

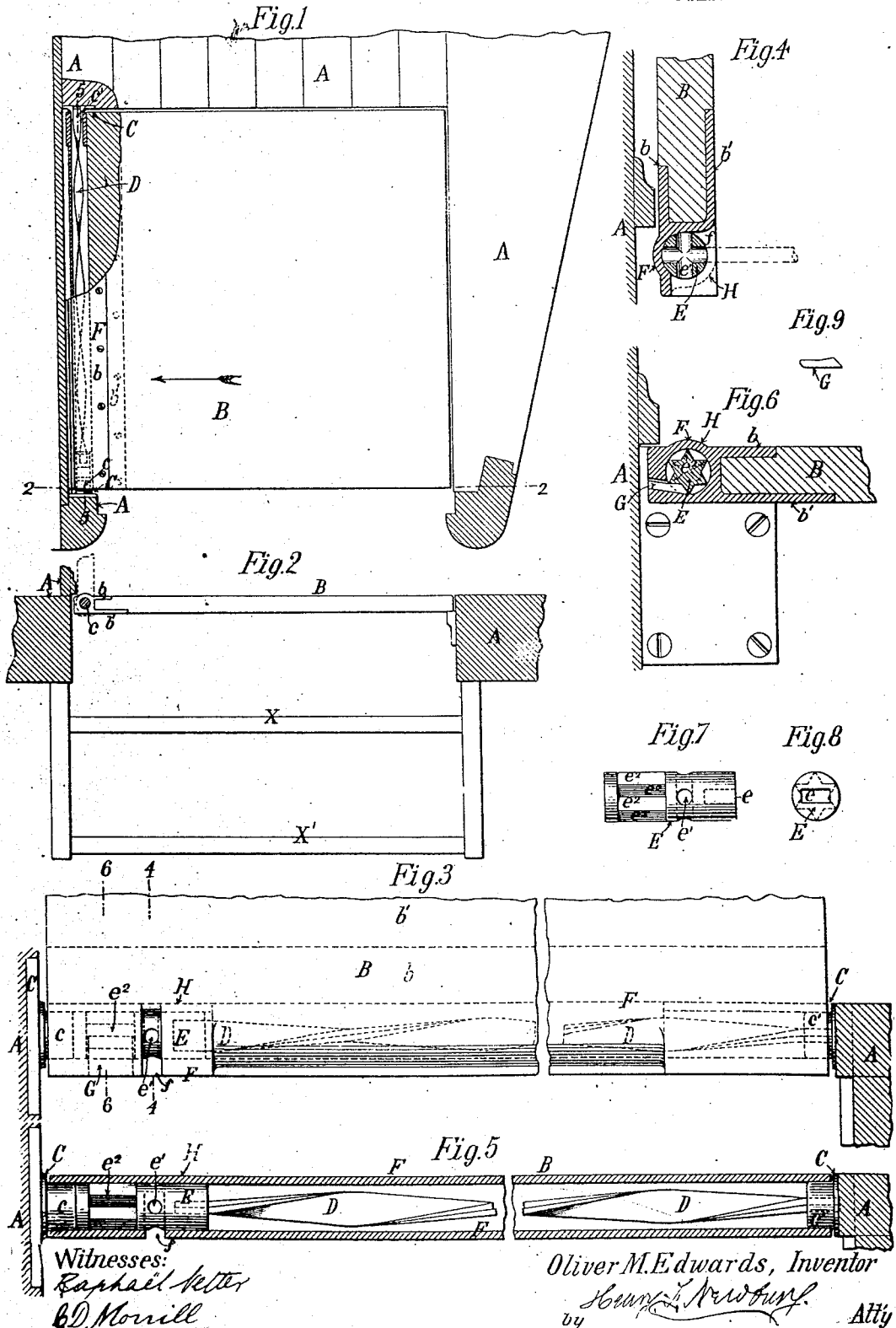
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No. 781,643.

PATENTED FEB. 7, 1905.

O. M. EDWARDS.
PLATFORM TRAP DOOR.
APPLICATION FILED MAY 6, 1909

3 SHEETS—SHEET 1.

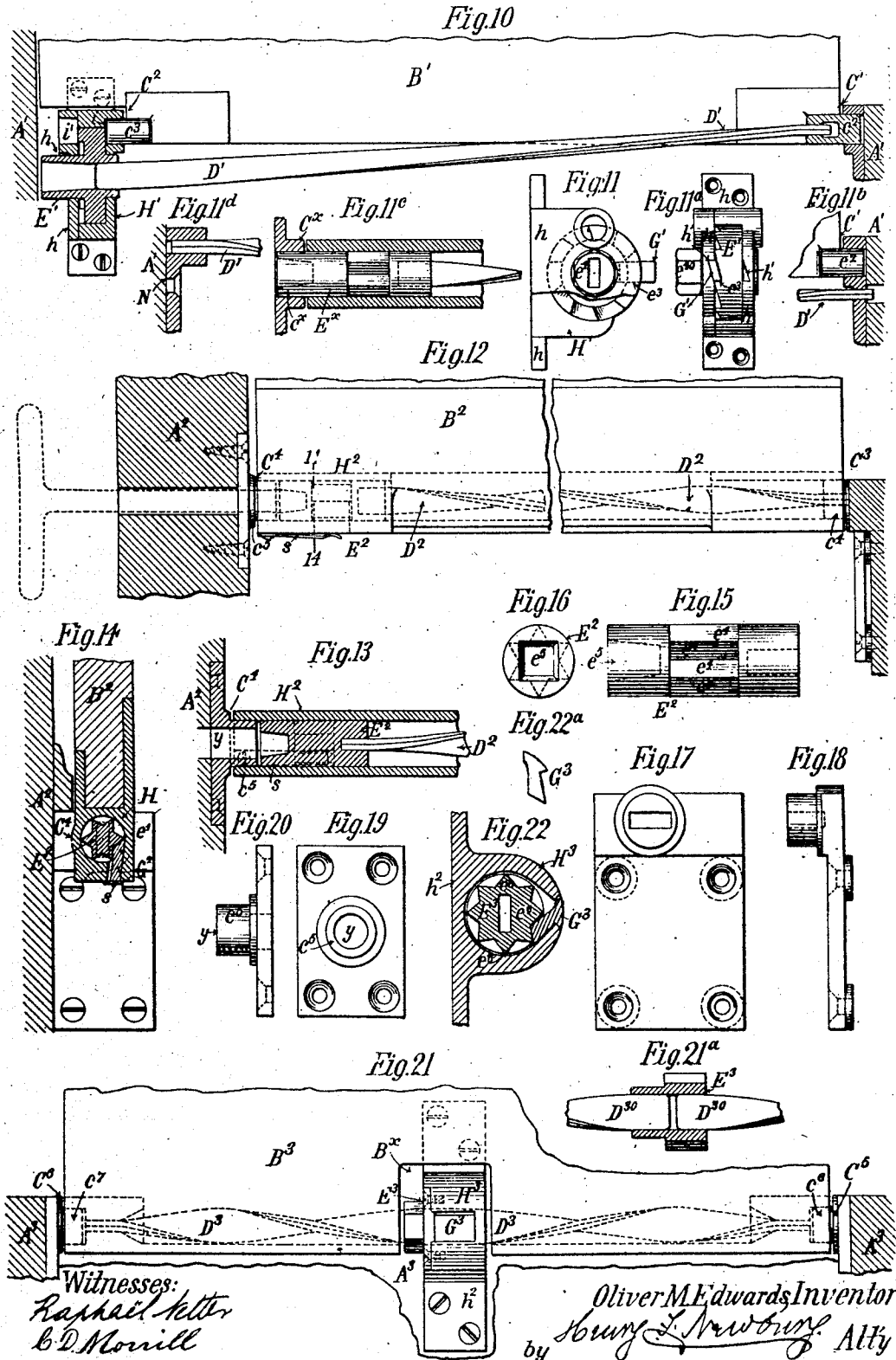


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3 SHEETS—SHEET 2.



Witnesses:
Raphael Ketter
b D Morrill

Oliver M. Edwards Inventor
b H Young & Newbury Att'y

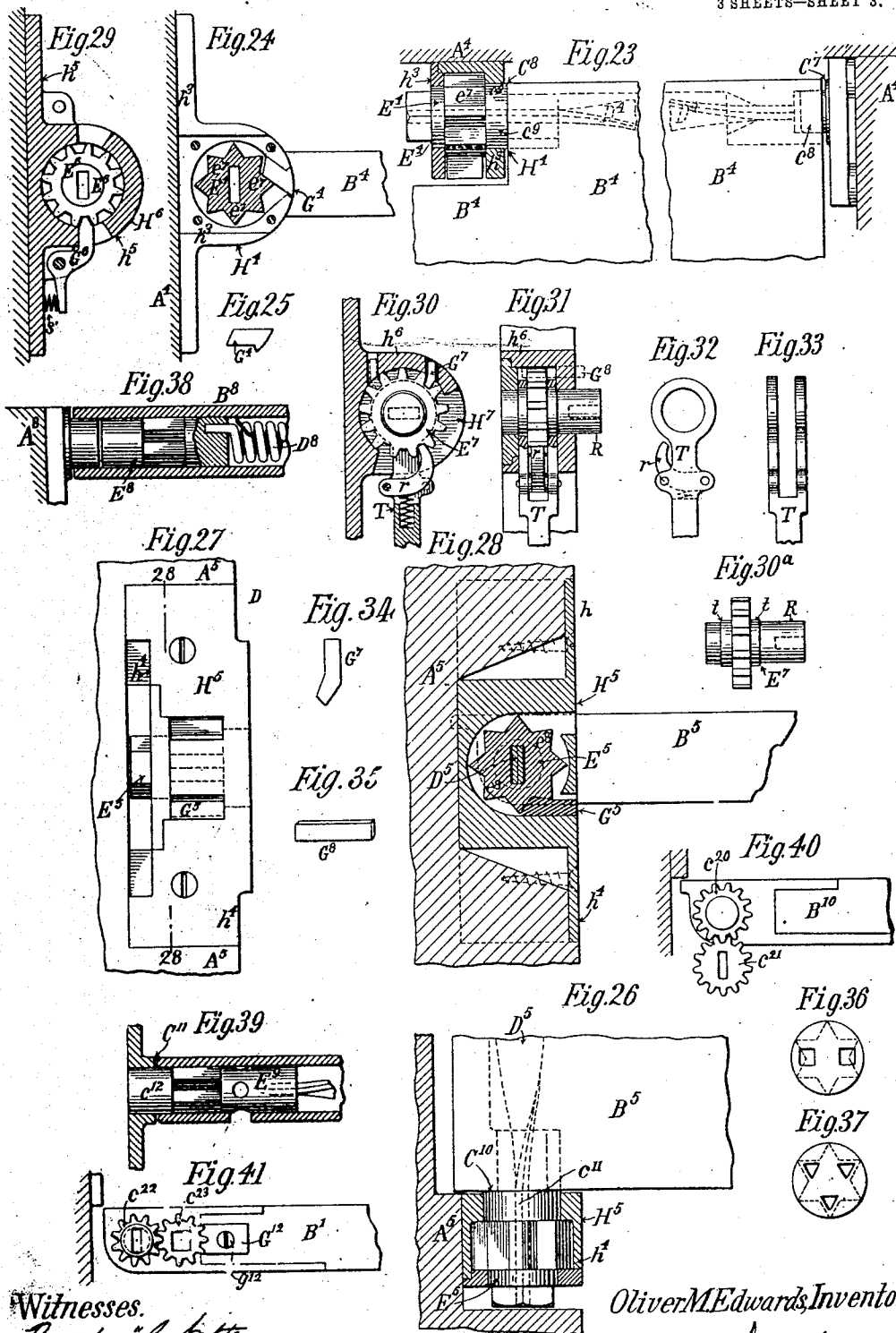
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3 SHEETS—SHEET 3.



Witnesses.
Raphael Jetter
Ed Morrill

Oliver M Edwards Inventor
by *Samuel L. Newburn* Atty

UNITED STATES PATENT OFFICE.

OLIVER M. EDWARDS, OF SYRACUSE, NEW YORK.

PLATFORM TRAP-DOOR.

SPECIFICATION forming part of Letters Patent No. 781,643, dated February 7, 1905.

Application filed May 6, 1902. Serial No. 106,129.

To all whom it may concern:

Be it known that I, OLIVER M. EDWARDS, a citizen of the United States, residing at Syracuse, in the county of Onondaga, State of New York, have invented certain new and useful Improvements in Platform Trap-Doors, of which the following is a full, clear, and exact description, reference being had to the drawings accompanying and forming a part of the same.

This invention relates to improvements in platform trap-doors—such, for instance, as are many times used in connection with platforms of railway cars to cover over the steps of the car by which passengers enter and leave when the use of such steps are required.

The main objects are to combine a trap-door and platform by hinges, which may be solid, and a spring substantially straight in form, one portion of which is connected with the platform and another portion is connected with the door without any portion of such spring passing through and beyond either hinge to connect with the door or platform; to combine a trap-door and platform by hinges, which may be solid, and a spring arranged substantially lengthwise of the axial line of the hinges; to combine a trap-door and platform by hinges, which may be solid, and a spring substantially straight in form and arranged substantially lengthwise of and more or less within the axial line of the hinges, which line may in some instances be within the edge-wise thickness of the door; to provide tension-adjusting means which may aid in connecting the spring or springs to the door or platform and by which the stress or tension of such spring or springs may be adjusted in opposite directions; and to provide combined reversible hinge and spring-tension adjusting devices, which may be used on opposite or the reversed side edges of the door and the tension or stress of the spring or springs may be adjusted at whichever side edge of the door the device may be placed.

My invention consists, first, in combining a trap-door with a platform by hinges, which may be solid, and a spring or springs connected with the door and platform through a rotatable part and a movable block, which

hold such spring or springs in fixed relations to the door and platform; second, in combining with the platform of a car or other structure a door, hinges, which may be solid, and a spring or springs substantially straight in form, one portion of which is connected with the platform and another portion is connected with the door without any portion of such spring or springs passing through and beyond either hinge; third, in combining with the platform of a car or other structure a door, hinges, which may be solid, a spring or springs substantially straight in form and arranged substantially lengthwise of and more or less within the axial line of the hinges, and means securing such spring or springs to the door and platform; fourth, in combining with such a platform a door, hinges, which may be solid, a spring or springs substantially straight in form and arranged substantially within the axial line of the hinges, and means securing such spring or springs to the platform and door without any portion thereof passing through and beyond either hinge; fifth, in combining with the means which secure the spring or springs to the platform or door adjusting means having a rotatable part and a movable block, movable to engage with the rotatable part to hold it against rotation in either of two directions; sixth, in combining with such a platform and door a reversible hinge bracket or support adapted to be secured to the platform at either of two opposite edges of the door and to receive a hinge member connected with the door and adjusting means, which means engage with a portion of a spring or springs connected with the door and hold the same in the adjusted position at either edge of the door; and it also consists in certain other novel and useful combinations of parts, all of which will be hereinafter more fully described, and particularly pointed in the claims, which form a part of this specification.

Like letters of reference whenever they occur indicate corresponding parts in all of the figures of the drawings.

Figure 1 illustrates one embodiment of my improvement in plan and sectional view, a portion of a platform of a car or other structure and a trap-door being seen in plan and adjoin-

ing parts in section, a portion of the trap-door being broken away to better illustrate a portion of the spring and its connection to the platform. Fig. 2 shows in side elevation the steps of a car and the trap-door seen in Fig. 1, the portions of the platform shown being in sections on line 2 2 of Fig. 1. Fig. 3 shows that portion of the trap-door adjacent to the hinges shown in Figs. 1 and 2 turned up into a vertical position, as indicated by dotted lines in Fig. 2, but as seen from the end of the car and looking toward the center thereof, as indicated by the arrow seen in Fig. 1, the parts being shown on an enlarged scale from that of Figs. 1 and 2 and with the central portions of the trap-door and connected parts broken away to permit the parts to be shown on a larger scale than would be practicable if this were not done. Fig. 4 shows the parts shown in Fig. 3 in cross-section on line 4 4 of Fig. 3. Fig. 5 shows in longitudinal section on line 5 5 of Fig. 1 the parts there seen, the door being in the horizontal or closed position over the steps. Fig. 6 shows in cross-section on line 6 6 of Fig. 3 the parts there shown, but with the trap-door in the closed position instead of in the fully-opened position, as is the case in Figs. 3 and 4, a portion of the hinge at the farther edge of the door being shown, which portion is secured to the platform as shown or otherwise, as desired. Fig. 7 shows in side elevation the rotatable part of the adjusting means with which a portion of the spring or springs and the movable block may engage to move such portion of the spring or springs and hold such part in fixed positions relatively to the door. Fig. 8 shows in end view the rotatable part seen in Fig. 7, when looking from the right to the left. Fig. 9 shows in side elevation the movable block seen in Fig. 6 and which enters in a suitable opening in the door and engages one of the teeth on the rotatable part, as illustrated in Fig. 6. Fig. 10 illustrates, partly in side elevation and partly in section, a modification in the manner of applying the spring to the door and platform and also a modified form of tension-adjusting device and manner of combining the parts together. Fig. 11 shows in side elevation the tension-adjusting device shown in section in Fig. 10, with the movable block seen, partly in dotted lines, in engagement with the casing of such device and with one of the teeth of the rotatable part, which part is mounted in such casing. Fig. 11^a shows in front elevation the tension-adjusting device seen in Figs. 10 and 11. Fig. 11^b shows a modification in the means connecting the spring shown in Fig. 10 to the platform when it is desired to connect the other end to the door—as, for instance, as shown in Fig. 11^c, or otherwise, as desired. Fig. 11^d shows a modification in the means connecting the spring shown in Fig. 10 to the door and also in the hinge itself. Fig. 11^e shows an-

other modification in the means for connecting the spring seen in Fig. 10 to the platform when such spring is connected to the door as seen in Fig. 10 and tension-adjusting devices are not employed. Fig. 12 shows a somewhat similar form of rotatable part to that seen in Fig. 11^c, but it does not serve as a portion of one hinge, and a similar way of connecting the spring with the platform seen in Figs. 3 and 5 of the drawings and with the trap-door turned up into the open position and the means for rotating the rotatable part indicated in dotted lines. Fig. 13 shows in longitudinal section the parts seen in the left-hand portion of Fig. 12, the trap-door being in the horizontal or closed position and illustrating the opening through the fixed member of the hinge at this side edge of the door to receive a wrench or tool as indicated in Fig. 12. Fig. 14 shows in cross-section on line 14 14 of Fig. 12 the parts then seen. Figs. 15 and 16 show in side elevation and in end view, respectively, the rotatable part seen in Figs. 12 and 13, Fig. 16 being seen as looking from left to right in Fig. 15. Figs. 17 and 18 show front and edge views, respectively, the member of the hinge secured to the platform at the right of Figs. 3, 5, and 12 and also seen in Fig. 6. Figs. 19 and 20 show in front and edge views the hinge member secured to the platform at the left of Figs. 12 and 13. Figs. 21 and 21^a show a modification in the arrangement of spring or springs and tension-adjusting means and also a modified form of such means or device and which are reversible—that is, used as here shown or turned end for end, accordingly as the projecting portion of the rotatable part may be desired to project in one or the other direction relatively to any particular portion of the spring or springs. Fig. 22 shows in vertical section the tension-adjusting device seen in Fig. 21 with the movable block in position to hold the rotatable part against rotation in one direction. Fig. 22^a shows in side elevation the movable block seen in Fig. 22. Fig. 23 shows the same tension-adjusting device or means as is seen in Figs. 21 and 22, but applied in a different manner, such device being reversible, so as to be adjusted for use at either of the opposite side edges of the door by simply turning the casing end for end, the trap-door being in the closed position and the casing or bracket of the adjusting device shown in horizontal section, the rotatable part and movable block being shown in full lines. Fig. 24 shows the reversible tension-adjusting device seen in Figs. 21, 22, and 23 in side elevation with a removable portion of the casing removed to better illustrate the rotatable part and movable block and the relations of these parts relatively to the casing or bracket and each other, such block being in reversed position from that seen in Fig. 22. Fig. 25 shows in side elevation the movable block seen in Fig. 24. Fig. 26 shows a modified

form of reversible tension-adjusting device or means from that shown in Figs. 21 to 24, inclusive, the trap-door being shown in the closed position and in plan, with the casing of the adjusting device in horizontal section. Fig. 27 shows this same reversible tension-adjusting device in front view or when looking at such device from the steps of the car and illustrates the space left for the wrench or tool to take hold of the six-sided projecting portion of the rotatable part, as well as openings in the casing to receive the movable block, which block may be placed in either of the two openings shown, accordingly as the tension-adjusting device may be applied to one side edge of the door or the other, this being done by simply turning the casing or bracket end for end, as desired. Fig. 28 shows the parts seen in Fig. 26 as they appear from the edge of the door and with the casing or bracket shown in vertical section on line 28-28 of Fig. 27. Fig. 29 shows a modified form of movable block and rotatable part. Fig. 30 shows, partly in vertical section and partly in side elevation, another modification of reversible tension-adjusting device. Fig. 30^a shows the rotatable part seen in Fig. 30, but detached therefrom and in side elevation. Fig. 31 shows, partly in front elevation and partly in section, the tension-adjusting device seen in Fig. 30, but with a modified form of movable block inserted substantially parallel with the axis of the rotatable part. Fig. 32 shows the means for rotating the rotatable part in Fig. 30, but detached therefrom and with the spring-pressed pawl in the reversed position from what is seen in Fig. 30. Fig. 33 shows in front view the means seen in Fig. 32, but with the pawl removed. Fig. 34 shows in side elevation the movable block seen in Fig. 30. Fig. 35 shows in side elevation the movable block seen in Fig. 31. Figs. 36 and 37 show in end view two modified forms of rotatable parts adapted to receive modified forms of springs. Fig. 38 shows a coiled spring attached to a rotatable part of a similar form to some of those seen in preceding figures. Fig. 39 illustrates a rotatable part similar to the one seen in Figs. 3 to 8, but so arranged as to serve as the male member of one hinge, as shown. Fig. 40 illustrates a modified connection of the spring with the door. Fig. 41 illustrates another modified connection of the spring with the door.

In Figs. 1 to 6, A represents a portion of a platform of a railway-car or other structure, which may be inclosed or not, as desired, and B represents a trap-door, which may, if desired, be arranged, as is many times the case, over the steps and cover the same, except when such steps are required for persons to enter or leave the car.

In many railway-cars at the present time there are two sets of steps at each end of the car, one set being for use by persons at one

side of the car and the other by persons on the other side, thus making four sets of steps, and if each set is to be provided with a trap-door to cover the same then four trap-doors for each of such cars is required, the main portion of the platforms being arranged centrally of the car and two sets of steps leading to a platform. Only one set of steps and one trap-door are shown, it being understood that there may be as many sets of steps as desired and as many of such steps provided with trap-doors as desired, each set of steps and trap-door being a duplicate of the other, if desired, except for the changes necessary to adapt the steps and trap-doors for opposite sides and ends of the car to which they are to be applied.

I have shown in Fig. 2 two steps X and X', as composing a single set; but it is to be understood that any desired number of steps may compose a single set, as this may vary, as desired, without affecting the coaction of the trap-door and the steps.

The trap-door B may be hinged to the platform A by any suitable hinges desired—as, for instance, the form shown in the above-named figures of the drawings—or any other form desired, so long as the door can turn thereon from the closed or substantially horizontal position to the open or nearly vertical position, as shown in these figures, or to any other extent desired. The hinges C C here shown consist of two members each, one member of each being fixedly secured to the platform and the other member being fixedly secured to the door, one hinge being arranged at one side edge of such door and the other at the other side edge. Each hinge is also composed of a male and a female portion or member, and either member may be fixedly secured to the platform A or to the door B, as desired. The male portions of such hinges may be solid or recessed to receive or engage with a portion of a spring or springs, as desired, which portion or portions do not pass through and beyond either of such hinges to engage with the platform or a part mounted thereon separate and distinct from the trap-door B, and in this sense such hinges may be solid, as the spring does not necessarily pass through and beyond the active portions of the same to engage with a part mounted on the platform. As here shown, the male members *c c'* of the hinges C C are securely fixed to the platform B, the member *c'* at the right of Figs. 3 and 5 being of the construction separately seen in Figs. 17 and 18 and, as there shown, recessed to receive one end of the spring or springs D, the other member, *c*, being of the construction seen at the left of Figs. 3 and 5. Both of these male members may be of the same construction as seen in Fig. 14, and both may be recessed, as shown, to receive one end of a spring, if desired, and then used interchangeably for either side edge of the trap-door or used as shown in Fig. 21.

In such a case both of such members may be made from a single pattern, and one or both may receive an end of a spring or springs, as desired. The spring D may be made of a single straight bar of suitable spring material or of two or more of such bars, as desired. I prefer that two or more of such bars be used, each having considerable width as compared with its thickness; but the dimensions in cross-section may be such as desired, as well as the number of bars which compose such spring D. I have found two such bars of the proportions in width and thickness indicated in Figs. 3 and 5 quite satisfactory for this purpose when placed side by side, as there shown, and made of the length required for an ordinary size of trap-door. The dimensions generally of such spring may also be such as desired for the work they are to do in connection with the trap-door so long as they are such as to properly serve their intended purpose.

As shown in Figs. 1 to 6, one end of the spring D engages with or is received by one end of a rotatable part E of the tension-adjusting means or device H therein shown; but, if desired, the spring D may be otherwise connected with the platform and door than in the particular manner here shown— as, for instance, as shown in Figs. 10 and 21, or otherwise. This spring D is shown in Figs. 1 to 6 as arranged axially of the hinges and within the edgewise thickness of the trap-door B, and this is the preferred manner of arranging this spring; but it may be arranged otherwise, if desired— as, for instance, as shown in Fig. 10. Also, as shown in these Figs. 1 to 6, the hinge members, fixedly secured to the trap-door, consist of a single piece of material, and this piece is provided with two, projecting flanges *b* and *b'*, between which an edge portion of the trap-door is received, and these members of the hinges are secured to the door. This single piece *F* extends clear across the trap-door and is provided with an opening for its whole length and preferably of the shape and dimensions shown, so that the end portions of this piece *F* may form the female members of the hinges and receive the male members *e* and *e'*; but any form or construction of the hinge members may be used that is desired, whether it be that shown in Fig. 10 or otherwise, so long as the hinges coact with the other elements herein described, and particularly pointed out in the claims annexed hereto and are enabled to serve their intended purpose. As here shown, Figs. 1 to 6, this piece *F* not only serves to receive the edge portion of the door B and the spring D, but also serves as a casing for the adjusting means or rotatable part E and movable block G, which with the casing form such tension-adjusting means or device by which the stress or tension of the spring D is adjusted to the

desired extent and then held in such adjusted relation to the door and platform. This rotatable part E is provided with a recess *c* to receive one end of the spring D. (Shown in end view in Fig. 8 and in dotted lines in Figs. 3, 5, and 7.) Nearly central longitudinally of said rotatable part a series of holes *c'* is provided adapted to receive one end of a rod or tool by which the part E can be rotated, as indicated in Fig. 4, the movable block G, being inserted in and through an opening in the piece *F*, as seen in Fig. 6, into position for one tooth or projection *c''* on E to engage therewith and hold such part E from rotating backwardly beyond the point at which *c''* engages with G, as shown in Fig. 6. When thus engaged, the rod or tool can be inserted into and moved from any one of the holes *c'* that may be exposed to view within the recess *f* in piece *F* opposite the series of holes *c'* in the part E, and such part may be rotated one tooth or projection at a time and the spring D placed under the desired stress or tension to act upon the door to more or less counterbalance the same when the parts are arranged as here shown.

It will be observed that the spring D connects with the platform through its engagement at one end with the male member *e'* of the right-hand hinge, which is fixedly secured to the platform, and at its other end engages with the rotatable part E, mounted on the door B to rotate therein, and that the movable block G is also mounted on the door in engagement with the teeth *c''* on such part. When the spring is placed under stress or tension, it is in continuous engagement with both the door and the platform, and when the stress or tension of the spring is once adjusted the spring at one end bears a fixed relation to the platform, and at its other end it bears a fixed relation to the door, and its stress is continuously exerted on the door. It will thus be seen that in the foregoing construction the spring D connects with the platform A at one end and with the door B at its other end without any portion of such spring passing through and beyond the hinges, which movably secure such door to the platform, the active connection of the spring D to the door and platform being wholly between or within the space taken up by the hinges themselves and in this particular instance within the space taken up by the door itself; also, that the spring D may be substantially straight in form as distinguished from one which is coiled at nearly right angles to its length. This form of spring is the preferred form; but for many of the combinations of devices herein described, and particularly pointed out in the claims, other forms of springs may be employed— as, for instance, as indicated in Fig. 38. Different forms and arrangements of the preferred forms of springs which are substantially straight in form may be employed, if desired— as, for instance, as

indicated in Figs. 36 and 37, in the former of which two of such bars substantially square in cross-section and arranged on opposite sides of the axial line of the rotatable part are shown, and in the latter, Fig. 37, three such bars substantially triangular in cross-section are shown arranged around the axial line of the rotatable part. These different forms of springs may be arranged relatively to the axial line of the hinges as desired so long as they are arranged to connect with the door and platform and coact therewith, as herein set forth, and particularly pointed out in the claims forming a part of this specification. The form of the rotatable part may be such as is desired if such part be used so long as it is adapted to engage with a portion of the spring and serve the functions of such a part, as herein explained.

In Fig. 10 a spring D' substantially straight in form (and one of the above preferred forms) is connected at one end with the door B' by engaging with a recess in the male member c' of the hinge C', which male member is fixedly secured to the door in any desired manner, and the opposite end of such spring D' is connected with the platform A' wholly outside of the hinge C', the male member of which is also fixedly secured to the door B' in any desired manner. It will thus be seen that no portion of this spring D' passes through and beyond either hinge C' or C'' to engage with a part mounted upon the platform A', such spring engaging with the rotatable part of the tension-adjusting device or means H', the casing or bracket of which is fixedly secured to the platform A' at one side of hinge C'', which casing or bracket receives and supports the male member c'. It will also be seen that so far as concerns this spring D' connecting or engaging with the platform A' the hinges C' and C'' may be solid—that is, with no opening through either hinge to receive a portion of such spring or a part attached thereto to connect with the platform and form a holding device for one end or a portion of such spring, so that it may exert its stress or tension on the door and coact therewith. The tension-adjusting device or means H' consists of a casing h, a rotatable part E', and a movable block G', the spring D' being received by or engaging with the rotatable part E', as shown, or otherwise, as desired, the casing h being provided with a circular opening i to receive the male member c' of the hinge C'', as shown in Fig. 10, there being a similar opening j' on the opposite side of such casing to receive the male member of hinge C' when such casing is mounted at the opposite side edge of the door to where it is shown as being mounted in Fig. 10, it being understood that the rotatable part E' will be reversed, as hereinafter described, when the casing is mounted at the opposite side edge of the door B'. This casing serves as a bracket frame or device to

receive and support a member of one hinge and adjusting means when it is secured in position on the platform A', and such casing may be made as shown or otherwise, as desired. This rotatable part E' is adapted to be mounted in the casing or bracket h, with its projecting six-sided part extending toward the left, as shown in Fig. 10, or to be turned end for end—that is, reversed—with such projecting part extending in the opposite direction, thus adapting such tension-adjusting device for use at either of two opposite side edges of the door by simply assembling such rotatable part with its projecting portion extending from the casing or bracket in one direction or the other, the casing being adapted, as above explained, for this purpose. By reason of this construction such adjusting means are reversible without turning the casing end for end—that is, usable at either of the opposite side edges of the door B'. It is obvious that if the casing or bracket were so made as to be turned end for end and the adjusting means thus be made reversible then the turning of the rotatable part end for end in the casing, as just explained, would not be necessary to enable the tension-adjusting device to be reversed without changing its construction and that this would be the same, in effect, as turning the rotatable part end for end in the casing. The rotatable part E' is provided with teeth e' on one of its sides, as shown, and the casing or bracket h is provided with a recess or cut-away portion h' to form an opening to receive the movable block G', as shown in Figs. 11 and 11*, and hold the rotatable part E' against a backward rotative movement when any one of the teeth e' is in engagement with such movable block, as there shown, and the spring D' is under tension. This rotatable part E' has its projecting part e' made six-sided to adapt it to receive a wrench or other suitable tool and by which it may be rotated as desired and as seen in Figs. 11 and 11*. As seen in Fig. 11*, the casing h has a recess h' or cut-away portion formed on each side of the rotatable part, thus adapting such means to receive the movable block G' (seen in Fig. 11) and hold the rotatable part E' against rotation whichever way such part may be assembled in the casing h of such tension device. The parts, as shown in this Fig. 10, are so combined together that the end portion of the spring D', which connects or engages with the door B', is within the axial line of the hinges C' and C'', while that portion which engages with or is received by the tension-adjusting device or means H' is wholly without such axial line and at one side thereof. It will also be seen that this spring D' is not within the edgewise thickness of the door B', but is, in fact, entirely below the main portion of the door with which it connects; also, that the spring D' is in continuous engagement with the door and platform through the movable

block G', holding the rotatable part E in position to put the spring under tension, so as to act on both door and platform at the same time. This spring D' or similar springs may be arranged in any manner desired relatively to the platform and the trap-door so long as it is substantially straight in form and does not pass through both members of either one of the hinges C' and C² and beyond the same to connect with the platform A', and thereby enable such platform to hold the spring in one direction when the same is put under stress or tension. Instead of such spring or springs connecting with the door B', as shown in Fig. 10, it may connect with the platform at that edge of the door and adjacent to hinge C', as seen in Fig. 11^b, and then connect with the door B' through the means of a rotatable part, as seen in Fig. 11^c, which part is connected with the door and serves as the male or pintle member c^x of the hinge C^x at that edge of the door in place of the male member c² there shown. This rotatable part E^x in Fig. 11^c is rotatable relatively to the door B' and extends beyond the edge of the door, so as to enable it to enter the female member of hinge C^x, as shown in said Fig. 11^c, and such part is provided with teeth or projections and a movable block, as in the case of the construction seen in Figs. 1 to 9, inclusive, whereby the tension of the spring may be adjusted, as before explained. Any desired means for rotating said rotatable part E^x may be employed—such, for instance, as the six-sided projecting part seen in Fig. 11^d, the series of holes e' seen in Figs. 3, 4, 5, and 7, or the recess seen in Figs. 15 and 16 and also seen in dotted lines in Fig. 11^c and to be more fully described in connection with Figs. 15 and 16. This recess form of means is a preferred form of rotating means which may be employed in connection with my improvements. This manner of arranging the spring or springs to connect with the platform and door brings the spring more or less within the axial line of the hinges, because in Fig. 11^c it is directly within such line, while in Fig. 11^d it is wholly without such line, and no portion of the spring passes through both members of either hinge to connect with the platform, so that it may be held against its stress or tension in one direction by the platform. Again, instead of using the rotatable part of a tension-adjusting device to connect a portion of the spring to either the door or platform, as herein explained, and using such part in adjusting the tension or stress of such spring such device may be dispensed with and a plain solid bracket, as seen in Fig. 11^d, be employed, the spring being placed under tension before the bracket N is secured to the platform A', such bracket taking the place of the tension device H', which was dispensed with, the spring engaging with bracket N, as indicated, and its opposite portion engaging with the door, as seen in Fig. 10, or in any other

desired manner. It will thus be seen that in each of the foregoing constructions and modifications a spring substantially straight in form is connected with the platform and the door without any portion of such spring passing through and beyond either hinge.

In Figs. 12, 13, and 14 a somewhat different tension device for adjusting the tension or stress of the spring or springs is illustrated. The construction and arrangement of the hinges C³ C⁴, spring D², door B², and platform A² may be somewhat like that seen in Figs. 1 to 6, inclusive, heretofore described, or different, as desired. When the construction is as shown in Figs. 12, 13, and 14, the rotatable part E² (seen separately in Figs. 15 and 16) is provided, preferably, with a recess e⁵, tapered or otherwise, as seen in dotted lines in Fig. 15 and in full lines (end view) in Fig. 16, to receive a wrench or tool, as indicated in dotted lines in Fig. 12, which passes through a circular opening in the platform and in the male member c⁵ of the hinge C⁴ at the left of Figs. 12 and 13, this opening in Figs. 13, 19, and 20 being designated as y and the parts being seen in longitudinal section in Fig. 13. This rotatable part E² is provided with projections or teeth e⁴, which engage with a movable block G², as in Figs. 3, 5, and 6; but, as shown, a spring s is provided, which is secured to the door B² in such manner that its free end may bear upon the outer end of the movable block and hold it in place with a yielding pressure. The purpose of this spring s is to return the movable block G² to the position seen in Fig. 14 after it has been moved outwardly endwise by the action of the face of any projection or tooth e⁴, adjacent to the inner end of such block, as the rotatable part is rotated in a direction to increase the stress or tension of the spring D². As soon as such face of such tooth has passed beyond the end of such block it permits of the block's inward movement into position for the opposite face of such tooth or projection to engage with such block. This arrangement of spring and movable block permits of the tension of the spring being adjusted without such block falling or moving out of place and also without manual movement inward, as would be the case if the spring were not used, as shown.

In Fig. 39 the rotatable part E⁹ is of somewhat similar construction to that seen in Figs. 7 and 8, except one end is prolonged to form the male member c¹² of the hinge c¹¹, the female member of the hinge being secured to the platform, as in Fig. 11^c. This rotatable part E⁹ is provided with teeth or projections, a movable block, and means for rotating the same as desired—that is, of the form found in Figs. 3 to 8 or otherwise, the form shown in Fig. 39 being similar to that of Figs. 3 to 8. This movable block G² of the tension-adjusting device H² is made somewhat thicker near its inner end than it is toward its outer

end, and as a consequence it is somewhat wedge shape, with the thicker end of the wedge near the inner end of the block, and when once a surface of one of the teeth e^1 engages with such block G^2 the tension or stress of the spring D^2 has to be overcome and the rotatable part E^2 moved in the forward direction slightly before such block can be readily moved outwardly away from the part E^2 , and thus when this block is once engaged with the rotatable part it is firmly held in place by the wedge form of construction shown. In this respect the block G seen in Figs. 6 and 9 is like the block G^2 just described, and a spring like spring s or of other construction, as desired, may be used to coact with the block G as such spring coacts with block G^2 , and this may be the case whether the movable block in either case is of wedge shape or not, so long as the opposite faces of the teeth or projections on the rotatable part are arranged to move the movable block from its holding position ready to be moved into such position by the rotative movement of such rotatable part as just heretofore described or otherwise. The angle of the wedge portion of the movable block, if such portion be employed, may be as desired, the angle of the opposite faces of the projection on the rotatable part being such as will give a bearing on a considerable portion of such wedge or not, as desired. It is preferred that a somewhat extensive bearing-surface be had, as it distributes the pressure of the spring over a greater extent of surface. The arrangement of the opposite faces of each of the teeth or projections relatively to each other (seen in Figs. 6, 7, 8, 15, and 16) is the preferred one; but other arrangements may be adopted, if desired, which will act upon the movable block in substantially the same manner as do the teeth in the above-named figures and where a spring would return the movable block back to its holding position—as, for instance, as shown in Fig. 29.

In the construction seen in Figs. 12, 13, and 14 the spring D^2 connects with the door at one end and with the platform near its other end, and no portion thereof or a part movable therewith passes through and beyond either hinge to connect or engage with the platform, and the hinges may be solid, so far as connecting the spring with the platform is concerned, and in this respect the construction seen in these figures of the drawings is the same as preceding constructions.

Figs. 21 and 22 illustrate another arrangement of spring D^2 and means for connecting the same to the door B^2 and platform A^2 . Here the spring D^2 may be as shown and connect at both ends to the door by any suitable means, such as is shown in Fig. 21 or otherwise, as desired, and to connect with the platform between its end portions or nearly midway of its length, also as there shown.

The means here shown by which the spring D^3 connects with the platform consist of a bracket or casing h^2 , containing a rotatable part E^3 and a movable block G^3 , composing a tension-adjusting device or means H^3 , by which the tension or stress of the spring D^3 may be adjusted as desired and held in the adjusted position. The tension-adjusting device or means H^3 differ somewhat from the devices H or H^2 heretofore described, although adapted to serve the same general purpose of connecting the spring D^3 with the platform and adjusting the stress or tension of such spring. The rotatable part E^3 is provided with the same character of teeth or projections as those seen in Figs. 6, 7, 8, 15, and 16; but there is a somewhat-differently-shaped movable block G^3 from what is shown in preceding figures, and the opening in the casing is also somewhat differently arranged than heretofore to receive such block. This block G^3 is shown in engagement with the rotatable part E^3 in Fig. 22, and it is shown separately in Fig. 22^a. The casing h^2 of this device H^3 has a single opening through which this block G^3 may pass for the teeth or projections e^2 to engage therewith, as shown in Fig. 22. The shape of this block G^3 at its outer end is such as to substantially close such opening and at the same time form a shoulder or abutting surface to limit the inward movement of such block, also as shown. As seen in Fig. 22, the block G^3 prevents rotative movement of part E^3 in one direction, and if it be removed and turned one-half way around in a sidewise direction and then be inserted in the same opening in the casing it will prevent movement of such part in the opposite direction, as seen in Fig. 24, where a somewhat similar movable block is shown as being so inserted, and as here shown the opening in the casing is substantially closed, as before, and the inward movement of such block is likewise limited. The device H^3 may have its rotatable part E^3 made as in the case of the device H^2 —that is, reversible end for end—if desired, in which case the projecting portion of E^3 , which is six-sided, may extend in either of two opposite directions, as may be most convenient for use. The casing h^2 of H^3 may also be made reversible end for end, as shown, or otherwise, and when so made the tension device H^3 as a whole is reversible end for end and is adapted for use one end up as well as the other and can therefore be placed near one side edge of the trap-door or the other, if desired, just the same as if the part E^3 were turned end for end in casing h^2 . The block G^3 , as in some other figures, is made somewhat wedge shape, as seen in Figs. 22, and 22^a, and with like effect. In Fig. 21 the hinges C^3 and C^3 may be solid so far as concerns the connection of the spring D^3 with the platform A^3 , because, as before explained, such connection is made nearly midway of the width of the door or the length of spring D^3 .

and consequently such spring does not pass through and beyond either hinge to connect or engage with the platform A³. The door B³ is notched, as indicated at B^x, to permit it to swing up on a circle, the axial line of the hinges being the same as that of the rotatable part E³ and sufficiently below the top surface of such door to permit of this being done in the manner indicated, the spring D³ being below the edgewise thickness of such door, if desired, or otherwise.

Instead of a single spring, as D³, being used two separate and distinct springs may be employed, as shown in Fig. 21^a, where the rotatable part E³ is shown in longitudinal section and with the ends of two springs being received therein, as indicated. As here shown, it will be seen that the opening in the part E³ extends entirely through such part; but it will also be obvious to a mechanic that if two separate and distinct springs D³⁰ D³⁰ are used, as here shown, this need not be the case and may be otherwise, the opening in the rotatable part in each case being such as to adapt it to receive or engage with the spring or springs whatever shape in cross-sections or dimensions it or they may be and as will effectually serve the intended purpose.

In Figs. 23 and 24 a combined hinge and tension-adjusting device is shown, and this forms one member of one hinge and means by which the tension or stress of the spring or springs may be adjusted as desired. The casing or bracket h³ of this hinge tension device H⁴ is adapted to be secured to the platform A⁴ and is preferably made with both end portions alike, so that it may be turned end for end, as desired, and thus serve its functions at either side edge of the door with substantially equal facility, and it may also be adapted to form one member of one hinge, and preferably the female member, as shown in Fig. 23, where the bracket or casing h³ is shown in horizontal section, and that portion of the door B⁴ and platform A⁴ there seen is in plan or as when the door is closed. As here seen, a tubular projecting part c⁴ forms the male member of the hinge C⁴, which male member is received by a circular opening in that portion of the bracket or casing next adjacent to the door B⁴, which forms the female member of such hinge, which bracket is fixedly secured to the platform. The male member c⁴ of the other hinge, C⁷, is formed on a plate which is fixedly secured to the platform, the female member of this hinge C⁷ being fixed to the door. From this it will be seen that the male member of one hinge and the female member of the other hinge are secured to the platform and that the other members of the two hinges are secured to the door. This casing h³, in effect, forms a hinge-bracket to hinge one side edge of the trap-door to the platform in addition to serving as a bracket for connecting the spring to the platform. The spring D⁴, which may be

of any desired form, is connected near one end to the door B⁴ near the hinge C⁷, and the other end passes entirely through and beyond the central opening of the tubular male member c⁴ of hinge C⁴ and is received by or engages with the rotatable part E⁴, rotatively mounted in the bracket or casing h³, as shown, which part E⁴, by means of the movable block G⁴ and casing h³, connects such spring with the platform A⁴. The block G⁴ seen in Figs. 24 and 25 is of the general construction of the block G³ seen in Figs. 22 and 22^a; but instead of being of wedge shape, as seen in the latter figures, it is of substantially the same thickness where the rotatable part E⁴ engages therewith and is shown in Fig. 24 as inserted, so as to hold the part E⁴ against rotation in a direction opposite to that shown in Fig. 22. When the hinge-bracket h³ is turned end for end, then the block G⁴ has to be changed from the position seen in Fig. 24 to one corresponding to that shown in Fig. 22, this being necessary when such bracket is reversed, as the direction of rotative movement of the rotatable part E⁴ is changed or reversed, this movement being in one direction when this hinge tension device is used at one side edge of the door and is in the opposite direction when such device is used at the opposite side edge. A removable plate seen in Fig. 23 is shown as being removed in Fig. 24. Hence the rotatable part E⁴ is there seen in end view in full lines. The door B⁴ is notched at the corner where this hinge tension device is located, as indicated, and a space is left for a wrench or tool to take hold of the six-sided projecting portion of the rotatable part E⁴ to rotate the same and adjust the tension of the spring D⁴. The door is thus notched or cut away to avoid cutting away the platform at the point where the device H⁴ is located, which if done would weaken the same at a corner of the car-body where strength is required. The notching of the door does not weaken the corner of the car-body.

In Figs. 26, 27, and 28 a somewhat-differently-constructed tension-adjusting device is illustrated. In this construction the casing or bracket portion of the device serves the same functions as are served by that of Figs. 23 and 24; but it is adapted to be let into the platform without the extent of cutting away of the corner of the car-body at this point that is required for the construction of bracket shown in Figs. 23 and 24, and consequently the door need not be notched or cut away when this construction is used if it is desired to have the door the full width at its hinge portion, and the door may appear as seen in Fig. 26, if desired. This hinge tension device is shown in horizontal section in this Fig. 26 and in vertical section in Fig. 28, that portion of the door shown being in the closed position in each case. Instead of a single opening in the casing or bracket h⁴ of the device

H⁶ for the reception of the movable block G⁵ two openings are shown, and such block is somewhat of the shape of the blocks G and G². (Seen in Figs. 6 and 14, respectively.) This block G⁵ may be of other shapes than here shown, if desired, so long as the rotatable part engages therewith and is held against rotative movement by the stress or tension of the spring D⁵. When this tension-adjusting device is used at the side edge of the door B⁵, (seen in Fig. 26,) the block G⁵ will engage with the rotatable part E⁵, as seen in Fig. 28; but if such device is to be used at the opposite side edge of the door B⁵ such block is turned half-way over in a sidewise direction, and it is then placed in the opening at the other side of E⁵ and the device as a whole turned end for end or reversed and ready to be attached to the platform A⁵ at the opposite side edge of such door, as the two end portions of the casing or bracket h⁵ are substantially alike. This device H⁵ is seen in face view in Fig. 27, and the circular opening, which receives the tubular projecting male member c¹¹ of the hinge C¹⁰, is indicated in dotted lines, the rotatable part E⁵ not extending into this part of the casing or bracket h⁵, also as shown. The rotatable part E⁵ is mounted in a removable plate, as indicated in Figs. 26 and 27, and such part may be removed from the casing or bracket h⁵ when desired. The shape and construction of the teeth or projections on the rotatable parts may be as desired so long as the movable block to be used with each of such parts coacts therewith to hold such part against rotative movement by the stress or tension of the spring or springs connected therewith. These teeth or projections, as herein shown, have surfaces which are adapted to engage with the movable block when it is inserted between one of such surfaces and a portion of the device fixed relatively to the rotatable part—as, for instance, a portion of the casing—and any two opposed engaging surfaces may, if desired, be arranged relatively to each other in such angular relation that they substantially meet, as shown, for instance, in Figs. 6, 14, and 22. For instance, such teeth or projection may be of the general shape of ordinary gear-teeth, as seen in Fig. 29, where the rotatable part E⁵, with such teeth or projections, coact with the movable block or pawl G⁵ in the tension device H⁵. This block or pawl G⁵ is pivotally mounted on the casing or bracket h⁵ and is provided with a coiled spring s', whose stress tends to hold block G⁵ into engagement with the teeth or projections on the periphery of the rotatable part E⁵. Otherwise than for the teeth or projections, movable block or pawl, and spring this device H⁵ may be the same as in Figs. 23 and 24. When this device H⁵ is turned end for end or reversed, the pawl or block G⁵ is removed from the position seen and pivoted to the casing or bracket h⁵ on the other side of the rotatable part E⁵, as indi-

cated in Fig. 29, the spring s' being attached to G⁵, so that such spring occupies the same relation to G⁵ whichever of the two indicated positions such block may occupy, and the device as a whole is reversible and may be used at either of the two opposite side edges of a door, as in the case of the other tension devices hereinbefore described.

Instead of providing a six-sided projecting portion to the rotatable parts, as seen in some of the preceding figures, a movably-mounted device T (seen in Figs. 30, 31, and 32) may be provided. This device T is mounted on the rotatable part E⁷ of the hinge tension device H⁷, as seen in Fig. 30, oppositely-extending hub portions t being provided to secure it therein, as shown in Fig. 30^a. This device T remains rotatively attached to E⁷, being rotatively mounted on the projecting portions t t of E⁷, and it has a part of a revolution thereon, swinging back and forth, as desired. This part E⁷ is thus rotatively mounted in the casing or bracket h⁶, which casing may serve as a hinge-bracket or not, as desired. If it does so serve, this may be accomplished by utilizing the extending shaft portion R of the rotatable part E⁷, as shown in Figs. 31 and 30^a, where such portion R forms the male member of one hinge, which is secured to the platform, the female member being secured to the door in any convenient manner. The rotation of this portion R in adjusting the tension of the spring or springs will not interfere with its serving as the male member of a hinge. This device T is provided with a movable pawl r, which is pivotally mounted thereon, as seen in Fig. 30, so that its outer end may engage with the teeth or projections of E⁷, as there seen, and as T is moved to the right it rotates E⁷ with it, and the movable block G⁷ may be moved outwardly away from E⁷ and a succeeding tooth or projection is brought into position for block G⁷ to engage therewith and hold E⁷, when T may be moved to the left, r swinging on its pivot away from the tooth it engaged with ready to engage with a succeeding tooth and again swing to the right, again rotating E⁷, as before, and so on until the desired tension of the spring or springs is attained. This pawl r may be removed from the position where it is seen pivoted in Fig. 30 and be pivoted upon the opposite side of T, as indicated in Fig. 32, when T is adapted to rotate E⁷ in the opposite direction, when the block G⁷ will be removed from the opening, where it is shown in full lines, and placed in the opening shown on the opposite side of the axis of E⁷, as indicated in dotted lines, when it will coact with the teeth or projections on E⁷, as before. T may have any form of handle portion desired in order to swing it back and forth, and, if desired, this handle portion may be removable in any convenient manner. The operation is the same in this construction as in preceding

ones, so far as concerns the adjusting of the tension or stress of the spring or springs, which may be connected with such rotatable part E' , and also, so far as concerns the casing or bracket h^6 , serving as a hinge-bracket, as explained, if constructed as shown or in some other way adapting it to serve such purpose, accordingly as desired.

Instead of a movable block G^7 , as seen in Fig. 34, inserted into an opening in the casing or bracket at substantially right angles to a plane through the axis of E' , as indicated in Fig. 30, a block G^8 , like that seen in Fig. 35, may be used and inserted in a direction substantially parallel with such axis, as indicated in Fig. 31 in dotted lines, the opening in the casing or bracket h^6 being adapted for this purpose.

Any form of spring or springs desired may be connected with the rotatable part E' , so long as they engage with such part and through such part are connected with the platform and the stress or tension of the springs or spring may be adjusted thereby—as, for instance, the form of spring seen in Figs. 23 and 26 or such as is seen in Fig. 38. The spring D^8 (seen in Fig. 38) is of the coiled form, as shown, and may be connected with the rotatable part E' if desired, in the manner it is shown as being connected with the rotatable part E' , which is substantially like the part seen in Figs. 15 and 16, except as to the recess therein to receive a portion of its spring, the door B' and platform A' being also as shown in Figs. 12, 13, and 14; or, if desired, springs, as indicated in Figs. 36 and 37 may, be employed, which consist of substantially straight bars having cross-sections, as indicated in said figures, or of any other form and arrangement desired. This is also true of some of the other constructions herein before described.

Different ways of connecting the spring or springs to the door and platform, if desired, may be employed than those heretofore described. For instance, instead of connecting the spring D' with the door, as shown at the right of Fig. 10, such spring may be connected with the door as illustrated in Fig. 40, wherein the axial-line of the male member of the hinge fixedly secured to the door is coincident with that of the pinion c^m , which is also fixedly secured to the door B' and meshes with the gear c^m , with which the spring D' (seen in Fig. 10) may engage by means of the central slot seen therein. This gear c^m is suitably mounted on the platform so as to rotate as the door B' opens and closes and so that the stress or tension of the spring tends to rotate such gear, and by reason of the pinion c^m , intermeshing therewith such stress acts upon the door the same as if connected directly thereto, as in Fig. 10, the spring being put under tension in the proper direction for this purpose. If this manner of connecting

the spring with the door shown in Fig. 40 be employed in connection with the tension-adjusting device shown in Figs. 10, 11, and 11^a, the rotatable part E' can be turned end for end or reversed, as before explained, and then the spring D' be placed under the proper tension for such spring to act on the door, as in Fig. 10. In such a case no part of the spring would be within the axial line of the hinges, but with the same coactive relation to the door and platform as in Fig. 10. This would also be the case if the tension-adjusting device seen in Fig. 10 were dispensed with and the manner of connecting such spring to the platform shown in Fig. 11^a were employed, as before explained. The gear c^m may be fixedly secured to the door in any desired manner, and the gear c^m may be rotatively mounted on the platform in any convenient way desired, it being immaterial as to the way this is done so long as the parts are adapted to coact in the general way herein described. Again, the spring may be connected with the door through a pair of gears mounted thereon, as indicated in Fig. 41, the spring D' engaging with a part somewhat similar to E of Figs. 1 to 8 or Fig. 39, except for the holes z' and teeth z' , and which is provided with a gear c^m at the edge of the door to intermesh with gear c^m , also mounted on the door, which may serve as the rotatable part, having a movable block engaging therewith, somewhat as indicated in Fig. 41, or in any convenient manner desired. This movable block G^m is in the form of a segmental rack held in engagement with c^m by a screw g^m . (Seen in Fig. 41.) The parts c^m and c^m may be mounted in any convenient manner, and c^m is to be adapted to engage with a spring, as D' , or of any other desired form, and c^m may also be rotated in any convenient manner desired—as, for instance, by means of a suitable tool entering a squared recess, as indicated in Fig. 41, or otherwise. In Fig. 41 the spring, whatever its form or construction may be, may be within the axial line of the hinges or partly within and partly without, as desired.

Other ways of connecting the spring or springs to the door or to the platform, or to both, than herein shown may be employed, the several ways here described indicating some of the ways that would be suggested to mechanics from the general description of the present improvements.

I have herein shown and described means for adjusting the tension of a spring or springs which are connected with a platform and door in such manner as to aid in manipulating the door relatively to the platform in its use in connection with the ingress and egress of a person or persons to or from cars, but it is manifest that these same means may be used in connection with doors and the parts to which they are hinged where they may do substantially the same work in essentially the same

way that such means do their work in the structures herein shown and described, and therefore I do not wish to limit this portion of my invention to the particular kind of structure to which it may be applied.

I have shown and described various combinations of parts having specific characteristics, and different specific constructions or forms of parts may be used in the place or places of some that are herein shown without in any way changing the character or coactive relations of the parts of such combinations, as must be manifest to a mechanic, and therefore I do not wish to be limited to the specific forms and constructions of parts herein shown to any greater extent than is specifically stated in each individual combination particularly pointed out, but wish to include all that are within the spirit of my invention.

What I claim as new is—

1. In a platform the combination, substantially as set forth, of a trap-door, hinges which may be solid, a spring connecting with the door and platform through a rotatable part and a movable block which hold the spring in continuous engagement with the door and platform.

2. In a platform the combination, substantially as set forth, of a trap-door, hinges which may be solid, a spring substantially straight in form connecting with the door and platform through a rotatable part and a movable block which hold the spring in continuous engagement with the door and platform.

3. In a platform the combination, substantially as set forth, of a trap-door, hinges which may be solid and adapted to movably connect the door to the platform, and a spring substantially straight in form, one portion of which is connected with the platform and another portion is connected with the door, without any portion of such spring passing through and beyond either hinge.

4. In a platform the combination, substantially as set forth, of a trap-door, hinges which may be solid and adapted to movably connect the door to the platform, and a spring substantially straight in form and arranged lengthwise of and a portion within the axial line of the hinges, one portion of the spring being connected with the platform and another portion is connected with the door, without any portion of such spring passing through and beyond either hinge.

5. In a platform the combination, substantially as set forth, of a trap-door, hinges which may be solid and adapted to movably connect the door to the platform, and a spring substantially straight in form and arranged with some portion thereof throughout its length within the axial line of the hinges, one portion of such spring being connected with the platform and another portion is connected with the door, without any portion of such

spring passing through and beyond either hinge.

6. In a platform the combination, substantially as set forth, of a trap-door, hinges which may be solid and adapted to movably connect the door to the platform, and a spring substantially straight in form and arranged within the edgewise thickness of the door, one portion of which is connected with the platform, and another portion is connected with the door, without any portion of such spring passing through and beyond either hinge.

7. In a platform the combination, substantially as set forth, of a trap-door, hinges which may be solid and adapted to movably connect the door to the platform, and a spring substantially straight in form, one portion of which is connected to the door near one of its side edges and another portion is connected to the platform between such edge and the opposite side edge of the door, without any portion of such spring passing through and beyond either hinge.

8. In a platform the combination, substantially as set forth, of a trap-door, hinges which may be solid and adapted to movably connect the door to the platform, and a spring substantially straight in form, one portion of which is fixedly connected to the platform near one hinge and another portion of which is connected to the door between such hinge and the opposite side edge of the door, without any portion of such spring passing through and beyond either hinge.

9. In a platform the combination, substantially as set forth, of a trap-door, hinges which may be solid and adapted to movably connect the door to the platform, and a spring substantially straight in form, one portion of which is connected to the door near one of its side edges and another portion is fixedly attached to the hinge member which is secured to the platform at the opposite side edge of the door.

10. In a platform the combination, substantially as set forth, of a trap-door, hinges adapted to movably connect the door to the platform, and a spring substantially straight in form and arranged axially of the hinges with one portion fixedly secured to the platform near one hinge and another portion connected to the door through a rotatable part, rotatable relatively to the door.

11. In a platform the combination, substantially as set forth, of a trap-door, hinges adapted to movably secure the door to the platform, and a spring fixedly secured to the platform at one portion thereof and connected to the door through a rotatable part, and movable block mounted on the door.

12. In a platform the combination, substantially as set forth, of a trap-door, hinges adapted to movably connect the door to the platform, a spring fixedly secured to the platform at one portion thereof and connected to the

door through a rotatable part, which part and spring are arranged substantially within the axial line of the hinge, and a movable block mounted on the door.

13. In a platform the combination, substantially as set forth, of a trap-door, hinges adapted to movably connect the door to the platform, at one portion thereof, and connected to the door through a rotatable part, which part and spring are arranged within the edge-wise thickness of the door.

14. In a platform the combination, substantially as set forth, of a trap-door, hinges adapted to movably connect the door to the platform, at one portion thereof, and a spring fixedly secured to the platform, and connected to the door through a rotatable part, which part and spring are arranged both within the edge-wise thickness of the door and the axial line of the hinges.

15. In a platform the combination, substantially as set forth, of a trap-door, hinges adapted to movably connect the door to the platform, by mounting the male member of one hinge to the door and the male member of the other hinge to the platform, and a spring, one portion of which is connected with the male member of the hinge mounted on the door and another portion connected with the male member of the hinge mounted on the platform.

16. In a platform the combination, substantially as set forth, of a trap-door, hinges adapted to movably connect the door to the platform, a tension-adjusting device, adapted to engage with a portion of a spring, and to be mounted on the door, and a spring, a portion of which is connected with the platform and another portion is engaged with the tension device, whereby the tension of the spring may be adjusted.

17. In a platform, the combination, substantially as set forth, of a trap-door, hinges adapted to movably connect the door to the platform, a tension-adjusting device provided with a rotatable part and movable block, such part being adapted to engage with a spring, and said device adapted to be mounted on the door, and a spring, a portion of which is connected with the platform and another portion is engaged with the rotatable part, which part is held against rotation by the movable block, whereby the tension of the spring may be adjusted.

18. In a platform the combination, substantially as set forth, of a trap-door, hinges adapted to movably connect the door to the platform, a tension-adjusting device having a rotatable part which is adapted to serve as the male member of one hinge and to engage with a spring, and a spring adapted to connect the door and platform through such rotatable part.

19. In a platform the combination, substantially as set forth, of a trap-door, hinges adapted to movably connect the door to the platform, a tension-adjusting device mounted upon the door and having a rotatable part which is adapted to serve as the male member of one hinge and to engage with a spring, and a spring adapted to connect the door and platform through such rotatable part.

20. In a platform the combination, substantially as set forth, of a trap-door, hinges adapted to movably connect the door to the platform, a tension-adjusting device having a rotatable part which is adapted to serve as the male member of one hinge and to engage with a spring, and a spring arranged axially of the hinge and adapted to connect the door and platform through such rotatable part.

21. In a platform the combination, substantially as set forth, of a trap-door adapted to receive the male member of a hinge at either of its opposite side edges, hinges adapted to movably connect the door to the platform, the male member of one hinge being adapted to be received at either of two opposite side edges of the door and also to serve as the rotatable part of tension-adjusting means, a spring adapted to connect the door and platform through such rotatable part, and a movable block, whereby such rotatable hinge part may be used at either of two opposite side edges of the door and the tension of the spring be adjusted where used.

22. In a platform the combination, substantially as set forth, of a trap-door adapted to inclose a spring and to receive the male member of a hinge at either of its opposite side edges, hinges adapted to movably connect the door to the platform, the male member of one hinge adapted to be received at either of two opposite side edges of the door and also to serve as the rotatable part of tension-adjusting means, a spring adapted to be received by the door and to connect the door and platform through such rotatable part, and a movable block, whereby such rotatable hinge part may be used at either of two opposite side edges of the door and the tension of the spring be adjusted where used.

23. In a platform the combination, substantially as set forth, of a trap-door adapted to receive a movable block and operatively hold the male member of a hinge at either of its opposite side edges, hinges adapted to movably connect the door to the platform, the male member of one hinge being adapted to be operatively mounted and held on either of two opposite side edges of the door and also to serve as the rotatable part of tension-adjusting means, a spring adapted to connect the door and platform through such rotatable part, and a movable block adapted to engage with the door and rotatable part at whichever side edge of the door the part is operatively mounted, whereby the tension of the spring may be adjusted in either of two directions accordingly as such rotatable part may be operatively mounted upon the door.

24. In a platform the combination, substantially as set forth, of a trap-door, hinges which may be solid and adapted to movably connect the door to the platform, a spring substantially straight in form, a portion of which is connected with the platform and another portion is connected with tension-adjusting means and adjusting means mounted upon the door whereby the tension of the spring may be adjusted.

25. In a platform the combination, substantially as set forth, of a trap-door, hinges adapted to movably connect the door to the platform, a spring adapted to connect the door and platform through a reversible tension device, and a reversible tension-adjusting device adapted to engage with a portion of such spring when secured in place in opposite positions, whereby the tension of the spring may be adjusted and the spring held against turning in either one of two directions.

26. In a platform the combination, substantially as set forth, of a trap-door, hinges adapted to movably secure the door to the platform, a spring connected to the door and platform at three points, one of which is through tension-adjusting means, and a tension-adjusting device adapted to be secured in place whereby the tension of such spring may be adjusted.

27. In a platform the combination, substantially as set forth, of a trap-door, hinges adapted to movably secure the door to the platform, a spring secured to the door near its ends and to the platform, between the points at which the spring is secured to the door, through adjusting means, and tension-adjusting means adapted to be secured in place and hold the spring against turning, whereby the tension of such spring may be adjusted.

28. In a platform the combination, substantially as set forth, of a trap-door, hinges adapted to movably connect the door to the platform, springs which connect with the platform and door through adjusting means a portion of each spring being connected to the adjusting means, and a tension-adjusting device adapted to be secured in place between the hinges and to engage with a portion of each spring, whereby the tension of the springs may be adjusted.

29. In a platform the combination, substantially as set forth, of a trap-door, hinges which may be solid and adapted to movably connect the door to the platform, a spring substantially straight in form, a portion of which is adapted to be connected with the door and another portion is adapted to be connected with the platform at points between the extreme opposite side edges of the door, and a tension-adjusting device adapted to engage with the spring and to be secured in place at a point also between such side edges, whereby the tension of the spring may be adjusted.

30. In a platform the combination, substan-

tially as set forth, of a trap-door, hinges which may be solid and adapted to movably secure the door to the platform, a spring substantially straight in form adapted to connect the door and platform through a reversible tension device, and a reversible tension-adjusting device adapted to engage with a portion of such spring when secured in place in opposite positions, whereby the tension of the spring may be adjusted and the spring held against turning in either one of two directions.

31. In a platform the combination, substantially as set forth, of a trap-door, hinges adapted to movably connect the door to the platform, and springs which are connected with the door and platform, one of which receives one portion of each spring and other portions of such springs are received by tension-adjusting means secured to the other, whereby the tension of the springs may be adjusted and such springs held against turning.

32. In a platform the combination, substantially as set forth, of a trap-door, hinges which may be solid and adapted to movably connect the door to the platform, springs substantially straight in form, which are connected with the door and platform, one of which receives one portion of each spring and other portions of such springs are received by tension-adjusting means secured to the other, whereby the tension of the springs may be adjusted and such springs held against turning.

33. In an adjusting device the combination, substantially as set forth, of a casing adapted to receive a rotatable part and a movable block, a rotatable part provided with a projection and adapted to engage with a portion of a spring, and a movable block adapted to enter the casing between it and the projection to hold such part against rotation in opposite directions accordingly as such block is received between the projection and casing.

34. In an adjusting device the combination, substantially as set forth, of a casing adapted to receive a rotatable part and a movable block, a rotatable part provided with a series of projections and adapted to engage with a portion of a spring, and a movable block adapted to enter the casing between it and one of the projections to hold such part against rotation in opposite directions accordingly as such block is received between one of the projections and casing.

35. In an adjusting device the combination, substantially as set forth, of a casing adapted to receive a rotatable part and a movable block, a rotatable part provided with substantially equal opposite engaging surfaces and is adapted to engage with a spring, and a movable block adapted to enter the casing between it and either one of the opposite surfaces of such part to hold it against rotation in one of two directions, accordingly as such block is received between one of such surfaces and the casing.

36. In an adjusting device the combination, substantially as set forth, of a rotatable part rotatively mounted therein and provided on its periphery with a projection formed of substantially equal angular surfaces, and adapted to engage with a spring, and a movable block adapted to enter between one angular surface of the projection and a fixed portion of the device to hold such part against rotation in one direction and between the other angular surface and a fixed portion of such device to hold such part against rotation in the other direction.

37. In an adjusting device the combination, substantially as set forth, of a rotatable part rotatively mounted therein and provided with a series of projections formed with substantially equal angular surfaces, and adapted to engage with a spring, and a movable block adapted to enter between one of such angular surfaces and a fixed portion of the device to hold such part against rotation in one direction and between another angular surface and a fixed portion of such device to hold such part against rotation in the other direction.

38. In an adjusting device the combination, substantially as set forth, of a rotatable part rotatively mounted therein and provided with projections formed with substantially equal angular surfaces, and adapted to engage with a spring, and a movable block having a wedge portion adapted to enter between one of such angular surfaces and a fixed portion of the device to hold such part against rotation in one direction and between another angular surface and a fixed portion of such device to hold such part against rotation in the other direction.

39. In an adjusting device the combination, substantially as set forth, of a rotatable part having projections with substantially equal angular surfaces and adapted to engage with a spring, and a movable block having two angular surfaces arranged at substantially the angle formed by adjoining angular surfaces between two projections on such part and adapted to engage one angular surface and with a portion of such device to hold such part against rotation in one direction and also to engage the other angular surface to hold such part in the other direction.

40. In an adjusting device the combination, substantially as set forth, of a rotatable part having projections with substantially equal angular surfaces and adapted to engage with a spring, and a movable block having a limiting-shoulder to engage against a portion of such device and adapted to engage one angular surface and with a portion of such device to hold such part against rotation in one direction and also to engage the other angular surface to hold such part in the other direction.

41. In an adjusting device the combination, substantially as set forth, of a rotatable part

having projections with substantially equal angular surfaces and adapted to engage with a spring and a movable block having a limiting-shoulder and a wedge portion adapted to engage with one angular surface and with a portion of such device to hold such part against rotation in one direction and also to engage the other angular surface and another portion of such device to hold such part in the other direction.

42. In an adjusting device the combination, substantially as set forth, of a rotatable part having projections on its periphery of substantially equal angular surfaces and adapted to engage with a spring, and a movable block adapted to engage one angular surface in one direction and with a portion of such device to hold such part against rotation, and also to engage the other angular surface in a direction at an angle approximately that of the angular surfaces of a single projection to hold such part in the other direction.

43. In an adjusting device the combination, substantially as set forth, of a rotatable part having projections on its periphery of substantially equal angular surfaces and adapted to engage with a spring, an opening in such device extending to such part, and a movable block adapted to enter such opening to engage one angular surface in one direction and with a portion of such device to hold such part against rotation and to substantially fill such opening at the exterior of such device and also to engage the other angular surface in a direction at an angle approximately that of the angular surfaces of a single projection to hold such part in the other direction.

44. In an adjusting device the combination, substantially as set forth, of a rotatable part provided with projections and adapted to engage a spring, means separate from the projections for rotating such part, and a movable block adapted to engage with the projections at one side thereof, to hold such part against rotation and also to engage the projections at the other side thereof to hold such part in the other direction.

45. In an adjusting device the combination, substantially as set forth, of a hinge member adapted to be secured in place in reversed positions, a rotatable part provided with projections and adapted to engage with a spring, and a movable block adapted to engage with the projections and a fixed portion of such device in either one of two directions.

46. In an adjusting device the combination, substantially as set forth, of a hinge member made integral with such device and adapted to be secured in place in reversed positions, a rotatable part provided with projections and adapted to engage with a spring, and a movable block adapted to engage with the projections and a fixed portion of such device in either one of two directions.

47. In an adjusting device the combination,

substantially as set forth, of a hinge member adapted to be secured in place in reversed positions, a rotatable part provided with projections and means separate from the projections for rotating such part and adapted to engage with a spring, and a movable block adapted to engage with the projections and a fixed portion of such means in either one of two directions.

48. In an adjusting device the combination, substantially as set forth, of a hinge member adapted to be secured in place in reversed positions, a rotatable part provided with projections arranged at an angle to the axis of such part, which part is adapted to engage with a spring, and a movable block, movable to engage with the projections and a fixed portion of such device in a direction at an angle to the axis of such part to hold it against rotation.

49. In an adjusting device the combination, substantially as set forth, of a hinge member adapted to be secured in place in reversed positions, a rotatable part provided with projections having substantially equal angular surfaces arranged at an angle to the axis of such part, which part is adapted to engage with a spring, and a movable block, movable to engage with either one of the angular surfaces and a fixed portion of such device in a direction at an angle to the axis of such part to hold it against rotation.

50. In an adjusting device the combination, substantially as set forth, of a rotatable part provided with projections arranged at an angle to the axis of such part, which part is adapted to engage with a spring, and a movable block, movable to engage with the projections and a fixed portion of such device in a direction at an angle to the axis of such part to hold it against rotation.

51. In an adjusting device the combination, substantially as set forth, of a rotatable part provided with projections arranged at an angle to the axis of such part, which part is adapted to engage with a spring, and a movable block, movable at substantially right angles relatively to the axis of such part to engage with such projections and a fixed portion of such device to hold such part against rotation.

52. In an adjusting device the combination, substantially as set forth, of a rotatable part provided with projections on its periphery having substantially equal side surfaces and adapted to engage with a spring, and a movable block, bodily movable relatively to such opposite side surfaces of the projections and a fixed portion of such device to engage with either one of such surfaces and hold such part against rotation in either one of two directions.

53. In a platform the combination, substantially as set forth, of a door, hinges adapted to movably connect the door to the platform,

a portion of which consists of a casing adapted to form a member of one hinge and to be secured in place at either of the opposite side edges of the door, a rotatable part mounted in such casing and provided with projections and adapted to engage with a spring, a spring connecting with the door and platform, and a movable block, movable to engage with the projections and a fixed portion of such casing in a direction at an angle to the axis of such part to hold it against rotation.

54. In a platform the combination, substantially as set forth, of a door hinges which may be solid and adapted to movably connect the door to the platform, a portion of which consists of a casing adapted to form a member of one hinge and to be secured in place at either of the opposite side edges of the door, a rotatable part mounted in such casing and provided with projections and adapted to engage with a spring, a spring substantially straight in form connecting with the door and platform without any portion of such spring passing through and beyond either hinge, and a movable block adapted to engage with such projections and a fixed portion of the casing and hold such part against rotation in either one of two directions.

55. In a platform the combination, substantially as set forth, of a door, hinges adapted to movably connect the door to the platform, a portion of which consists of a casing adapted to support a member of one hinge and to be secured in place at either of the opposite side edges of the door, a rotatable part mounted in such casing and provided with projections and adapted to engage with a spring, a spring connecting with the door and platform, and a movable block adapted to engage with such projections and a fixed portion of the casing and hold such part against rotation in either one of two directions.

56. In a platform the combination, substantially as set forth, of a door, hinges adapted to movably connect the door to the platform, a portion of which consists of a casing adapted to support a member of one hinge and to be secured in place at either of the opposite side edges of the door, a rotatable part adapted to be mounted in such casing in either one of two opposite positions and adapted to engage with a spring in either one of such positions, and which is provided with projections, a spring connecting with the door and platform, and a movable block adapted to engage with such projections and a fixed portion of the casing and hold such part against rotation in either one of two directions.

57. In a platform the combination, substantially as set forth, of a door, hinges adapted to movably connect the door to the platform, a portion of which consists of a casing adapted to support a member of one hinge and to be secured in place at either of the opposite side edges of the door, a rotatable part adapted to

be mounted in such casing and provided with spring-engaging means at both of its axial ends and also with projections, a spring connecting with the door and platform, and a movable block adapted to engage with such projections and a fixed portion of the casing and hold such part against rotation in either one of two directions.

58. In a platform the combination, substantially as set forth, of a door, hinges adapted to movably connect the door to the platform, a portion of which consists of a casing adapted to support a member of one hinge and to be secured in place at either of the opposite side edges of the door, a rotatable part adapted to be mounted in said casing and to engage with a spring and provided with projections and having means, outside of the projections, adapted to rotate such part, a spring connecting with the door and platform, and a movable block adapted to engage with such projections and a fixed portion of the casing and hold such part against rotation in either one of two directions.

59. In a platform the combination, substantially as set forth, of a door, hinges adapted to movably connect the door to the platform, a portion of which consists of a casing adapted to support a member of one hinge and to be secured in place at either of the opposite side edges of the door, a rotatable part adapted to be mounted in the casing and to engage with a spring, and provided with projections and a portion, other than the projections, by which such part may be rotated, a spring connecting with the door and platform, and a movable block adapted to engage with such projections and a fixed portion of the casing and hold such part against rotation in either one of two directions.

60. In a platform the combination, substantially as set forth, of a door, hinges adapted to movably connect the door to the platform, a portion of which consists of a casing adapted to receive a member of a hinge and adjusting means and to be secured in place in reversed positions, a rotatable part provided with projections and adapted to engage with a spring, a spring connecting with the door and platform, and a movable block adapted to engage with such projections and a fixed portion of the casing and hold such part against rotation in either one of two directions.

61. In a platform the combination, substantially as set forth, of a door, hinges adapted to movably connect the door to the platform, a portion of which consists of a casing adapted to receive a member of a hinge and adjusting means and to be secured in place in reversed positions, a rotatable part adapted to be mount-

ed in the casing in either one of two positions and to engage with a spring, and provided with projections, means for rotating such part, a portion of which is attached to and reversible with such part, a spring connecting with the door and platform, and a movable block adapted to engage with such projections and a fixed portion of the casing and hold such part against rotation in either one of two directions.

62. In a platform the combination, substantially as set forth, of a door, hinges adapted to movably connect the door to the platform, a portion of which consists of a casing adapted to receive a member of a hinge and adjusting means and to be secured in place in reversed positions, a rotatable part adapted to be mounted in the casing axially of the hinge member received thereby and to engage with a spring, and provided with projections, a spring connecting with the door and platform, and a movable block adapted to engage with such projections and a fixed portion of the casing and hold such part against rotation in either one of two directions.

63. In a platform the combination, substantially as set forth, of a door, hinges adapted to movably connect the door to the platform, a portion of which consists of a casing adapted to receive a member of one hinge and adjusting means and to be secured to the platform in reversed positions, a rotatable part adapted to be mounted in the casing and to engage with a spring and provided with projections, a spring connecting with the door and platform, and a movable block adapted to engage with such projections and a fixed portion of the casing and hold such part against rotation in either one of two directions.

64. In a platform the combination, substantially as set forth, of a door of a width at its hinge portion substantially that of the main portion of the door, hinges adapted to movably connect the door to the platform, a portion of which consists of a casing adapted to receive a member of a hinge and adjusting means and to be secured to the platform in reversed positions, a rotatable part adapted to be mounted in the casing and to engage with a spring and provided with projections, a spring connecting with the door and platform, and a movable block adapted to engage with such projections and a fixed portion of the casing and hold such part against rotation in either one of two directions.

OLIVER M. EDWARDS.

Witnesses.

C. M. HANRAHAN,
THOS. J. McCAULEY.