O. C. FOSSELMAN.

COUNTERBALANCED STAIRWAY.

APPLICATION FILED DEC. 12, 1908.

945,029.

Patented Jan. 4, 1910.

3 SHEETS—SHEET 1.

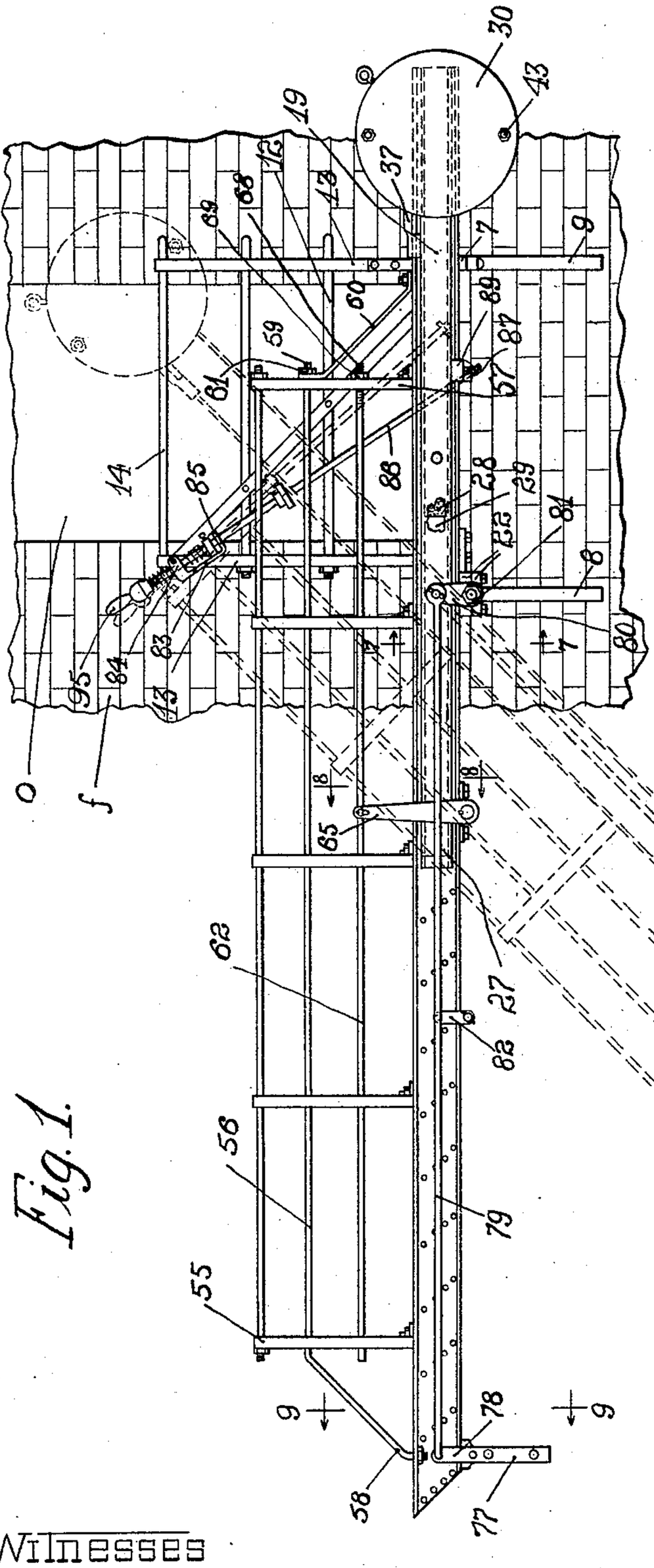

Fig. 1.

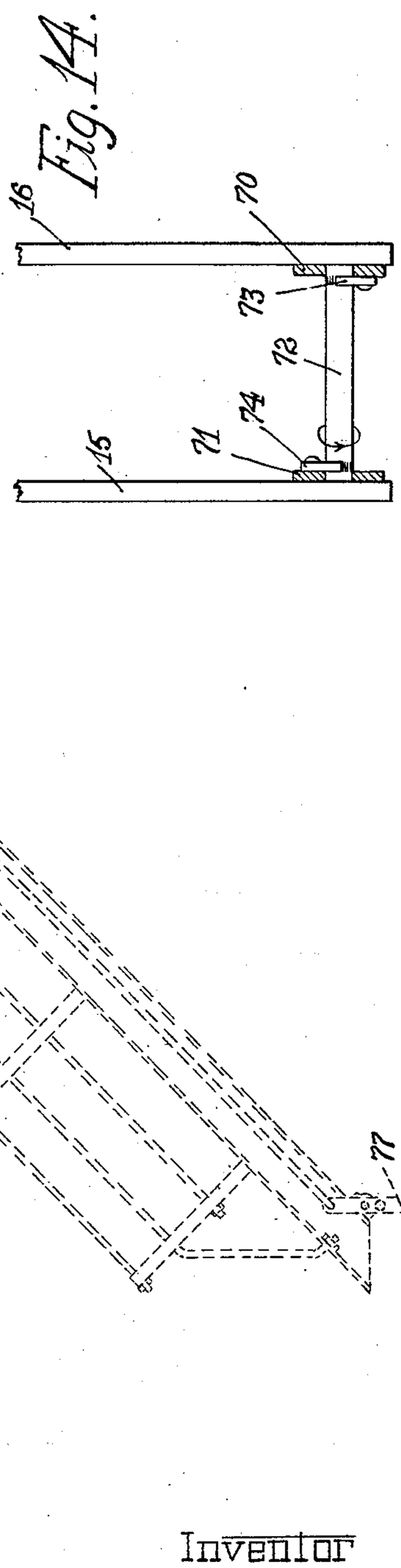

Fig. 14.

Witnesses

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3 SHEETS—SHEET 2.

Fig. 2.

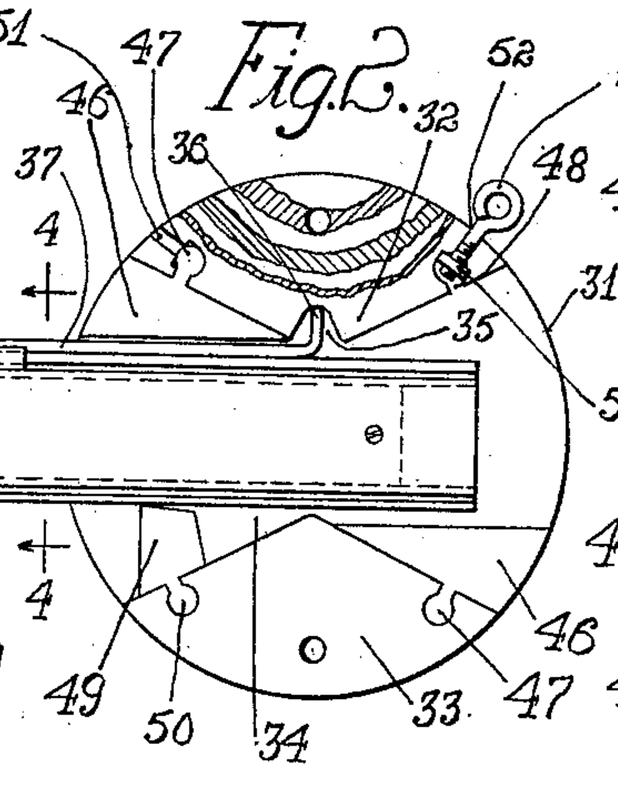


Fig. 3.

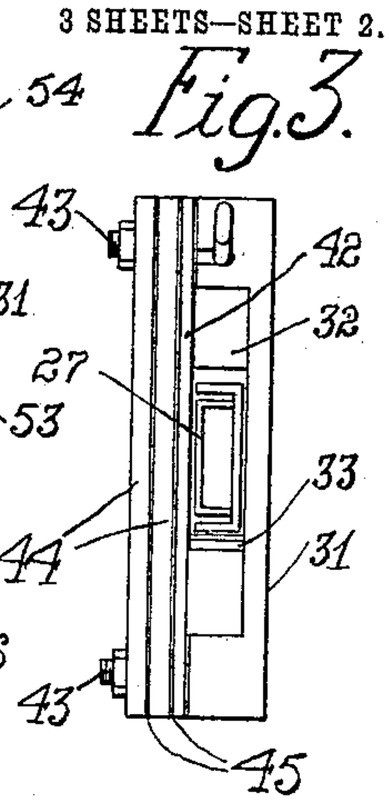


Fig. 4.

Fig. 6.

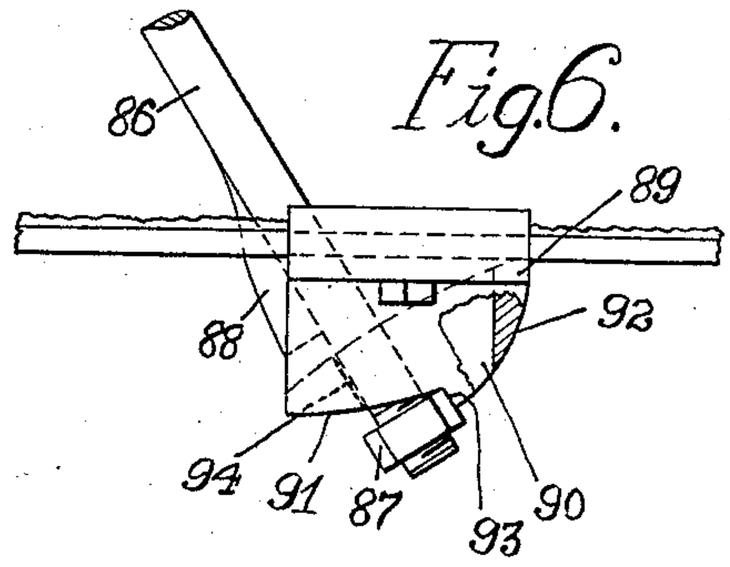
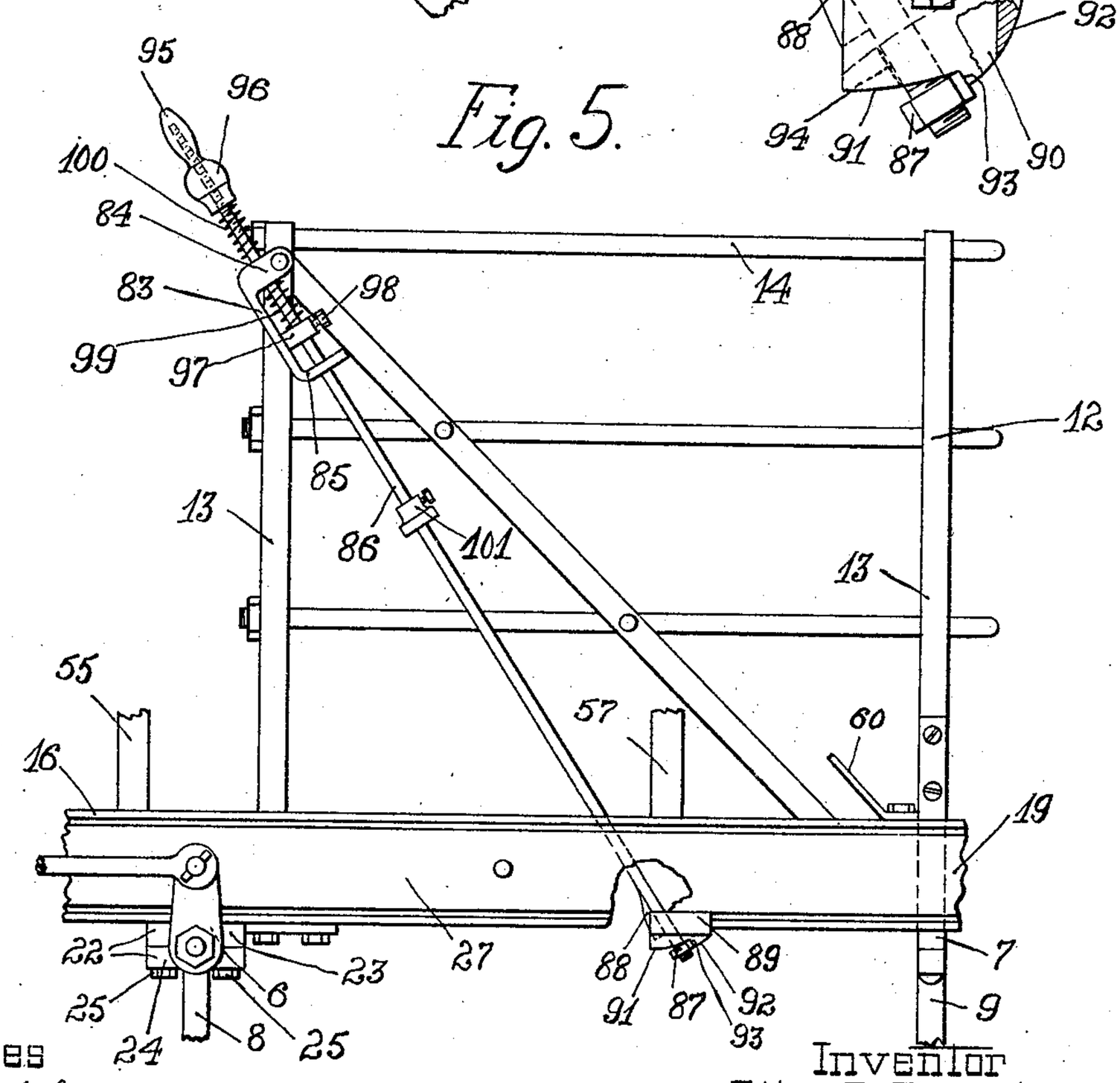


Fig. 5.



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3 SHEETS—SHEET 3.

Fig. 7.

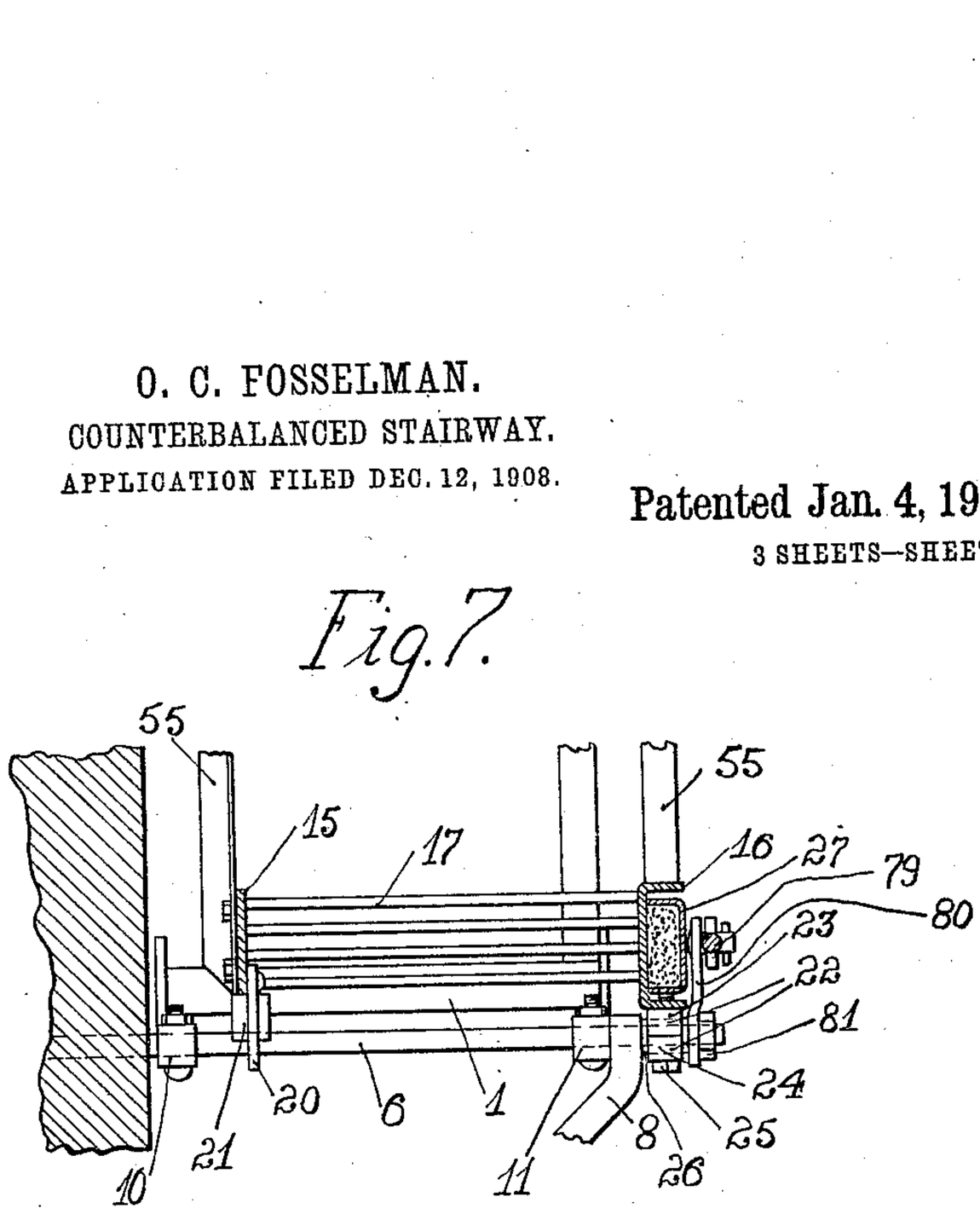


Fig. 12.

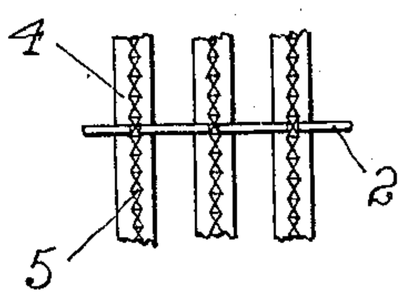


Fig. 13.

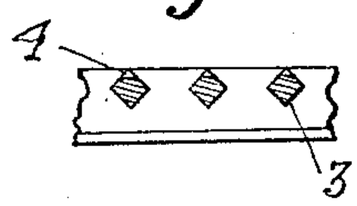


Fig. 8.

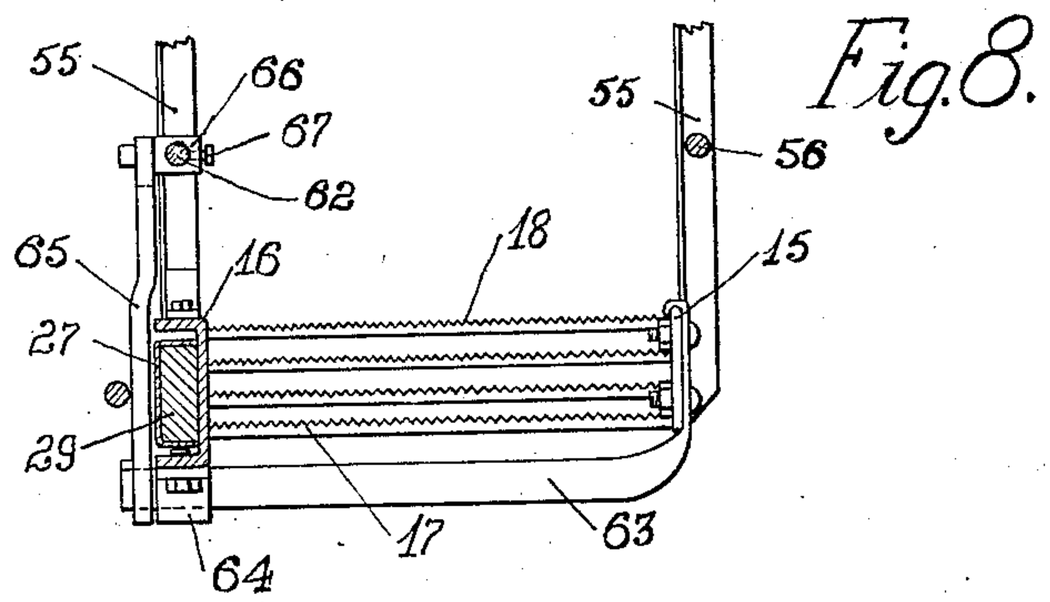


Fig. 9.

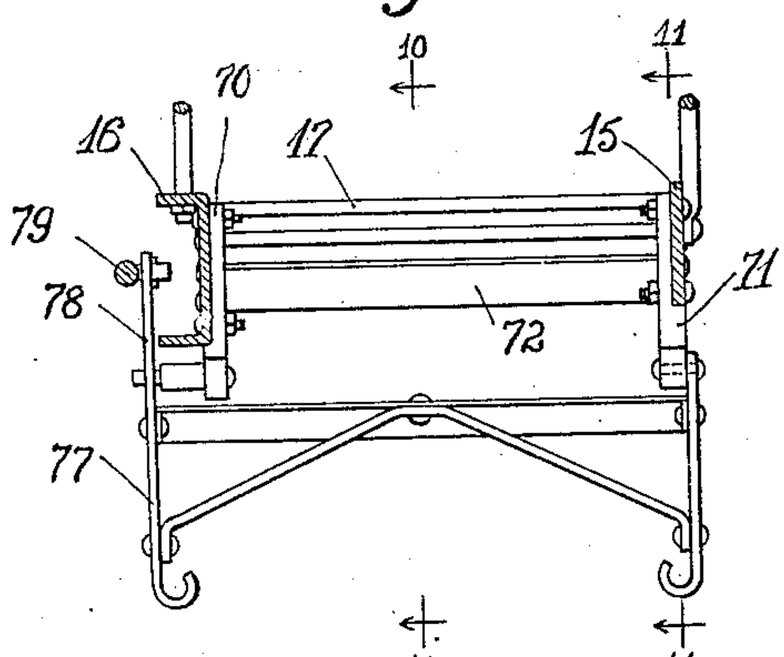


Fig. 10.

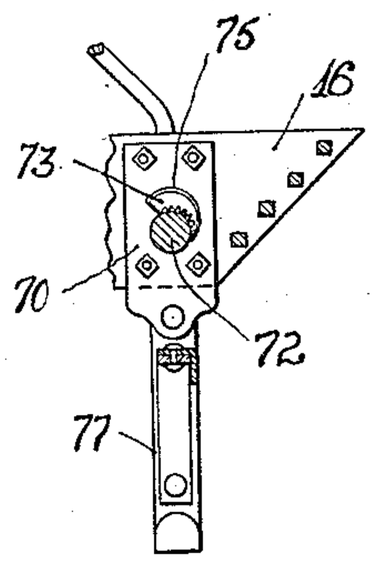
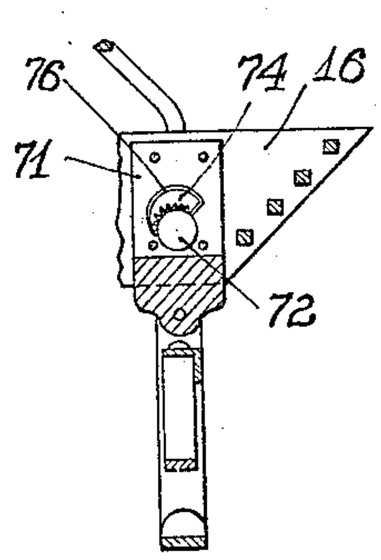


Fig. 11.



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UNITED STATES PATENT OFFICE.

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COUNTERBALANCED STAIRWAY.

945,029. Specification of Letters Patent. **Patented Jan. 4, 1910.**

Application filed December 12, 1908. Serial No. 467,157.

To all whom it may concern:

Be it known that I, OTTO C. FOSSELMAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and Improved Counterbalanced Stairway, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to counter-balanced stairways, and has for its object an improved construction and arrangement thereof for obtaining greater stability, safety and efficiency.

One feature of my invention resides in the fact that the counterweight can be rigidly secured to the counter-balanced beam instead of being pivotally supported thereon to swing upon movement of the stairway, or connected with lever mechanism to be positively swung when the stairway is moved. With this feature, more simple construction is possible, and greater safety is also assured.

Another feature resides in cushioning mechanism for preventing the stairway from coming to rest position with its full dead weight. This cushioning mechanism is in the form of springs, which take up the shock, and thus prevent violent contact of the stairway with the side walk or with the supporting platform.

Another feature is the locking arrangement, whereby the stairway is automatically locked in its raised position, actuating mechanism for the locking mechanism being, however, so disposed that unlocking will occur when the person or persons mount the stairway from the platform. This locking mechanism is also of such arrangement that the stairway cannot be lowered from below, thus preventing burglars or mischievous persons from dropping the stairway.

Improved means are also provided for maintaining the stringers in parallel relation to prevent sliding of the unweighted stringer, and thus distortion of the stairway.

There are also several other features, all of which will be brought out in detail in the accompanying specification, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation view of a platform and counter-balanced stairway supported from the wall, the stairway being in raised position and the lowered position being shown in dotted lines; Fig. 2 is an enlarged elevation view of the rear end of the counter-balanced beam and the weight, parts of the weight being broken away for clearness; Fig. 3 is an end view of the weight arm and weight; Fig. 4 is an enlarged sectional view, taken on plane 4—4, of Fig. 2; Fig. 5 is an enlarged front elevation view of the platform and the adjacent part of the weight beam, showing the locking mechanism; Fig. 6 is an enlarged view of the locking parts; Fig. 7 is an enlarged sectional view, taken on plane 7—7, of Fig. 1; Fig. 8 is a sectional view taken on plane 8—8, of Fig. 1; Fig. 9 is an enlarged sectional view taken on plane 9—9 of Fig. 1; Fig. 10 is a sectional view taken on plane 10—10 of Fig. 9; Fig. 11 is a sectional view taken on plane 11—11 of Fig. 9; Fig. 12 is an enlarged plan view of a section of the platform floor showing the construction thereof; Fig. 13 is an end view of Fig. 12, and Fig. 14 is a diagrammatic representation illustrating a means for maintaining the stair stringers in parallel relation.

The platform comprises the rectangular inclosing frame 1 and cross pieces 2. As best shown in Figs. 12 and 13, these cross pieces have rectangular slots 3, in which are held the bars 4 with their upper edges lying in a common plane with the top edges of the cross members 2, the top edges of the bars 4 having serrations 5. These serrations give a good hold and prevent slipping longitudinally of the bars, while the bars themselves prevent transverse slipping, the platform floor thus giving a safe foothold. The bars 4 could, of course, also be round and roughened on top with serrations. The platform is supported on booms 6 and 7, strengthened by brace bars 8 and 9, and booms and bars being suitably secured to framework *f* adjacent to the opening *o* with which the platform communicates. The opening *o* may be a window, the support *f* the framework or brick surrounding the window. The platform may be directly built or riveted to the rear boom 7, and its front edge may have loops or bearing members 10 and 11 engaging the front boom 6, which is made rounded, for purposes which will appear later. Surrounding the rear and side of the platform is a suitable guard frame or railing 12,

comprising the upright members 13 and the rails or bars 14, whose rear ends may be secured in the wall *f* to give additional support to the platform

The stairway structure comprises the inner stringer 15 and the outer stringer 16, the inner stringer being in the form of a plate and the outer stringer being in the form of a channel beam. Extending between the stringers and arranged to form steps or treads are the bars 17, of rectangular cross-section, with their upper edges 18 roughened to prevent persons from slipping longitudinally on the steps. The outer stringer 16 extends rearwardly a distance beyond the stringer 15, and forms a weight beam 19. Secured to the rear end of the stringer 15 is a bearing frame 20, which engages the boom 6, a bushing 21 of brass or other material being inserted to reduce the friction. At a point opposite this bearing 20, a bearing frame 22 is secured to the under side of stringer 16, this bearing frame comprising the upper bearing block 23 and the lower bearing block 24, between which the boom 6 is pivotally clamped by means of screws 25, a bushing 26 of suitable material being inserted between the bearing members to reduce friction. The boom 6 being round and in the form of a shaft, the stairway structure can be swung in a vertical plane from the upper horizontal position, as shown in full lines in Fig. 1, to the lower, inclined position, as shown in dotted lines in Fig. 1. Bolted to the weight end of the stringer 16 and also extending a distance forwardly beyond the pivot plane, is a reinforcing beam 27, and this may be in the form of a channel iron bolted to the stringer 16 to form a receptacle 28, for ballast material, such as sand, a partition piece 29 being inserted between the beams so that the ballast receptacle will be to the rear of the pivot plane of the stairway. This strengthening beam also stiffens the channel beam 16, and prevents sagging thereof at its front end.

The weight structure 30 is carried at the end of the beam extension 19, and its construction and arrangement are best shown in Figs. 2 and 3. The weight is cylindrical, and its body part comprises the disk part 31 and the two opposite segmental lugs 32 and 33 cast integral therewith. These lugs form the passageway 34, through which the end of the weight beam extends. In the point of the lug 32 is a pivot pocket 35 for receiving the pivot end 36 of the bar or plate 37, which rests against and is parallel with the top face of the beam 19, and which terminates in a clamp 38, whose one jaw 39 hooks under the upper limb of the beam 19 and whose opposite jaw 40 engages the back of the beam 19, set screws 41 passing through the jaw 40 and against the beam 19 to securely lock the clamp and the bar 37 in any adjusted position. A plate or disk 42 engages the lug faces, and closes the channel 34, the bolts 43 passing through the lugs and the disk, serving to hold the disk in place, and serving also as a support for any number of weight units in the form of disks 44. The weight can, therefore, be built up to properly counter-balance any stairway structure. To prevent rain or moisture from entering between the weight body, disk and weight units, some water-proof material 45 is inserted between the various members to protect the bolts against rust, and therefore to prevent accidental disengagement of the weight parts, which might drop. The lug segments 32, 33 are less than 180 degrees, and I provide detachable segment blocks 46, which may be applied to any face of the lug segments. To hold the segment blocks in place, each is provided with a locking tongue 47, these tongues being adapted for locking engagement in slots 48 cut into the faces of the lug segments. As shown in Fig. 2, a block 46 is applied to the left face of the upper lug 32, and another block is applied to the right face of the lower lug 33. The angle of the blocks is such that when applied to a lug segment, the inner face of the block will be parallel to the beam 19 when said beam is in horizontal position, and opposite blocks will form the upper and lower walls for the channel 34, through which the beam 19 extends. It might be desirable, in some instances, to use the weight with only the elements thus far described.

Referring to Figs. 1 and 2, the beam 19 is in horizontal position and the channel formed between the blocks 46 is parallel therewith. The end of pivot extension 36 is also some distance above the center of the weight, and if the stairway be lowered, the center of the weight will swing forwardly. That is, the center of gravity of the weight will swing forwardly, and reduce the moment of the stairway structure at the right of its pivot plane. As the weight swings, the beam 19 will come into parallel relation with the right and left parallel faces of the upper and lower lug segments 32 and 33, respectively. We have, therefore, in effect, two intersecting channels through the weight, one channel formed by the opposite faces of the attached block segments, and the other channel being formed by the faces of the lugs to which no segment blocks have been applied. I find, however, that with my construction of stairway, the weight is preferably held rigid with respect to the beam 19, and I therefore provide a locking block 49, which also has a locking extension 50 for engaging in any one of the locking slots 48. This locking block is applied to prevent swinging of the weight structure upon swinging of the beam 19. As shown in Fig. 2, this locking block is applied to the left

face of the lower lug segment 33, thereby preventing swinging of the weight when the stairway is lowered. The block would serve the same purpose, however, by being applied to the right face of the upper lug 32. By the use of the detachable locking block, the weight can, therefore, be adjusted to be rigid with reference to the beam or to swing upon rotation of the beam to thereby shift its center of gravity to assist in the proper operation of the stairway structure. By having each lug face provided with a locking pocket, the segment blocks and locking block can be arranged in various ways to adapt the weight structure for different positions on the stair structure and for the different positions of the stair structure itself.

In the upper lug 32 of the weight structure, I also provide channels 51 and 52, leading from the exterior to the slots 48, these slots being squared out sufficiently at the ends of the passageways 51, 52, to receive a bolt head 53 of an eye screw 54. This eye screw enables the weight structure to be readily suspended, so that it can be very quickly and easily slipped in place on the beam 19. The angle of these eye screws is such that when the weight is suspended thereby, the channel 34 through the weight is in parallel relation with the beam 19, which is swung to its upper position, this being plainly shown in Fig. 1, the stairway proper on account of its unbalanced condition being in its down position. The weight structure can, therefore, be hoisted up and readily slipped in its proper position. When the conditions are such that the flared channel through the weight structure should receive the beam 19, the eye screw can be applied in the opposite passageway 51, and when the weight is then suspended, the proper channel will be in position to receive the beam. After the weight is applied, the bar 37 can be slid one way or the other until the proper balance conditions are obtained, whereupon the set screws 41 can be tightened up and the weight supporting bar 37 secured. If the rigid weight is more desirable, the locking block 49 is applied, and if the shifting weight is more desirable, the block 49 is omitted. As before stated, the compartment formed between the two beams 19 and 27 can be filled more or less with sand from the end of the beams, which end can then be suitably plugged up. After the weight is set for a certain position or condition, the unused inlet for the eye screw can be plugged up in some suitable way, to prevent moisture from entering into the weight.

The stairway proper is also provided with suitable railing structure, comprising uprights 55 suitably secured to the stringers and connected by rail bars 56 of any suitable number. As shown in Fig. 1, the weight stringer 16 has an additional upright 57 at its weight end to carry the railing a distance adjacent the railing of the platform. One of the rail bars of the weight stringer rail structure at its front end 58 inclines downwardly, and is secured to the stringer, while the rear end 59 is threaded and passes through the upper end of a brace member 60, whose lower end is bolted to the weight stringer. A bolt 61 engages the threaded end 59 outside the brace member, and by tightening up this bolt the bar 56 and its supporting uprights 55 form a sort of bridge structure for assisting in stiffening the weight stringer structure. One of the bars 62 over the weight stringer forms part of the mechanism for retaining the inner stringer in proper parallel relation with the weight stringer. This mechanism is best understood by reference to Figs. 1 and 8. A bar 63 is rigidly secured at its inner end to the inner stringer 15, and at its outer end is pivotally supported in a bearing member 64 secured to the weight stringer 16. The outer end of the bar is also keyed or otherwise secured to a lever 65, whose upper end is pivoted to a block 66, which is slidable along the rail bar 62 and which can be rigidly locked to said bar in adjusted position, as by a set screw 67. The torsion produced in the bar 63 upon clockwise rotation of the arm 65 will tend to cause upward rotation of the inner stringer about its pivot, and therefore any sagging of the inner stringer can be counteracted by rotation of arm 65, and the stringers kept in parallel relationship.

The right end 68 of rail bar 62 is threaded a considerable distance, and engaged by a nut 69 at the outside of the upright 57, the bar 62 being free to slide in the other uprights. By turning the nut 69, the rod 62 is drawn to the right, and the arm 65 given clockwise rotation to produce the necessary torsion in the bar 63 to bring the inner stringer into the proper position. Thus, a very simple mechanism is provided for setting the inner stringer when the stairway structure is installed, and for taking up any sag which might develop after the stairway structure has been in service for a time. If the stair is very long, additional means might be necessary for assisting in maintaining the inner stringer in proper alinement. Such additional means is shown in Figs. 9, 10, 11 and 14. Secured to the inside of the lower ends of the stringers are bearing plates 70 and 71, which journal the ends of a shaft or pipe 72. A pawl 73 suitably supported from the plate 70 coöperates with one end of the shaft 72 and a pawl 74 suitably supported by the plate 71 is associated with the other end of the shaft 72, the pawls acting oppositely. The operation of this mechanism can, perhaps, be best understood by referring to Fig. 14, which shows the arrangement more diagrammatically. The

weighted stringer 16 is stable and rigid, while the front end of inner stringer 15 tends to sag. If the shaft 72 were locked at its right end by the pawl 73 and twisted at its left end in the direction indicated by the arrow, and the pawl 74 then locked to the shaft, the torsion produced in the shaft will tend to raise the end of the stringer 15 and to counteract and offset the sag in said stringer. With this arrangement, adjustment would preferably be made before the stair treads are finally secured. The inner stringer is raised to the proper angle above the weight stringer, so that after the tread bars are finally secured and the stair structure suspended in final position, the resultant position of the inner stringer will be parallel to the weight stringer. Both means described can be used on the same stairway structure for properly setting the inner stringer, or either one can be used alone, depending upon the size of the stairway structure. In Figs. 10 and 11, the more practical arrangement of the pawls 73 and 74 is shown, these pawls being arranged in pockets 75, 76 above the shaft 72. These pockets taper, and the pawls engaging in the tapered ends are forced into gripping engagement with the shaft 72.

Sometimes the available space for the counterbalanced stairway is very limited, and yet, at the same time, a steep stairway is undesirable. If the end of the stringers were to touch the ground, the pitch would necessarily have to be steep on account of the limited width. I therefore provide a strut frame 77, which is pivoted at the end of the stringers as best shown in Fig. 9, the strut frame being shown as pivoted to the lower ends of the bearing plates 70 and 71. An arm 78 extending upwardly from one end of the strut frame is pivoted to one end of a rod 79, whose other end pivots to arm 80 extending upwardly from and secured to the outer end of the shaft boom 6, this arm 80 being screw-threaded to the end of said boom and locked thereto by the nut 81. The strut frame 77 would tend to hang vertically for all positions of the stairway structure, but the arms 78 and 80 being of the same length, and parallel, and connected by the rod 79, the strut frame will be positively held in the vertical position for any position of the stairway structure. The use of this strut frame renders it unnecessary to have the stringers touch the floor, and the pitch of the stairway can be gradual, while at the same time the necessary space for the structure is considerably reduced. This positive operation of the strut frame also prevents the inclination of this frame should it strike an obstacle, which might allow the stringers of the stairway to touch the ground and to cause the stairway to be too steep. To prevent flexure of the rod 79, or binding thereof, an intermediate support is provided in the form of an arm 82 adjustably pivoted at some intermediary point along the stringer 16.

It is very desirable that the stairway be locked against accidental or mischievous lowering, and it is also desirable to prevent shocks and jars caused by the stairway striking the ground or the platform, with full impact. I provide combined locking and cushioning mechanism, which is best illustrated in Figs. 1, 5 and 6. Pivoted to the upper end of upright 13 of the platform railing is a U-frame 83, this frame being pivoted at the end of its upper limb 84. Through this limb and through the lower limb 85, a rod 86 is adapted to slide. The lower end of this rod is threaded, and receives a nut 87. Near the end of this rod and extending downwardly, there is also a locking tooth, or detent, 88. Clamped to the under side of the weight beam part 19 is a locking frame 89, which extends to the side of the beam, and which has the elongated slot 90 of sufficient width to readily accommodate the rod 86. The lower edge of this frame has the two surfaces 91 and 92, separated by a shoulder 93. The rod 86, owing to its weight, tends to hang down and against the end wall 94 of the slot 90, but in this position the tooth or detent 88 overhangs the end wall 94, and the stairway structure is locked against lowering. In the upper position of the stairway, the weight lever is down and the surface 91 of the locking frame bears against the nut 87, which nut prevents rotation of the rod by engaging the shoulder 93. The rod cannot, therefore, be rotated until the stairway is swung sufficiently downwardly to raise the shoulder 93 clear of the nut 87. When this is done, the rod can be swung so that the detent 88 will clear the end wall 94, to be opposite the slot, so that the locking frame can be carried past the tooth upon further lowering of the stairway. Upon release of the rod, it, of course, falls back to its normal position, and then when the stairway is again raised, the end wall 94 engages and passes the tooth and finally comes to rest below the tooth; the rod, when the end wall leaves the tooth, falling forwardly so that the nut 87 will reëngage the surface 91 in front of the shoulder 93, and the stairway structure is again automatically locked in its raised position. It is therefore necessary that the stairway must be lowered slightly, before unlocking can take place to allow the stairway to be completely lowered to service position. I, however, place actuating means for the rod in such position that when a person steps on the stairway to cause it to lower, he will naturally grasp the actuating means to move the rod in unlocking direction, and the stairway is practically unlocked simultaneously when it is started to be lowered. The actuating means is in the form of a grip

or handle 95 threading on the end of the rod 86, a counterweight 96 having also threading engagement with the rod end. This counter weight tends to reduce the weight of the rod below the pivoted frame 83, so that very little pressure on the grip end of the rod will serve to unlock the rod. The upper end of the rod with the weight and grip are just above the platform upright 13, and of such height and in such position that they will be in the path of a person coming on the platform, to offer a natural support. The person walking onto the step of the stairway to cause lowering thereof, will most naturally grasp the end of the rod which looks like a grip provided for supporting purposes, and thus automatically the unlocking rod will be actuated to allow the stairway to be lowered. It is, however, impossible for mischievous or unlawful persons to lower the stairway, for the reason that the stairway must both be lowered and the locking rod disengaged, which operations it is impossible to accomplish from the ground. Storms, or the accidental falling of some object or material on the stairway, will not cause the stairway to lower. In fact, it is only in the use of the stairway for purposes for which it is intended that its operation is possible. Clamped to the rod 86 between the limbs 84 and 85 of the pivoted frame is a collar 97 having a flat base which rests against the base of the frame 83, and therefore prevents turning of the rod 86, and this serves to hold the locking detent 88 in its proper position in a vertical plane.

If it is desired to eliminate the locking feature, the clamping screw 98 can be loosened and the rod 86 turned in collar 97 to carry the detent 88 to the upper side of the rod and the screw 98 then retightened. With this arrangement, locking will not take place, as the tooth will pass unhampered through the slot 90 in the locking frame.

Encircling the rod 86 between the collar 97 and the limb 84 is a buffer spring 99, and encircling the rod between the limb 84 and the counter weight 96 is the buffer spring 100. These springs can be adjusted respectively by collar 97 and by weight 96, to come into effect to cushion the stairway just before its end strikes the ground, or before its other end strikes the nut 87 at the end of the locking rod. The spring 100 comes into effect just before the locking frame strikes the nut 87, while the spring 99 comes into effect when the beam 19 strikes against the abutment collar 101, clamped to the rod 86 at a point intermediate the frame 83 and the nut 87. Thus, very simple means are provided which will lock the stairway structure against undesired operation, and which will cushion the operation to prevent shocks or jars which might readily injure the stairway structure or the building to which it is attached. The end of boom 7 extends upwardly a distance along the front of the platform end upright, and is beveled to form a skid surface for preventing violent contact of the weight beam with the platform.

The pivot boom or shaft being at quite a distance below the stringers, and there being considerable superstructure on the stringers, the center of gravity which is on the weight side when the stairway is up soon shifts to the stairway side after a small angle of rotation, and it is unnecessary, in most cases, to cause the weight to shift either by gravity or by lever mechanism. This enables the construction to be much simplified. Also, by having a single long channel beam forming both the stringer and the weight beam, the construction is much simplified, and much neater, and besides, of much greater strength. Parts of the rail structure being utilized in mechanism for alining the stringers makes it unnecessary to use special additional mechanism for this purpose. In other words, the feature of having the same members perform several functions greatly reduces the number of parts required, and thus simplifies the construction, and reduces the cost. I do not, however, wish to be limited to the precise arrangement and construction shown, as changes are, of course, possible, which would still come within the scope of my invention.

I desire to secure the following by Letters Patent:

1. In a counter-balanced stairway structure, the combination with a pivot member, of a pair of stringers above said pivot member having a bearing member at the under side thereof embracing said pivot member, one of said stringers being extended beyond the pivot to form a counter-weight arm for overbalancing the stair portion of the structure when the structure is in one position, said stair portion overbalancing the said counter-weight arm when the structure is swung about the pivot.

2. In a counter-balanced stairway structure, the combination with a pivot member, of a pair of stringers above said pivot member having a bearing member at the under side thereof embracing said pivot member, one of said stringers being extended beyond the pivot to form a counter-weight arm, and a weight member supplementing said counter-weight arm, said weights overbalancing the stair portion of the structure when the structure is in one position, said stair portion overbalancing said weights when the structure is swung about the pivot.

3. In a counter-balanced stairway structure, the combination with a pivot member, of a pair of stringers above said pivot member having a bearing member at the under side thereof embracing said pivot member, one of said stringers being extended beyond

the pivot to form a counter-weight arm, and a weight member adjustably mounted upon said counter weight arm, said weights overbalancing the stair portion of the structure when the structure is in one position, said stair portion overbalancing said weights when the stair structure is swung about the pivot.

4. In a counterbalanced stairway structure, the combination of stringers, stair treads supported by the stringers, a support on which the stringers are pivoted, a counterbalance arm extending from one of said stringers, a weight structure having a channel adapted to receive the counterbalance arm, a pivot member on the counterbalance arm on which the weight is suspended, said channel being flared at both ends to permit swinging of said weight, and a locking attachment for the weight, said attachment when applied serving to secure said weight to the counterbalance arm.

5. In a counterbalanced stairway structure, the combination of stringers, stair treads supported by the stringers, a support to which the structure is pivoted, an arm extending from one of the stringers, a pivot member having longitudinal adjustment along the top of said arm, a weight engaging said pivot member at a point above its center of gravity and having a channel with outwardly flared ends to receive said arm and to permit relative movement, and an attachment for the weight adapted when applied to lock the weight to the arm to prevent swinging of the weight upon swinging of the stairway structure about its pivot, the removal of said attachment allowing said weight to swing upon swinging of the structure.

6. In a counterbalanced stairway structure, the combination of a stairway, a counterbalance arm extending from said stairway, a weight structure, an upper and a lower segmental lug for the weight structure, said weight structure being pivoted to the counterbalance arm near the apex of the upper segmental lug, and attachments for the faces of said lugs by means of which channels can be built at different angles between said lugs, the built up channel receiving the counterbalance arm and preventing swinging movement of the weight structure with reference to the arm.

7. In a counterbalanced stairway structure, the combination of a stairway, a support to which the stairway is pivoted, a counterbalance arm extending from the stairway, a weight structure, an upper segmental lug and a lower segmental lug for the weight structure, each segment having a polar angle of less than 180 degrees and having their apices extending toward each other, a pivot member on said arm engaging the upper lug near its apex whereby the weight is hung from the arm, segmental blocks adapted to be applied to the faces of the lugs to define a channel for receiving the arm, and a locking block adapted to be applied to the faces to lock the arm in said channel.

8. In a counterbalanced stairway structure, the combination of a stairway, a support to which the stairway is pivoted, a counterbalance arm extending from the stairway, a weight, segmental lugs extending from opposite sides of the weight and each having a polar angle less than 180 degrees, pivot mechanism pivotally connecting the weight with the arm at a point near the apex of the upper lug, segmental blocks adapted to be interchangeably applied to any face of the lugs to define a passageway between the lugs parallel to the arm and for receiving the arm, a locking block adapted to be applied to any face of the lugs for engaging the arm to confine the arm to said channel, similar locking members on the segmental blocks and locking block, and similar companion locking members on the faces of the lugs, said locking members serving to lock the blocks when applied to the faces.

9. In a counterbalanced stairway structure, the combination of a stairway, a support to which the stairway is pivoted, a counterbalance arm extending from the stairway, a weight, two segmental lugs extending from the weight at opposite edges thereof, the polar angle of each lug being less than 180 degrees, pivot mechanism for pivotally suspending the weight from the arm at a point near the apex of the upper lug, interchangeable and detachable segmental blocks applied to diagonally opposite faces of the lugs to define a passageway through the weight parallel with the arm, and a detachable locking block adapted to be applied to the other diagonally opposite faces of the lugs, said locking block when applied serving to confine the arm between the segmental blocks, removal of said locking block allowing the weight to swing on its pivot mechanism upon swinging of the stairway about its pivot, whereby said arm may move from between the segmental blocks to between the other faces of the blocks.

10. In a counter-balanced stairway, the combination of a pair of pivoted stringers one of which extends beyond the pivot to form a counter-balancing arm, a weight member having two opposite disposed segmental lugs pivotally hung on said arm, said arm passing between said lugs, and said segmental lugs having polar angles to permit and define swinging of said weight relative to said arm.

11. In a counter-balanced stairway, the combination of a pair of pivoted stringers one of which extends beyond the pivot to

form a counter-balancing arm, a weight member having two oppositely disposed segmental lugs between which said arm passes, and a plurality of supplemental weight units attached to said weight member.

12. In a counter-balanced stairway, the combination of a pair of pivoted stringers one of which extends beyond the pivot to form a counter-balancing arm, a weight having two oppositely disposed segmental lugs pivotally hung on said arm, said arm passing between said lugs, a cover secured to said lugs, and a plurality of supplemental weight units attached to said weight member.

13. In a counter-balanced stairway structure, the combination of supporting booms, a platform structure mounted on said booms, one of said booms being in the form of a pivot shaft, a pair of stringers above said pivot shaft having a bearing member at the under side thereof embracing said pivot shaft, one of said stringers being extended beyond said pivot shaft to form a counter-weight arm for overbalancing the stair portion of the structure when the structure is in one position, the stair portion overbalancing said counter-weight arm when the structure is swung about said pivot shaft.

14. In a counterbalanced stairway structure, the combination of two stringers, a support to which the stringers are pivoted, a weighted arm extending from one stringer, stair treads connecting the stringers, a shaft pivoted to the weight arm stringer and rigidly secured to the other stringer, means for mechanically connecting said shaft with said weight arm stringer, means for adjusting said connecting means to adjust the torsional strain on said shaft, the torsional strain on said shaft causing the stringers to be held in parallel relation, and means for locking said shaft after torsional strain has been placed thereon, whereby the parallel relationship between the stringers will be maintained.

15. In a counter-balanced stairway, in combination, a pair of stringers, treads connecting said stringers, a shaft secured to one stringer and pivotally mounted relatively to the other, and adjustable means for rotating the free end of the shaft and connecting the same to said second named stringer.

16. In a counterbalanced stairway structure, the combination of two stringers, a support to which the stringers are pivoted, a weighted arm extending from one stringer, stair treads connecting the stringers, a shaft pivoted to the weight arm stringer and rigidly secured to the other stringer, an arm extending from the pivoted end of the shaft and adjustably connected to the weighted arm, rotation of said arm causing said shaft to be put under torsional strain to take up sag in the other stringer and to bring said stringer into parallel relation with the weight arm stringer, and means for locking said arm in adjusted position to maintain parallel relationship between the stringers.

17. In a counterbalanced stairway structure, the combination of two stringers, a support to which the stringers are pivoted, a weighted arm extending from one stringer, stairs connecting the stringers, a shaft pivoted to the weight arm stringer and rigidly secured to the other stringer, an arm extending from the pivoted end of the shaft, rotation of said arm causing said shaft to be put under torsional strain to take up sag in the other stringer and to bring said stringer into parallel relation with the weight arm stringer, and screw threaded mechanism connected with the arm and with the weighted stringer for rotating said arm and for locking said arm in rotated position to maintain parallel relationship between the stringers.

18. In a counterbalanced stairway structure, the combination of two stringers, a support to which the stringers are pivoted, a weighted arm extending from one stringer, stairs connecting the stringers, a shaft pivoted to the weight arm stringer and rigidly secured to the other stringer, an arm extending from the pivoted end of the shaft, rotation of said arm causing said shaft to be put under torsional strain to take up sag in the other stringer and to bring said stringer into parallel relation with the weight arm stringer, a rod extending from the arm and having screw threads, and a nut connected with the weighted stringer for engaging the threads, whereby said arm may be rotated and locked in rotated position to maintain parallel relationship between the stringers.

19. In a stairway structure, the combination of two stringers, stair treads connecting the stringers, a weight arm connected with one of the stringers, a weight on said arm, a shaft extending between the stringers, means whereby said shaft may be secured at one end with reference to one stringer, adjustable means for connecting the other end of the shaft with the other stringer and rotating the same to produce torsional strain therein which will have a tendency to bring the stringers in parallel relation, and means for locking said shaft in rotated position to maintain such torsional strain and thereby the parallel relationship of the stringers.

20. In a counterbalanced stairway structure, the combination of stringers, stair treads connecting said stringers, a weight arm extending from one stringer, a weight on said arm, a superstructure on said weighted stringer comprising upright members and rail bars, a shaft extending between the stringers and rigidly secured to one stringer but having pivotal connection with the

weight arm stringer, a lever extending from the pivot end of said shaft, said lever being pivoted at its end to one of said rail bars, said rail bar being threaded at its end, and a nut engaging said threaded ends and one of the uprights of the superstructure, turning of said nut causing rotation of the lever and rotational stress in the shaft, whereby said stringers may be relative and brought into parallel relation.

21. In a stairway structure, the combination of stringers, stair treads connecting the stringers, said stringers being pivoted at one end, a shaft extending transversely between the stringers, said shaft being rigidly secured to one of the stringers and pivotally associated with the other stringer being mechanically connected therewith by adjustable rotating means, rotation of said shaft causing torsional strain therein whereby relative sagging of the stringers can be counteracted and the stringers brought into parallel relationship, and means for locking said shaft in rotated position to maintain the torsional strain and therefore the relative adjustment between the stringers.

22. In a counterbalanced stairway structure, the combination of a pair of stringers having treads therebetween, a support on which said stringers are pivoted at one end and from which the stairway may swing in a vertical plane, a strut frame pivoted to the free end of said stringers, and lever mechanism pivoted at one end of the pivot support and at its other end to the strut for positively maintaining said strut in vertical position during the entire range of movement of said stairway.

23. In a counterbalanced stairway structure, the combination of a pair of stringers having treads therebetween, a support on which said stringers are pivoted at one end and from which the stairway may swing in a vertical plane, a strut frame pivoted to the free end of said stringers, and a rod pivoted to the strut frame and to the pivot frame for positively maintaining said strut frame in vertical position during the entire range of movement of the stairway.

24. In a counter-balanced stairway, the combination of pivoted stair stringers, of a counter-balancing arm, means for limiting the movement of said structure, and yielding means for cushioning the same at each end of the stroke thereof.

25. In a counter-balanced stairway, the combination of stair stringers swinging about a pivot, of a balancing arm of said stringers, a yieldingly mounted rod associated with said balancing arm, and abutment pieces upon said rod for engagement by said balancing arm to limit the stroke thereof.

26. In a counterbalanced stairway structure, the combination of a stairway, a support to which the stairway is pivoted and from which it may swing from a horizontal to a lower position, a weighted counterbalance arm extending from the stairway and tending to prevent lowering of the stairway when in horizontal position, locking mechanism for positively locking the stairway in its upper position independently of the weight, and detent means for preventing release of said locking means until after the stairway has commenced to swing.

27. In a counterbalanced stairway structure, the combination of a stairway pivoted at one end to swing in a vertical plane from an upper to a lower position, a weight arm extending from the stairway and tending to prevent lowering of the stairway from its upper position, locking mechanism adapted to become automatically effective to positively lock the stairway against lowering after said stairway has been brought to its upper position, and releasing mechanism for said locking mechanism arranged to be operated by a person entering the stairway, and detent means for preventing release of said locking means until after the stairway has commenced to swing.

28. In a counterbalanced stairway structure, the combination of a stairway structure pivoted at one end to swing in a vertical plane from an upper to a lower position, a weight arm extending from said stairway and tending to prevent lowering of the stairway from its upper position, a locking latch automatically engaging the stairway structure to positively lock the stairway against downward movement from its upper position, and detent means controlled by the rotation of said stairway for preventing unlatching of said locking latch.

29. In a counterbalanced stairway structure, the combination of a stairway structure pivoted at one end to swing in a vertical plane from an upper to a lower position, a weight arm extending from said stairway and tending to prevent lowering of the stairway from its upper position, a locking latch automatically engaging the stairway structure to positively lock the stairway against downward movement from its upper position, detent means controlled by the rotation of said stairway for preventing unlatching of said locking latch, and means whereby a slight downward movement of the stairway will release the detent to allow unlatching of the locking latch.

30. In a counterbalanced stairway structure, the combination of a stairway pivoted at one end to swing in a vertical plane between an upper and a lower position, a weight arm extending from said stairway, a latch bar automatically engaging with the stairway structure when raised to positively lock said structure in the upper position, and mechanism in the form of a supporting grip

disposed within reach of persons entering the stairway, said actuating mechanism having a limited longitudinal movement to cause unlatching of the latch bar and release of the stairway.

31. In a counterbalanced stairway structure, the combination of a stairway pivoted at one end to swing in a vertical plane between an upper and a lower position, a weight arm extending from said stairway, a latch bar automatically engaging with the stairway structure when raised to positively lock said structure in the upper position, actuating mechanism in the form of a supporting grip disposed within reach of persons entering the stairway, operation of said actuating mechanism causing unlatching of the latch bar and release of the stairway, and means for preventing operation of said actuating mechanism until said stairway has been lowered a slight distance.

In witness whereof, I hereunto subscribe my name this 5th day of December, A. D. 1908.

OTTO C. FOSSELMAN.

Witnesses:

CHARLES J. SCHMIDT,

FRANK J. THELEN.