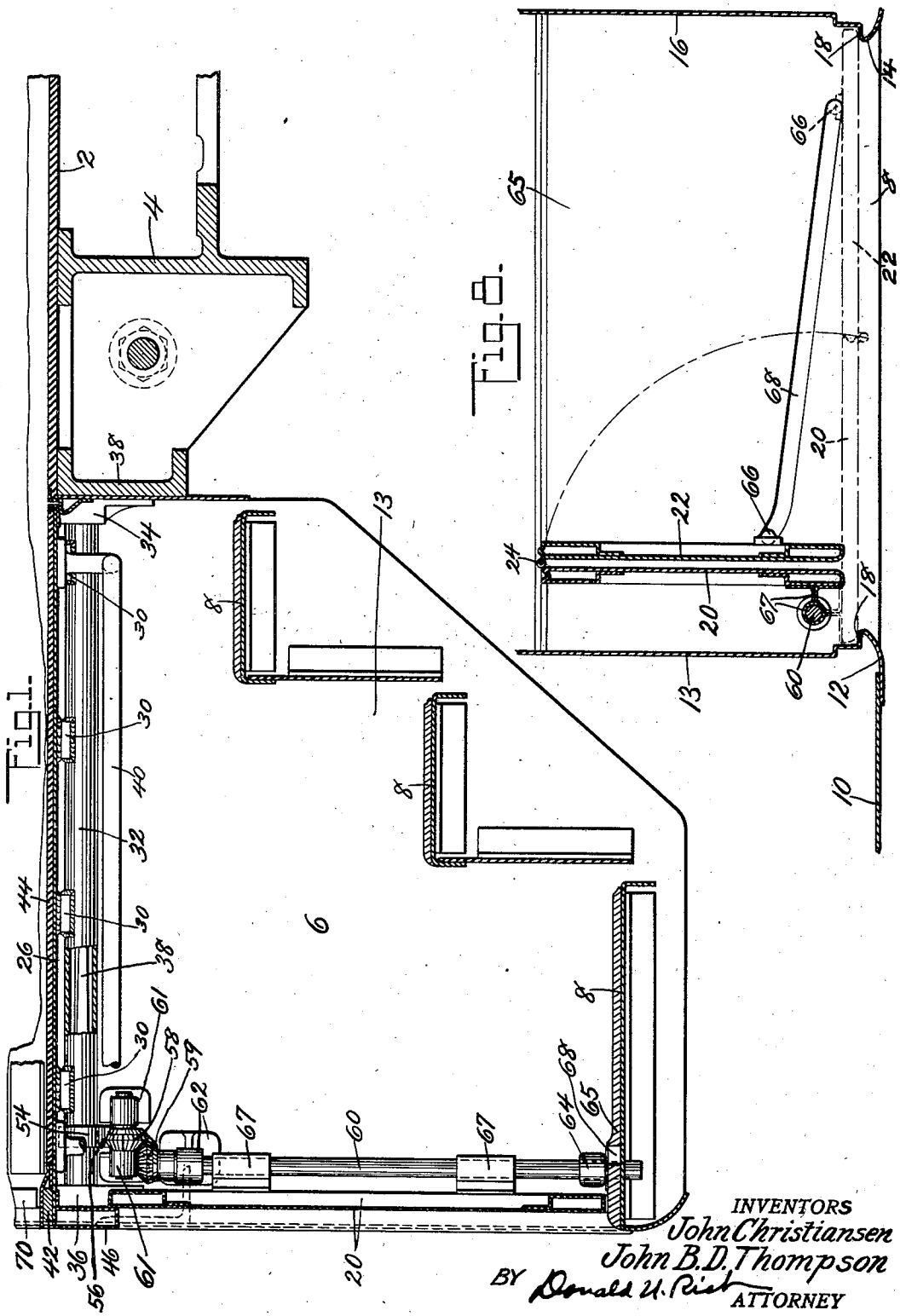
Dec. 17, 1935. J. CHRISTIANSEN ET AL 2,024,338

STEP WELL CLOSURE AND OPERATING MEANS THEREFOR

Filed Dec. 6, 1934 6 Sheets-Sheet 1



Dec. 17, 1935. J. CHRISTIANSEN ET AL 2,024,338

STEP WELL CLOSURE AND OPERATING MEANS THEREFOR

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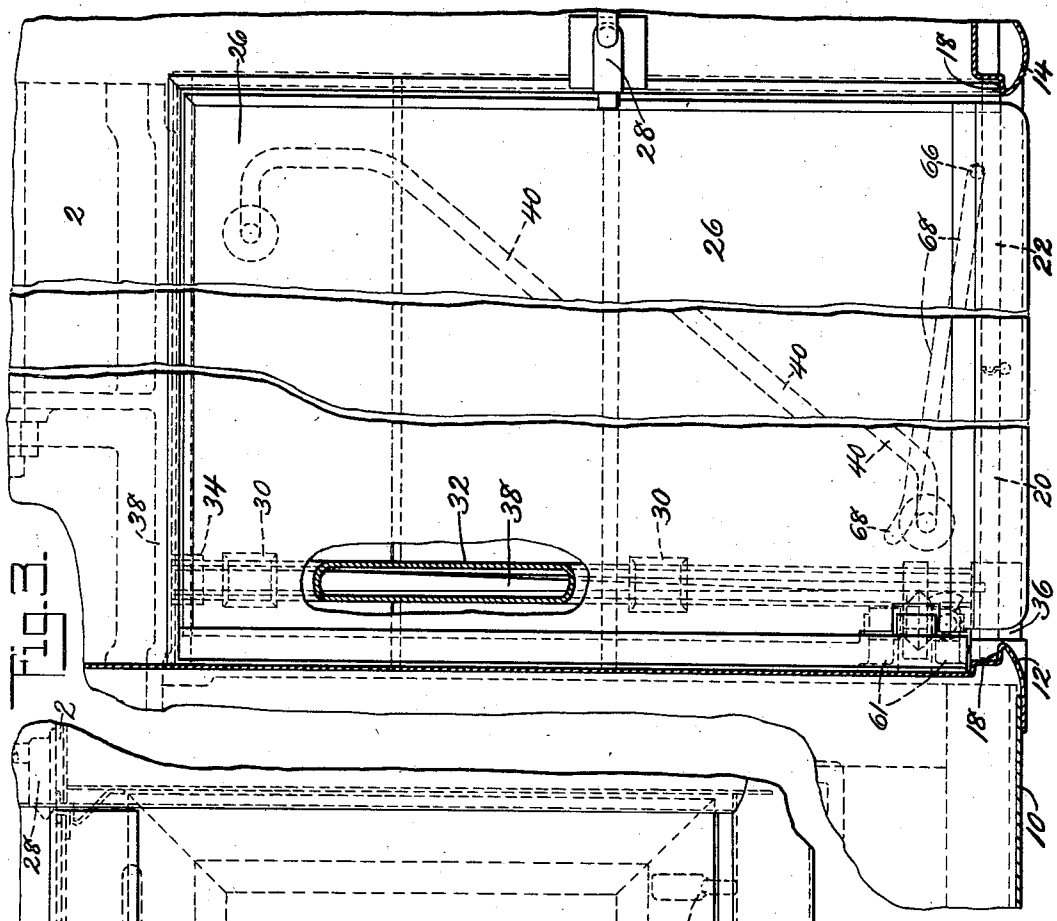

Fig. 3.

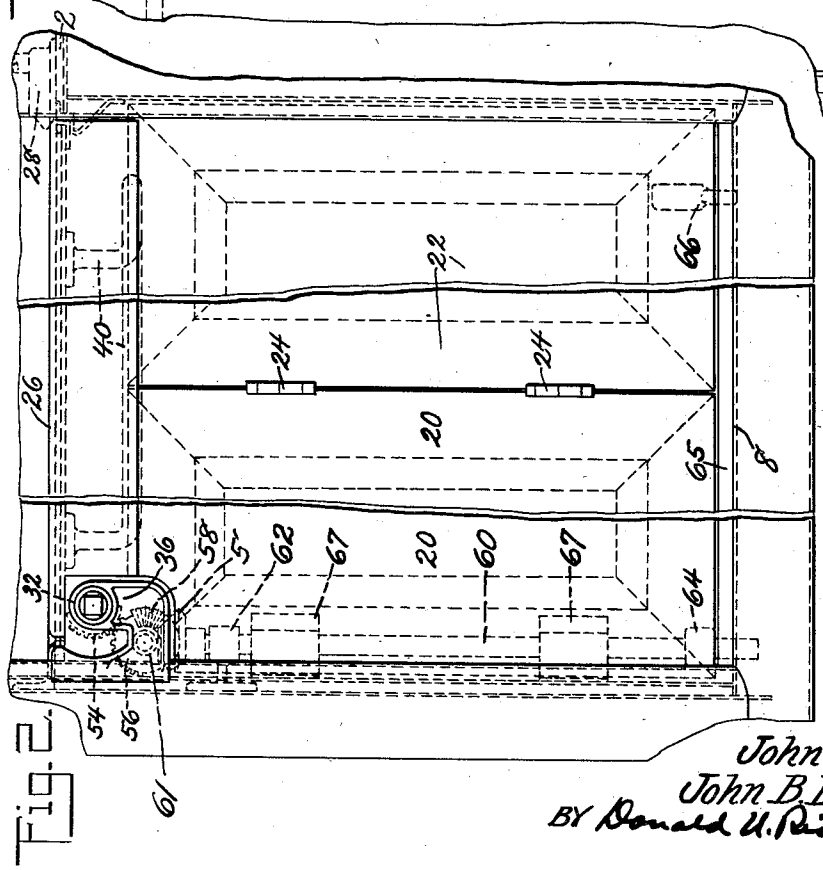

Fig. 2.

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STEP WELL CLOSURE AND OPERATING MEANS THEREFOR

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Fig. 6.

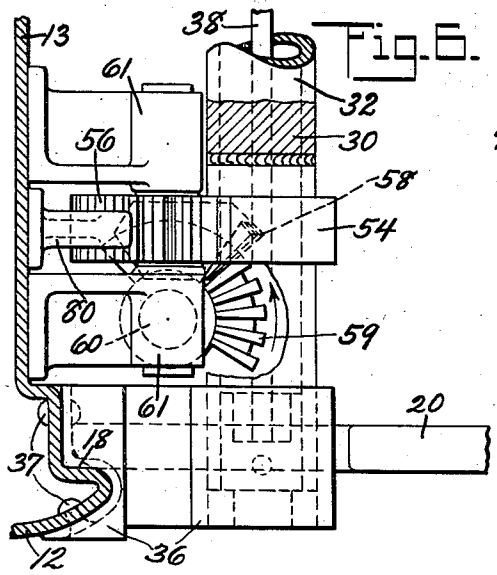


Fig. 7.

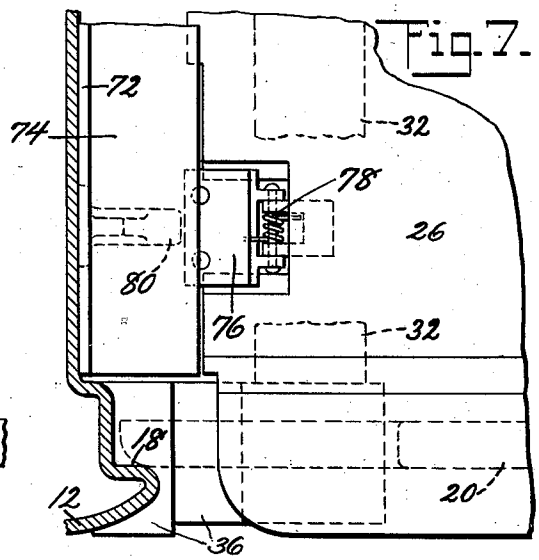


Fig. 5.

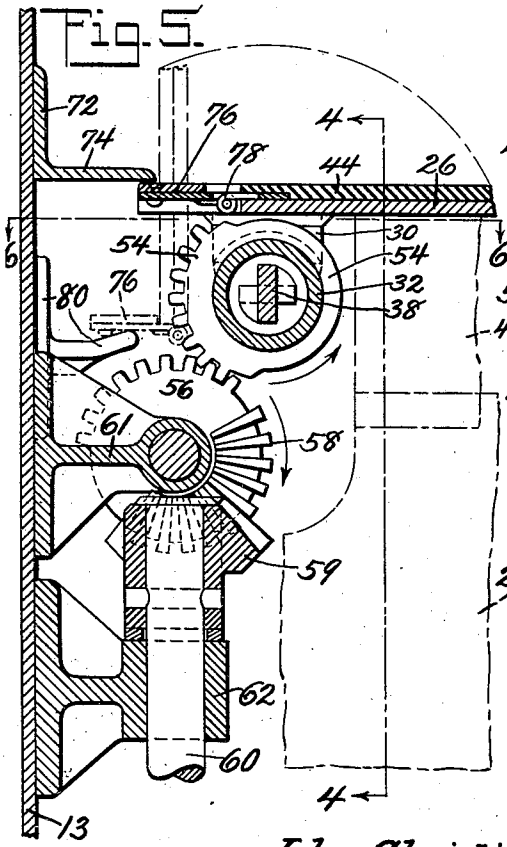
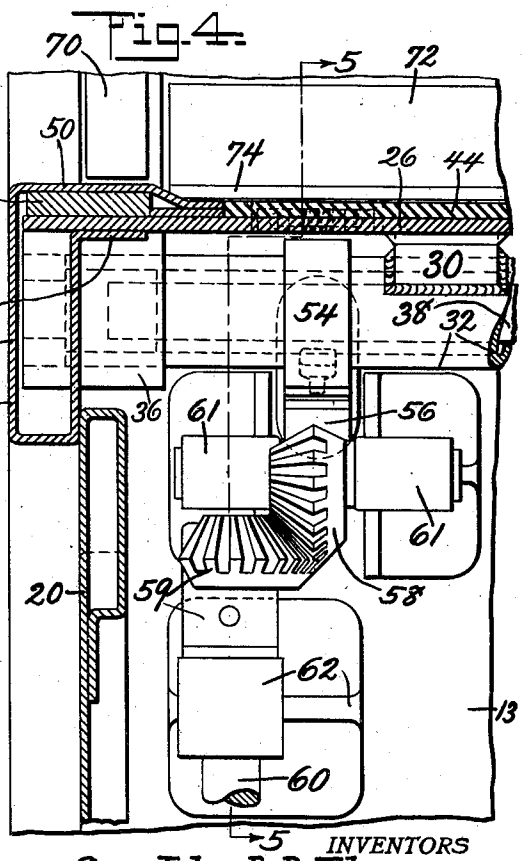


Fig. 4.



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STEP WELL CLOSURE AND OPERATING MEANS THEREFOR

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Fig. 9.

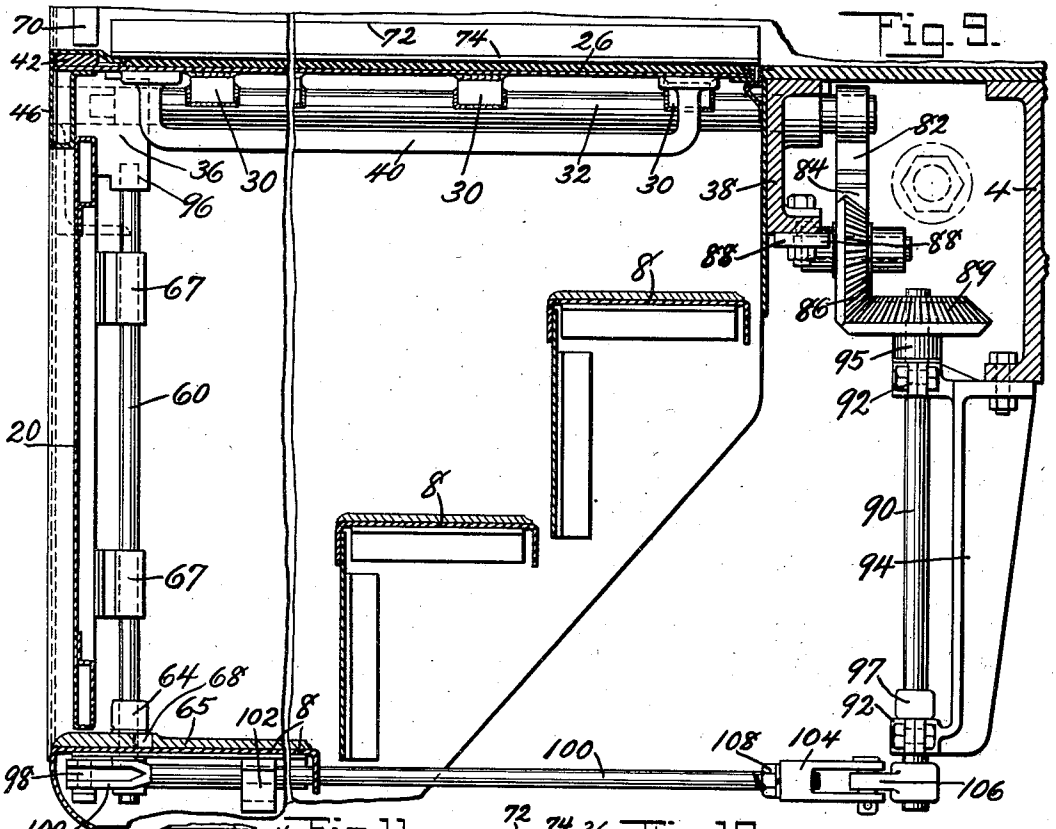


Fig. 11.

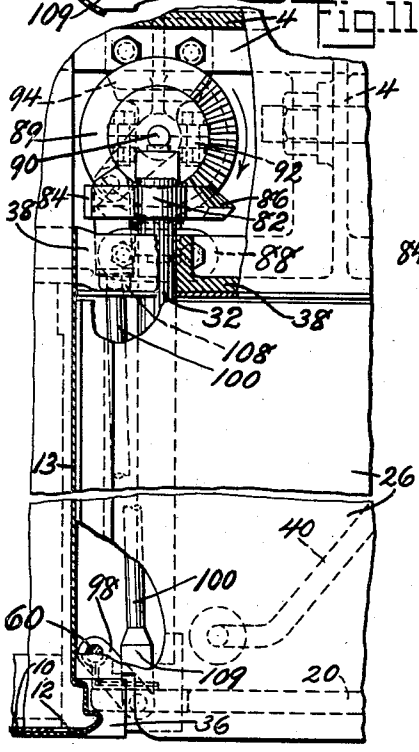
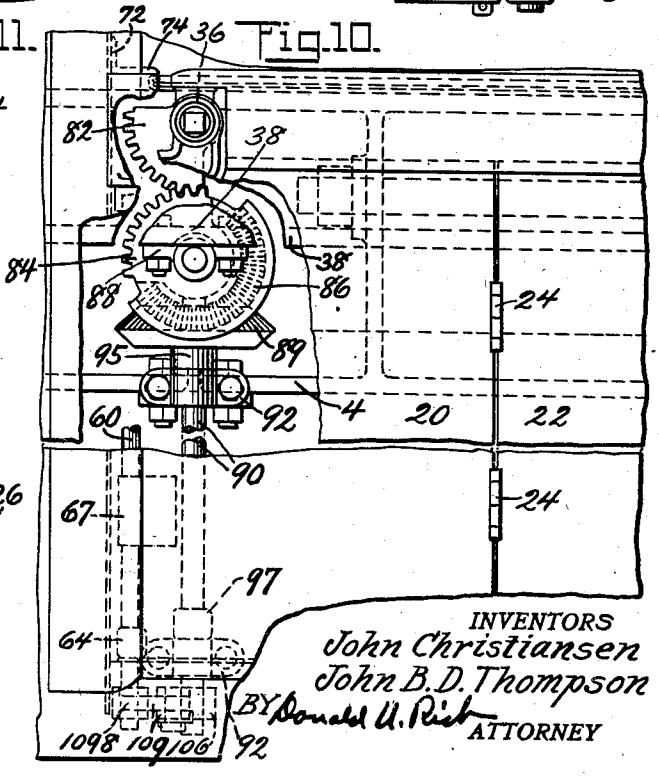


Fig. 10.



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STEP WELL CLOSURE AND OPERATING MEANS THEREFOR

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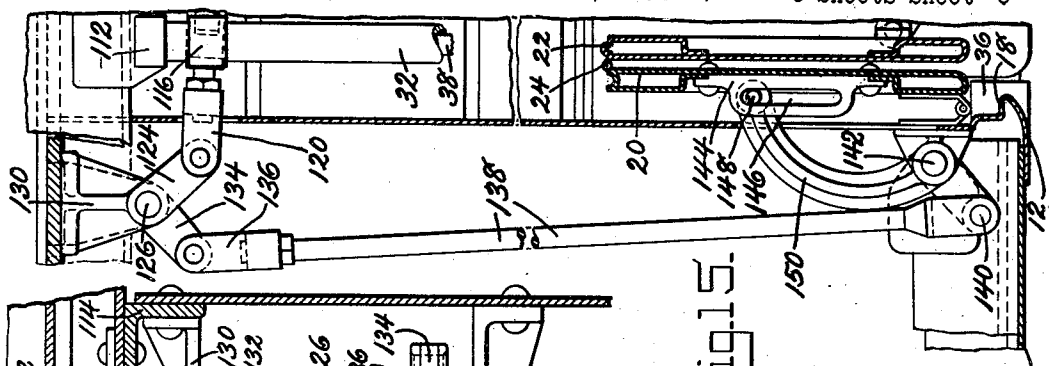

Fig. 15.

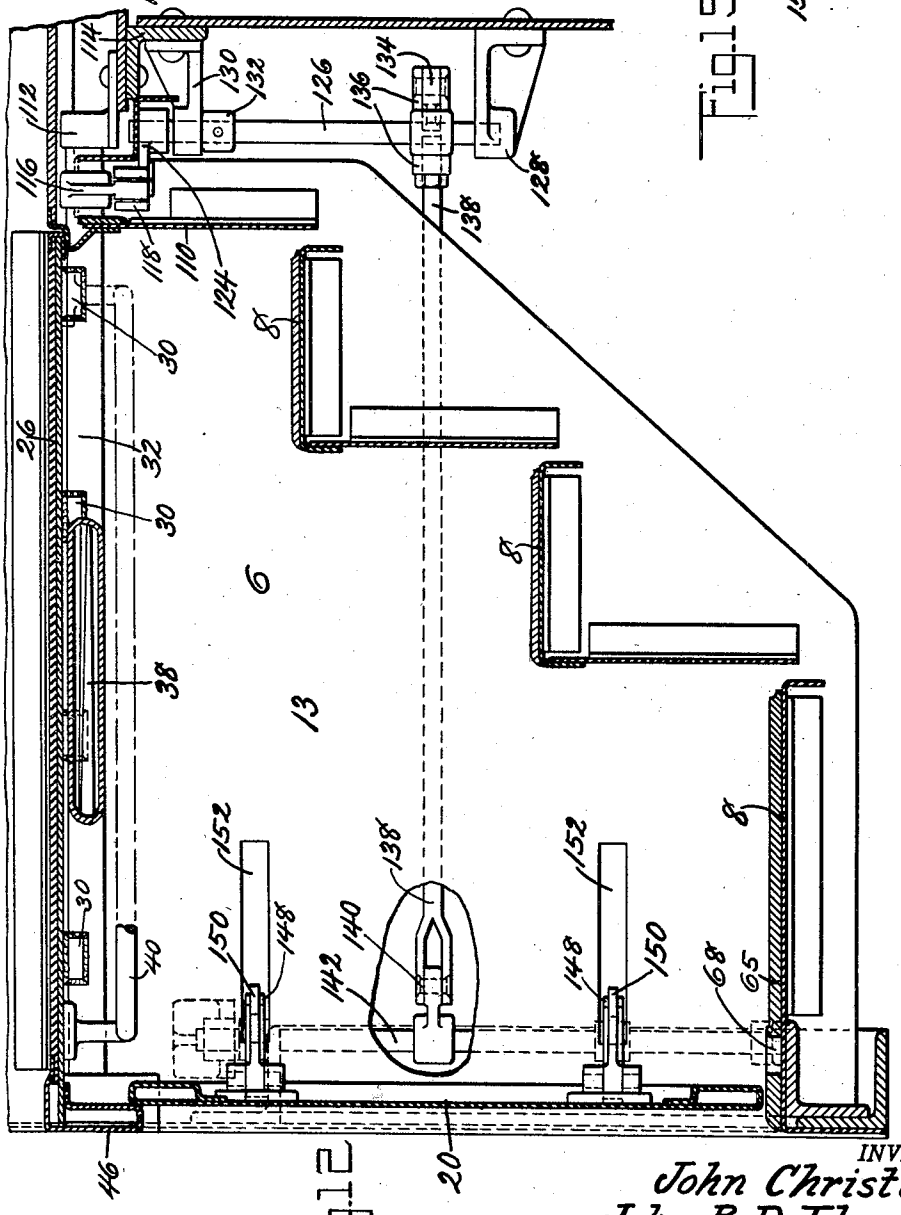

Fig. 12.

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STEP WELL CLOSURE AND OPERATING MEANS THEREFOR

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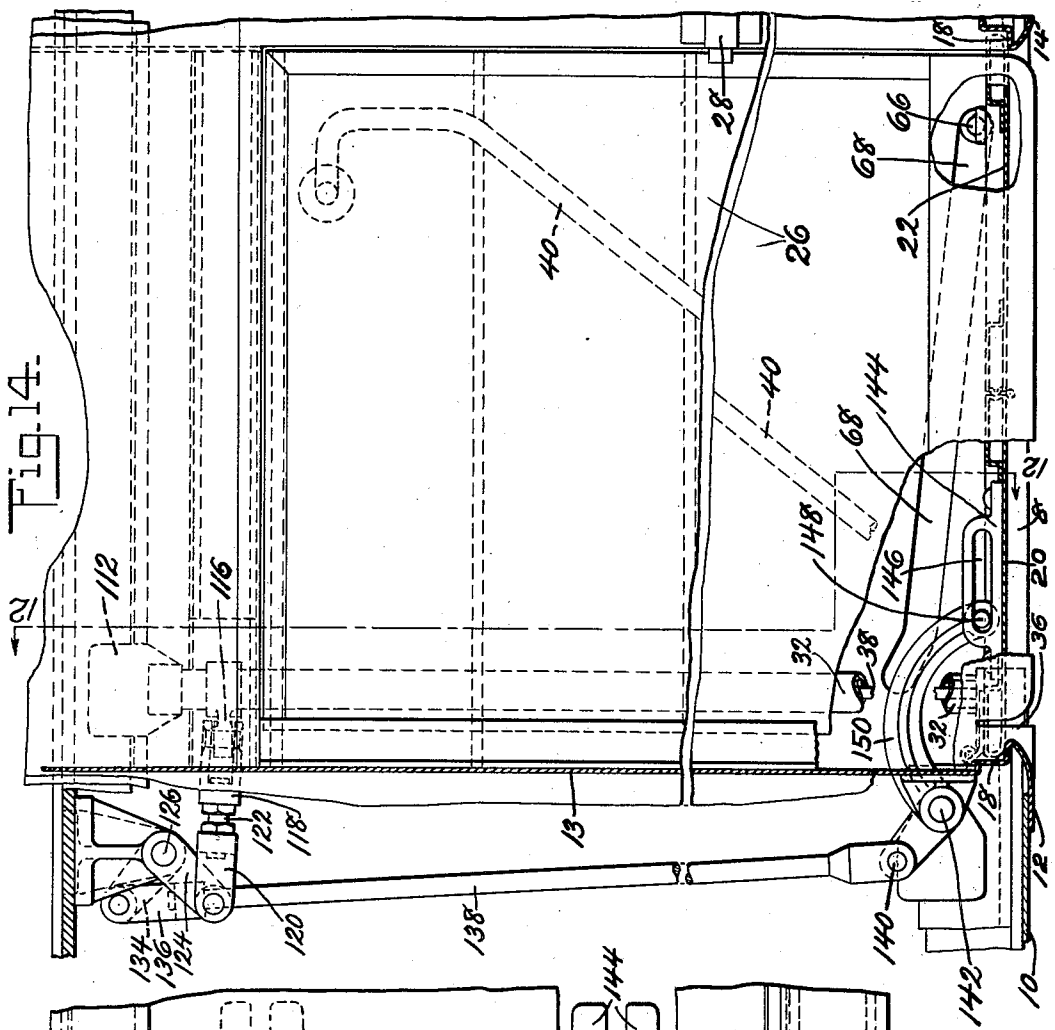

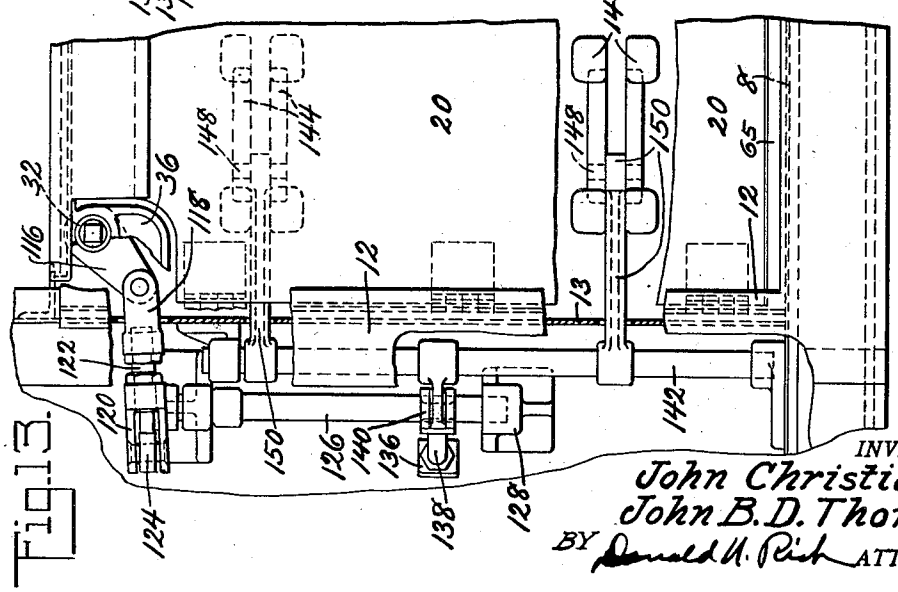

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Patented Dec. 17, 1935

2,024,338

UNITED STATES PATENT OFFICE

2,024,338

STEP-WELL CLOSURE AND OPERATING MEANS THEREFOR

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Application December 6, 1934, Serial No. 756,234

22 Claims. (Cl. 105—450)

This invention relates generally to railway car construction and has particular reference to step-well closures and operating means therefor.

The trend in railway car construction at the present time is to produce what is known as a streamlined train; one which is so constructed that the resistance, due to wind while the train is in motion, is reduced to a minimum. To effect this it is necessary and desirable that air pockets be eliminated to the greatest extent and the present invention therefore aims to provide a construction which will close the step-wells of railway cars to prevent the formation of air pockets and therefore reduce the wind resistance.

Another object of this invention is the provision of means for substantially entirely closing the step-well of a railway car.

Still another object of this invention is the provision of a new and improved step-well closure for railway cars and means for operating the same to open and closed positions.

A further object of this invention is the provision of doors for closing the step-well of a railway car below the usual trap door thereof.

A still further object of this invention is the provision of a step-well closure comprising a trap door constituting a part of the floor of the car vestibule when in closed position and doors for closing the step-well below the trap door and constituting, when closed, substantially a continuation or a part of the side wall of the car; the step-well doors and trap door being interconnected for simultaneous movement in both opening and closing directions.

A still further object of this invention is the provision of new and improved means for operating step-well closures for railway cars.

Another object of this invention is the provision of step-well closure and operating means therefor which is easy and inexpensive to manufacture and strong and durable in operation.

Other objects and advantages of this invention will be fully apparent to those skilled in the art from the following description taken with the accompanying drawings in which:

Figure 1 is a sectional view through the step-well of a railway car showing one form of the invention.

Fig. 2 is a broken front elevation of the form of the invention shown in Fig. 1.

Fig. 3 is a broken top plan view of the construction shown in Figs. 1 and 2, certain parts being broken away and other parts being shown in section.

Fig. 4 is an enlarged detail view, partly in section, of certain parts of the operating mechanism of the construction shown in Fig. 1, the view being taken on the line 4—4, Fig. 5.

Fig. 5 is a sectional view on the line 5—5, Fig. 4.

Fig. 6 is a sectional view on the line 6—6, Fig. 5.

Fig. 7 is a top plan view of the construction shown in Fig. 5.

Fig. 8 is a sectional view, largely diagrammatic, showing the step-well doors of Figs. 1, 2 and 3 in open position.

Fig. 9 is a sectional view through a step-well showing one modified form of operating means.

Fig. 10 is a fragmentary front elevation of the form of the invention shown in Fig. 9, certain parts being broken away.

Fig. 11 is a fragmentary broken top plan view of the construction shown in Figs. 9 and 10, certain parts being broken away to disclose other parts in section.

Fig. 12 is a sectional view through the step-well of a car showing another modification of the closure operating means, the view being taken on the line 12—12, Fig. 14.

Fig. 13 is a fragmentary front elevation of the modification shown in Fig. 12, certain parts being broken away and other parts being shown in section.

Fig. 14 is a broken top plan view of the form of the invention shown in Figs. 12 and 13, certain parts being broken away to disclose other parts in section, and

Fig. 15 is a fragmentary broken detail view, partly in section, of the construction shown in Figs. 12, 13 and 14; this view showing the step-well doors in section and in open position.

In the drawings, only those parts of a railway car necessary to an understanding of the present invention are shown, it being understood that the present invention may be applied to any conventional passenger car. In the several views of the drawings similar characters of reference designate similar parts and now, referring more particularly to the drawings, the invention is shown applied to a railway passenger car having a vestibule, the floor of which is shown at 2, supported by car underframe parts 4 which may be sills or other underframe elements. The vestibule has the usual step-well indicated generally at 6 and provided with a series of steps 8. The side wall of the car is indicated at 10 and door posts 12 and 14 are also indicated in Fig. 8; door post 12 in the instance shown being formed as a part of the inner wall 13 of the vestibule while door post 14 is shown at the end of the car body and forms a part of the end wall 16

of the car. In practice, the walls 13 and 16 are step-well walls as will be obvious.

The posts 12 and 14 are each so formed as to provide internal shoulders 18 with which step-well doors 20 and 22 are adapted to engage when in closed position (see Fig. 8) to constitute, in effect, parts of the side wall of the car and to close the step-well at the side of the car. This is clearly indicated in Fig. 1 where the length of the doors is shown as sufficient to substantially rest upon the lower step 8.

As shown clearly in Fig. 2 the doors 20 and 22 are hingedly connected together at 24 and are arranged below the trap door 26, the latter forming, when closed, a part of the floor 2 of the vestibule and being normally retained in closed position by a latch 28 as shown in Fig. 3.

The trap door is rigidly connected by brackets 30, or the like, to a tubular hinge rod 32 rotatably supported in bearings 34 and 36 respectively, bearing 34 being secured to a step-well brace member 38 (see Fig. 1) while bearing 36 is connected to door post 12, as clearly shown in Fig. 6 by being riveted thereto as shown at 37. Arranged within the double hinge rod 32 is a torsion spring 38, one end portion of which is fixedly secured to the tube 32 while the opposite end portion is secured within the bearing 36 in any suitable or desired manner, the arrangement being such that the spring constantly urges the trap door 26 to open position. The trap door 26 is provided with the usual grab handle 40. For convenience, the hinged edge portion of the trap door is termed the inner edge portion while the opposite edge or latched portion is termed the free edge portion. The edge portion of the trap door 26 adjacent the side of the car is termed the outer side edge portion. As can be clearly seen in Fig. 4 a stiffener bar 42 is secured to the upper surface of the trap door 26, the latter having the usual tread surface 44 secured thereto.

Secured to the outer edge portion of the door is a retainer indicated generally at 46, said retainer depending from the door 26 and providing a stop or rail against which the upper edge portions of step-well doors 20 and 22 are adapted to contact when in closed position, as shown clearly in Fig. 4.

In the instance shown the retainer comprises substantially a box section portion 48 formed by a plate bent back upon itself and having an upper portion inwardly flanged at 50 to overlie the stiffener 42, and a lower flange 52 underlying the door 26; the flanged portions 50 and 52 being secured in any suitable or desired manner to the trap door 26.

The present invention contemplates the substantially simultaneous operation of the trap door and step-well doors to open and closed positions and, as clearly shown in the drawings, a gear sector 54 is rigidly secured to the hinge shaft 32 adjacent the outer end portion thereof and is arranged in meshing relation with the sector portion 56 of a gear 58 rotatably mounted in bearings 61 secured to step-well wall 13 and in meshing relation with a beveled gear 59 secured to the upper end portion of a vertically arranged hinge rod 60. The upper end portion of rod 60 is rotatable in a bearing 62 secured to vestibule wall 13 while the lower end portion of hinge rod 60 extends through the lower step 8 and is supported by a collar 64 having bearing on the step or on a reinforcing element 65 secured to the step, all as clearly shown in Figs. 1, 4 and 5. The hinge rod 60 is fixedly secured to step-well door 20 by means of brackets 67, as particularly shown in Fig. 1.

Depending from step-well door 22 adjacent the free edge thereof is a guide element 66 such as a bolt, pin or the like arranged in a guide slot 68 formed in the lower step 8 and so arranged as to cause relative movement of the doors 20 and 22 on their hinges 24 whereby they will fold parallel to the adjacent step-well wall 13 in the position shown in Fig. 8.

From the above description it can be seen that upon release of the latch 28 the trap door 26 will be started towards open position because of the torson spring 38 and the hinge rod or tube 32 will consequently be rotated in the bearings 34 and 36. The trap door 26 may then be manually lifted to complete open position. The vestibule is provided with the usual vestibule door 70 above the trap door and the vestibule door is first moved to open position, this being conventional. Due to the connection between the hinge rod 32 and the hinge shaft 60 through the gearing as above described it will be apparent that upon rotation of the hinge rod 32, due to opening movement of the trap door 26, the hinge shaft 60 will be actuated to fold the step-well doors 20 and 22 to open position as illustrated in Fig. 8.

As clearly shown in Figs. 5 and 7, an angle 72 is secured to the vestibule wall 13 and has its horizontal flange 74 so arranged as to overlap the hinged edge portion of the trap door. In the instance shown in the drawings, to permit full opening movement of trap door 26 without contact thereof with gear sector 56, a portion of said door is cut out as shown at 76 and is connected to the door by a spring hinge 78. Upon opening movement of trap door 26 the hinge portion 76 will contact with a stop 80 secured to wall 13 and will be retained against further movement which would otherwise cause contact thereof with the gear 56.

Referring now to the form of the invention shown in Figs. 9, 10 and 11, parts similar to those shown in Figs. 1 to 8 inclusive are identified by like characters. The construction shown in Figs. 9, 10 and 11 provides a modification of the operating means for the trap door 26 and step-well doors 20 and 22 respectively and it can be seen in Fig. 9 that the inner end portion of the hinge rod or tube 32 projects through the step-well brace member 38 and has a gear sector 82 secured to the inner end portion thereof and arranged in meshing relation with the sector portion 84 of a bevel gear 86 supported by a bearing 88 secured to the lower portion of the brace 38; the gear 86 being arranged in meshing relation with a bevel gear 89 fixedly connected to the upper end portion of a vertically arranged drive shaft 90 supported in bearings 92 formed at the upper and lower end portions of a bracket 94. The bracket 94 is secured to and depends from the underframe member 4 of the car. The drive shaft 90 is rotatable in the bearings 92 and at its upper end portion the hub 95 of the gear 89 rests upon the upper bearing 92. Secured to the lower end portion of drive shaft 90 is a collar or the like 97 which rests upon the lower bearing 92, all as clearly shown in Fig. 9. In this form of the invention the bearing member 36, in which the opposite end portion of shaft 32 is supported, is formed to provide a bearing 96 for the upper end portion of the hinge rod or shaft 60. Se-

cured to the lower end portion of the hinge rod 60 is a link 98 connected with one end portion of a connecting rod 100 supported in a bearing 102 depending from the lower step 8 and having a clevis 104 at its opposite end portion connected by a link 106 to the lower end portion of the drive shaft 90. The clevis 104 is adjustably connected to the rod 100 by being threadedly engaged therewith as shown in Fig. 9; an adjusting nut 108 being provided to retain the parts in desired position. The opposite end portion of the connecting rod 100 is provided with a clevis 109 by which said rod 100 is pivotally connected to link 98.

As to the modification shown in Figs. 9 to 11 inclusive it will be apparent that as the trap door 26 is being moved to open position, thus rotating the hinge shaft or tube 32, the drive shaft 90 will be actuated through the gearing 82, 86 and 89 to cause movement of the connecting rod 100 whereby to operate the step-well doors 20 and 22 substantially simultaneously with the operation of the trap door.

In the form of the invention shown in Figs. 12 to 15 inclusive the inner end portion of the hinge rod or tube 32 extends through the riser 110 over the upper step 8 and is journaled in a bearing 112 secured to a car underframe part 114 which latter may be a sill or a member provided specifically for the purpose of supporting said bearing 112. In the form shown member 114 is an angle though this is merely by way of example.

Secured to the inner end portion of the hinge tube or shaft 32 is a crank 116 to which is pivotally connected a clevis 118 which latter is adjustably connected to a second clevis 120 as shown clearly at 122. This double clevis arrangement constitutes a connection between the crank 116 and a link 124 pivotally connected to clevis 120 and fixedly secured to a vertically arranged rock shaft 126, the lower end portion of which latter is journaled in a bearing 128 as shown clearly in Fig. 12. The rock shaft is guided in an upper bearing member 130 projecting laterally from the car underframe part 114. Secured to shaft 126 is a collar 132 so arranged as to substantially contact with the lower surface of the upper bearing 130 to prevent displacement of the shaft 126 from the lower bearing 128. Secured to the lower end portion of the rock shaft 126 is a link 134 to which is pivotally connected as by a clevis 136 an actuating rod 138, the opposite end portion of which is pivotally connected as shown at 140 to the hinge shaft 142 for the step-well doors 20 and 22. As clearly shown in Fig. 14 the shafts 126 and 138 and the hinge rod 142 are arranged outside the step-well. Secured to the step-well door 20 are vertically spaced brackets 144 provided with elongated slots 146 in which latter pins 148 are positioned, said pins being formed at one end portion of hinge links 150, the opposite end portions of said links being connected to the hinge shaft 142 as shown more clearly in Fig. 14.

The hinge links 150, as can clearly be seen in Fig. 12, extend through horizontally arranged openings 152 formed in the step-well wall 13.

In the form of the invention shown in Figs. 12 to 15 inclusive, movement of the trap door 26 to open position obviously causes rotation of the hinge rod or tube 32 to actuate link 116; the latter through the clevis connection and link 124 causing rotation of the shaft 126 to operate the hinge shaft 142 to effect movement of the step-well doors 20 and 22.

From the description just above it can be seen that in each form of the invention the torsion spring 38 constantly urges the trap door 26 to open position and, upon release of the latch 28, the trap door is started to open position. Manual lifting of the trap door 26 effects, through the several mechanisms described, movement of the step-well doors 20 and 22 to open position. Obviously closing of the trap door causes a reversal of movement of the parts and consequently a closing of the step-well doors whereby the latter form a part of the side wall of the car and eliminate the formation of air pockets in the step-well.

The drawings illustrate certain embodiments of the invention but it is to be understood that they are for illustrative purposes only and various changes in the form and proportions of the constructions may be made within the scope of the appended claims without departing from the spirit of the invention.

What is claimed is:

1. In a railway car having a step well, a trap door for the step well, step-well doors forming, when closed, a part of the side wall of the car, a hinge shaft to which the step-well doors are connected, and means operatively connecting the trap door and hinge shaft so formed and arranged as to operate the step-well doors simultaneously with operation of the trap door.

2. In a railway car provided with a vestibule and a step well, a trap door normally forming a part of the vestibule floor, step-well doors normally constituting a part of the side wall of the car, a hinge rod to which the trap door is secured, a hinge shaft for the step-well doors, and means including gearing connecting the hinge rod and hinge shaft for simultaneous operation whereby said trap door and step-well doors are simultaneously actuated.

3. In a railway car, a step well, a trap door hingedly connected to the car body and normally closing the upper portion of the step well, a door hingedly connected to the car body on a vertical axis and normally closing the front portion of the step well, and means connecting the trap door and step-well door adapted to effect simultaneous operation of the doors.

4. In a railway car, a step well, and means normally closing the step well comprising step-well doors hingedly connected to the car body on a vertical axis, said doors being substantially alined with the side wall of the car, a trap door hingedly connected to the car body, and actuating means for the step-well doors connected with the trap door and operable thereby upon movement thereof.

5. In a railway car, a step well, and means closing said step well comprising a trap door hinged on a horizontal axis, and step-well doors hinged on a vertical axis, and means on said trap door so formed and arrranged as to constitute an upper rail for said step-well doors.

6. In a railway car provided with a step well and a trap door forming a top closure means for the step well, the combination of doors forming substantially a part of the car side wall, and closing the step well at the side of the car, means hingedly supporting the step-well doors, and operating mechanism for the said hinge means connected with the trap door and operable upon movement thereof to actuate said step-well doors.

7. A step-well closure and operating means therefor comprising a trap door hinged on a horizontal axis, and step-well doors hinged on a

vertical axis, and means operated by the trap door hinge element to actuate the step-well door hinge element to effect simultaneous operation of the trap door and step-well doors.

8. In a railway car provided with a step well having a step therein, a trap door for closing the upper portion of the step well, a pair of connected doors for closing the front portion of the step well and adapted to fold therewithin when in open position, a guide slot in said step, means connecting one of said pair of doors and the trap door for effecting operation of the doors in unison, and a guide member on the other of said pair of doors slidable in said slot.

9. In a railway car having a step well, a plurality of steps therein, closure means for the step well comprising a horizontally-hinged trap door and a vertically-hinged folding door, means connecting said doors so formed and arranged as to be operable upon movement of the trap door to simultaneously operate the folding door, and cooperable guide means on one of the steps and on the folding door.

10. In a railway car having a step well, closure means for the step well comprising a horizontally-hinged trap door and a vertically-hinged folding door, and means connecting said doors so formed and arranged as to be operable upon movement of the trap door to simultaneously operate the folding door.

11. In a railway car, a step well, a trap door hinged to the car body and normally closing the upper portion of the step well, a vertically hinged folding door for closing the front portion of the step well so formed as to constitute a part of the side wall of the car when in closed position, means connecting said doors for substantially simultaneous operation, and means so arranged as to limit movement of the folding door in one direction whereby said folding door is substantially alined with the car side wall when in closed position.

12. In a railway car, a step well, a trap door normally closing the upper portion of the step well, a folding door normally closing the front portion of the step well and forming a portion of the car side wall when the door is in closed position, and means provided on the trap door adapted when the latter is in closed position to constitute an upper rail for said folding door.

13. In a railway car, a step well, horizontally and vertically arranged hinge shafts supported within the step well, closure means for the step well secured to said shafts, and means for effecting simultaneous operation of the closure means comprising interconnected gearing on adjacent end portions of the shafts and mounted within the step well.

14. In a railway car, a step well, closure means for the step well comprising a horizontally hinged trap door and a vertically hinged folding door, and means for effecting simultaneous operation of the closure means comprising a drive shaft connected with the trap door, and means including a rod between the folding door and drive shaft connected with the drive shaft for operation thereby.

15. In a railway car having a step well, a trap door for the step well, step-well doors forming, when closed, a part of the side wall of the car, a hinge shaft to which the step-well doors are connected, a connecting rod associated with said hinge shaft, and a drive shaft operatively connecting the trap door and connecting rod adapted to operate the step-well doors simultaneously with operation of the trap door.

16. In a railway car, a step well, and means normally closing the step well comprising a pair of connected doors substantially alined with the side wall of the car, a trap door, actuating means for the connected doors operatively engaged with the trap door and adapted upon movement of the latter to operate the connected doors in unison, and means provided on said trap door cooperable with the connected doors when the latter and the trap door are in closed position to prevent movement of the connected doors beyond the car side wall.

17. In a railway car, a step well, a trap door hingedly connected to the car body for closing the upper portion of the step well, means latching the trap door in closed position, spring hinge means supporting the trap door and constantly urging the trap door to open position whereby upon release of the latch means said trap door is partly opened, a door hingedly connected to the car body on a vertical axis for closing the front portion of the step well, and means connecting the trap door and second-named door so arranged as to operate the said second-named door upon operation of said trap door.

18. In a railway car, a step well, a step well door normally closing the front portion of the step well, a trap door normally closing the upper portion of the step well and having a portion overlapping the upper edge portion of the step well door to form a door rail when the doors are in closed position, and means connecting the step well door and trap door and operative by the latter upon movement thereof to effect substantially simultaneous operation of the step well door.

19. In a railway car, a step well, a step well door normally closing the front portion of the step well, a trap door normally closing the upper portion of the step well, hinge shafts supported by the car body to which the doors are secured, and means directly connecting said shafts so formed and arranged as to effect substantially simultaneous operation of the step well door upon operation of the trap door.

20. In a railway car, a step well, a step well door normally closing the front portion of the step well, a trap door normally closing the upper portion of the step well, hinge shafts supported by the car body to which the doors are secured, and means for effecting substantially simultaneous operation of the doors including gearing connecting the hinge shafts.

21. In a railway car, a step well, a step well door normally closing the front portion of the step well, a trap door normally closing the upper portion of the step well, hinge shafts supported by the car body to which the doors are secured, and means for effecting substantially simultaneous operation of the doors including lever and link mechanism directly connecting said shafts and operative upon movement of the trap door.

22. In a railway car having a step well, closure means for the step well comprising a horizontally hinged trap door connected to the car body and a vertically hinged folding door, and means connecting said doors so formed and arranged as to be operable upon movement of and by the trap door to substantially simultaneously operate the folding door.

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