C. D. SEEBERGER.

CONVEYER.

APPLICATION FILED NOV. 2, 1905.

1,049,613.

Patented Jan. 7, 1913.

4 SHEETS—SHEET 1.

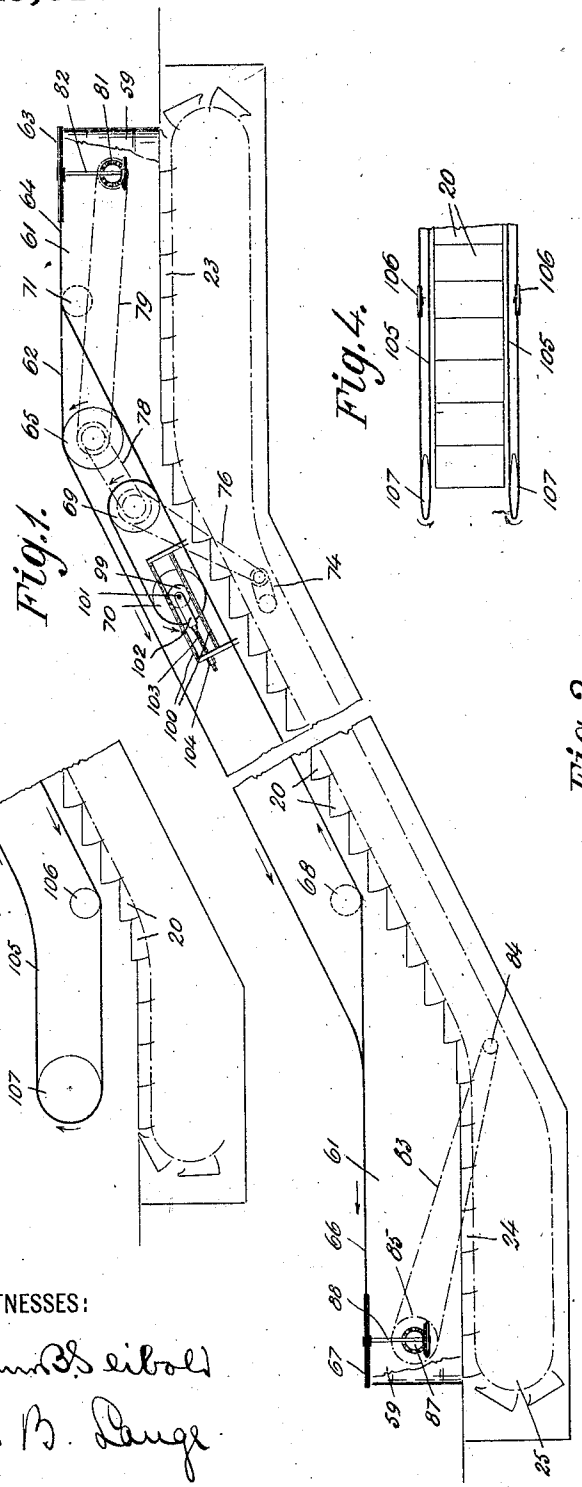

Fig. 1.

Fig. 4.

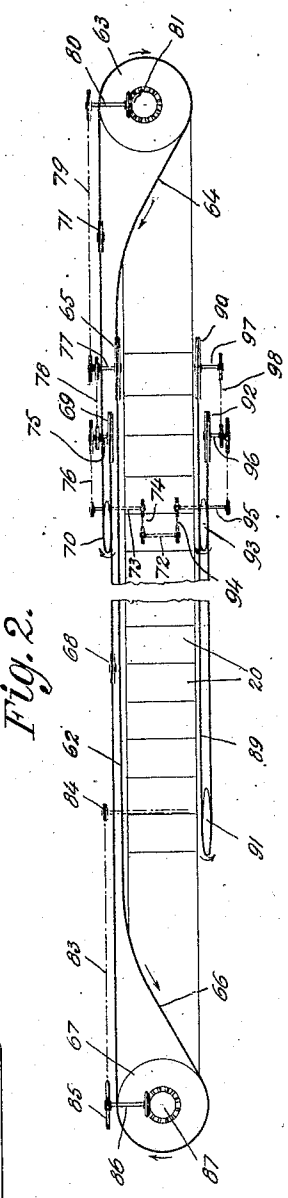

Fig. 2.

Fig. 3.

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4 SHEETS—SHEET 2.

Fig. 5.

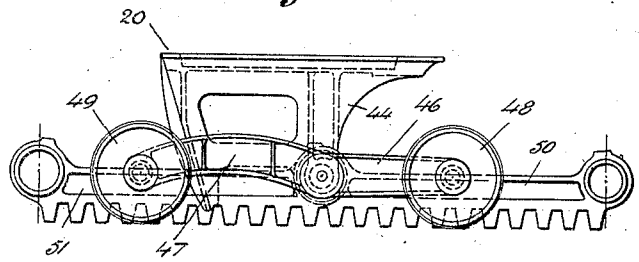


Fig. 6.

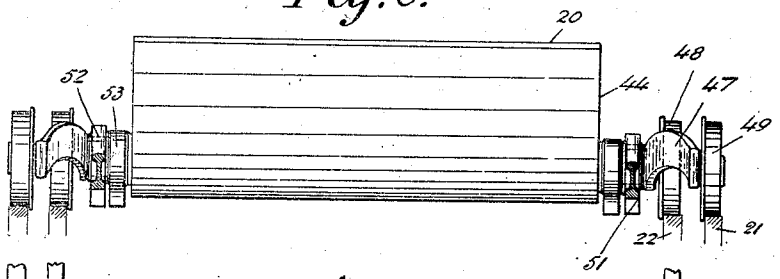
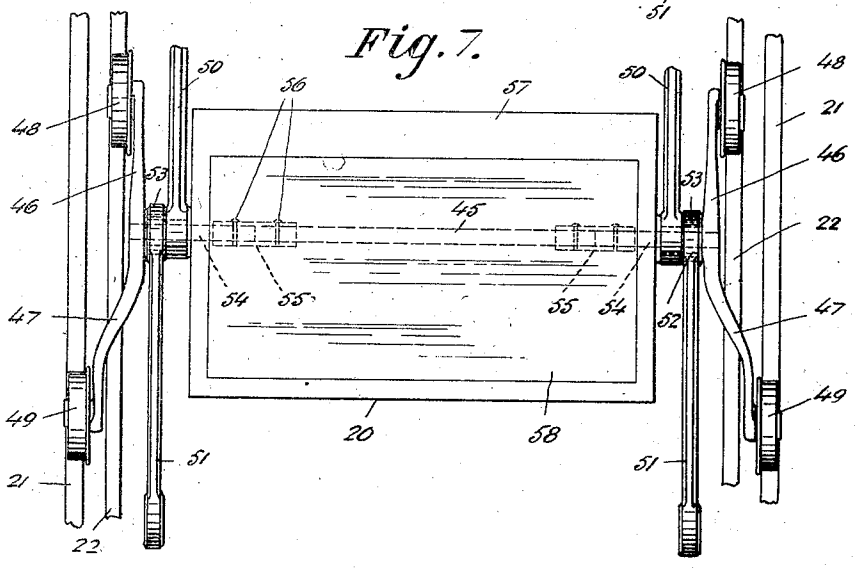


Fig. 7.



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4 SHEETS—SHEET 3.

Fig. 8.

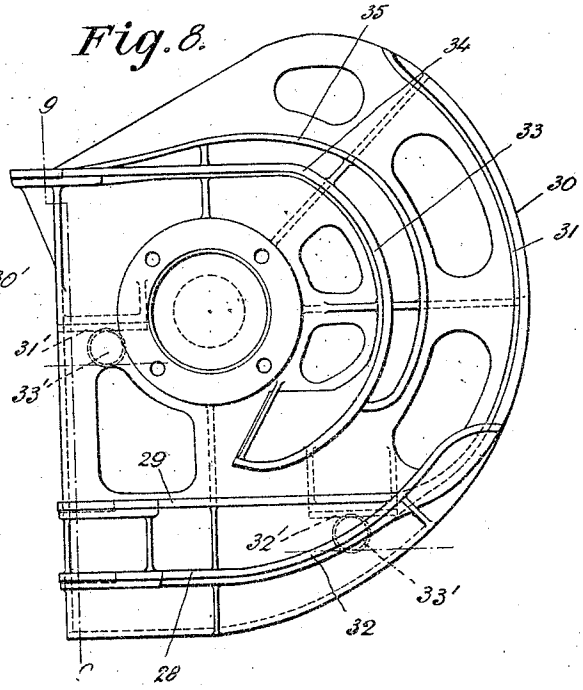


Fig. 9.

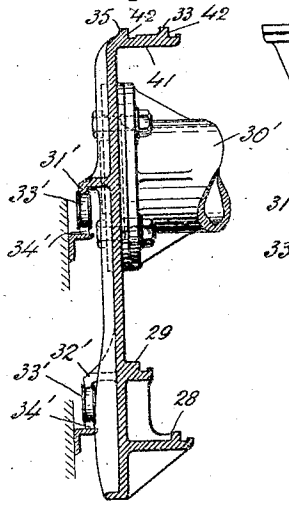


Fig. 10.

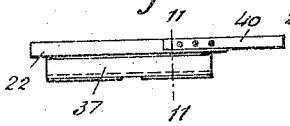


Fig. 11.

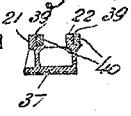


Fig. 12.

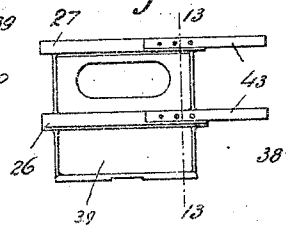
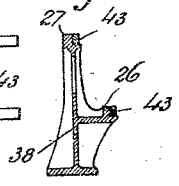


Fig. 13.



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4 SHEETS—SHEET 4.

Fig. 16.

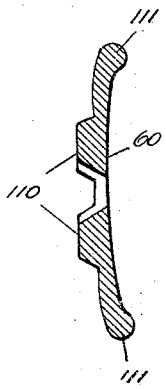


Fig. 15.

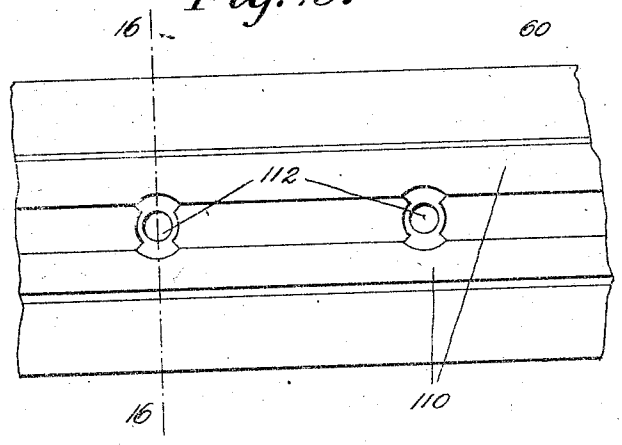
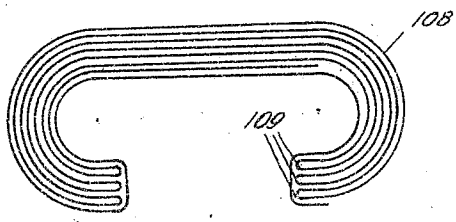


Fig. 14.



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CONVEYER.

1,049,613. Specification of Letters Patent. Patented Jan. 7, 1913.

Application filed November 2, 1905. Serial No. 285,561.

To all whom it may concern:

Be it known that I, CHARLES D. SEEBERGER, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Conveyers, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention has reference to certain improvements in that class of conveyers employed for transporting passengers between different floors or levels; and the features and objects of the same will be pointed out in the accompanying description.

The invention consists of the organizations and arrangements of parts hereinafter particularly described and then pointed out in the accompanying claims.

In the accompanying drawings—Figure 1 is a view in side elevation, partly diagrammatic, of a traveling stairway embodying my present invention and arranged for transporting in either direction, with one hand-rail omitted; Fig. 2 is a plan view of the same showing both hand-rails; Fig. 3 is a diagrammatic view in side elevation of the lower landing showing a modified arrangement of hand-rail; Fig. 4 is a plan view of the construction shown in Fig. 3; Fig. 5 is a side elevation of one of the step units and associated links; Fig. 6 is a view in front elevation of the same; Fig. 7 is a plan view of the same; Fig. 8 is a side view of one of the members of the carriage through which the traveling stairway passes from one run to the other; Fig. 9 is a section on the line 9—9 of Fig. 8; Fig. 10 is a view in side elevation of one of the track sections for the upper or transporting run of the stairway; Fig. 11 is a sectional view on the line 11—11 of Fig. 10; Fig. 12 is a side view of one of the track sections for the return run of the traveling stairway; Fig. 13 is a section on the line 13—13 of Fig. 12; Fig. 14 is a cross section of the traveling hand-rail; Fig. 15 is a plan view of the hand-rail guide; and Fig. 16 is a section on the line 16—16 of Fig. 15.

A series of steps 20 is adapted to travel in either direction upon the tracks or bearing surfaces 21 and 22, and in the device illustrated diagrammatically in Fig. 1 the direction of movement is that of a down-carrying machine. These tracks in the present embodiment of the invention are on different levels on the incline, the tracks 21 being above and outside of the tracks 22, and at the upper and lower levels, 23 and 24, respectively, the tracks of the carrying run are in substantially the same horizontal plane, as shown in Fig. 6, to bring the tread surfaces of the steps into alinement to form horizontal landings, as shown in Fig. 1. At the end of the lower landing 24 the steps pass through a carriage, as at 25, to or from the transporting run. At the opposite or upper end of the conveyer the lower and upper tracks 26 and 27 for the return run of the stairway are continued by tracks 28 and 29 of a carriage 30. This carriage consists of two members similar to that shown in Fig. 8 with the tracks on the inner or facing sides. The outer track 29, as shown in Fig. 8, is arranged horizontally for a suitable distance and then describes a suitable curve, as at 31, to its point of termination. The lower and inner track 28 is also horizontal for a suitable distance and then terminates in a suitably curved portion 32 shown as crossing the other track. The members of the carriage are also provided with an inner track 33, which is curved from a point over the curved track 32 to the point 34 and then extends horizontally, and also with an outer track 35 which extends in a curve beyond the point 34 and then sinks to the level of the horizontal portion of the track 33, as shown in Fig. 9. The tracks 21 and 22 for the upper or transporting run of the stairway at the end adjacent the carriage 30 are merged into tracks 35 and 33, respectively, of the carriage. The members of the carriage 30 are preferably made of single or unitary castings in order that the tracks thereof may be accurately positioned with reference to the tracks of the upper and lower runs of the traveling stairway and to insure the path of the connections of the steps being of constant length.

Throughout the entire cycle or course of

the stairway, in the present embodiment of the invention, the tracks are in parallel vertical planes, as shown in Figs. 9, 11 and 13, and the associated tracks on each side of the machine are preferably made in integral castings, as 37 and 38, Figs. 10 to 13, of convenient lengths so that they can be readily and accurately assembled, and these castings or sections may be secured to the supporting structure in any suitable manner. The tracks 21 and 22 of the section or casting 37 for the upper run adjacent the carriage 30 are reduced in width or recessed as at 39, Fig. 11, and slide tracks 40, which are preferably of steel, are secured, as by bolts, in such recesses. The carriage tracks 33 and 35 are also reduced in width or recessed, and the track-base or web 41 is provided with flanges 42 which with the recessed tracks form guide-ways for the slide tracks 40, to guard and prevent lateral movement of the said slide tracks. The flanges 42 are not necessary in the track section 37 as the slide tracks are bolted thereto. The slide tracks 40 practically fill the recesses in the tracks 33 and 35, allowing only sufficient clearance for the endwise movement of the carriage.

The tracks 26 and 27 of the return run are also recessed adjacent the carriage, as shown in Figs. 12 and 13, and provided with slide tracks 43 which are seated in similar recesses in the adjacent ends of the tracks 28 and 29. The combined width of the recessed tracks and slide tracks is the same as the normal width of the tracks, thereby rendering the track surface flush at the points of connection. By reason of the track connections described I secure the required width of cast iron track necessary to insure the proper strength and also a thick steel slide track, thereby making a material improvement in wearing quality.

The tracks at the lower end of the machine may be connected to the tracks of the carriage 25 in the same manner.

The members of the carriage are connected by a cylindrical flanged sleeve 30', as shown in Fig. 9. On the outer face of each member of the carriage upper and lower bearing flanges 31' and 32', respectively, are formed, being positioned on opposite side of the cylindrical connecting sleeve. These flanges rest upon anti-friction rollers 33', which in turn rest upon tracks 34' suitably secured to the supporting structure. Any suitable means may be employed for moving the carriage to take up slack in the connected series of steps to hold the same taut. By reason of the employment of the intermediate supporting rollers 33' the travel of the carriage is increased, being double that of the rollers.

Each step is composed of a suitable frame 44 having a tread and overhanging riser, and is provided with an axle bar 45 fixed thereto and the ends of which extend beyond the ends of the step, as shown in Fig. 7. Each step has a carriage or wheel base comprising yokes composed of oppositely extending arms 46 and 47, fixed on the ends of the axle bar 45, and the arms provide bearings for the wheels 48 and 49 coöperating with the inner and outer tracks 22 and 21, respectively, the wheels 48 being the front wheels looking up the stairway. Links 50 and 51 connect the axle bars of adjacent steps and these links are in the form of rack-bars.

The alternate links connect alternate pairs of axle bars and are preferably arranged in the form of male and female links, each end of the male link 50 being provided with an outwardly extending sleeve 52, shown in dotted lines in Fig. 7, loosely receiving the axle bar and on which a collar 53 at the adjacent end of the female link 51 is pivoted. By reason of the construction described each step and its yokes are practically a unit and free to revolve in the sleeves of the links or allow the links to revolve about this unitary construction in passing the angles or in turning through the ends of the machine, as more fully set forth in an application for patent filed by me October 18, 1905, Serial Number 283,302.

In the construction illustrated and as shown in Figs. 6 and 7, the linkage is pivoted between the step frames and yokes and the wheels on the yokes are outside of the linkage. By having the linkage at the side of the steps the dimension from the wheel base to the tread is much smaller than it usually is where the links are placed under the steps owing to the clearance required for the riser in this latter construction. Furthermore, by this arrangement the steps are free to turn over when passing around the ends so that their treads may be uppermost on both runs whereby the machine may also be used for transporting upon its return run if desired.

The front arm 46 of each yoke is preferably shorter than the rear arm whereby the tracks on the incline may be located nearer together requiring less depth of girder. The axle or line of the joint of the links is in advance of the center of the tread when viewed looking up the stairway and the wheel base is wider than the tread so that the passenger's weight is practically carried by the wheels on the long arms and his position within the area of the carriage is insured so that stability of the step is provided and all tendency of the step to tilt is obviated. Also by making the rear arms of the yoke longer than the front arms the step may be made wider so as to extend the foot space more to an area between the lines of its riser and axle and by this construction the overhanging nosing will be prevented

from striking the foot of the passenger. The yoke arms for the rear wheels are bent upwardly and laterally to pass over the tracks of the front wheels, as clearly shown in Figs. 6 and 7. As shown in Figs. 5 and 6, the centers of the axle bar and wheels of each step unit are in line, and while the front arm 46 may be straight the rear arm 47 is bent upwardly or curved between the wheel 49 and axle bar.

As the wheels of each step enter the carriage 36, assuming the stairway to descend, the wheel 49, which is herein termed the rear wheel, rides on the outer track 29 the wheel 48 engaging the track 28. The curved portion 32 carries the wheel 48 into engagement with the track 33 while the curved track 31 is extended far enough to guide the wheel 49 to the track 35. By curving the arm 47 such arm clears the angle or bend at 34 so that the step is guided through the carriage without raising the nosing of the step above the floor level, as would result were the arm 47 not curved as described.

As shown in Fig. 7, the axle bar 45 may be made in sections, consisting in the present instance of a central section and end sections 54 on which the links are pivoted and to which the yokes are fixed. These sections are connected together by collars 55 which receive the adjacent ends of the sections and are fixed thereto by suitable pins 56. This arrangement is designed for convenience in taking out a unit and to afford access to the inside for repairs or other purposes. The former may be accomplished by removing the pins 56 connecting the end sections 54 to the central axle bar section and then withdrawing the yokes to slip the end sections out of the links and step frame. In case it is desired to get under the steps it is first necessary to remove the tread and then by sliding the collars upon the central section of the axle after the pins are withdrawn, the central section may be taken out to enable the workman to drop down through the step opening, which otherwise would be prevented by the obstruction of the axle.

As shown in Figs. 5 and 7, the step frame has a wide border 57 at its front nosing the purpose of which is to have the tread 58, preferably of wood, which defines the standing space, entirely outside of the vertical dropped from the overhanging nosing of the step in advance and therefore free from interference, when occupied, by such step. The wide border serves to indicate the portion of the tread surface where interference is possible. This is of importance in a descending stairway as the heels of a passenger may occupy the space under the overhanging portion of the next step and if too close are pushed by the nosing of the next step as it develops from the upper landing downward.

The steps are driven in either direction, depending upon whether the stairway is to be employed for ascending or descending, by means of any suitable drive. The teeth of each of the rack bars are located entirely between the articulations thereof, a space instead of a tooth being located at its end under the pivotal center or axle thus obviating or reducing the tendency of the links to tilt as the end tooth of each link engages a driving pinion.

As indicated in Fig. 1 the traveling stairway is provided with a balustrade 59 provided at its upper edge with a hand-rail guide 60 (Figs. 15 and 16). The balustrade at one side of the stairway is deflected across the landing steps of the stairway to provide a stationary shunt, as indicated at 61 in Fig. 1. Where the stairway is designed to be reversible, that is to say adapted to be employed for ascending or descending, a similar shunt is located at the opposite end, so that whichever way the stairway is running a shunt will be located at its exit. In the present instance the exits are located at the same side of the stairway. By this arrangement, that is to say by providing two side landings, it is possible to discharge the load laterally in the use of the machine for transporting in either direction.

Suitable traveling hand-rails are employed and where the stairway is reversible one of the hand-rails is arranged to provide a traveling shunt at each landing, as shown in Figs. 1 and 2. To this end one of the hand-rails, as 62, passes from a horizontal drive pulley 63, located at the upper end of the conveyer and over the landing steps, across the landing steps along the guide 60 at the upper edge of the shunt 61, as at 64, to the opposite side of the conveyer. It then passes, assuming the stairway to be used for descending, over a pulley 65 rotating in a vertical plane and in the direction of the arrow, Fig. 1, and located at the top of the incline. From the pulley 65 the hand-rail passes in the direction of the arrows along the guide 60 on the balustrade at the side of the conveyer to the bottom of the incline where it is deflected by the guide at the lower shunt 61 across the steps, as at 66, at the lower landing and then passes to the front of and around a horizontal drive pulley 67 located adjacent the end of the steps at the lower landing. From the pulley 67 the hand-rail passes to and under an idler 68 located in the present instance near the bottom of the incline; thence to a pulley 69 near the top of the incline. The hand-rail passes over the said pulley 69 and back to and over an angularly disposed pulley 70 by which it is deflected to a suitable idler 71 over the upper landing and which deflects the hand-rail to the plane of the horizontal pulley 63 at the upper end of the conveyer.

By deflecting the hand-rail across the landing steps such hand-rail acts as a traveling shunt to direct the passenger from the conveyer before the body comes into contact with the associated stationary shunt. This hand-rail 62 may be driven in any suitable manner. In the present instance, power is applied to the hand-rail at the ends of the machine and preferably to the oppositely moving runs thereof intermediate the ends by suitable driving connections for the pulleys 63, 65, 67 and 69. To this end a transverse shaft 72, which may be driven from the drive for the stairway, is located under the transporting run of the stairway and motion is communicated from this shaft to a counter shaft 73 by a chain and sprocket connection 74. The horizontal shaft 75 on which the pulley 69 is fixed is driven from the shaft 73 by a chain and sprocket connection 76. The shaft 75 transmits motion to the shaft 77, on which the pulley 65 is fixed, through the medium of a chain and sprocket connection 78. A chain and sprocket connection 79 between the shaft 77 and a horizontal shaft 80 drives the upper pulley 63, by means of suitable bevel gearing 81 between the shaft 80 and the vertical shaft 82 on which the horizontal pulley 63 is fixed. A suitable connection, such as the chain 83, transmits motion from a sprocket wheel 84 driven from the drive of the stairway to a sprocket wheel 85 fixed on a horizontal shaft 86, and this shaft transmits motion, through suitable bevel gearing 87 to the vertical shaft 88 on which the horizontal pulley 67 at the lower end of the stairway is fixed. The driving contact of either of the pulleys 63 and 67 is greater than a semi-circle, and the combined contact of the pulleys 65 and 69, which are located adjacent the top of the incline, is practically two semi-circles. This increased area of contact is designed to prevent slippage.

A short hand-rail 89 is located at the opposite side of the stairway and passes over a drive pulley 90 located at the head of the incline and rotating in a vertical plane, thence to an angularly disposed idler 91 located at the bottom of the incline and rotating in the direction of the arrow, Fig. 1. The idler 91 deflects the return run of the hand-rail to and under a driven pulley 92. The hand-rail then passes to and over an angularly disposed pulley 93 which deflects the hand-rail to the pulley 90. The pulleys 90 and 92 are similar to 65 and 69 in providing increased area of contact with the rail. Motion is communicated to the hand-rail 89 in the present instance by means of a chain and sprocket connection 94 between the shaft 72 and a counter shaft 95, the latter shaft communicating motion by a suitable connection to the horizontal shaft 96 on which the pulley 92 is fixed, and thence communicates motion to the shaft 97 on which the pulley 90 is fixed through the medium of a suitable chain and sprocket connection 98 between the shafts 96 and 97. While the driving connections for the hand-rails have been referred to as chain and sprocket connections, it is to be understood that such connections may be of any other suitable character.

The pulleys 90 and 91 are located at the ends of the incline so as to provide suitable spaces at the shunts for passengers to get on and off the landing steps. Both hand-rails are driven at practically the same speed as the conveyer, and by reason of the application of power to both pulleys 63 and 67 slack in the hand-rail along the balustrade is prevented as the hand-rail is pulled along the hand-rail guide irrespective of the direction of the movement. This is also true of the short hand-rail 89 owing to the fact that power may be applied at the end of its operative run so that the rail is pulled along. This avoids slack in the hand-rails at the hand grasp portions.

In order to maintain the hand-rails at the proper tension, means are preferably provided for taking up the slack in the event of stretching of the same due to wear. This may be accomplished in any suitable manner. In the present embodiment of the invention the pulley 70, as shown in Fig. 1, has its hubs 99 journaled between a pair of guides 100, the inner faces of which are recessed as indicated in dotted lines in Fig. 1 to prevent lateral movement of the pulley. This pulley is provided with an arbor 101 the ends of which are provided in a yoke 102 having a threaded extension 103 which passes through the end of the guide frame. A nut 104 on the end of the threaded extension serves to adjust the pulley in the guides to take up the slack in the hand-rail so as to maintain the latter always at the desired tension. This adjustment may be accomplished while the hand-rail is in motion and without interfering with the operation of the same. An adjustment similar to that described for the hand-rail 62 may also be employed for taking up slack in the hand-rail 89.

Where the traveling stairway is employed for ascending, the hand-rails may be arranged as shown in Figs. 3 and 4, each of such hand-rails, as 105, at the lower end of the conveyer passing on the return run under a pulley 106 located near the bottom of the incline, thence to an angularly disposed pulley 107 adjacent the end of the horizontal lower landing and from the latter along the balustrade to provide the ascending run of the hand-rail.

The hand-rail may be of any suitable character, being preferably substantially elliptical in cross section, as shown in Fig.

14, with the under face of the same cut out to adapt it to fit on the guide strip 60, the inturned edges, provided by the cut out portion, being located at the opposite sides of the balustrade and covered to prevent exposure thereof. The hand-rail is made of a number of plies and in the present instance is shown as consisting of one continuous sheet of suitable material 108, such as canvas, folded back and forth into a number of plies, one ply, such as the outside ply, being continued and folded across the folded edges 109 of the other plies, and inclosing the edge of the first layer, as shown in Fig. 14, and providing a wear strip for the tractive surface of the hand-rail. With a hand-rail built up of a number of plies of material the difficulty has been that the plies soon show rough edges which interfere with the guides and pulleys causing friction and also resulting in raveling out of the edges of the various plies, in time destroying the rail. With the present arrangement all edges are covered up and protected and therefore cannot come into contact with either the guide or pulleys.

It will of course be understood that the canvas or other fabric of which the hand-rail is made may be coated with or embedded in rubber or other suitable material, as is usual in this class of devices.

The hand-rail guide 60, which consists of a single strip, preferably of brass, is provided on its upper face with longitudinal ribs or bearing surfaces 110 which serve to support the rail and upon which it slides. The side edges are preferably rounded as at 111 and by reason of their engagement with the curved inner faces of the hand-rail prevent sidewise deflection of the latter. The guide 60 may be secured to the balustrade in any suitable manner, as by screws passing through the openings 112. The bearing surfaces 110 serve to support the rail. On the straight run normally there is clearance between the rounded edges 111 and the hand-rail. At the curves, as around the shunt and turns, the rounded edges serve as supports on which the rail slides. By this design I secure greater durability of guide and minimum surface of contact, thereby reducing friction.

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

1. In a device of the class described, a step the wheel-base of which comprises opposite arms provided with carrying wheels, one of said arms being deflected upwardly between its ends.

2. In a device of the class described, the combination with tracks forming a way, of a series of link connected steps the wheel-base of each of which comprises oppositely extending arms provided with wheels adapted to travel on the tracks, one of said arms being curved in the line of its path of travel.

3. In a device of the class described, the combination with inner and outer tracks forming a way, of a series of link connected steps, oppositely extending wheel-base arms fixed to each step, and wheels supporting the steps and mounted on the arms, the wheels associated with the step riser extending beyond the same, and the arms carrying such wheels crossing the inner tracks and being bent upwardly between the ends.

4. In a device of the class described, the combination with inner and outer tracks forming a way having horizontal and curved end portions, of a series of connected steps, the wheel-base of each of which comprises oppositely extending arms provided with wheels adapted to travel on the tracks, the arms carrying the wheels for the outer tracks crossing the inner tracks and extending upwardly between the ends to clear the inner tracks at the angles between the horizontal and curves.

5. In a device of the class described, a step unit comprising a step, an axle bar fixed thereto, and oppositely extending wheel-base arms fixed to the axle bar and having one pair of arms bent outwardly and also bent upwardly.

6. In a device of the class described, a series of steps provided with axle bars, links connecting the axle bars, and oppositely extending arms fixed to the axle bars and providing a wheel-base, one pair of such arms being longer than the other and bent upwardly between the ends.

7. In a device of the class described, the combination with inner and outer tracks forming a way, of a series of connected steps each having a wheel-base the arms of which are of uneven length, the wheels on the outer tracks being on the longer arms and such arms being bent upwardly to clear the inner tracks at the turns.

8. In a device of the class described, the combination with inner lower and outer upper inclined tracks extending in the same horizontal plane at the landing and connecting with curved tracks for the return, of a series of steps having axle bars located in advance of the center of the tread of such step, wheel-base arms fixed to the axle bars and the front arms of which are provided with wheels adapted to the inner tracks and the rear arms of which are longer than the other arms and provided with wheels adapted to the outer tracks, the said rear arms crossing the inner tracks and also being bent upwardly to clear the inner track angles to prevent the steps rising above the level of the landing.

9. In a device of the class described, a step, a wheel-base therefor comprising oppositely extending arms fixed to the step, the axes of

the wheels and the center of fixture of the wheel-base being in line, and one of the arms being bent upwardly from such line.

10. In a device of the class described, a step having an axle bar, a wheel-base comprising oppositely extending arms fixed to the axle bar, and wheels on the arms, the said axle bar and the wheel centers being substantially in line, and the rear wheel arms being longer than the others and also being bent upwardly from such line.

11. In a device of the class described, a step, and a wheel yoke therefor having one of its arms bent with reference to the vertical and horizontal planes.

12. In a device of the class described, the combination with a circuit consisting of inner and outer inclined tracks having horizontal landing portions and curved tracks connecting with the latter for the return, of a series of steps provided with oppositely extending arms provided with wheels, the arms carrying the wheels for the outer tracks crossing the inner tracks and being bent upwardly to clear the inner tracks as the steps pass to or leave the curves and prevent the steps being raised above the landing level.

13. In a device of the class described, a series of steps, and a single series of links connecting the steps and each link having its teeth entirely between the articulations thereof.

14. In a device of the class described, the combination with tracks forming a way, of steps having wheels adapted to the tracks, and a single series of links pivotally connecting the steps, each of such links having teeth on its under side and a space at the ends under the pivotal centers.

15. In a device of the class described, the combination with tracks forming a way, of steps each of which is provided with an axle bar, wheel-base arms fixed to the axle bar, and rack links pivoted on the axle bars and connecting the steps, each of such rack links having a space at the ends under their pivot centers to obviate tilting of the links as the end tooth is engaged by the driving pinion.

16. In a device of the class described, the combination with tracks and a carriage at the terminal thereof, of a step with wheel-base broader than the tread of the step, the center of the wheel-base being back of the center of the tread, whereby no portion of the step rises above the level of the landing.

17. In a device of the class described, a step unit comprising a step, an axle bar fixed thereto in advance of the center line of the tread, and a wheel-base wider than the tread and comprising oppositely extending arms fixed to the axle bar, the center of the wheel-base being back of the center of the tread.

18. In a device of the class described, a step having an axle bar, a wheel-base comprising oppositely extending arms fixed to the axle bar, and wheels on the arms, the said axle bar and the wheel centers being substantially in line, and the center of the tread being in front of the center of the wheel-base.

19. In a device of the class described, a step unit comprising a step, an axle bar fixed thereto in advance of the center line of the tread, and a wheel-base wider than the tread and comprising oppositely extending arms fixed to the axle bar, one of the arms being upwardly and outwardly curved.

20. In a device of the class described, a series of steps provided with axle bars in advance of the centers of the treads, links connecting the axle bars, and oppositely extending arms fixed to each axle bar and providing a wheel-base, one of the arms being upwardly and outwardly curved.

21. In a device of the class described, a step, and a wheel base therefor comprising oppositely extending arms fixed to the step in advance of the center line of the tread, one of the arms being upwardly and outwardly curved.

22. In a device of the class described, a step having an axle bar, a wheel-base comprising oppositely extending arms fixed to the axle bar, and wheels on the arms, the said axle bar and the wheel centers being substantially in line, and the axle bar being in front of the center line of the tread, one of the arms being upwardly and outwardly curved.

23. In a device of the class described, tracks having recesses in their abutting ends, and a slide track secured in the recess of one track and seated in the recess of the other track.

24. In a device of the class described, tracks having side recesses at their abutting ends, and a slide track secured in the recess of one track and slidingly filling the recess of the other track.

25. In a device of the class described, tracks having side recesses at their abutting ends, a slide track secured in the recess of one track and practically filling the recess of the other track, the latter track being provided with a flange to guard the slide track.

26. In a device of the class described, a track section having inner and outer tracks provided at the ends with side recesses, a carriage having tracks abutting the said inner and outer tracks and also having recesses, slide tracks secured in the recesses of the inner and outer tracks and seated in the recesses of the carriage tracks with sufficient clearance for the endwise movement of the carriage, and flanges guarding the slide tracks.

27. In a device of the class described, a

step provided with an overhanging nosing and having a tread surface provided with means to define the standing space entirely outside of the vertical dropped from the nosing of the succeeding step.

28. In a device of the class described, a conveyer consisting of sections which break into step-like form on the incline, each step having a tread surface, and a wide border at the edge of the step opposite the nosing to locate the tread surface which defines the standing space entirely outside of the vertical dropped from the nosing of the succeeding step.

29. In a device of the class described, a step having a sectional axle bar.

30. In a device of the class described, a step having a sectional axle bar for the supporting wheels.

31. In a device of the class described, an axle bar consisting of sections detachably connected together and extending beyond the ends of the step frame, and wheel-base arms fixed to the ends of the axle bar.

32. In a device of the class described, a step unit consisting of a step, a wheel base therefor comprising wheel carrying yokes, and an axle bar consisting of end sections fixed to and passing through the ends of the step frame and on which the yokes are fixed, and an inner section to which the end sections are detachably connected.

33. In a device of the class described, a step unit consisting of a step, a wheel-base therefor, and an axle bar consisting of end sections fixed to and passing through the ends of the step frame and on which the wheel-base is fixed, and an inner section to which the end sections are detachably connected.

34. In a device of the class described, a series of step units for a moving stairway each of which consists of a step provided with an axle bar, a wheel-base comprising wheel carrying yokes, links pivoted on the axle bars between the step frame and the yokes, said axle bar consisting of end sections fixed to and passing through the ends of the step frame and on which the yokes are fixed and an intermediate section, collars receiving and connecting the adjacent ends of the sections, and pins detachably securing the collars to the sections, whereby each unit may be removed by disconnecting the axle sections.

35. A hand-rail consisting of a sheet of material folded into a number of plies.

36. A hand-rail consisting of a sheet of material folded back and forth into a number of plies.

37. A hand-rail substantially elliptical in cross section and consisting of a sheet of material folded back and forth into a number of plies.

38. A hand-rail substantially elliptical in cross section cut out at its under side and consisting of a sheet of material folded back and forth to provide a number of plies.

39. A hand-rail consisting of a sheet of material folded back and forth to provide a number of plies and having inturned edges protected by a continuation of one of the plies.

40. A hand-rail consisting of one continuous sheet of material folded back and forth to provide a number of plies and having inturned opposing edges, one ply crossing the edges and providing the tractive surface of the hand-rail.

41. A hand-rail substantially C-shape in cross-section and consisting of a plurality of layers, and a wear strip covering the inner layer and extending across the edges of the layers.

42. A hand-rail substantially C-shape in cross-section and consisting of a strip of suitable material folded back and forth to provide a plurality of plies, and a wear surface formed by a continuation of the strip covering and interior of the rail and the edges of the plies.

43. A hand-rail substantially C-shape in cross-section and consisting of a strip of material folded back and forth to form a number of layers, a wear surface formed by a continuation of the strip covering the interior of the rail and the bites of the folds and the edges of the strip, and a coating for the hand-rail.

44. A hand-rail substantially C-shape in cross-section and consisting of a folded strip, the end of the strip forming a wear strip covering the interior of the rail and the bites of the folds, and a body of material, such as a rubber, by which the strips are connected.

45. A hand-rail consisting of layers of canvas or other suitable material, the sides being inturned and one of the layers inclosing the edges and having straight bearing surfaces.

46. A hand-rail substantially elliptical in cross section open longitudinally at its under side for the balustrade and consisting of a sheet of material, such as canvas, folded back and forth to provide a number of plies, the folds between the plies being located at opposite sides of the opening, and the inner ply being a continuation of the outer ply and being carried across the folds to protect the same.

47. A hand-rail composed of a number of plies the edges of which are not exposed.

48. In a device of the class described, a guide, and a hand-rail adapted to travel on and embrace the stationary guide and composed of a number of plies the edges of which are not exposed.

49. In a device of the class described, a moving hand-rail, and a stationary guide

therefor consisting of a strip having longitudinal raised bearing surfaces on its upper face to support the hand-rail and upon which it slides.

50. In a device of the class described, a moving hand-rail having inturned edges, a stationary guide straddled by the hand-rail and having longitudinal bearing surfaces on its upper face to support the hand-rail and on which it slides.

51. In a device of the class described, a moving hand-rail having inturned edges, a stationary guide straddled by the hand-rail and having rounded edges engaged by the inner side surfaces of the hand-rail to prevent sidewise deflection of the latter.

52. In a device of the class described, a moving hand-rail substantially elliptical in cross section and open at its under side, a stationary guide strip by which the hand-rail is straddled and having longitudinal bearing surfaces on its upper face to support the hand-rail and on which it slides and rounded edges engaged by the inner sides of the hand-rail to prevent sidewise deflection of the latter.

53. In a device of the class described, a moving hand-rail having inturned curved sides, a stationary guide having a raised bearing surface on its upper face to support the hand-rail on the straight runs and rounded edges on which the hand-rail slides at the turns.

54. In a device of the class described, a moving hand-rail substantially elliptical in cross section and open longitudinally on its under side, a stationary guide straddled by the hand-rail and having a bearing surface on its upper face with which the tractive face of the hand-rail engages on the straight run, the guide having rounded edges which on the straight run prevent sidewise deflection of the hand-rail and on the curves become the supports on which the rail slides.

55. In a device of the class described, a moving hand-rail for a conveyer, a horizontal drive wheel for the hand-rail at each end of the conveyer whereby the hand-grasp portion of the rail is pulled along irrespective of the direction of movement, and a vertical drive wheel for each run of the hand-rail.

56. In a device of the class described, the combination with a conveyer connecting different levels, of a traveling hand-rail, and a drive therefor located at the end of the incline and consisting of two pulleys connected by a sprocket chain.

57. In a device of the class described, a moving hand-rail, means for carrying the hand-rail, an idler for taking up slack in the hand-rail, and an adjusting device on which the take-up idler is pivoted.

58. In a device of the class described, a moving hand-rail, a drive therefor, an idler for taking up slack in the hand-rail, a guide in which the idler slides and turns, and an adjusting device for sliding the idler.

59. In a device of the class described, a moving hand-rail, a drive therefor, an idler for taking up slack in the hand-rail and having a hub, a guide in which the hub is journaled and in which it is free to slide, and an adjusting yoke on which the idler is pivoted.

60. In a device of the class described, a moving hand-rail, a drive therefor, an idler for taking up slack in the hand-rail and having a hub, guide bars between which the hub is journaled and having recesses receiving the hub to prevent lateral movement of the idler, a yoke on which the idler is pivoted and having a threaded stem, and a nut on the stem for adjusting the yoke to slide the idler along the guide bars.

61. A traveling hand-rail for a conveyer connecting different levels, a drive for the hand-rail located at the end of the incline and consisting of more than one driving pulley, and means for taking up slack in the hand-rail.

62. In a device of the class described, the combination with a conveyer connecting different levels, of a traveling hand-rail, a drive therefor located at the end of the incline and consisting of two pulleys connected by a sprocket chain, and an adjustable idler for avoiding slack in the hand-rail.

63. In a device of the class described, the combination with a conveyer, of a hand-rail, a drive therefor having more than a semi-circle of contact with the hand-rail at practically the same point with reference to the conveyer, an idler, and means for adjusting the idler to maintain the hand-rail at the proper tension.

64. In a device of the class described, a traveling hand-rail, a drive located at a certain point and providing more than a semi-circle of driving contact with the rail, and an idler for adjusting the tension of the hand-rail.

65. In a device of the class described, the combination with a conveyer, of a traveling hand-rail, a drive therefor with more than a semi-circle of contact with the hand-rail at practically the same point with reference to the conveyer, an idler for taking up slack in the hand-rail, a guide in which the idler slides and turns, and an adjusting device for sliding the idler.

66. In a device of the class described, the combination with a conveyer having an inclined run and a horizontal landing portion at the end of the incline, of a traveling hand-rail passing along one side of the incline and crossing the landing portion, pulleys at the ends of the conveyer, a driving pulley engaging each run of the hand-rail, an angularly disposed pulley for deflecting the

hand-rail from the pulley engaging the return run to one of the end pulleys, a guide in which the angularly disposed pulley rotates, and a device for sliding the pulley in the guide to take up slack in the hand-rail.

67. In a device of the class described, the combination with a conveyer having an inclined run and horizontal landing portions at the ends of the incline, of a traveling hand-rail passing along one side of the incline and crossing both landing portions, horizontal driven pulleys at the ends of the landing portions around which the rail passes, a vertical driven pulley engaging each run of the hand-rail, an angularly disposed pulley for deflecting the hand-rail from the pulley engaging the return run to the horizontal end pulley to which it passes, a guide in which the angularly disposed pulley rotates and in which it is adapted to slide, and an adjusting yoke on which the said pulley is pivoted for sliding the pulley along the guide.

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

CHARLES D. SEEBERGER.

Witnesses:
W. H. BRADY,
EDMUND E. FIELD, JR.