J. FORBES, DEC'D.
H. J. FORBES, EXECUTRIX.
MOVABLE STAIRWAY.
APPLICATION FILED OCT. 10, 1914.

1,237,627.

Patented Aug. 21, 1917.
2 SHEETS—SHEET 1.

Fig. 5.

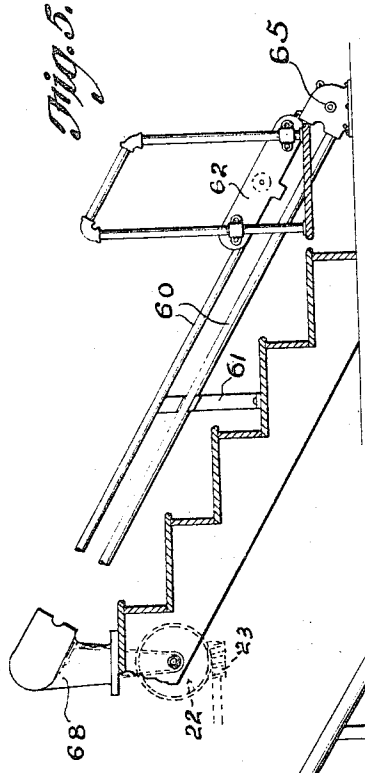



Fig. 1.

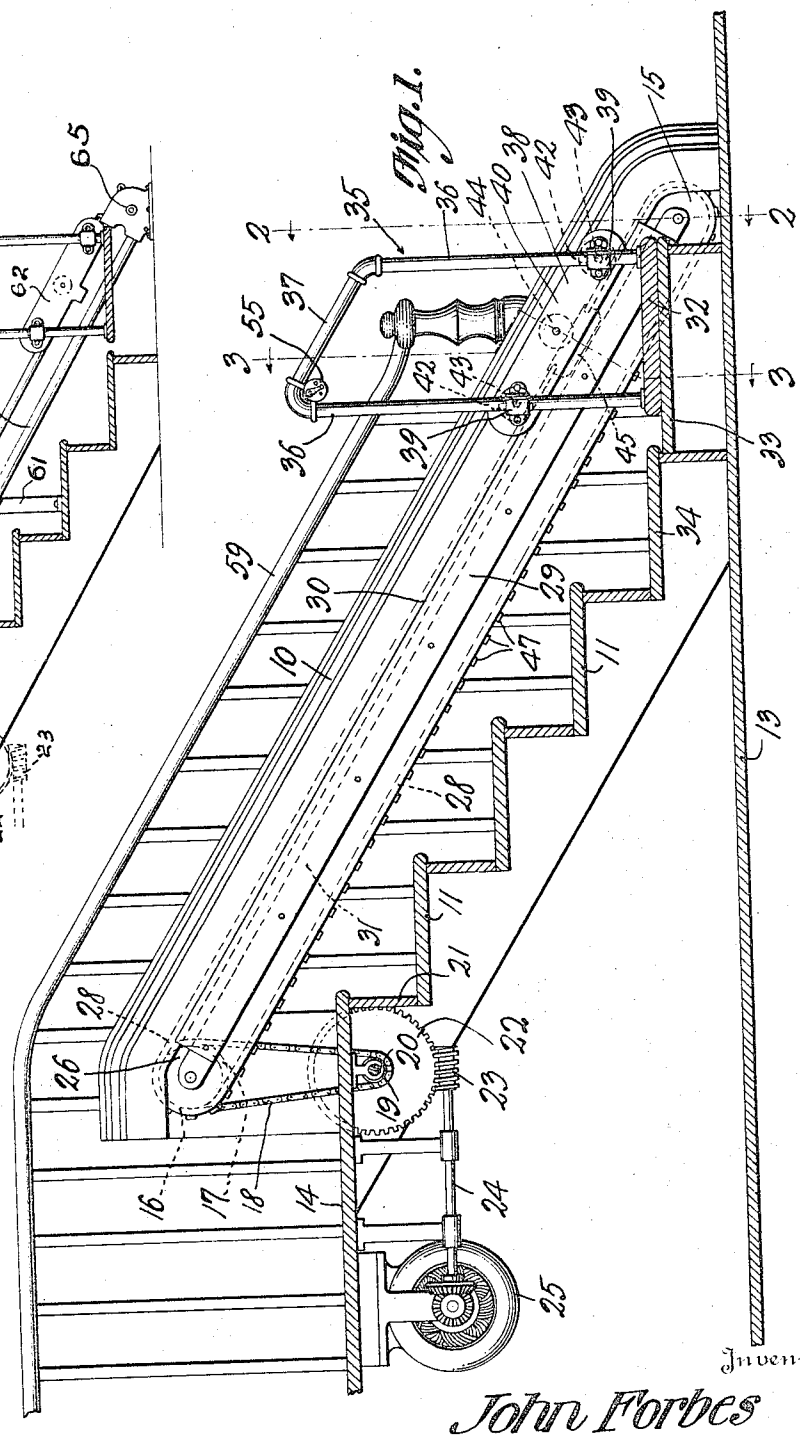
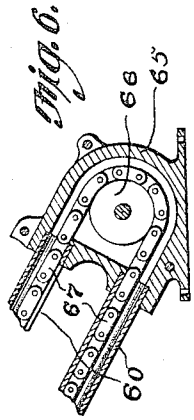



Fig. 6.




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Fig. 3.

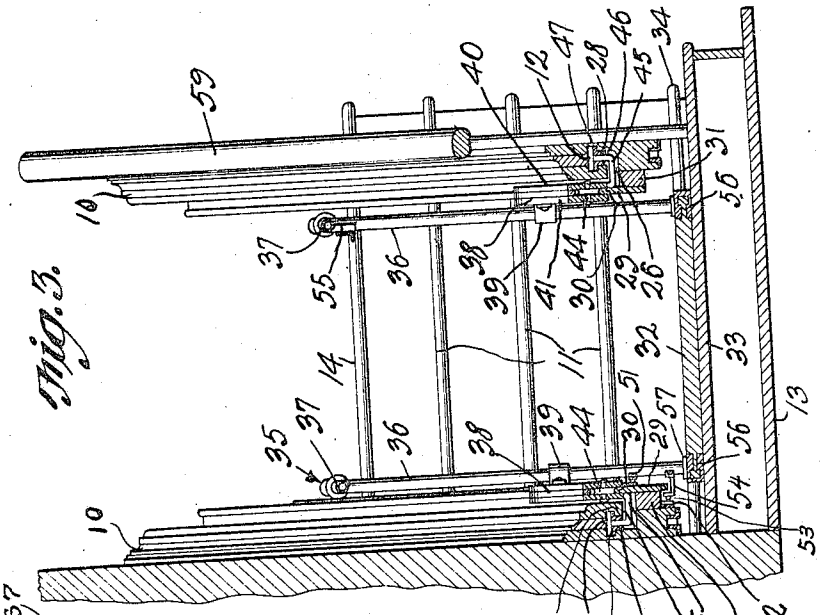


Fig. 4.

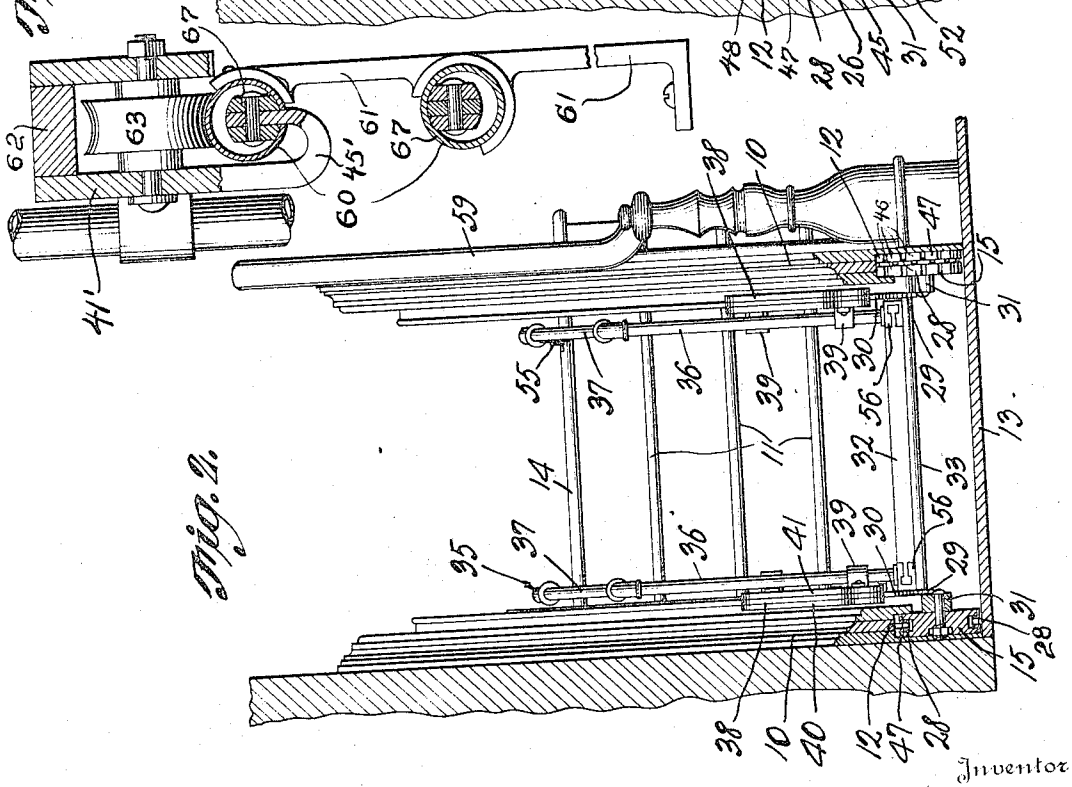


Fig. 2.



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# UNITED STATES PATENT OFFICE.

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## MOVABLE STAIRWAY.

1,237,627. Specification of Letters Patent. Patented Aug. 21, 1917.

Application filed October 10, 1914. Serial No. 866,100.

*To all whom it may concern:*

Be it known that I, JOHN FORBES, a subject of the King of England, residing at Halifax, in the county of Halifax and Dominion of Canada, have invented certain new and useful Improvements in Movable Stairways, of which the following is a specification.

The invention has for an object to present a stairway suitable for use in domestic establishments operable at will as a mechanical power operated lift or as a stairway of the ordinary type. It is an important aim to enable the erection of my invention in conjunction with the ordinary stairway, without requiring any more space than customarily available in such situations. It is a further important object to so construct the device that the mechanical lift may form a part of the stationary stairway when not in use. It is an important aim to enable the construction of the device at a low cost and in a form that will harmonize with, and be available in, the stairways of private houses. It is a valuable attainment of the invention that operative connections are provided of a simple and inexpensive character, enabling the device to be operated with a very small application of power. A further valuable feature of the invention lies in the fact that the supporting and traction devices for the moving element of the stairway are adapted respectively to be mounted on and concealed behind, a stair string, and will not obtrude upon the stairway noticeably.

Additional objects, advantages and features of invention will appear from the construction, arrangement and combination of parts hereinafter set forth and shown in the drawings, in which,

Figure 1 is a longitudinal sectional view of a stairway constructed in accordance with my invention.

Fig. 2 is a cross section thereof on line 2—2 of Fig. 1,

Fig. 3 is a similar view on the line 3—3 of Fig. 1,

Fig. 4 is a cross sectional detail of a modification of the chain mounting,

Fig. 5 is an elevation thereof,

Fig. 6 is a detail of the pulley mounting for the modification.

There is illustrated a stairway comprising the built-up strings 10 which may be supported at their ends in any customary manner, a series of steps 11 being carried therebetween in the customary fashion. The strings 10 are extended somewhat above the steps 11, and each has formed therein a passage 12, located just above the risers of the steps, and terminating immediately over the lower floor 13 at one end and just above the upper floor 14 at the opposite end. At the lower end of each passage there is mounted an idle pulley 15, while at the upper end a driving sprocket 16 is mounted having a second driven sprocket 17 thereon engaged with which is a chain 18 from a sprocket 19 fixed upon a horizontal shaft 20 mounted behind and parallel with the last riser 21 at the head of the stairs. This shaft is provided at one end with a large gear 22 driven by a worm 23 on a suitably mounted shaft 24, the power for which may be supplied in any way convenient, as for instance by a small one-horse power electric motor, or possibly by a smaller unit, depending on the ratio of the gear and worm, and the capacity of the lift desired. The shaft 24 may be mounted at the lower side of the gear 22 and extended into the space beneath the stairs, where a motor 25 may be conveniently mounted upon the ceiling of the lower floor of the building.

A slot 26 is formed in the inner face of the stair string at each side, alined with the path of the lift chain 28, which is endless and engaged around the sprocket 16 and pulley 15 at each side of the stair. Immediately below and parallel to the slot 26 there is mounted a track rail 29 on each string having an upwardly projecting clear edge 30. This track rail is a plain strip of sheet metal bolted to the string, with an interposed batten 31 of lesser width.

A lift is provided consisting of the platform 32, which approximates the form of the stair treads, its length being abbreviated sufficiently to clear the strings 10 while its breadth may be slightly greater than that of the treads mentioned. A sub-step 33 is provided at the bottom of the stairway, the height of which is just sufficient to receive the platform 32 and support it on a level with the first regular tread 34 of the stairway, being otherwise the same as the usual steps. Fixed on the platform 32 rigidly in a suitable manner to lift the platform and its load, there are side rails 35, including

each an integral pair of uprights 36 and hand rail 37 formed from piping, as shown, although other suitable construction may be employed.

Fixed upon the lower parts of the uprights 36 there is at each side a carriage 38, comprising a pair of castings 39 apertured to receive and suitably secured to respective uprights. A pair of plates 40 and 41, the latter next to the lift, and two wheels 42 are revolubly mounted therebetween, upon bushings surrounding the bolts 43 by which the plates are secured to the castings. It may be found desirable also to mount a third wheel 44 centrally of the carriage, all of these wheels being grooved and engaged upon the upper edge of the rail 29. The carriages thus have support vertically over each longitudinal edge of the platform 32, or a little outward thereof. The outer plate 40 of each carriage is provided with an intermediate extension 45 on its lower edge, bent abruptly outwardly, so as to extend through the slot 26, being then turned upward in the passage 12 and connected to the upper section of the chain 28. For convenience in assembly the chain has its opposite ends fixed to respective ends of the extension 45 in a suitable manner. If desired, in order to support the upper part of the chain between the pulley and sprocket a runway may be provided therefor, and to simplify this construction as well as to give a greater bearing for the chain, the links 46 may be formed with outturned flanges 47 resting upon the runway 48.

The electrical connections for control of the device will be well understood, and a formal showing is made, in which the rail 29 at one side is engaged by an insulated resilient wiper contact 51, and an insulated rail 52 is mounted beneath the batten 31, the rail 29 extending downwardly thereover and serving as a guard. With the insulated rail a second wiper 53 engages, carried by a suitable insulated bracket 54 mounted on one of the uprights 36, upon which the wiper 51 may also be supported. From the wipers a suitable set of connections is made with a switch 55 carried on the under side of the handrail 37. The reversing of the driving motor would preferably be accomplished by some automatic device operated by the movement of the lift, so that if the power is not cut off the device will move up and down the stairway, thus obviating the necessity for special appliances to guard against damage to the lift or other parts of the device by its movement beyond proper limits at either end of the stairway. The movement of such a device should be slow in ordinary domestic establishments, and thus it will not be difficult to check the device properly when desired. By providing any well known form of cut-out operable by a moving body, at one or both ends of the stair, however, the device may be controlled in the familiar manner customary in electric elevators.

The platform of the lift may be fixed therein, in which event the normal initial position of the lift will be at the bottom of the stair, so that persons not requiring its assistance may use the stairway in the customary manner. It may be found desirable to have the lift remain at the upper end of the stairs at times, notwithstanding the continued use of the stairway by pedestrians. The platform may then be mounted in dovetail grooves of suitable base pieces 56 carried by the uprights 36, as shown at 57. When the lift is at the upper limit of its movement, slightly above the level of the upper floor, the platform may be pressed forwardly over the floor, clearing the space over the next steps. By providing a contact making device 58 including a member movable—to break contact—across the path of the platform when displaced, and engaged by yieldable means to so move it, accidental starting of the device while the platform is so displaced will be obviated.

It will be observed that the stringer construction is such that these units may be made up at the factory and installed on ordinary stationary stairways without expensive structural modifications of the buildings, the principal one of these which is essential being the formation of openings for the shaft 20 and gear 22, and the connections therewith. While the extension of the balustrade 59 of the ordinary stair can be made as illustrated, this is not essential. Where a balustrade is built at one or both sides, the stringers may be secured to the balusters. It is not essential, either, to provide the substep 33, as the lift may be readily mounted by a passenger while supported by the rails 39, although it is desirable to use the substep as a limit to movement of, and for steadying of, the lift.

With the worm drive, it will be apparent that with the worm 23 formed with a low pitch, no special devices will be required to hold the device against movement by gravity during loading, and movement in both directions may be controlled by the motor, which should be of one of the familiar types having an automatic brake operative when the current is cut off.

In Figs. 4 to 6 there is illustrated a modified construction by which the mounting of my appliance is simplified and cheapened. In place of the strings 10 two parallel inclined pipes 60 are mounted at each side of the steps on suitable brackets 61, the upper of these pipes being slotted throughout its length at the lower side and receiving slidably therethrough the extension 45′ corresponding to the extension 45 of the carriage structure 62, which is constructed and

mounted on the lift as before described, with the exception that the extension 45′ is formed upon the inner plate 41′ corresponding to the one 41 before mentioned. The upper pipe is so mounted that the wheels 63 mounted in the carriage 62 may traverse the pipe and support the lift. A suitable casing 65 is provided constructed to be secured upon a floor, having a suitable idler 66 therein to support the chain 67, the ends of the pipes 60 being set in the casing and the chain being run through the pipes, the upper section of the chain being connected to the extension 45′. A casing 68 of suitable construction may be mounted at the upper end of the stairway in which the upper ends of the pipes are engaged, a suitable driving sprocket and other connections being provided, as will be understood.

What is claimed:

1. A device of the class described comprising parallel strings constructed for mounting over a stair, a longitudinal passage in each, rotating supports at each end of the passage, an endless member carried thereby, a slot in the inner side of each string, a rail carried by the string outwardly of and parallel to the slot, a transversely disposed lift platform disposed between the strings, lift carriages connected to each end of the lift each comprising an inner plate, an outer plate, wheels carried revolubly therebetween engaged with the rails respectively, the outer of said plates having a lateral extension engaged through said slot and connected to said endless member, and operative connections for said endless member.

2. In a device of the class described a lower floor, an upper floor, inclined guides therebetween, carriages on the guides, and a lift including a platform slidably mounted therebetween and connected thereto for support, movable relatively to the carriages horizontally beyond the path of the lift, the platform being movable to a position above said upper floor for the purpose described.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN FORBES.

Witnesses:
RUTH FERGUSON,
W. B. MACCOX.