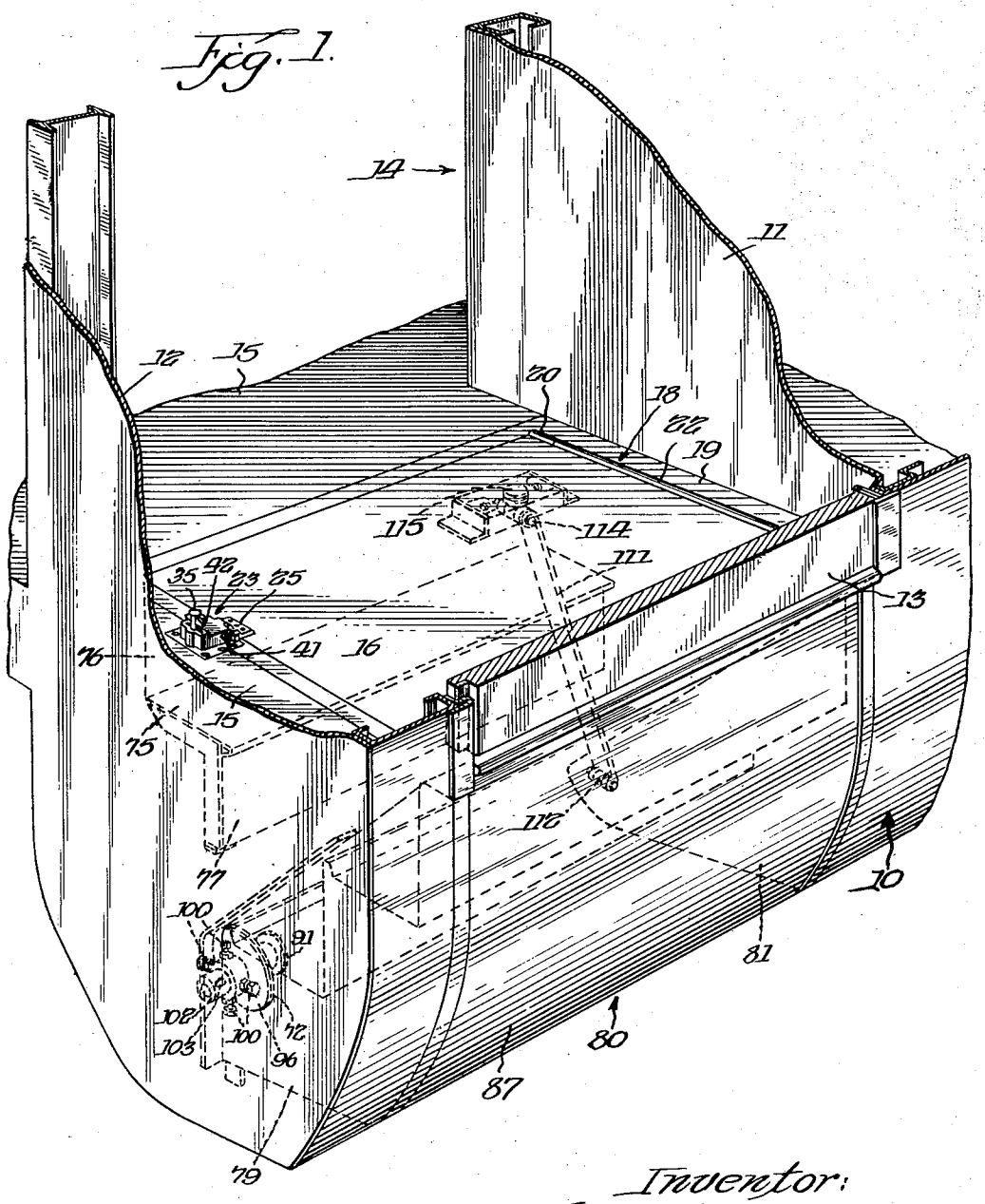
Sept. 19, 1950 F. C. HEYERDAHL 2,522,674

FOLDING STEP AND TRAPDOOR ARRANGEMENT

Filed April 30, 1945 7 Sheets-Sheet 1

Fig. 1.



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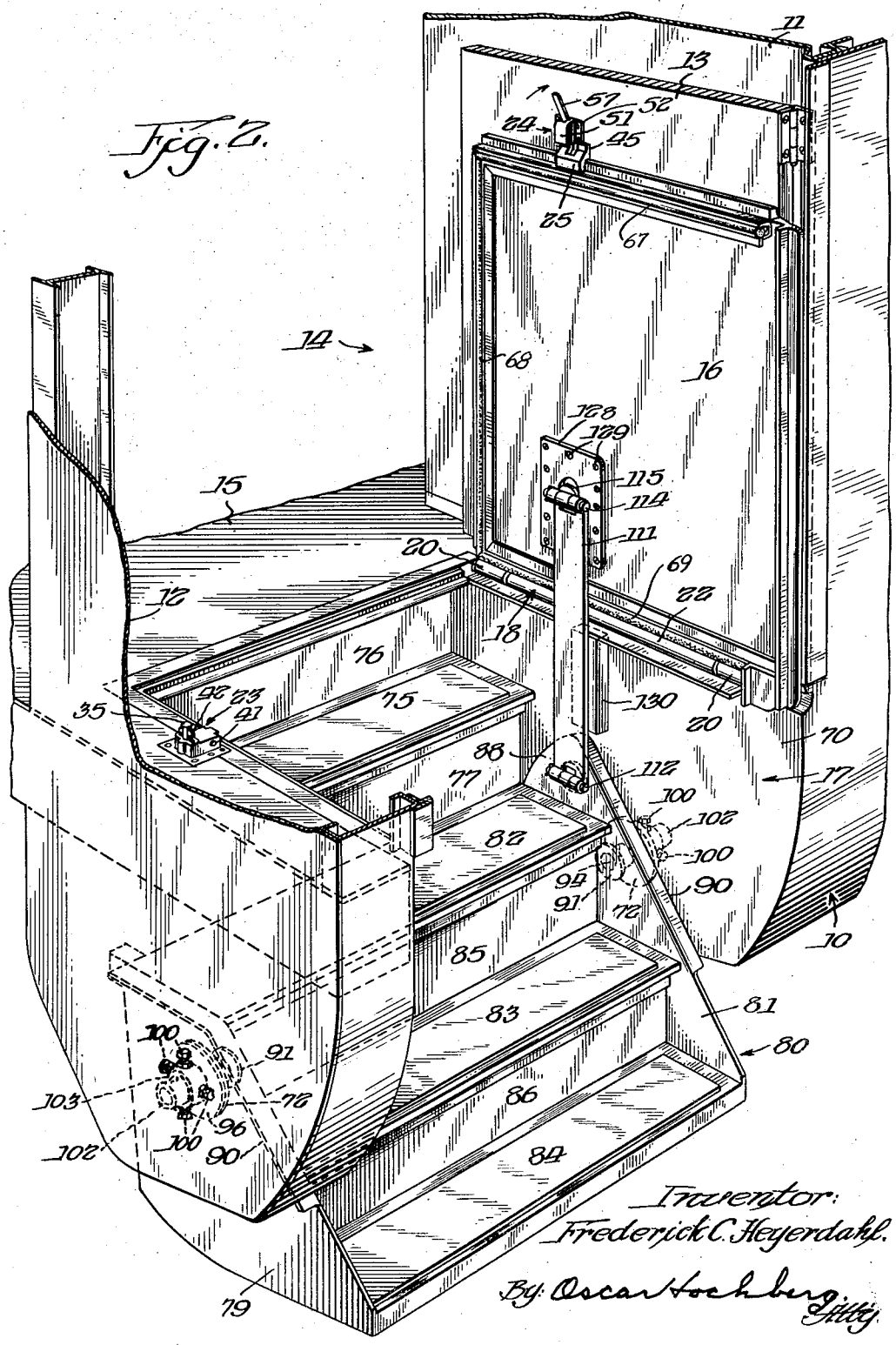
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FOLDING STEP AND TRAPDOOR ARRANGEMENT

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Fig. 2.



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FOLDING STEP AND TRAPDOOR ARRANGEMENT

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Fig. 3.

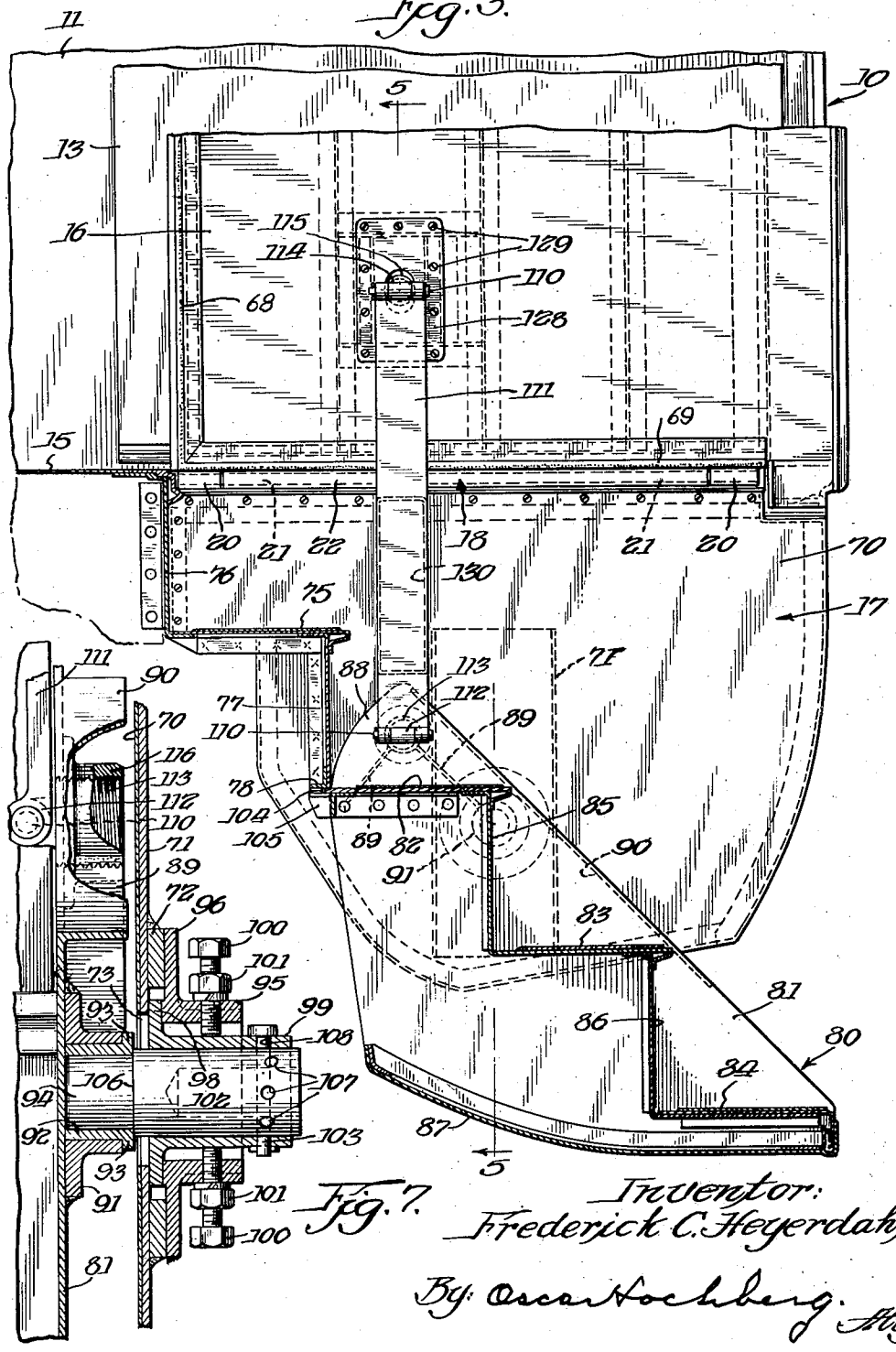


Fig. 7.

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FOLDING STEP AND TRAPDOOR ARRANGEMENT

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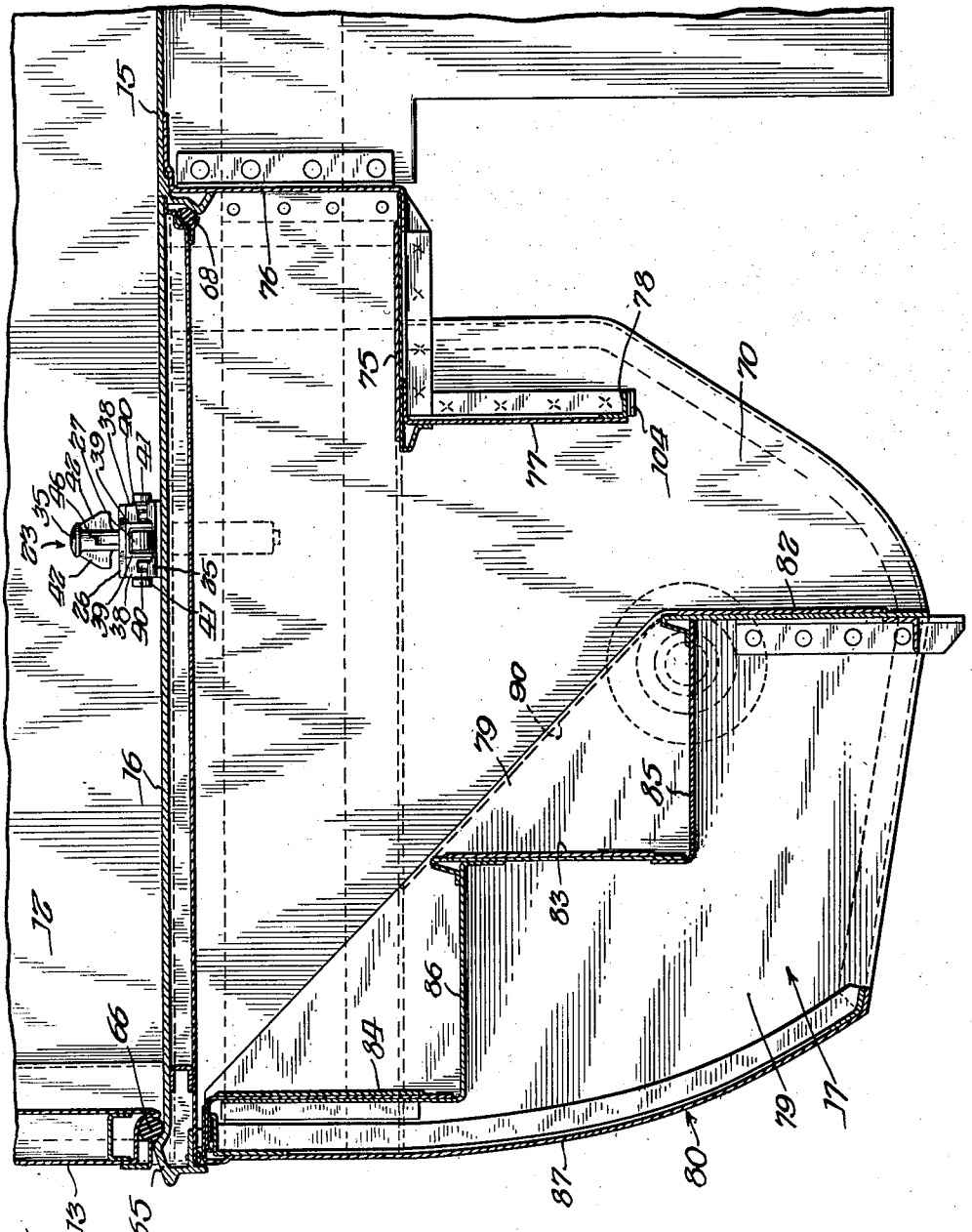


Fig. 4

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FOLDING STEP AND TRAPDOOR ARRANGEMENT

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Fig. 6.

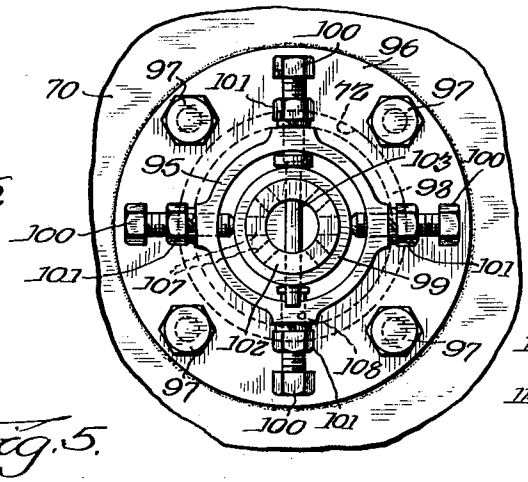
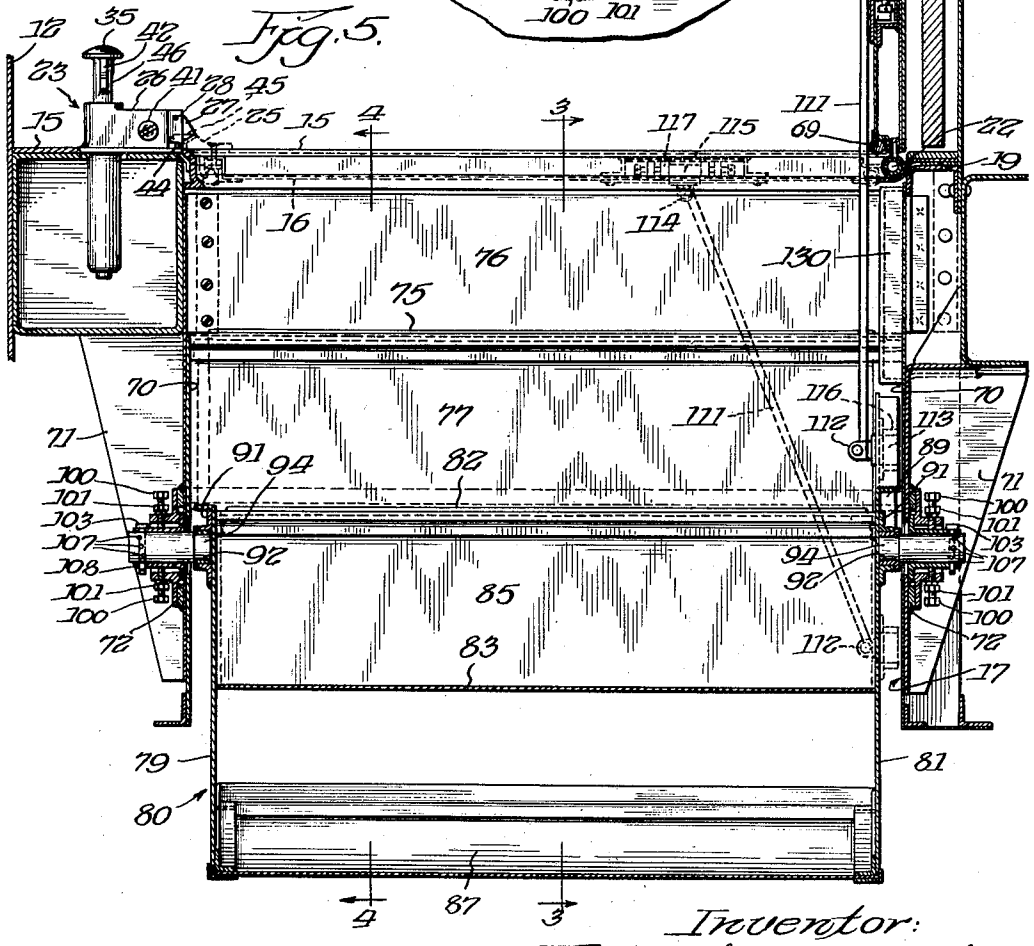


Fig. 5.



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FOLDING STEP AND TRAPDOOR ARRANGEMENT

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Fig. 8.

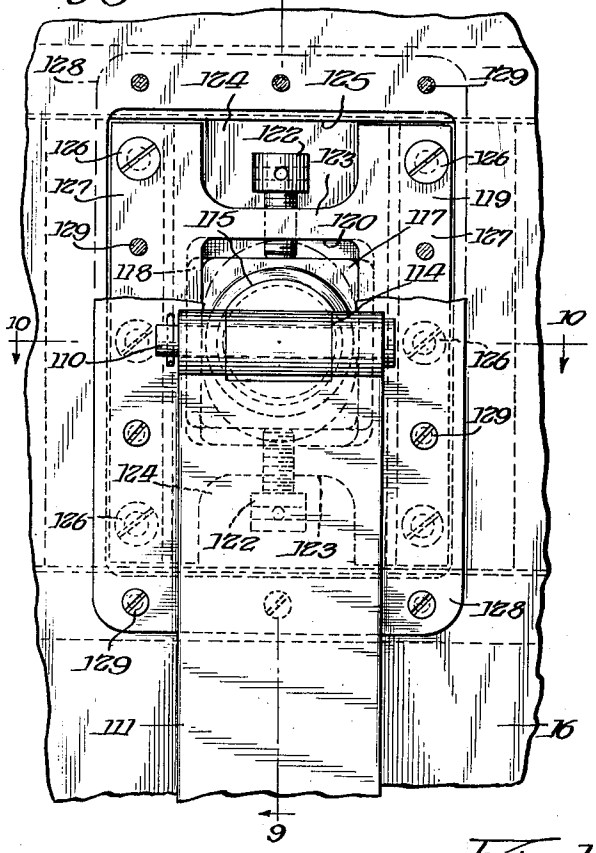


Fig. 9.

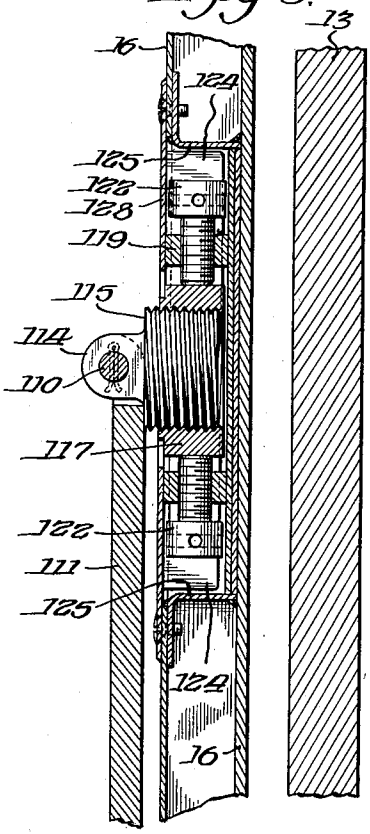
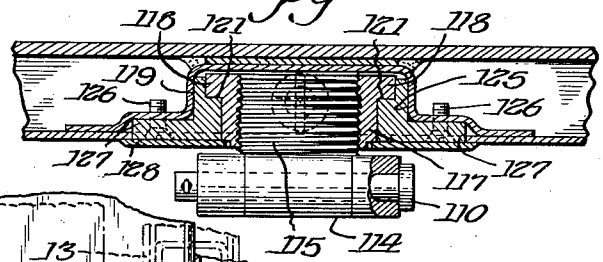


Fig. 10.



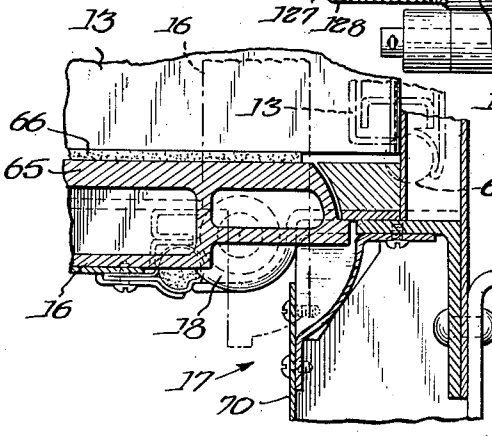


Fig. 11

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FOLDING STEP AND TRAPDOOR ARRANGEMENT

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Fig. 12.

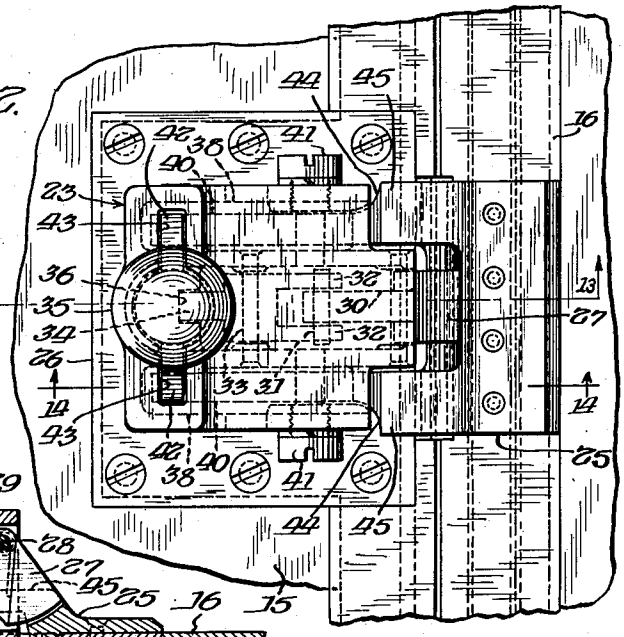


Fig. 13.

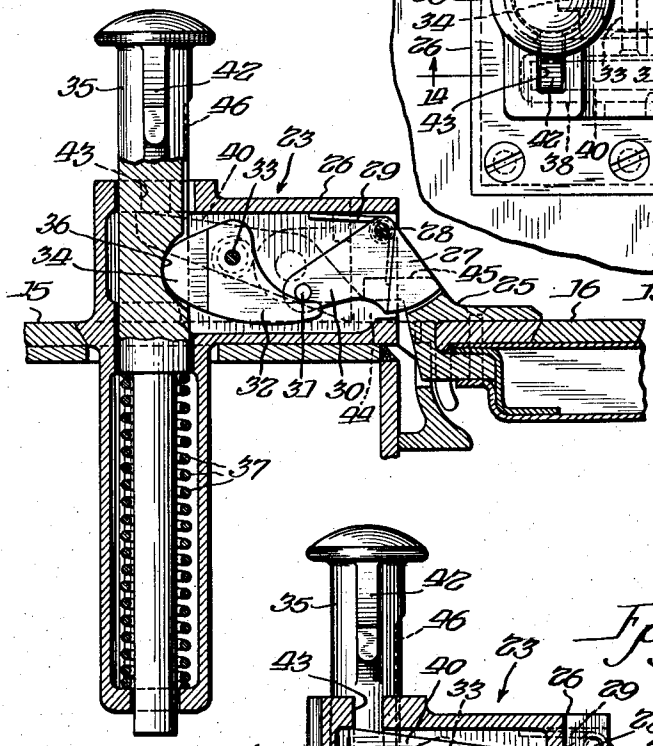
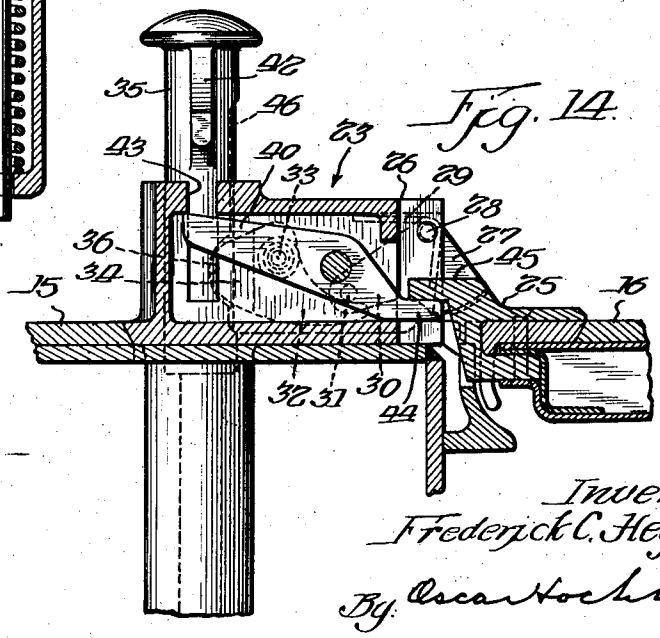


Fig. 14.



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UNITED STATES PATENT OFFICE

2,522,674

FOLDING STEP AND TRAPDOOR ARRANGEMENT

Frederick C. Heyerdahl, Chicago, Ill., assignor to Pullman-Standard Car Manufacturing Company, Chicago, Ill., a corporation of Delaware

Application April 30, 1945, Serial No. 591,154

16 Claims. (Cl. 105—430)

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This invention relates to an interconnected folding step and trapdoor arrangement for railway passenger cars and has for its primary purpose the provision of a pre-assembled step structure adapted readily to installation in the step well of cars under construction and provided with adjustable mechanism for mounting the step assembly to compensate for variations occurring between the step and the step well and with respect to the trapdoor, and having mechanism connecting the folding step and trapdoor for coincidental operation, including multiple adjusting means in the connection for varying the relation thereof with respect to the trapdoor and to the step and to compensate for variations in the relation of the mounted step assembly to the cooperating trapdoor and incident to the fitting of the step into the step well and of the trapdoor in the car end platform over the step well.

An important object of the invention is to provide an arrangement for installing a step assembly in a step well, including demountable bearings for pivotally supporting the step and which are adjustable to locate the pivotal axis of the step as determined by the relative operative position of the step with respect to the step well.

A particular object of the invention is the provision of a bearing arrangement for supporting a step assembly in a step well and which may be adjusted to regulate the normal operative position of the step in the step well and having demountable means for removing the step without disturbing the adjustment of the arrangement whereby the relation of the step to the step well is unchanged and the step may be removed and reinstalled without changing such adjustment.

A further important object of the invention contemplates a folding step assembly and coincidentally operating trapdoor interconnected for simultaneous opening and closing movements by means having threaded engagement with the step and trapdoor, adapted to have relative swiveling movements in respect to each through the medium of such threaded connection and including a strut member pivotally connected between the threaded connections whereby the interconnecting means has universal swiveling movements relative to the trapdoor and step assembly.

Another object realized by the invention comprises a strut operative between a folding step assembly and a cooperating trapdoor, and which has universally pivotal connections with the step

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and trapdoor, each including a threaded connection providing for adjustment of the strut with respect to the step and to the trapdoor and one of such threaded connections being bodily adjustable relative to the associated part in which it is mounted.

A still further object of the invention provides a connection between a coincidentally operating trapdoor and folding step assembly comprising a strut member of a section to transmit all operating forces between the step and trapdoor but so designed as not to project prominently into the stairway and disposed closely adjacent to the exposed surface of the trapdoor when the steps are disposed in operative position and so proportioned and arranged in relation to the trapdoor and fixed portions in the step well as to preclude use of the connection as a hand grab.

The foregoing and other and more specific objects of the invention, including improved hardware for securing the trapdoor and thereby the step assembly in open and closed positions and for releasing the securing means and initiating actuation of the parts, are attained by the construction and arrangement of parts illustrated in the accompanying drawings, in which

Fig. 1 is a general perspective view of a portion of a railway car equipped with the folding step assembly and cooperating trapdoor of this invention showing the vestibule of the car with the steps in raised inoperative position and the trapdoor secured in closed position over the step well with the vestibule side door overlying the trapdoor and disposed in closed position against the threshold thereon;

Fig. 2 is a similar general perspective view of the vestibule area of the car with the vestibule side door in open position secured to the body end wall and the trapdoor raised to uncover the step well and secured against the open side door with folding step assembly lowered to provide a stairway to the car platform and showing the connection between the trapdoor and step for coincidental operation with the adjustable supporting bearings for the step assembly indicated in dotted lines;

Fig. 3 is a cross sectional view through the vestibule taken on the line 3—3 of Fig. 5 with the trapdoor raised and the steps lowered to their operative position, with the operating connection extending between the steps and trapdoor and clearly showing the relation of the connection to the pivotal axes of the steps trapdoor and the relation of the folding step assembly to the fixed

step incorporated as a part of the step well structure;

Fig. 4 is a similar cross sectional view through the step and trapdoor arrangement taken on the line 4—4 of Fig. 5 and looking in the opposite direction from Fig. 3 but illustrating the folding steps in their raised position with the bottom side thereof conforming to the curvature of the car side and the trapdoor releasably secured in its lowered position covering the step well with the vestibule side door in closed position overlying the trapdoor and engaging the threshold thereon in weathersealing relation;

Fig. 5 is a sectional view through the step well longitudinally of the car taken on the line 5—5 of Fig. 3, illustrating the steps and trapdoor both in open position and showing, in section, the adjustable attachment of the connection between the steps and trapdoor to the trapdoor and the adjustable and demountable bearing supports for the folding steps, and illustrating also the hardware for releasably securing the trapdoor in closed position and that on the vestibule side door for retaining the trapdoor in upright open position. This view indicates in dotted lines the trapdoor in closed position with the relative position of the step connection;

Fig. 6 is a fragmentary detail view in end elevation and on a larger scale of one of the adjustable supporting bearings for the folding step showing the demountable nature of the assembly as a unit and the adjustability of the bearing either vertically or horizontally to adjust the steps to irregularities in the step wells and compensate for variations in the relation of the step assembly to the trapdoor;

Fig. 7 is another view of one of the adjustable supporting bearings taken in section in the same plane as in the case of the bearing at the right in Fig. 5 and showing the unitary demountability of the assembly and the means for adjusting the bearing vertically, and clearly revealing the removable trunnion arrangement providing for the removal of the step assembly without disturbing the adjustment of the supporting bearing;

Fig. 8 is a detail elevational view, to larger scale, of the attachment of the operating connection between the trapdoor and step assembly to the trapdoor with the coverplate partially broken away better to reveal the adjustable sliding block for bodily shifting the point of attachment of the connection to the trapdoor with the adjustable means for effecting such shifting, and showing the swiveling mounting in the sliding block to which the operating connection is secured for pivotal movement at right angles to the swiveling movements of the mounting whereby to afford universal movement of the operating connection with respect to the trapdoor;

Fig. 9 is a vertical sectional view through the connection to the trapdoor taken on the line 9—9 of Fig. 8 and clearly showing the threaded securement of the swiveling mounting in the sliding block with the operating connection pivotally secured to the mounting at right angles to the swiveling movement and the adjustments for shifting the block with the cover plate secured in position to conceal the mechanism;

Fig. 10 is a horizontal cross sectional view through the connection taken on the line 10—10 of Fig. 8 showing the adaptability of the swiveling and pivotal connections to universal movement and clearly revealing the interlocking relation of the sliding block with the base portion of

the assembly secured in the trapdoor and disclosing the removability of the entire assembly from the trapdoor structure;

Fig. 11 is a detail sectional view taken at the hinge edge of the trapdoor adjacent the side door threshold showing the conditions at this point beyond the extent of the hinges for the trapdoor and illustrating the trapdoor in lowered closed position, but indicating the raised open position thereof in broken lines and similarly indicating the open position of the vestibule side door adjacent to the body end wall;

Fig. 12 is a detail plan view of the releasable securing means for retaining the trapdoor in its lowered position, flush with the platform, and showing the fulcrum means for imparting an upward thrust on the trapdoor subsequent to the release of the securing means and both operated by the same plunger;

Fig. 13 is a detail sectional view of the trapdoor securing mechanism taken on the line 13—13 of Fig. 12 through the central portion of the device and showing the pivoted latch member engaging the trapdoor with the intermediate lever member for retracting the latch disposed between the latch and a foot-operated plunger for actuating the mechanism; and

Fig. 14 also is a detail sectional view of the trapdoor securing mechanism taken on the line 14—14 of Fig. 12 through a portion of the device symmetrical at opposite sides of the central portion and showing the operation of one of the fulcrum levers for initially actuating the trapdoor when the foot plunger is depressed to release the securing latch.

Heretofore it has been the customary practice to construct the vestibule folding steps as a sub-assembly, which was then brought to the car for installation in the step well. The step assembly was connected for simultaneous operation with and as an incident to the operation of the trapdoor and consequently in the mounting of the assembly in the step well it was necessary that the steps be so fitted and adjusted before permanent mounting in the car structure as to operate in proper relation to the step well and so as not to engage or bind upon the side walls of the step well. The operation of the step assembly about its pivotal axis must be such that in the inoperative position of the steps the bottom surface of the assembly is disposed flush with the outer curved side wall of the car and the edge of the first step tread, comprising the uppermost portion of the step in this position, must close in properly spaced parallel relation to the lower surface of the closed trapdoor, and in the operative position of the steps all of the treads must be disposed horizontally. All of this necessitated some very fine calculation with respect to the positioning of the step assembly in the step well at the time of installation and constituted a tedious and time-consuming operation which, unless the utmost care were exercised, made it possible in the final assembly to obtain conditions not desired in the operative relations of the parts.

In the present invention these objections are overcome in part by the provision of mounting means for the step assembly in the step well which provides for the adjustment of the pivotal axis of the step assembly to permit shifting thereof as required by the positioning of the assembly in the step well to accommodate any changes in the disposition of the axis necessary to the normal operation of the steps between a

horizontal operative position and an inoperative position in proper relation to the car side and trapdoor and insuring the functioning of the step assembly in spaced parallel relation to the side walls of the step well. As a means of further obviating the objections to previous arrangements and to overcome difficulties encountered relative to the mounting and operative alignment of the step assembly and trapdoor in relation to each other and to the step well and platform and the car side, an adjustable connection is provided between the trapdoor and step assembly which is secured to each for relative universal movements, and adjustable with respect to both to compensate for irregularities occurring between the step and trapdoor incident to their initial installation in the car. The universal attachments each include a threaded member securing the connection to the trapdoor and step assembly respectively and which serves the twofold function of providing at once, not only a means of affording the swiveling movement necessary to one direction of the universal movements of the connection, but also a means of adjustment of the connection relative to the respectively associated parts. One of the universal attachments of the connection—that, in the form shown, on the trapdoor—is mounted for bodily shifting movements relative to the supporting part to provide a means of further adjustment of the connection supplementing the adjustments afforded by the threaded connections and provides a positive means of regulating the relative positions of steps and trapdoor in their two extremes of movement and relative to the step well, platform and car side.

In the drawings, 10 represents a railway car having a body end wall 11 and a vestibule wall 12 which, together with side door 13, define a vestibule 14 which is complemented by a similar arrangement at the opposite side of the car to provide a full width vestibule occupying the car end and having a passageway affording communication between adjoining cars in a train. The platform 15 comprises the floor of the vestibule and a trapdoor 16, flush with the surface of the platform in the closed position of the trapdoor, covers a step well 17 beneath the level of the platform and between the end walls 11 and 12. When the side door 13 is closed the trapdoor cannot be opened since the side door overlies the trapdoor in this position and it is necessary first to open the vestibule side door and then the trapdoor which serves as a safety feature in that the trapdoor must always be lowered before the side door can be closed so that the trapdoor is not likely to be left open while the car is in transit, and since the trapdoor is connected to a step assembly, hereinafter to be described, the steps cannot be moved to operative position when the side door is closed and cannot inadvertently be left in lowered position in transit.

The trapdoor is hingedly mounted adjacent the end wall 11 by means of hinge structure 18 incorporated for the purposes of assembly as a part of the trapdoor structure. The hinge structure 18 includes a hinge butt 19 extending substantially full width of the trapdoor from the threshold to the inner side and having spaced end bearings 20 secured thereto by welding and between which a continuous concentrically disposed tube 22, constructed as a part of and forming the hinge edge of the trapdoor between the hinge bearings, is adapted to be received. The

trapdoor is supported for pivotal movement in the end bearings 20 by means of short axles 21 fixed in the end bearings and about which the trapdoor rotates by reason of the entrance of the supporting axles within the tube 22 forming the hinge edge of the trapdoor . The hinge butt 19 is sub-assembled with the trapdoor and the complete assembly installed in the car by securing the hinge butt to the car platform structure adjacent to end wall 11, as best indicated in Fig. 5.

The trapdoor is secured in its lowered, closed position flush with the car platform 15 by means of a latch mechanism 23 constituting part of improved hardware more fully hereinafter to be referred to, and, when the vestibule side door 13, which swings inwardly, has been opened and secured against the vestibule end wall 11 by means of a door-holding device (not shown), the trapdoor is adapted to be pivoted about its hinge structure 18 and raised to a position in front of and fastened to the outer face of the side door within the vestibule where it is securely held by means of a catch mechanism 24 on the side door which engages the same keeper 25 on the trapdoor to hold the trapdoor open as engaged by the latch 23 to hold the trapdoor closed and both of which are automatically engaged by the keeper as the trapdoor is moved from one position to the other releasably to maintain the trapdoor in either of its final positions covering or uncovering the step well respectively.

The latch mechanism 23 securing the trapdoor in closed position covering the step well combines the functions of releasing the trapdoor and imparting an initial opening thrust thereto. The mechanism comprises a casing 26 removably secured by means of machine screws to the platform structure 15 adjacent the edge of the trapdoor opening at the free edge of the trapdoor, and in which a retractible bolt 27 is pivotally mounted in position to project beyond the edge of the trapdoor opening into the path of the trapdoor to overlie the keeper 25 in the closed position of the trapdoor. The bolt 27 is pivoted at 28 adjacent the top of the casing 26 so that as the trapdoor 16 is moved to closed position it will engage the outer sloping face of the bolt automatically to retract it as the trapdoor is pressed home to its fully closed position. The bolt is projected by a spring 29 automatically to engage the keeper 25 as the trapdoor passes, to maintain the trapdoor in fully closed position.

A rearward extension 30 on the bolt, having laterally projecting lugs 31, provides a means of retracting the bolt when it is desired to release the trapdoor for opening movement. This rearward extension is of restricted width compared with the keeper engaging portion of the bolt, as best shown in Fig. 12 and is straddled by a bifurcated fulcrum lever 32 pivotally mounted at 33 in the casing 26 and the respective jaws of which engage beneath the lugs 31 to exert a lifting force thereon when actuated and thereby rotating the bolt about its pivot 28 to withdraw the projecting portion thereof from engagement with the keeper 25 on the trapdoor. The fulcrum lever 32 is actuated by a foot-operated plunger 35 mounted in the casing 26 for vertical reciprocation and having a recess 36 in its shank adapted in the released condition of the plunger to receive that end of the fulcrum lever opposite the bifurcated jaw engaging the retractible bolt. When the plunger 35 is depressed, the engagement of the lever end 34 within the recess 36

causes the fulcrum lever to be rotated about its pivot point 33 and thereby impart the lifting force to the rearward extension 30, before referred to, for retracting the bolt 27.

The plunger 35 after being depressed to release the trapdoor is returned to normally raised position by means of a compression spring 37 disposed about the shank of the plunger and mounted in a portion of the casing 26 extending about the shank and projecting beneath the surface of the platform as indicated in Fig. 5. When the foot plunger is depressed to release the trapdoor latch it serves the additional function of imparting an initial opening thrust to the trapdoor and which occurs subsequently to the operation of releasing the latch 27. The retractible bolt 27, the fulcrum lever 32 and the plunger 35 are arranged in sequential alignment disposed substantially centrally of the casing 26 with the retractible bolt and the fulcrum lever flanked by intermediate walls 39 of the casing and in which the pivots 28 and 33 for these members are mounted. At respectively outer sides of the intermediate walls, powerful lifting levers 40 are fulcrumed in the casing in position to engage the keeper 25 on the trapdoor and to be engaged by means on the plunger for actuating them. The levers 40 are entirely separate of each other and are pivotally mounted in the casing 26 between the intermediate walls 39 and respectively outer walls 38, as best shown in Fig. 12, by means of removable fulcrums 41 threaded into the outer walls, passing through the lifting levers and finding bearing in the respective inner walls. The fulcrums, while separate, are axially aligned for simultaneous functioning of the lifting levers and are securely held in position by means of lock washers disposed between the heads of the fulcrums and the respectively associated walls 38.

The lifting levers 40 each extend continuously from a point engaged beneath the keeper 25 on the trapdoor, over the fulcrums 41 and to a point alongside of the shank of the plunger 35, and except for the portions extending beneath the keeper, disposed entirely within the casing 26 so that they are substantially completely enclosed. The ends of the levers at the sides of the foot plunger are engaged by lateral projections 42, integral with the plunger, when the plunger is depressed to release the latch 27 and actuate the levers. These lateral projections pass through slots 43 in the casing 26 to engage the levers 40 as the plunger 35 is depressed and normally are spaced above the levers a distance sufficient to permit downward travel of the plunger to the extent necessary to release the latch 27 before the levers are engaged to impart an upward thrust on the trapdoor so that when the levers are actuated the path of movement of the trapdoor is clear of the projecting bolt 27. The ends of the lifting levers cooperating with the trapdoor each have a widened bearing area, as indicated at 44, engaging beneath upwardly offset portions 45 of the keeper 25 at opposite sides of the retractible bolt 27 and disposed alongside of the intermediate walls 39 of the casing, as shown in Fig. 12, the outside walls 38 and that portion thereof covering the levers being cut back to expose the lifting end of the levers and to provide a space at the respective outer sides of the intermediate walls to receive the offset portions 45 overlying these exposed ends of the levers. The ratio of the length of the lifting levers between their fulcrums 41 and the plunger 35 and between the fulcrums and the keeper 25 on the trapdoor is such that the former length is greater than the latter whereby to increase the force of any given pressure applied to the foot plunger when translated to a lifting force on the trapdoor. When the foot plunger is depressed, the immediate function is to rotate the fulcrum lever 32 about its pivot 33 to release the latch 27, during which action the fulcrum lever portion 34 is forced out of the recess 36 in the plunger by the downward movement thereof and during the continued movement of the plunger the lever portion 34 engages in slot 46 to maintain the proper alignment between the fulcrum lever and the recess 36 upon release, and insuring also the alignment of the lateral projections 42 on the plunger with the slots 43 in the casing 26 during depression.

The catch mechanism 24 for automatically engaging the trapdoor as it is raised and for releasably securing the trapdoor in open position comprises a casing 51 secured by machine screws upon the outer face of the side door in position to cooperate with the keeper 25 on the trapdoor. The casing is provided with a depending base flange 52 against which one of the offset portions 45 of the keeper 25 is adapted to bear in the fully open position of the trapdoor. A retractible bolt 53 is pivotally mounted in the casing at 54 in position normally to extend below the level of the casing into the path of the travel arc of the keeper 25 when the trapdoor is moved to open position. The bolt is projected by means of a spring 55 which permits the bolt to be retracted to permit passage of the member 45 and which is accomplished automatically in the opening movement of the trapdoor by the engagement of the keeper member 45 with the sloping exposed surface of the bolt, after passage of which the bolt, under pressure of the spring, is returned to its fully projected position with the member 45 on the keeper lying between the bolt and the depending base flange portion 52 and when it is desired to move the trapdoor to closed position the bolt may be retracted manually. The outward movement of the bolt is limited by a stop 56 thereon which is engageable with the base of the casing to prevent rotation of the bolt about its pivot beyond a predetermined locking relation to the keeper member.

The bolt 53 may be retracted manually for closing operations of the trapdoor by means of an operating handle 57 pivotally mounted at 58 in the casing adjacent the upper end thereof and entirely removed from the path of movement of the trapdoor. The operation of this upstanding handle is in a direction toward the open side door 13 as indicated by the arrow in Fig. 5, and when the handle is thus moved a depending lever extension thereof, integral therewith, as shown at 59, moves in the opposite direction within the casing 51 to rotate the bolt 53 about its pivotal axis in a direction to retract the projecting lock portion. This integral lever portion of the operating handle is bifurcated similarly to the fulcrum lever 32 of the trapdoor latch mechanism 23 and is adapted to straddle an extension 61 of the locking bolt and engage oppositely extending lugs 60 for operation of the bolt in a manner similar to that of the previously described arrangement but without the interposition of an intermediate fulcrum lever between the operating member and the bolt—the operating handle 57 being directly connected through the bifurcated lever 59 with the locking bolt for direct actuation thereof. It will be seen from an examina-

tion of the perspective illustration of the arrangement shown in Fig. 2 that the natural inclination of one operating the mechanism is to press the operating handle 57 in a direction towards the face of the open side door 13, whereupon, as shown in Fig. 5, the engagement of the lever 59 with the lugs 60 on the bolt extension 61 causes the bolt to be rotated about its pivotal axis 54 a distance sufficient to withdraw the locking portion 53 from the path of the keeper portions 45 to enable the trapdoor 16 to be moved out of range of the catch mechanism when the operating handle may be released and the trapdoor then moved to fully closed position, secured by the latch mechanism 23.

The trapdoor, adjacent its outer edge on the upper surface, is provided with a threshold 65 which in the horizontal closed position of the trapdoor is disposed in position to be engaged by weatherstrip 66 on the bottom edge of the vestibule side door to provide a weatherseal therebetween in the closed position of the side door. The remaining three sides of the trapdoor are weatherstripped about the step well 17, as at 67, 68 and 69 respectively, whereby the entrance of dirt and moisture, or the like, into the vestibule area is positively prevented.

The step well 17, for receiving the step assembly hereinafter to be described, includes side walls 70 at respectively opposite sides of the step well. These side walls are each rigidified by means of a vertically disposed channel shaped reinforcing member 71 secured to the respective walls by welding, and extending from the platform structure and the underframe structure, to both of which they are secured by welding, substantially to the lower extremity of the respective side walls. These reinforcing members are disposed in that area of the side walls of the step well in which the pivotal supports for the step assembly are located and serve to supplement the side walls 70 in the support of the step assembly from the platform and underframe structures at respectively opposite sides of the step well and to stiffen the side walls against lateral flexure. Mounting plates 72 are secured in the channel members for the attachment of removable bearing assemblies for the pivotal support of the steps, and these plates are welded to the members 71 in positions disposed about openings 73 extending through the respective side walls and the reinforcing members, and through which the bearing assemblies are adapted to protrude in opposing relation from opposite sides of the step well in the support of the step assembly.

A fixed step tread 75 extends between and is secured to the side walls 70 in the step well at one step level below the level of the platform 15 and a riser 76, also extending between and secured to the side walls of the step well, closes the space between this step and the platform, and a similar depending riser 77 disposed adjacent to the forward edge of the step extends downwardly therefrom a distance corresponding to the normal height of a step. This riser also extends between and is secured to the side walls 70 of the step well and is reinforced at its bottom edge by an angle member 78 secured thereto by welding, and disposed at the rear side thereof. This angle member is continuous and extends upwardly at the respectively opposite sides of the step well for attachment to the side walls 70. This fixed step 75 and the risers 76 and 77 define the inner limits of the step well and are so disposed as to cooperate with the folding step assembly, presently to be described, in such manner as to provide a continuous unbroken stairway extending from a normal height at the car side to the platform 15.

The step assembly 80 is comprised of a pair of spaced side walls 79 and 81 connected by upper, intermediate and lower step treads 82, 83 and 84 respectively, disposed at equal, vertically spaced intervals corresponding substantially to the height of the risers 76 and 77 associated with the fixed step 75 and having risers 85 and 86 between the intermediate tread and the respective upper and lower treads. The under side of the steps is covered by a closure plate 87, which, in the inoperative position of the steps, conceals the underside thereof and conforms to the inward curvature of the car side wall at the lower portion, all as best shown in Fig. 4, so that the steps when thus disposed serve to close the step well opening at the side of the car and present a surface flush with the surface of the side. The closure plate 87 overlaps and is secured to the edge flange portion of the lower tread 84 at the free edge of the step assembly and all of parts, including the treads 82, 83 and 84, the risers 85 and 86, and the back closure plate 87, are secured to the side walls 79 and 81 by welding to provide an integrated assembly rigidified by the very nature of the box structure thus afforded, and stiffened and reinforced by the disposition of the tread plates and risers in angular relation throughout the major area of and extending between the step side walls, and further stiffened by the closure plate in portions of the side walls not reinforced by the treads or risers.

The respective side walls 79 and 81 of the step assembly are each provided with a fixed bearing receptacle in the form of a flanged collet 91 secured on the outer face of the side walls by welding, as best shown in the large scale sectional view illustrated in Fig. 7. The collets are disposed with their base flange portions in contact with the respective step side walls and their open and cylindrical barrel portions extending outwardly therefrom in axial alignment on an axis passing through the step at one side of the center of balance assembly and about which such assembly is adapted to revolve. The collets 91 are adapted to receive removable cylindrical sleeve bearings 92 which are mounted in the barrel portions thereof and have outstanding annular flange portions 93 overlapping the open end of the respective barrel portions to provide end bearing adapted to resist end thrust.

The pivotal axis of the step assembly is located to that side of the center balance of the steps whereby, when released, the steps move by gravity in the direction toward their operative position, affording access to the car platform, and are mounted in the step well 17 by means of removable supporting assemblies secured in the respective side walls 70 of the step well. When the step assembly is properly positioned in the step well, the bearing receptacles 91 on the step side walls 79 and 81 are disposed in axial alignment with the openings 73 in the respective side walls of the step well and trunnions 94 project through these openings and enter the bearing receptacles pivotally to support the steps for the movement necessary to rotate them from their inoperative raised position, shown in Figs. 1 and 4, to their lowered operative position illustrated in Figs. 2 and 3 and vice versa. The trunnions 94 are fixedly supported in the side walls of the step well and the bearings 92 in the bearing receptacles on the steps

rotate relatively thereto with the step assembly as it is operated.

The trunnions each comprise part of a unitary assembly which may be removed in its entirety from association with the step assembly and disconnected from the supporting walls 70. These assemblies, as shown in Figs. 5 and 6, each include a mounting collar 95 having an annular flange 96 which affords a means of attaching the collar to the mounting plate 72 on the side wall 70 of the step well. Bolts 97 which may be in the form of cap screws threaded into the plate 72 through the flange 96 and secured by lock washers, provide means of removably fastening the mounting collar to the web of the supporting and rigidifying channel member 71 on the side wall 70. The mounting collar 95 is adapted adjustably to support a floating sleeve 99 carrying the trunnion 94, and which is provided with an annular flange 98 disposed between the collar 95 and the web of channel member 71 in the plane of the attaching plate 72. When the collar is secured by bolts 97, the sleeve 99 is thus confined against axial displacement by the engagement of the annular flange between the mounting collar and the channel member.

The sleeve member is suspended in the mounting collar 95 by means of a plurality of adjustable cap screws 100 threaded through the collar and engaging the sleeve on all four sides. Locking nuts 101, secured by lock washers, maintain the adjustment of the cap screws. The trunnion 94 for supporting each side of step is provided with an enlarged hollow shank portion 102 entered in the sleeve 99 and secured against rotation or axial displacement by means of a pin 103 passing diametrically through the sleeve and shank and cotter keyed in place so that the trunnion is fixed with respect to the sleeve member. The trunnion 94 enters the bearing 92 on the steps and the enlarged shank 102 affords a shoulder 106 adapted to engage the bearing portion 93 to maintain the step assembly centrally disposed between the side walls 70 of the step well since ample clearance is provided between the bearings at opposite sides of the steps and the respectively adjacent side walls of the step well to provide for the ready removal of the step assembly when the supporting trunnions are withdrawn. The trunnions 94 are adjustable axially to provide for take-up on the bearings in compensation for clearance as a result of wear and initially to regulate the centrally disposed installation of the step assembly in the step well. The enlarged shank portion 102 is provided with a series of radially disposed holes 107 at axially spaced intervals and the sleeve 99 is provided with a plurality of radially disposed holes 108, also axially spaced with respect to each other, and the pin 103 is adapted to be inserted through one of the holes 108 in the sleeve and pass through one of the holes 107 in the trunnion shank 102 to secure the trunnion in adjusted position. By moving the trunnions at opposite sides of the step assembly axially through the sleeves 99 to position the shoulders 106 in relation to the bearings 93 and to locate the steps properly in respect to the step well and then aligning the proper hole 107 in the shank 102 with one of the holes 108 in the sleeve 99, it will be seen that the proper adjustment of the trunnions may readily be had. The number of such adjustments available is determined by the number of axially spaced holes 107 provided in the trunnion shanks multiplied by the number of axially spaced holes 108 in the sleeves 99 since the combinations afforded by associating the various holes in the trunnion with the respective holes in the supporting sleeve each provide an axial adjustment of the trunnion when secured by the pin 103. The sleeve 99, by means of the bolts 100, is fixed with respect to the mounting collar 95 whereby, with the trunnions 94 projecting through the openings 73 in the opposite side walls 70, axially aligned fixed pivots are provided in the step well about which the step assembly is adapted to rotate as a unit. The sleeve 99 normally is concentrically disposed within the collar 95, with clearance therebetween on all sides to provide for adjustment of the sleeve in any direction necessary to the fitting of the step assembly to the step well, and the trunnion projecting through opening 73 in the side wall of the step well is adapted normally to be disposed concentrically with respect thereto, but which relation varies in accordance with the adjustment of the sleeve member supporting it.

It will readily be seen that, with the adjustable trunnion assemblies mounted upon the respective side walls 70, with the trunnions projecting through the openings 73 into the bearings 92 within the receptacles 91 on the steps, the steps are supported in the step well on a pivotal axis, the angular disposition of which may be varied to alter the angle of operation of the steps and change the relation thereof with respect to the step well and the trapdoor. Where a number of cars are under construction, variations occur from car to car which affect the relation of the folding step and trapdoor in respect to their operative disposition in the step well, but in the present invention the folding steps may be constructed as a sub-assembly, complete in every respect, and accurately fitted in the step wells of any of the cars under construction and adjusted to compensate for any variation in the relation thereof to the step well, to the car side, or to the trapdoor when in the closed position. The adjustable trunnion assemblies provide for the raising or lowering or horizontal shifting of the folding step structure at either end of the step to counteract any discrepancies incident to the mounting of the assemblies on the walls 70 of the step well or in the relation of the step to the trapdoor in the closed position and with respect to the step well.

When the sub-assembled step structure is brought to the step well for installation, the bolts 100 may be adjusted properly to position the steps. The vertically disposed bolts may be adjusted so to position the trunnion sleeve 95 as to regulate the height of the step assembly and to level the steps on a horizontal plane when in operative position, and when the steps are inoperatively disposed, to position the free edge of the step assembly in proper relation to the under side of the closed trapdoor. The horizontal bolts 100 may be adjusted to position the trunnion sleeve so that the step assembly is disposed in proper relation to the fixed step 75 when in the open position, and when the steps are closed to position the back side 87 flush with the inwardly curved side of the car and in proper relation to the side edge of the trapdoor. The adjustment of all of the bolts 100, once determined, is permanently maintained by the locknuts 101. The engagement of the annular flange 98 on the trunnion supporting sleeve member 99, between the channel member 71 and the mounting collar 95, maintains the axis of the sleeve member at

all times on a horizontal plane whereby to prevent cocking thereof at an angle as the bolts 100 are adjusted and serves as a guide, insuring movement of the sleeve only in directions necessary to the adjustment of the bolts. After the final adjustment of all of the bolts 100 has been effected, the step assembly still may be dismounted without disturbing such adjustment merely by removing the respective pins 103 and withdrawing the trunnions 94 from the bearing receptacles 91 through the sleeves 99, whereupon the step assembly may be removed from the step well. The entire trunnion assembly, including trunnion 94, sleeve 99, and mounting collar 95, may be removed as a unit by removing the four cap screws 97. Thus it will be seen that a simple means of removing the step assembly for maintenance purposes has been provided which does not necessitate the readjustment of the mounting assemblies upon reinstallation.

The step assembly 80 is connected to the trapdoor 16 for coincidental operation of both in proper relation to each other, and the means for connecting the two structures provides for the further adjustment of the cooperative relation between these members and in respect thereof to the car platform 15 and the step well 17. The operative position of the step assembly is determined by the engagement of stop members 105 on the steps with stops 104 in the step well. The stops 105 are in the form of angle members secured to the side walls 79 and 81 of the step assembly immediately beneath the uppermost tread 82 and extending rearwardly therebeyond for engagement with the stops 104 which are mounted upon the under side of the horizontal flange of the angle member 78 at the lower edge of the fixed riser 76 as the step assembly is lowered to full open position for use. The connection between the steps and trapdoor provides for the adjustment of the full open position of the trapdoor to this full open position of the steps. The engagement of the stops 104 with the stops 105 acts as a positive limit of rotation in the opening movement of the step assembly and provides a rigid stabilizer for the steps in their open position, and the adjustment of the connection between the steps and trapdoor does not disturb this rigidly supported condition. The operative position of the steps as determined by the engagement of the stops 104 and 105 may be regulated by the use of shims for adjusting the stops.

The pivotal axis of the step assembly is disposed at an angle of substantially ninety degrees to the hinged axis of the trapdoor and the connection between the step and trapdoor is universally movable with respect to each to accommodate the movements of the two structures operating in directions at right angles to each other. The connection comprises a strut member in the form of a flat bar 111 having articulation members 113 and 115 hingedly connected thereto at the respectively opposite ends thereof as at 112 and 114. The articulation members are threaded, and the member 113, connected with the step assembly, is threaded into a fixed pivot block 116 secured to the side wall 81 of the step assembly by welding. It is to be noted that the side wall 81 extends above the level of the uppermost tread 82 as at 88 and it is in this extended area that the pivot block 116 is secured on the outer side of the step assembly, but communicating through an opening in the side wall with the inner side thereof, from which position the articulation member 113 is entered.

The extended area of the side wall is stiffened by reinforcing plates 89 radiating from the pivot block 116, to which and the side wall 81 they are secured by welding. One of the reinforcing plates extends to and is secured to the bearing receptacle 91, and both of the plates extend beneath the level of the tread 82 whereby to rigidify the extended area 88 to the fullest and to distribute forces transmitted by the strut 111 incident to the coincidental operation of the steps and trapdoor into the side wall 81 and the step assembly as a whole. The upwardly extended portion 88 and the side wall 81 are further stiffened by the flanging of the side wall outwardly within the area of the step well as at 90. The flange 90 rigidifies the side wall and by closing the space between the step assembly and the adjacent side wall 70 of the step well conceals the trunnion support mechanism and the pivot block 116 from the view of persons using the steps. The side wall 79 at the opposite side of the step assembly also is flanged outwardly at 90 to close the space between that side of the steps and the step well and thereby conceal the trunnion mechanism, but at the upper tread 82 the flange is disposed horizontally flush with the surface of the tread, since it is unnecessary for this side wall to extend above the level of the top tread.

The articulation member 113 is adapted to be screwed into the pivot block 116 and serves the twofold purpose of adjusting the flat bar 111 in regard to the vertical disposition of the bar in the open position and in respect to clearances thereof in relation to the trapdoor, the step well structure and the step side wall extension 88 and in the operation of the assembly, provides for the relative rotation in one of the directions necessary to the universal movement of the connecting bar 111 with respect to the step assembly. The member 113 turns on the threads in the pivot block 116 as the step assembly is pivoted from closed to open position and return, and the direction of rotation of this turning movement in the threads is at right angles to the hinge axis of the connection 112 to the connecting bar so that the bar is universally movable in regard to its connection to the steps whereby the movements of the bar with respect to the steps in directions at right angles due to the disposition of the steps and trapdoor for operation at right angles is entirely unrestricted.

The connection of the strut 111 at its opposite end to the trapdoor 16 is similarly adjustable by the threaded engagement of the articulation member 115 in the pivot block 117, but the pivot block is slidingly mounted for further adjustment of the connection as required to obtain the proper relation between the trapdoor and steps and the platform. As best shown in the larger scale views of Figs. 9, 10 and 11, the sliding pivot block 117 is rectangular in form and provided with laterally extending base flanges 118 adapted to interlock with a frame 119 removably mounted in the trapdoor. The frame 119 might be said to be H-shaped with a central rectangular opening 120 for the reception of the sliding block 117 and which is provided with an undercut groove 121 at each side to receive the projecting base flange 118 at the corresponding side of the sliding block. The sliding block is guided between the side walls of the central opening 120 against any but a sliding motion in the direction of operation of the trap-

door and the final position of the block in the opening is determined by cap screws 122 engaging opposite ends of the sliding block to fix the location of the block in accordance with adjustments made at the time of installation of the connection between the trapdoor and steps. The end walls 123 defining the length of the central opening 120 are spaced from the opposite ends of the sliding block 117 distances sufficient to provide ample space for adjustment of the block, and the cap screws 122 are threaded through these end walls in oppositely disposed relation to receive the sliding block between them, and whereby the block may be adjusted lengthwise of the opening in either direction by retracting one or the other of the cap screws and advancing the other. End spaces 124 in the frame 119 provide for the adjustment of the cap screws.

The frame 119 is recessed into the under side of the trapdoor and is rigidly mounted in a pocket 125 provided therefor in the structure of the trapdoor. The frame is secured by means of countersunk machine screws 126 passing through laterally extended flanges 127 on the frame and threaded into the trapdoor. Thus secured, the frame virtually becomes a part of the trap door and affords a solidly anchored point of attachment for the connection 111, and the adjustable sliding pivot block 117, by reason of the flanges 118 underlying the grooved side walls of the frame, is interlocked with the frame in such manner as to preclude removal thereof without first dismounting the frame so that, when assembled, with the pivot block adjusted and the articulation member 115 threaded into position therein, the only relative movement between any of the parts will be the rotation of the member 115 in its threaded mounting as the trapdoor and steps are operated, and of course the hinging action of the strut 111 about the hinge 114. A plate 128 covers the pocket 125 and serves to conceal the frame 119 and the adjusting mechanism when the trapdoor is raised. The cover plate is secured in position by means of flat head machine screws 129 and is provided with an elongated central opening through which the articulation member 115 is adapted to extend for connection with the strut 111.

The articulation member 115 at the trapdoor and the member 113 at the step assembly may, each of them, be installed in the respective pivot blocks 117 and 116, or the adjustment thereof changed, merely by removing the hinge pin 110 from the connections 114 or 112 at either end of the connecting strut 111 whereby to disconnect the strut, and whereupon the articulation members may be screwed into or out of the pivot blocks to obtain the desired relation between the various parts, and the hinge pin then replaced. The hinge pins 110 are held in place by means of cotter keys. Adjustment of the member 115 may be had without the necessity of removing the cover plate 128 since this member projects through the central opening in the plate. When adjusting the position of the pivot block 117 in the frame 119, however, it is necessary that the cover plate be removed in order to manipulate the adjusting screws 122. Adjustment of the member 115 may be utilized to modify the effective length of the connection 111 in adjusting the steps and trapdoor relative to each other, and like the member 113, also may be used to regulate the vertical position of the connection relative to the trapdoor and a cooperating guard member 130 mounted upon the side wall 70 of the step well in operative relation to the connection.

As best shown in Figs. 2 and 5, the strut 111 in the open position of the trapdoor is adapted normally to be disposed parallel to the under surface of the trapdoor, and the flat construction of the strut enables the most inconspicuous disposition thereof in the step well. By reason of the threaded articulation members 115 and 113, the connecting strut may be adjusted as closely adjacent to the underneath surface of the trapdoor as possible in the open position and consistent with the proper cooperative relation between the trapdoor and steps when in closed position whereby the strut does not project into the step well in such manner as to be objectionable, and by reason of such disposition of the strut its use as a grab handle is prevented. The guard 130 may be used to close the space between the strut and the side wall 70 below the level of the trapdoor and thereby prevent the strut from being grasped as a handhold at that position.

The step assembly thus is supported in the step well on trunnions which are removable for dismounting the steps and which are adjustable axially to center the step assembly in the step well, and adjustable vertically and horizontally to regulate the position of the steps relative to fixed portions in the step well and to the car side wall and in relation to a cooperating trapdoor with which the steps are operatively connected for coincidental actuation, to rotate in directions at right angles about their respective pivotal axes, and this connection is movable universally and adjustable in respect both to the steps and trapdoor and is adjustable further in respect to one to compensate for differences in the relation of each to the other and the car platform and side wall and to adjust the extreme positions of both. The trunnion assemblies may be removed as units and the connection between the steps and trapdoor comprises a flat strut which may readily be disconnected from either for adjustment. Improved hardware facilitates operation of the trapdoor and steps and securely maintains the parts in either of their extreme positions of movements.

What is claimed is:

1. In a railway car having a platform and a step well with a folding step assembly pivotally mounted in the step well and a hinged trap door operating in directions at right angles to the step assembly and adapted to fold flush with the platform over the step well, means for adjusting the pivotal axis of the step assembly in vertical and horizontal directions to regulate the normal operative position of the assembly relative to the step well and platform comprising trunnions mounted in the step well and universally adjustable in directions perpendicular to the pivotal axis of the step assembly, said trunnions engaging bearings on the step assembly pivotally to support the assembly in adjusted normal operative position relative to the step well, and means providing a compensating adjustment between the step assembly and trapdoor comprising a universally movable strut member extending between and having individually adjustable connections to the step assembly and trapdoor respectively for regulating the length thereof in accordance with the adjustment of the step assembly relative to the trapdoor.

2. In a railway car having a platform and a step well with a folding step assembly pivotally

mounted in the step well and a hinged trap door operating in directions at right angles to the step assembly and adapted to fold flush with the platform over the step well, means for adjusting the pivotal axis of the step assembly in vertical and horizontal directions to regulate the normal operative position of the assembly relative to the step well and platform comprising trunnions mounted in the step well and universally adjustable in directions perpendicular to the pivotal axis of the step assembly, said trunnions engaging bearings on the step assembly pivotally to support the assembly in adjusted normal operative position relative to the step well, means providing a compensating adjustment between the step assembly and trapdoor comprising a universally movable strut member extending between and having individually adjustable connections to the step assembly and trapdoor respectively for regulating the length thereof in accordance with the adjustment of the step assembly relative to the trapdoor, and means for adjusting one of said connections perpendicularly to said lengthwise adjustment further to compensate for adjustment of the step assembly relative to the trapdoor.

3. In a railway car having a platform and a step well with a folding step assembly pivotally mounted in the step well and a hinged trapdoor operating in directions at right angles to the step assembly and adapted to fold flush with the platform over the step well, means for fitting the step assembly in the step well and with respect to the platform and trapdoor including trunnions for pivotally supporting the steps and a member connecting the step assembly with the trapdoor for coincidental operation, said trunnions being mounted in the step well for adjustment axially and adjustable universally in directions perpendicular to the pivotal axis of the step assembly and engageable with bearings on the step assembly whereby to adjust the pivotal axis of the assembly in vertical and horizontal directions to regulate the normal operative position of the assembly relative to the step well, and said member connecting the step assembly with the trapdoor comprising a strut having hinged connection at respectively opposite ends with articulation members threaded directly into the step assembly and trapdoor whereby to afford universal swiveling movements of the strut with respect thereto and provide for regulating the length of the strut in accordance with the adjustment of the step assembly relative to the trapdoor.

4. In a railway car having a platform and a step well with a folding step assembly pivotally mounted in the step well and a hinged trap door operating in directions at right angles to the step assembly and adapted to fold flush with the platform over the step well, means for fitting the step assembly in the step well and with respect to the platform and trapdoor including trunnion assemblies for pivotally supporting the steps and a member connecting the step assembly with the trapdoor for coincidental operation, said trunnion assemblies comprising mounting collars secured respectively in opposite side walls of the step well, a sleeve member mounted in concentric spaced relation within each collar, and a trunnion mounted in the respective sleeve members, supporting bearings at opposite sides of the step assembly engaged by the respective trunnions, and means for adjusting the respective sleeve members in said mounting collars perpendicularly to the axes of said trunnions to adjust the location of the trunnions and thereby adjust the pivotal axis of the step assembly in vertical and horizontal directions whereby to regulate the normal operative position of the assembly in the step well, said member connecting the step assembly with the trapdoor comprising a strut movable universally with respect to both and adjustable with respect to one for regulating the disposition of the strut in accordance with the adjustment of the step assembly relative to the trapdoor.

5. In a railway car having a platform and a step well with a folding step assembly pivotally mounted in the step well and a hinged trapdoor operating in directions at right angles to the step assembly and adapted to fold flush with the platform over the step well, means for fitting the step assembly in the step well and with respect to the platform and trapdoor including trunnion assemblies for pivotally supporting the steps and a member connecting the step assembly with the trapdoor for coincidental operation, said trunnion assemblies comprising mounting collars secured respectively in opposite side walls of the step well, a sleeve member mounted in concentric spaced relation within each collar, and a trunnion mounted in the respective sleeve members, supporting bearings at opposite sides of the step assembly engaged by the respective trunnions, means for adjusting the respective sleeve members in said mounting collars perpendicularly to the axes of said trunnions to adjust the location of the trunnions and thereby adjust the pivotal axis of the step assembly in vertical and horizontal directions whereby to regulate the normal operative position of the assembly in the step well, and means for securing the respective trunnions in said sleeve members in a plurality of axially adjusted positions whereby to center the step assembly between said side walls, said member connecting the step assembly with the trapdoor comprising a strut movable universally with respect to both and adjustable with respect to one for regulating the disposition of the strut in accordance with the adjustment of the step assembly relative to the trapdoor.

6. In a railway car having a platform and a step well with a folding step assembly pivotally mounted in the step well and a hinged trap door operating in directions at right angles to the step assembly and adapted to fold flush with the platform over the step well, means for fitting the step assembly in the step well and with respect to the platform and trapdoor including trunnion assemblies for pivotally supporting the steps and a member connecting the step assembly with the trapdoor for coincidental operation, said trunnion assemblies comprising mounting collars secured respectively in opposite side walls of the step well, a sleeve member mounted in concentric spaced relation within each collar, and a trunnion mounted in the respective sleeve members, supporting bearings at opposite sides of the step assembly engaged by the respective trunnions, and means for securing the respective trunnions in said sleeve members in a plurality of axially adjusted positions whereby to center the step assembly between said side walls, said member connecting the step assembly with the trapdoor comprising a strut movable universally with respect to both and adjustable with respect to one for regulating the disposition of the strut in accordance with the adjustment of the step assembly relative to the trapdoor.

7. In a railway car having a platform and a step well with a folding step assembly pivotally

mounted in the step well and a hinged trap door operating in directions at right angles to the step assembly and adapted to fold flush with the platform over the step well, means for fitting the step assembly in the step well and with respect to the platform and trapdoor including trunnion assemblies for pivotally supporting the steps and a strut member connecting the step assembly with the trapdoor for coincidental operation, said trunnion assemblies comprising mounting collars secured respectively in opposite side walls of the step well, a sleeve member mounted in concentric spaced relation within each collar and having a portion confined between the collar and respectively adjoining side wall to prevent axial displacement of the sleeve member, and a trunnion mounted in the respective sleeve members, supporting bearings at opposite sides of the step assembly engaged by the respective trunnions, means for adjusting said sleeve members in the mounting collars perpendicularly to the axes of said trunnions thereby to adjust the locations of the trunnions in the step well, and means for securing the respective trunnions in said sleeve members in a plurality of axially adjusted positions whereby to center the step assembly between said side walls.

8. In a railway car having a step well with a folding step assembly disposed therein, means for pivotally mounting the step assembly in the step well including a trunnion assembly for adjusting the angular disposition of the pivotal axis of the step assembly, said trunnion assembly comprising a mounting collar removably secured in the step well, a sleeve member mounted in concentrically spaced relation within said collar and having a portion confined between the collar and the step well to prevent axial displacement of the sleeve member, and a trunnion removably mounted in the sleeve member, a cooperating bearing in the step assembly engaged by the trunnion, means for adjusting said sleeve member in the mounting collar perpendicularly to the axis of said trunnion whereby to adjust the location of the trunnion in the step well and thereby regulate the angular disposition of the pivotal axis of the step assembly, and fastening means for securing the trunnion in said sleeve member in a plurality of axially adjusted positions to center the step assembly in the step well, said trunnion assembly being removable as a unit by removing said mounting collar and said trunnion being removable independently by removing said fastening means.

9. In a railway car having a platform and a step well with a folding step assembly pivotally mounted in the step wall and a hinged trap door operating in directions at right angles to the step assembly and adapted to fold substantially flush with the platform over the step well, means for pivotally mounting the step assembly in the step well incluuding trunnions adjustable perpendicularly to the pivotal axis of the step assembly for fitting the step assembly relative to the step well, a strut member connecting the step assembly with the trapdoor for coincidental operation comprising a flat bar disposed closely adjacent to the trapdoor in the inoperative position thereof, means connecting the strut member to the step assembly and trap door comprising end members hingedly connected to the strut on parallel axes transversely of the strut and having threaded swivel connection with the step assembly and trap door on axes perpendicular to the axes of the hinge connections whereby to provide universally swiveling connections to the step assembly and trap door, means for disconnecting said end members from the strut whereby to adjust the threaded connections in the step assembly and trap door to regulate the relation of the strut member therebetween, pivot blocks in the step assembly and trap door respectively adapted to receive said threaded connections, means in the trap door to mount said pivot block for relative sliding movement including a removable guide frame, and means for adjusting the position of the pivot block in said frame to compensate for said adjustment of the step assembly.

10. In a railway car having a platform and a step well with a folding step assembly pivotally mounted in the step well and a hinged trap door operating in directions at right angles to the step assembly and adapted to fold substantially flush with the platform over the step well, means for pivotally mounting the step assembly in the step well including trunnions adjustable perpendicularly to the pivotal axis of the step assembly for fitting the step assembly relative to the step well, a strut member connecting the step assembly with the trap door for coincidental operation comprising a flat bar disposed closely adjacent to the trap door in the inoperative position thereof, means connecting the strut member to the step assembly and trap door comprising end members hingedly connected to the strut on parallel axes transversely of the strut and having threaded swivel connection with the step assembly and trap door on axes perpendicular to the axes of the hinge connections whereby to provide universally swiveling connections to the step assembly and trap door, and means for disconnecting said end members from the strut whereby to adjust the threaded connections in the step assembly and trap door to regulate the relation of the strut member therebetween and to compensate for said adjustment of the step assembly.

11. In a railway car having a platform and a step well with a folding step assembly pivotally mounted in the step well and a hinged trap door operating in directions at right angles to the step assembly and adapted to fold substantially flush with the platform over the step well, means for pivotally mounting the step assembly in the step well including trunnions adjustable perpendicularly to the pivotal axis of the step assembly for fitting the step assembly relative to the step well, a strut member connecting the step assembly with the trap door for coincidental operation comprising a flat bar disposed closely adjacent to the trap door in the inoperative position thereof, means connecting the strut member to the step assembly and trap door comprising end members hingedly connected to the strut and having threaded swivel connection with the step assembly and trap door whereby to provide universally swiveling connections to the step assembly and trap door, pivot blocks in the step assembly and trap door respectively adapted to receive said threaded connections, means in the trap door to mount said pivot block for relative sliding movement including a removable guide frame, and means for adjusting the position of the pivot block in said frame to compensate for said adjustment of the step assembly.

12. In a railway car having a platform and a step well with a folding step assembly pivotally mounted in the step well and a hinged trap door operating in directions at right angles to the step assembly and adapted to fold substantially

flush with the platfrom over the step well, means for pivotally mounting the step assembly in the step well including trunnions adjustable perpendicularly to the pivotal axis of the step assembly for fitting the step assembly relative to the step well, a strut member connecting the step assembly with the trap door for coincidental operation comprising a flat bar disposed closely adjacent to the trap door in the inoperative position thereof, means connecting the strut member to the step assembly and trap door comprising end members hingedly connected to the strut and having threaded swivel connection with the step assembly and trap door whereby to provide universally swiveling connections to the step assembly and trap door, pivot blocks in the step assembly and trap door respectively adapted to receive said threaded connections, means to mount one of said pivoted blocks for relative sliding movement, and means for adjusting the position of the pivot block to compensate for said adjustment of the step assembly.

13. In a railway car having a platform and a step well with a folding step assembly pivotally mounted in the step well and a hinged trap door operating in directions at right angles to the step assembly and adapted to fold substantially flush with the platform over the step well, means connecting the steps with the trap door including a strut member, means connecting the strut member to the step assembly and trap door comprising end members hingedly connected to the strut on parallel axes transversely of the strut and having threaded swivel connection with the step assembly and trap door on axes perpendicular to the axes of the hinge connections whereby to provide universally swiveling connections to the step assembly and trap door, means for disconnecting said end members from the strut whereby to adjust the threaded connections in the step assembly and trap door to regulate the relation of the strut member therebetween, pivot blocks in the step assembly and trap door respectively adapted to receive said threaded connections, means in the trap door to mount said pivot block for relative sliding movement in a direction perpendicular to the hinge axis of the trap door including a removable guide frame, and means for changing the position of the pivot block in said frame whereby to change the effective length of said strut and provide a compensating adjustment for fitting the step assembly and trap door relative to each other.

14. In a railway car having a platform and a step well with a folding step assembly pivotally mounted in the step well and a hinged trap door operating in directions at right angles to the step assembly and adapted to fold substantially flush with the platform over the step well, means connecting the steps with the trap door including a strut member, means connecting the strut member to the step assembly and trap door comprising end members hingedly connected to the strut and having threaded swivel connection with the step assembly and trap door whereby to provide universally swiveling connections to the step assembly and trap door, pivot blocks in the step assembly and trap door respectively adapted to receive said threaded connections, means in the trap door to mount said pivot block for relative sliding movement in a direction perpendicular to the hinge axis of the trap door including a removable guide frame, and means for changing the position of the pivot block in said frame whereby to change the effective length of said strut and provide a compensating adjustment for fitting the step assembly and trap door relative to each other.

15. In a railway car having a platform and a step well with a folding step assembly pivotally mounted in the step well and a hinged trap door operating in directions at right angles to the step assembly and adapted to fold substantially flush with the platform over the step well, means connecting the steps with the trap door including a strut member, means connecting the strut member to the step assembly and trap door comprising end members hingedly connected to the strut on parallel axes transversely of the strut and having threaded swivel connection with the step assembly and trap door on axes perpendicular to the axes of the hinge connections whereby to provide universally swiveling connections to the step assembly and trap door and means for disconnecting said end members from the strut whereby to adjust the threaded connections in the step assembly and trap door to change the effective length of the strut member and thereby provide a compensating adjustment for fitting the step assembly and trap door relative to each other.

16. In a railway car having a platform and a step well with a folding step assembly pivotally mounted in the step well and a hinged trap door operating in directions at right angles to the step assembly and adapted to fold substantially flush with the platform over the step well, means connecting the step assembly with the trap door including a strut member, said strut member comprising a flat bar adapted to be disposed closely adjacent to the trap door in the inoperative position whereby to prevent use of the strut as a handhold, and means beneath the level of the trap door substantially closing the space between the strut member and step well to prevent use of the strut as a handhold.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
684,183	Brisner	Oct. 8, 1901
1,078,693	Rogers	Nov. 18, 1913
1,199,849	Willoughby	Oct. 3, 1916
2,124,872	Chaffee	July 26, 1938
2,146,668	Baade	Feb. 7, 1939
2,148,522	Axe	Feb. 28, 1939
2,220,035	Brack	Oct. 29, 1940

Certificate of Correction

Patent No. 2,522,674 September 19, 1950

FREDERICK C. HEYERDAHL

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 10, line 46, before the word "assembly" insert *of the step*; column 19, line 62, for "incluuding" read *including*;

and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 5th day of December, A. D. 1950.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.