus to produce positive opening of the doors. Ultimately, the ridge 114 upon the door comes down upon the upper edge of web 82 (Figure 3) and prevents further relative movement of the door and body.

During the return from this tilted position, the links 84 act in compression to cause the door to move in a counterclockwise direction about its pivot 21 (Figure 6) whereby the door is returned to its closed position. During this

operation, the toggle spring 92 comes into action during the latter part of the movement, in which the axis of the spring is at only a slight angle to the line joining the axes of pivots 99 and 100, and thereby is able to prevent breakage of door members in case a rock or other article is caught between the door and body. This spring 92 also serves to hold the door tight against the end sheets of the body to insure sealing against spillage of any fine material being carried in the body.

In the event that the door is prevented from opning during the tilting movement of the body, as for example by the presence of a pile of material (Figure 1), a portion of the door therefore remains relatively at a standstill with respect to the ground track and frame. The continued tilting of the body then causes a downward pressure through the door pivot 21 upon the lever system comprising the door, the links 84, toggle plates 90. Since the link 84 is substantially blocked in its travel position, which normally is the upper and outermost position in Figure 6, the structure including the door, the links 84, pivot 86 and the toggle plate 90 moves together, and the toggle plate 90 therewith rocks about the lip 33 as a pivot (Figure 1) whereby any danger of breaking these elements is avoided. If the door is prevented from moving with respect to the body, as for example when the load of wet material is frozen to the door and body, the combined body structure tends in like manner to pivot about the lip 33, and the weight of the body operating downward at pivot 86 tends to cause a breaking of the toggle upon the lip 33 and then a traction from plates 90 upon the blocks 98 and thus upon the links 84, and thus pulls the door open with respect to the body. This force is dependent upon the distances between the axes of the fulcrum members 86 and 33, 21 and 100, and the dimensions of other parts of the structure, including the height of the door. Hence there is no force great enough to break the parts in case the door cannot be pulled open by this means.

It will be noted that throughout the tilting and returning movements, the central web walls 34 of the buckets on the tilting side have remained between the inner walls 83*a* of the body castings, thus preventing any lengthwise displacements of the body on the frame.

At the raised side of the body, the corresponding members have remained in the same position relative to the body as that occupied while in transport. The toggle plate 90 at this side has continued to rest against the inwardly projecting rib 82*b* on the wall 82 of body member 80, and the toggle plate 90, toggle link 84 and toggle spring 92 are held together in their end position in which the door is blocked closed. It will be noted that even in this position, if the upper door receives an outward push, this motion is absorbed by the toggle springs 92 without breakage of any structure and upon the releasing of such push or force the upper door will be forced tight against the door jambs, and held sealed there by the action of the springs 92.

Upon the return of the body into its transport position, the walls 95 of the toggle plates encounter the pads 96 on the frame casting and thus guide the body into its proper transverse position.

The relative movement permitted the toggle plate 90 during tilting movement of the body and while the door is blocked (Figure 1) is also permitted upon tilting of the body beyond the position shown in Figure 3. Thus in Figure 23 when the body floor 17 is moved beyond the position at which the maximum door opening is permitted, the continued movement of the door pivot 21 as the body tilts causes a tension through the link 84, since the ridge 114 is now engaged with the surface 82*c*. This tension is exerted upon pivot 99 and thence transmitted through the block 98 shown in Figure 23 to the toggle plate 90. The toggle plate is therefore caused to rock around the lip 33, and the normal body pivot 86 is raised. In this way the toggle plate 90 may move from the position shown by the dash and dot line (extending from normal position of the axis of pivot 86, Figure 23) through an angle to the position shown by the dash and double-dot line (pin 86 has been raised, Figure 23). It will be noted that the effect of this is to shift the fulcrum point of the body from the pin 86 to the lip 33, thus displacing the fulcrum outwardly away from the center of the frame and thus assuring a return of the body by gravitational action. Further, this permits a continued movement of the body, with the door in fully open position, and without excessive strain upon the link 84 and other parts.

The structure thus provides at each side of the body a normal fulcrum about which the body may tilt, and a secondary fulcrum (of which lip 33 forms one element) about which the body may tilt when the door is blocked against opening with respect to the body, whether this blocking occurs by reason of an obstacle in the path of the door, or the movement of the door into its fully opened position with respect to the body. Specifically, the normal fulcrum occurs between the body and rocker members 90 which during normal tilting, i. e. the tilting while the door has not yet attained its fully opened position, are resting upon frame members: and these rocker members may move about the lip 33 for providing the second fulcrum: and/or the upper surface 85 of the notch formed in the member 83*a* rigid with the body may turn about the lip 33, this latter operation occurring when the door is in fully opened position (Fig. 23).

It is obvious that the invention is not limited to the form of construction shown but that it may be modified in many ways within the scope of the appended claims.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a dump vehicle, a frame comprising longitudinal members, a stiffener sheet secured on top of said members and transverse members secured on top of said sheet, body fulcrum buckets carried by the transverse members at the ends thereof and having supporting surfaces below the tops of the transverse members, a dump body, and depending fulcrum devices carried by the body laterally beyond the ends of the transverse members and resting on said surface during transport.

2. In a dump vehicle, a frame comprising longitudinal members, a stiffener sheet secured on top of said members, transverse members secured on top of said sheet, body fulcrum buckets carried by the transverse members at the ends thereof and having supporting surfaces below the tops of the transverse members, a cross brace connecting the buckets on opposite ends of a transverse member and passing below and connected to said longitudinal members.

3. In a dump vehicle, wheeled trucks on opposite sides thereof, a frame including transverse members extending in the transverse vertical planes of the trucks and supported thereby, a dump body, body supports mounted at the ends of the transverse members, and body fulcrum members mounted on the body to move bodily therewith and resting during transport on said body supports.

4. In a dump vehicle, the combination with a frame and a body, of a saddle-shaped structure attached to the frame and having supporting surfaces on its outer lower end, a depending support member on said body, a rocker member adapted to rest on said supporting surfaces during transport, and a pivot for connecting said members and providing a fulcrum about which the body may tilt relative to said frame.

5. In a dump vehicle, the combination with a frame and a body, of a saddle-shaped structure attached to the frame and having a supporting surface on its outer lower end, a depending support member on said body, a rocker member adapted to rest on said supporting surface during transport, a pivot for connecting said members and providing a fulcrum about which the body may tilt relative to said frame, a horizontal truck member located in the space beneath said saddle-shaped structure, and a truck pivot mounted in said structure for rockably holding said truck member.

6. In a dump vehicle, the combination with a frame and a body, of a saddle-shaped structure attached to the frame and having a supporting surface on its outer lower end with an upturned longitudinal lip at the outer edge, a depending support member on said body, a rocker member resting on said supporting surface during transport and having a portion for engaging said lip, a door pivoted on said body on an axis parallel to said lip, a door control device for connecting the rocker member and the door, and a pivot for connecting said members and providing a normal fulcrum about which said body may tilt relative to said frame, said rocker member and lip providing a secondary fulcrum about which the body may tilt when the door is blocked against opening.

7. A dump vehicle as in claim 6, in which said door control device comprises a compression link for connecting the door and rocker member and including a loose connection and a spring for holding said connection extended, said spring being operative to permit yielding of the door upon a blow against the inner surface thereof when the door is in closed position.

8. In a dump vehicle, a frame, wheels, a saddle-shaped structure having a supporting surface below the wheel axes, a horizontal longitudinally extending truck member mounted on said wheels and passing through the space beneath said structure, a brace connected to the outer end of said structure and passing beneath the same toward the longitudinal center axis of the vehicle, a vertical pivot joining the structure and brace and passing through the truck member, a body, and a support member carried by said body and resting on said surface.

9. In a dump vehicle, a frame, an integral structure having a horizontal portion connected to the frame and a depending portion for presenting a supporting surface below said horizontal portion, a body, body supporting means depending from said body and resting during transport on said surface, and an upright portion adjacent said surface for limiting movement of said body supporting means laterally and including a structure for providing a fulcrum for the body.

10. In a dump vehicle, a frame, means at each side of the frame for providing support surfaces below the top of said frame, and inclined guide surfaces between said top and support surfaces, a body, and depending body members resting during transport on said supporting surfaces and having surfaces cooperating with said inclined surfaces to center said body on said frame and to hold said body against lateral shifting during transport.

11. A dump vehicle as in claim 10, in which said frame means includes an upstanding flange at the outer edges of said surface and cooperating with said depending body members to hold the body against lateral shifting during tilting movement thereof.

12. In a dump vehicle, a frame, wheels, a structure extending outwardly and then downwardly from said frame and having a supporting surface below the wheel axes, a horizontal longitudinally extending truck member mounted on said wheels and passing beneath said structure, a body, fulcrum devices carried by said body and resting on said surface, and a vertical pivot mounted on and extending downwardly from said structure and providing a turning axis for said truck member.

13. In a dump vehicle, a frame, a structure providing a supporting surface below the level of the top of said frame, a body, a door pivoted on said body, a pivot carried by said body and located during transport below the level of the top of said frame, a rocker carried by said body pivot and resting during transport on said surface, a door control device for connecting said rocker and the adjacent door whereby to hold the door closed during transport and to control the opening and closing of the door during the tilting of the body about said body pivot, a stop on said body engaged by said rocker to limit the movement thereof, said rocker and link having a common pivot located during normal transport and during tilting toward the opposite side relatively below the line of centers of said body pivot and the door pivot so that when the rocker is engaged with said stop the rocker and link prevent opening movement of the door during tilting toward the opposite side, and a spring included in said control device to permit relative movement of said link and rocker so that the rocker may move relative to the body during tilting toward the adjacent side.

14. In a dump vehicle, a frame, means at each side of the frame for providing supporting surfaces below the top of said frame and inner and outer upwardly extending surfaces in pairs adjacent said supporting surfaces, a body, depending body members on said body at its sides, rocker members, pivots for connecting said members, said rocker members resting during transport on said supporting surfaces and between said pairs of inner and outer surfaces whereby lateral shifting movement of the body is prevented during transport and whereby lateral shifting of said rocker member is prevented during tilting.

15. In a dump vehicle, a frame, a tiltable dump body, a door pivoted to said dump body, an intermediate member normally resting on said frame, a pivotal connection between said

member and said body, a door-controlling connection between said body and said door, and means on said frame and said member for providing a fulcrum about which said member may turn relative to said frame, said fulcrum means being spaced from said pivotal connection.

16. In a dump vehicle, the combination of a frame, a body, a fulcrum upon which said body may normally tilt with respect to the frame, a second fulcrum, a door pivoted on said body to fold down for dumping, a door control device for positively producing opening and closing movements of the door during the tilting and the return from tilting of said body and effective when said door is blocked against opening movement during the tilting about said normal fulcrum for causing the body thereafter to tilt about said second fulcrum so as to relieve the door and the controlling mechanism therefor from excessive breaking strains.

17. In a dump vehicle, the combination of a frame, a body, an intermediate member pivotally connected to said body to provide a normal fulcrum about which the body may tilt for dumping and normally resting on said frame, a door pivoted on said body, positive means for connecting said member and door to control the opening and closing of the door during the tilting and the return from tilting of said body, and means on said member and frame for providing a secondary fulcrum about which the body may turn when said door is prevented from opening during the tilting of the body about said normal fulcrum so as to relieve the door and the controlling mechanism therefor from excessive breaking strains.

18. In a dump vehicle, the combination of a frame, a body, means for providing a normal fulcrum about which the body may tilt relative to the frame for dumping, a door pivoted on said body, stop means on the body for limiting the opening movement of the door relative to the body, positive means for controlling the opening and closing of the door during the tilting and the return from tilting of said body about said normal fulcrum, and means on said body and frame for providing a secondary fulcrum about which the body may turn when said door has engaged said stop means.

19. In a dump vehicle, the combination of a frame, a body, an intermediate member pivotally connected to said body to provide a normal fulcrum about which the body may tilt for dumping and normally resting on said frame, a door pivoted on said body, stop means on the body for limiting the opening movement of the door relative to the body, positive means for connecting said member and door to control the opening and closing of the door during the tilting and the return from tilting of said body, and means on said body and frame for providing a secondary fulcrum about which the body may turn when said door has engaged said stop means.

20. In a dump vehicle, the combination of a frame, a body, means for providing a normal fulcrum about which the body may tilt relative to the frame for dumping, a door pivoted on said body, stop means on the body for limiting the opening movement of the door relative to the body, positive means for controlling the opening and closing of the door during the tilting and the return from tilt of said body about said normal fulcrum, and means on said body and frame for providing a secondary fulcrum about which the body may turn when said door has engaged said stop means, said secondary fulcrum being farther from the center of gravity of said body than said normal fulcrum.

21. In a dump vehicle, the combination of a frame, a body, a body support normally resting during transport on the frame adjacent an edge of said vehicle, a pivotal connection between said support and said body for providing a first fulcrum about which the body may tilt with respect to the frame, a down-folding door pivoted to said body adjacent to and on an axis parallel to that of said pivotal connection, a door control device connected to said door and body support and cooperating through said support with the frame and body, means on said door located above the pivotal connection when the door and body are in normal transport position for limiting the opening movement of the door, cooperating door limiting means located on the body outside said first fulcrum, and means on said support and frame for providing a secondary fulcrum outside said first fulcrum.

22. In a dump vehicle, the combination of a frame, a body, body supports pivotally mounted on the body adjacent opposite edges thereof and normally resting on the frame during transport, the pivotal connections between said body and said supports providing fulcrums about which the body may tilt with respect to the frame, opposite doors pivoted on said body to fold down for dumping, door control devices for said doors each connected to its corresponding door and support and cooperating through said support with the frame and body for holding said door closed during normal transport and during tilting about the opposite fulcrum and for controlling the opening and effecting the closing of said door during tilting about the adjacent fulcrum, means on said supports and frame for providing secondary fulcrums about which the body and support may tilt with respect to the frame, and door limiting means on the body and door and located outside the fulcrums on the corresponding side of the car.

23. In a dump vehicle, the combination of a frame, a body, means located adjacent an edge of the body for providing a fulcrum about which the body may tilt with respect to the frame, a door pivoted on said body to fold down for dumping, a door control device for said door connected to said door and body and cooperating with the frame and operating during tilting of the body to control the opening of the door relative to the body until the door reaches a predetermined position relative to said body, and limit means including elements rigid with the body and with the door for determining said position and maintaining it during a further tilting of the body, the limit elements on said body being located outside the pivot connection of the door and body and thereby operating to relieve downward pressure by the door upon the door pivot as the vehicle lading slides from the body and over the door for dumping discharge.

24. In a dump vehicle, the combination of a frame, a body, means located adjacent an edge of the body for providing a fulcrum about which the body may tilt with respect to the frame, a door pivoted on said body to fold down for dumping, a door control device for said door connected to said door and body and cooperating with the frame and operating during tilting of the body to control the opening of the door relative to the body until the door reaches a

predetermined position relative to said body, and limit means including elements rigid with the body and with the door for determining said position and maintaining it during a further tilting of the body, the limit elements on said body being located outside the pivot connection of the door and body and thereby operating to relieve downward pressure by the door upon the door pivot as the vehicle lading slides from the body and over the door for dumping discharge, the limit elements on said door comprising means projecting from the door and located above and outside the door pivot when the body and door are in upright and closed positions for transport and moving with the door during opening into abutting relationship with said body limit elements.

HENRY FORT FLOWERS.