

No. 625,905.

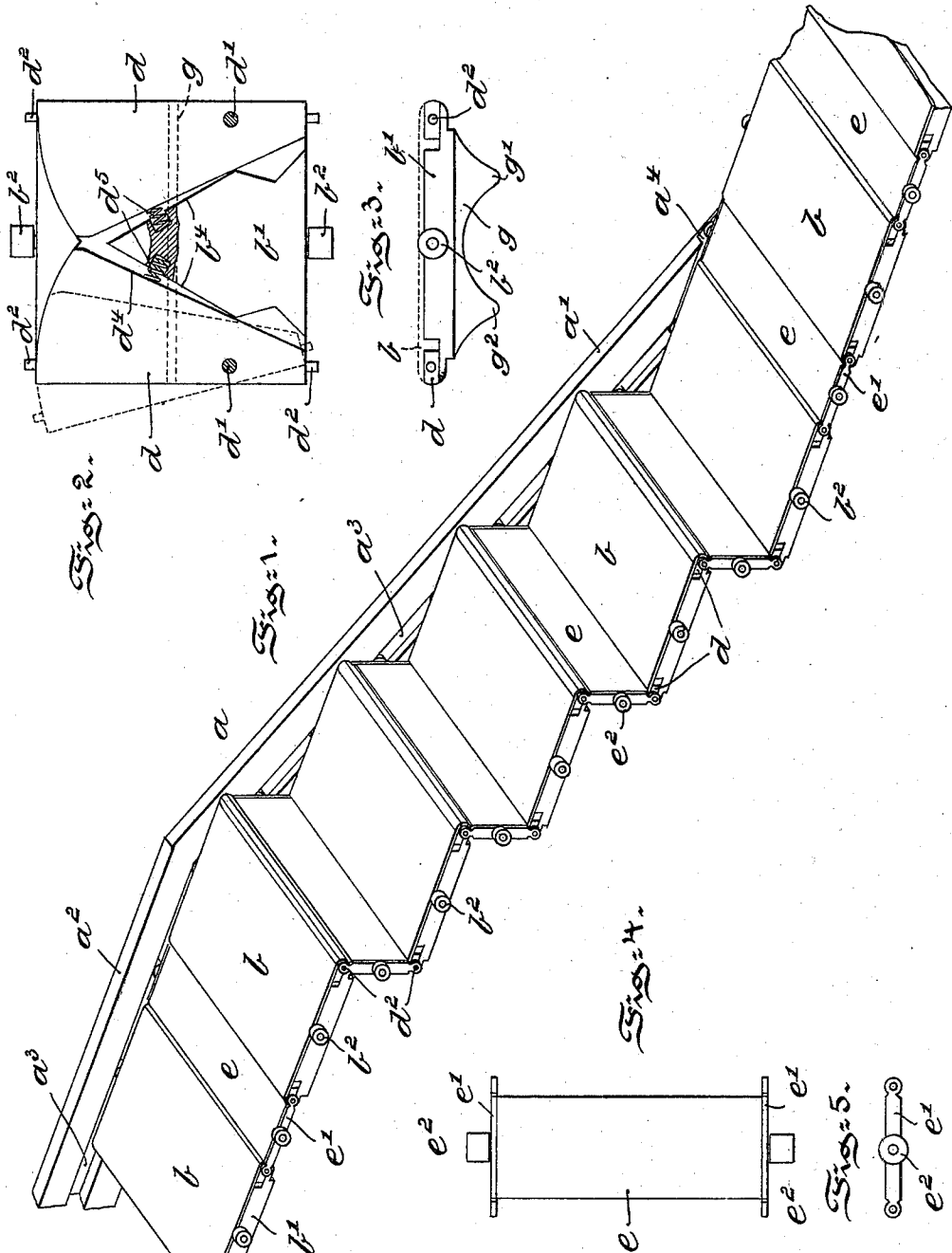
Patented May 30, 1899.

L. G. SOUDER.
MOVING STAIRWAY OR ELEVATOR.

(Application filed Dec. 10, 1898.)

(No Model.)

3 Sheets—Sheet 1.



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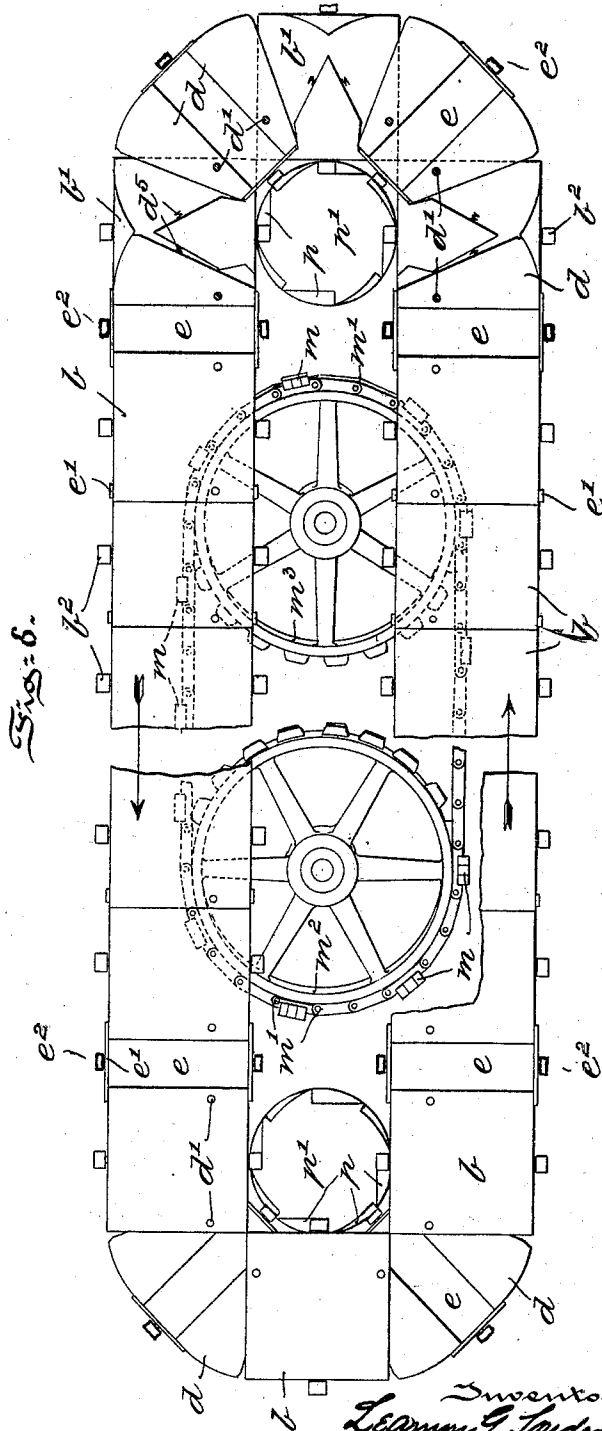
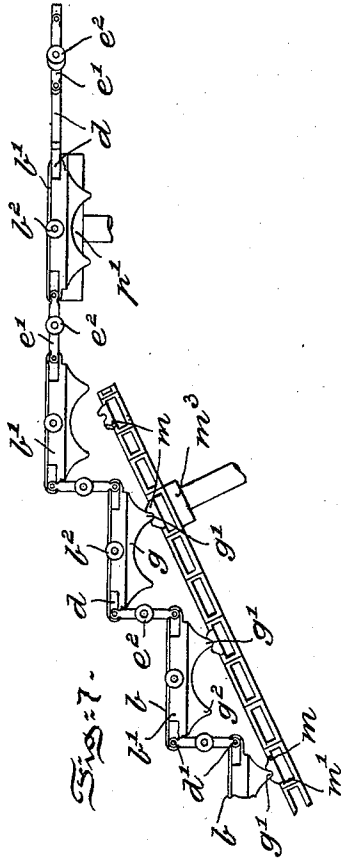
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3 Sheets—Sheet 3.

Fig: 8.

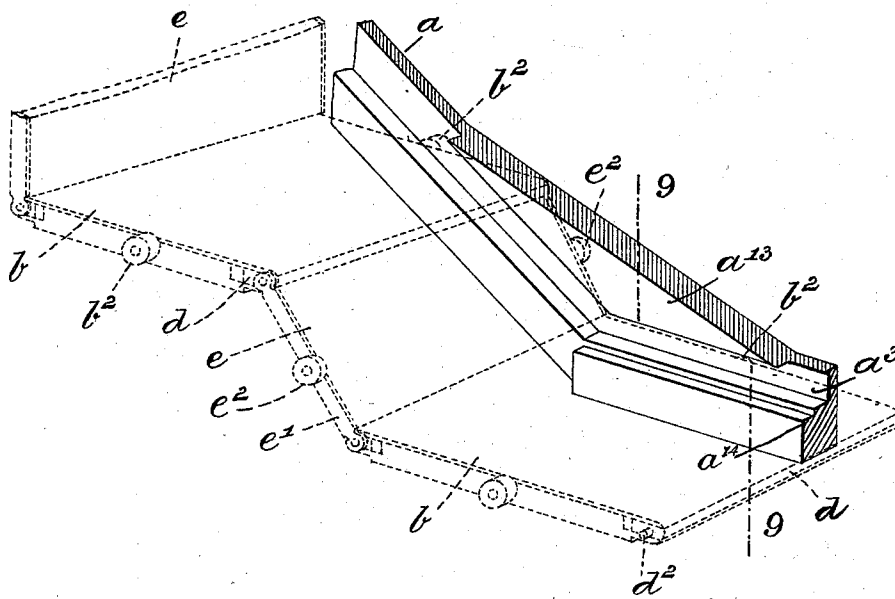
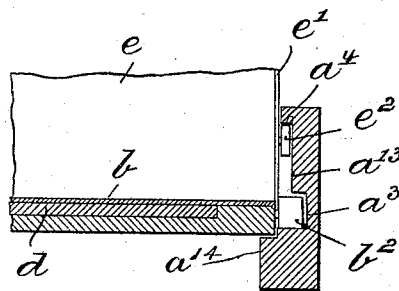


Fig: 9.



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UNITED STATES PATENT OFFICE.

LEAMON G. SOUDER, OF PHILADELPHIA, PENNSYLVANIA.

MOVING STAIRWAY OR ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 625,905, dated May 30, 1899.

Application filed December 10, 1898, Serial No. 698,813. (No model.)

To all whom it may concern:

Be it known that I, LEAMON G. SOUDER, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Moving Stairways or Elevators, of which the following is a specification.

My invention has relation to a traveling stairway of the character or type substantially as illustrated in the Letters Patent No. 406,314, granted to me July 2, 1889, and in which the risers and treads are so connected that at the landings or horizontal planes of the staircase they assume substantially a horizontal position. The present invention is an improvement upon such a stairway, and relates more particularly to the construction and arrangement of the same.

The principal objects of my invention are, first, to provide a traveling stairway in which the steps consist of risers and treads so connected that in ascending or descending the inclined portions of the stairway they are forced to assume the position of steps, while when turning curves or traveling over horizontal portions of the stairway the risers and treads spread out into a horizontal plane; second, to provide in such a stairway an ascending and descending flight of steps so connected at landings and at the top and bottom that the steps will spread out into a horizontal plane, thus making a single and continuous ascending and descending stairway without having a return portion beneath the steps in use, and, third, to so construct and arrange a stairway that the same may be safe, convenient, and simple.

My invention, stated in general terms, consists of a traveling stairway constructed and arranged in substantially the manner hereinafter described and claimed.

The nature and scope of my invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part hereof, in which—

Figure 1 is a perspective view illustrating one flight of steps embodying main features of my invention, one guide-rail being removed to more clearly illustrate the construction and arrangement of the steps. Fig. 2 is

a top or plan view, enlarged, of the tread portion of a step, with its top plate or tread proper removed. Fig. 3 is a side elevational view of Fig. 2. Figs. 4 and 5 are respectively a top or plan view and a side elevational view, enlarged, of the riser. Fig. 6 is a top or plan view of the stairway, with the top plates of the steps removed at the upper or right-hand end of the stairway. Fig. 7 is a side elevational view of the right-hand end of Fig. 6. Fig. 8 is an enlarged detail perspective view of that portion of the stairway at which the risers are flexed into the same plane as the treads, the upper edge or flange of the guide-rail being cut away to more clearly illustrate the wedge and groove in said rail; and Fig. 9 is a cross-sectional view on the line 9 9 of Fig. 8.

Referring to the drawings, *aa* represent the side or guide rails of the stairway, consisting, as illustrated in Figs. 1 and 6, of inclined portions *a'* and horizontal portions *a²*, arranged, respectively, along the ascending and landing portions of the stairway. In the guide-rails *a* is formed a groove or channel *a³*, in which is adapted to slide suitable rolls carried by the treads and risers of the stairway, as hereinafter described.

The steps of the stairway consist, essentially, of the following parts: The tread consists of a top plate *b*, beneath which is located a base *b'*, to which the plate *b* is secured in any suitable manner. The base *b'* has at its sides the rolls *b²*, which travel in and are guided by the grooves *a³* of the rails *a*. The face of the base *b'* adjacent to the plate *b* is cut away, as shown in Fig. 2, to receive and permit of the oscillation of two wings or arms *d* on said base beneath the top plate *b*. These wings *d* are pivoted intermediate of the sides, as at *d'*, to the base and have projections *d²*, by means of which the wings are pivotally connected to the risers. The projections *d²* and pivot or fulcrum *d'* are all in the same line. The riser consists of a transverse piece *e*, having two side plates *e'*, adapted to be connected at their ends to the projections *d²* of adjacent wings and carrying rolls *e²*, which project laterally a slightly less distance farther than the rolls *b²* of the base *b'* project. The rolls *e²* of the risers when the steps ascend or descend and the risers are in vertical

position travel in the main inclined grooves a^3 of the inclined portion a' of the rail; but when the steps approach a landing and begin to flatten out, as hereinafter explained, the rolls e^2 switch into an auxiliary groove a^4 , as illustrated in Figs. 1, 8, and 9, which groove a^4 is above the angle formed by the grooves a^3 in the inclined portions a' and their continuation in the horizontal portions a^2 of the rails.

The manner in which the risers are flexed to assume a position in the same horizontal plane as the treads is more clearly illustrated in Figs. 8 and 9. It is to be understood that the rolls b^2 and e^2 of the treads and risers upon the inclined portion of the staircase travel downward in the main grooves a^3 and rest against the upper edge of each groove. At the points slightly in advance of the points where the bend from an incline to a horizontal position of the staircase takes place the upper edge of the inclined groove a^3 is widened and enlarged to form a wedge-shaped projection a^{13} , which is thick enough to only permit the rolls e^2 to pass and rest against its upper edge or auxiliary groove a^4 , but too wide to let the rolls b^2 pass, which rolls are confined in the main groove a^3 . The risers are thus permitted to swing upward with respect to the treads and assume a horizontal position when the platform or horizontal part of the staircase is reached. In traveling upward from the horizontal to the inclined portion of the staircase the rollers b^2 of the tread follow the groove a^3 , and as each roller leaves the horizontal and enters the inclined portion of said groove the respective treads are lifted upward. Inasmuch as all the treads and risers are pivotally connected together, as at d , they form a continuous chain, and hence the upward movement of each tread will cause the contiguous edge of a next-succeeding riser to be pulled upward from a horizontal position until the riser assumes an angular position, in which its rollers e^2 are elevated to rest under the edge of the auxiliary groove a^4 . The riser will then assume various positions of angularity as its rollers e^2 travel over the wedge a^{13} until it finally assumes a position at right angles to the tread at the point where the upward incline of the staircase begins. The risers are the only parts of the chain of sections which can be flexed, and the necessary movement of the risers is obtained in ascending by reason of the fact that the tread-sections between which a riser is located will respectively throw the contiguous edges of the risers so that the riser will assume succeeding positions of angularity until it is finally forced to operative position at right angles to the treads. These movements of the riser with respect to the guide-rails of the staircase are permitted by reason of the fact that its rollers e^2 can slide upward on the wedge a^{13} , whereas the rollers d^2 of the treads are confined to the main groove a^3 . When the treads and risers are flexed into horizontal

position, as at the platforms, any tendency to tilt downward or upward upon their rollers b^2 or e^2 is prevented by projecting the side rails of the staircase at the under edge of the groove a^3 , so as to form supports a^{14} , on which the bottom of each tread or riser can rest, as clearly illustrated in Figs. 8 and 9 of the drawings.

Between the inner edge d^4 of the wings d and the outer edge b^4 of the uncut portion of the base b are interposed springs d^5 , of metal or other suitable flexible material, which permits of a yielding of the wings inward toward the uncut portion of the base b' , which would be necessary should the ascending and descending flights travel in slightly diverging or converging directions instead of, as illustrated, in parallel directions. To the underneath portion of each base b' and preferably midway between its ends is secured in any suitable manner a depending plate g , having two curved legs g' and g^2 . When the steps are ascending, the curved leg g' is adapted to enter one of a series of complementally-formed projections m , carried by an endless band or chain m' , as shown in full lines in Fig. 7 and in dotted lines in Fig. 6. When the steps are descending, the other leg g^2 enters one of the projections m . It is to be understood that the distance between the legs g^2 and g' is so proportioned to the distance between the projections m of the chain m' that they will enter said projections at the proper times. The chain m' is likewise caused to travel on its sprockets m^2 and m^3 with sufficient speed to bring its projections m into position to properly register with the required legs g^2 or g' . This being merely a matter of mechanical calculation forms no part of my present invention, and hence further explanation is not thought to be necessary. The steps are thus caused to travel in ascending and descending by the chain m' , which is operated, preferably, by two sprockets m^2 and m^3 , rotating in an inclined plane at or near each landing, to which sprockets motion is conveyed in any suitable manner. (Not shown.) In turning the curves at the top and bottom of the stairway the rolls b^2 and e^2 will of course leave the grooves a^3 of the guide-rails. They are, however, guided into suitable sockets or recesses p , formed in the periphery of the two wheels p' , as shown in Fig. 6 of the drawings.

The operation of the stairway hereinbefore explained is as follows: In ascending or descending the inclines the rolls b^2 and e^2 are guided in an inclined channel a^3 and the treads and risers assume and maintain a position at right angles to each other, thus forming steps. When, however, a landing is reached, as at the lower right-hand end of Fig. 1 or Fig. 8, and no turn is to be made, the rolls e^2 first enter the auxiliary groove a^4 of the guide-rails and the risers are caused to gradually flatten out until they are in the same horizontal plane as the treads of the steps. This movement of the risers is pos-

sible by reason of the pivotal connection of their side plates with the projections d^2 of the wings. In turning curves—as, for instance, at the ends of the stairway—the risers and the adjacent wings, to which they are connected, remain fixed; but the bases and their tread-plates swing upon the fulcral points d' , as illustrated in Figs. 6 and 7. The space between succeeding treads is thereby filled out by a riser and its two adjacent wings.

From the foregoing description it will be understood that the treads of the steps always travel in a horizontal plane whether the steps are ascending or descending or whether they are turning at the ends of the staircase or traveling over the landings. It will also be understood that the treads are never reversed, but remain always with the plate b uppermost.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A movable stairway, comprising a continuous set of treads and risers adapted to travel upward and downward in an inclined direction at right angles to each other, said treads and risers being pivotally connected to each other in such manner that they may both assume a position in the same horizontal plane when a landing is reached, substantially as and for the purposes described.

2. A movable stairway, comprising a continuous set of treads and risers adapted to travel upward and downward in an inclined way at right angles to each other, said treads and risers being so pivotally connected together that they may both assume a position in the same horizontal plane when a landing is reached and said risers being so arranged that they may oscillate upon said treads when the treads and risers are turned in a horizontal plane, substantially as and for the purposes described.

3. In a traveling stairway, a step consisting of a tread-plate, a base secured to said plate, two wings pivotally secured to said base below the tread-plate and adapted to oscillate on said base, and a riser pivotally secured at one edge to one of said wings and at its other edge to a similar wing of an adjacent step, substantially as and for the purposes described.

4. In an elevating-conveyer having horizontal and inclined portions, a band con-

structed at all points throughout its length for the support of a load, and combined with means for causing flexure of the band at predetermined intervals throughout the length of the inclined portion to form carrying-sections for the load, substantially as described.

5. The combination in endless-belt conveying mechanism having horizontal and inclined ways, of a series of sections hinged one to another, means on the horizontal ways for keeping the surfaces of all the sections in alignment, and means on the inclined ways for keeping alternate sections horizontal, substantially as described.

6. A moving stairway, consisting of a chain of successive links pivoted together and forming a continuous surface, in combination with means for changing the angle of certain of the links in respect to alternate links, whereby the chain can form either a traveling horizontal platform or steps, substantially as described.

7. In an elevating-conveyer having horizontal and inclined portions, a band constructed at all points throughout its length for the support of a load combined with means for causing flexure of the band to form carrying-sections for the load throughout the length of the inclined portions, combined with means for causing flexure of the band into substantially horizontal sections at the horizontal portions and combined with means for causing the sections to oscillate upon each other when flexed into horizontal form, substantially as and for the purposes described.

8. The combination, in an endless-belt conveying mechanism having horizontal and inclined ways, of a series of sections hinged one to the other, means on the inclined ways for keeping alternate sections horizontal, means on the horizontal ways for keeping the surfaces of all the sections in alignment, and means on the horizontal ways for causing the aligned sections to oscillate upon each other in a horizontal plane, substantially as and for the purposes described.

In testimony whereof I have hereunto set my signature in the presence of two subscribing witnesses.

LEAMON G. SOUDER.

Witnesses:

J. WALTER DOUGLASS,
THOMAS M. SMITH.