No. 800,783. PATENTED OCT. 3, 1905.

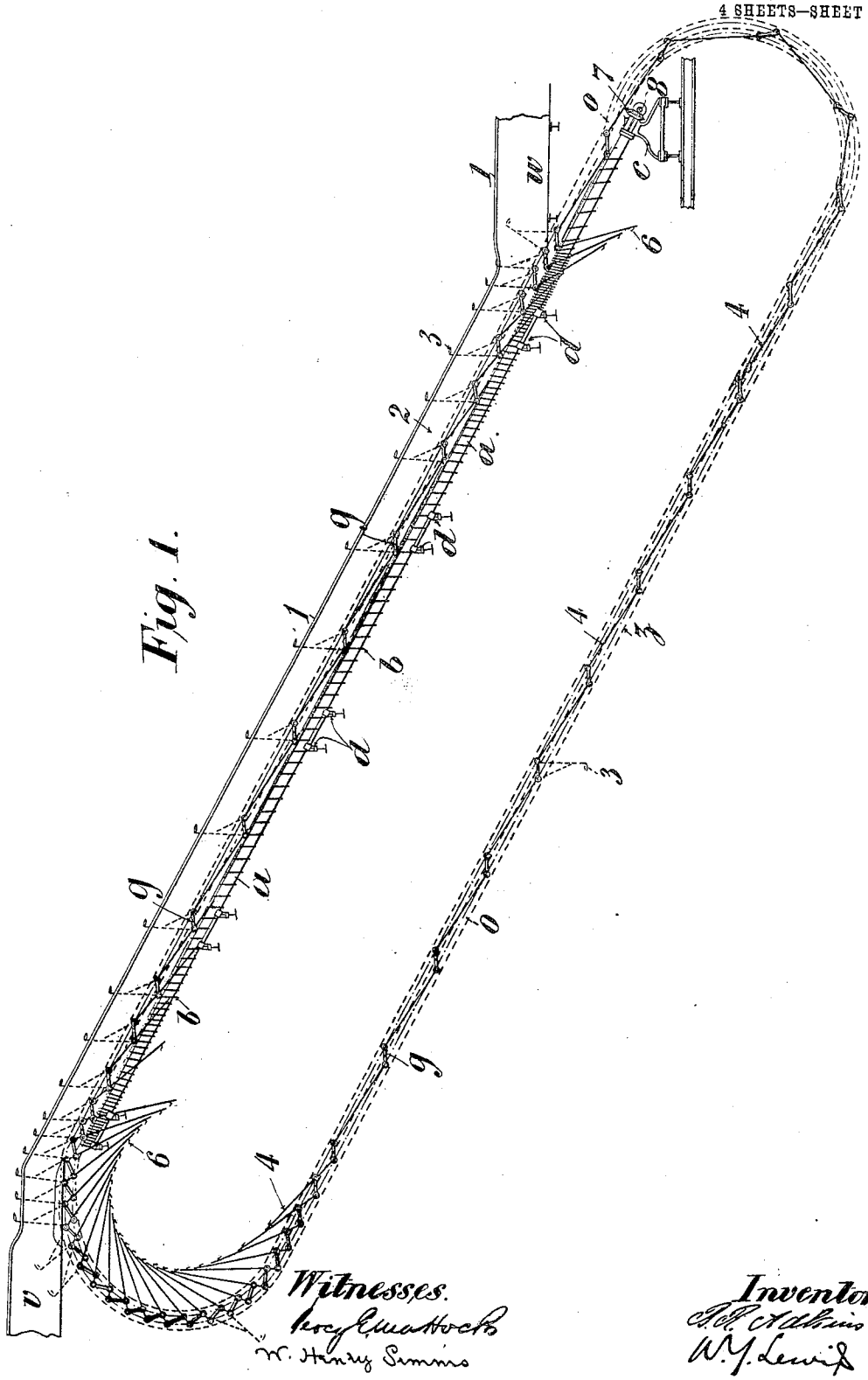
B. R. ADKINS & W. Y. LEWIS.

PASSENGER ELEVATOR AND CONVEYER.

APPLICATION FILED MAR. 9, 1903.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses.
Lucy Quattlebaum
W. Henry Simms

Inventors.
B. R. Adkins.
W. Y. Lewis

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4 SHEETS—SHEET 2.

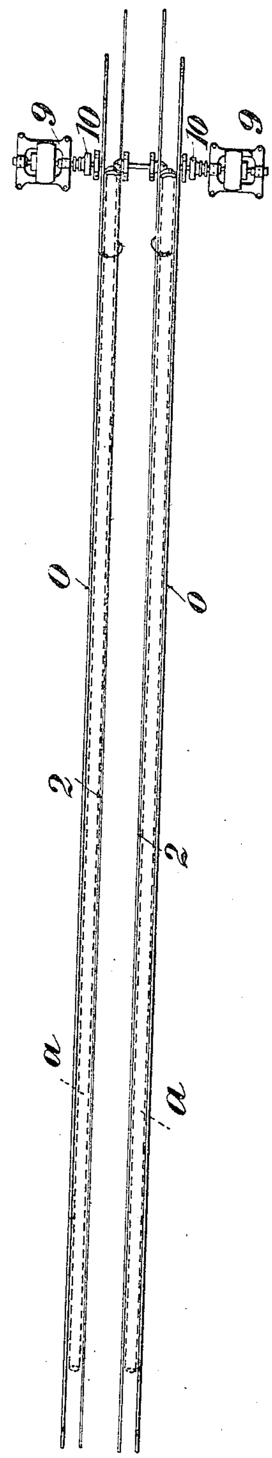

Fig. 2.

Witnesses.

Percy E. Mattock

W. Hardy Simmins

Inventors.

B. R. Adkins

W. Y. Lewis

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4 SHEETS—SHEET 3.

Fig. 5.

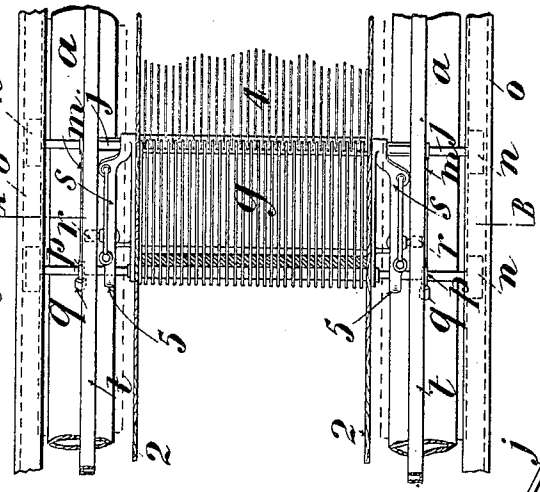
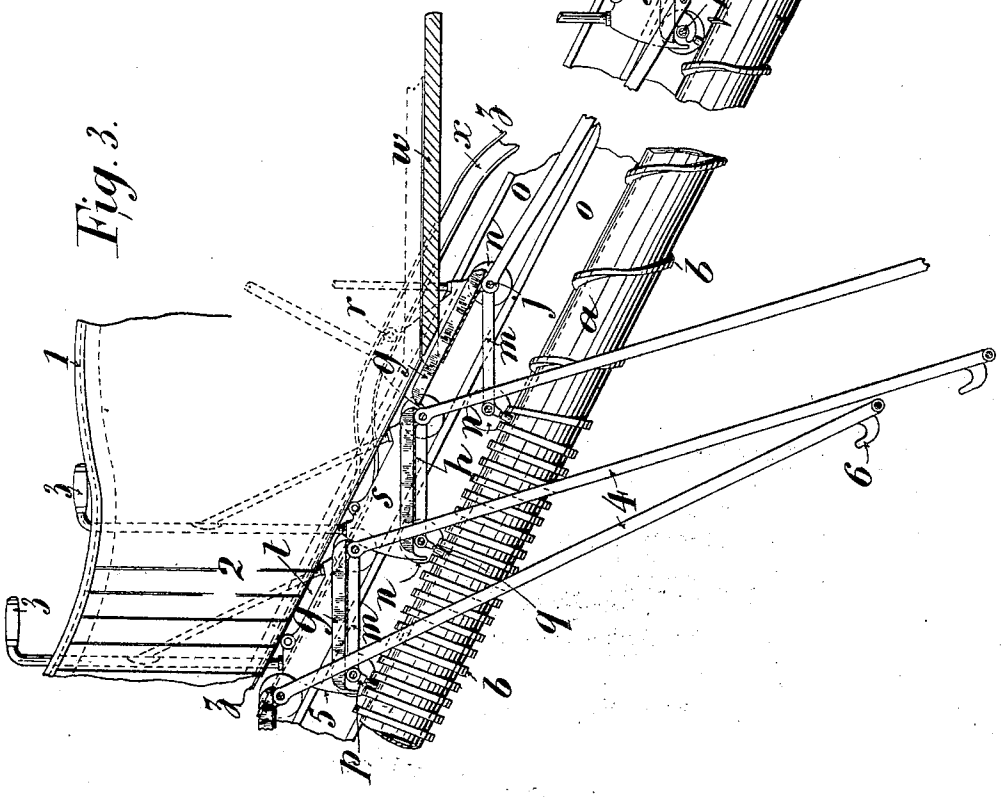


Fig. 3.



Witnesses.
Percy E. Westcott
W. Finley Simms

Inventors.
B. R. Adkins.
W. Y. Lewis

No. 800,783.

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B. R. ADKINS & W. Y. LEWIS.

PASSENGER ELEVATOR AND CONVEYER.

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4 SHEETS—SHEET 4.

Fig. 4.

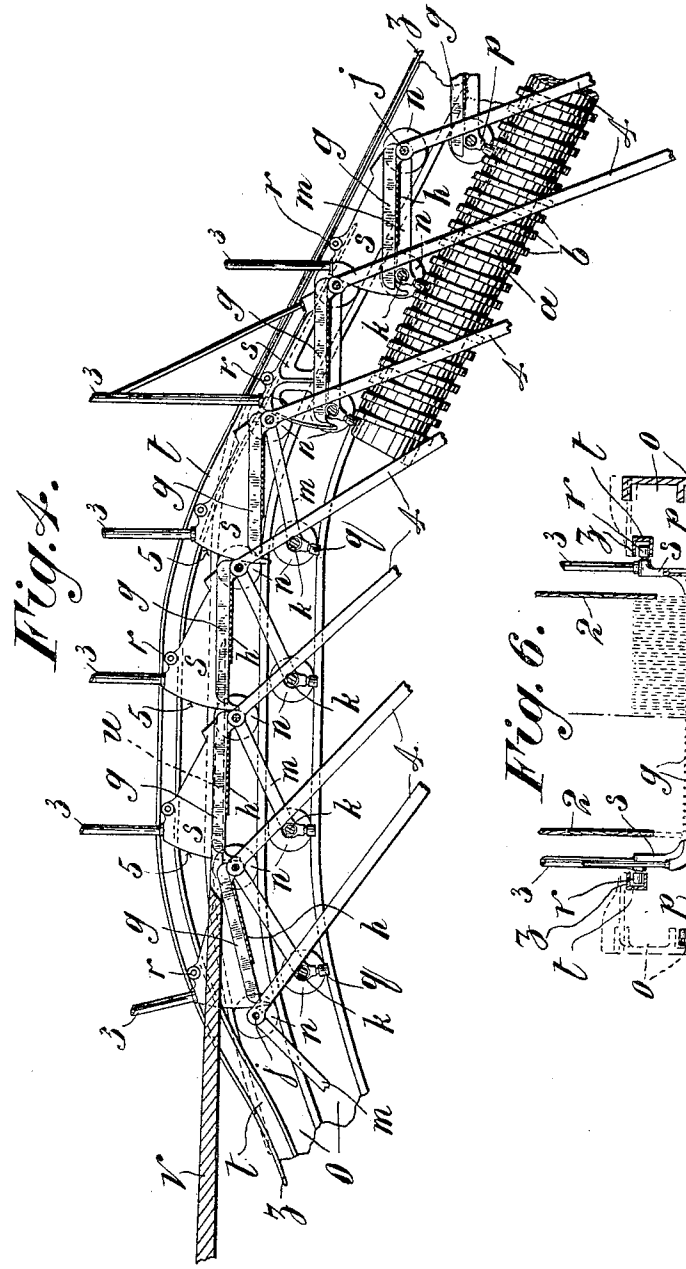
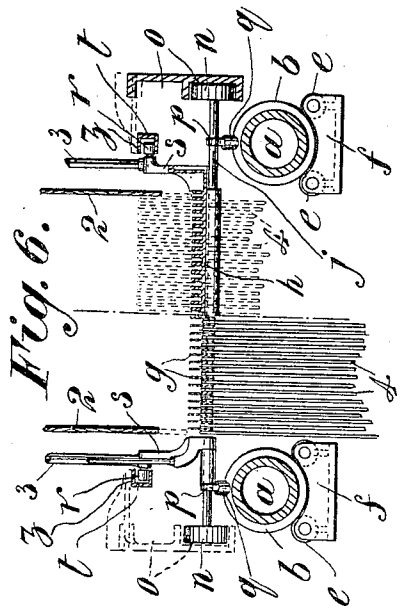


Fig. 6.



Witnesses.
Percy Earnshaw
W. Henry Simms

Inventors.
B. R. Adkins
W. Y. Lewis

UNITED STATES PATENT OFFICE.

BENJAMIN RATCLIFFE ADKINS, OF FINCHLEY, AND WILLIAM YORATH LEWIS, OF HIGHBURY, ENGLAND.

PASSENGER ELEVATOR AND CONVEYER.

No. 800,783. Specification of Letters Patent. Patented Oct. 3, 1905.

Application filed March 9, 1903. Serial No. 146,958.

To all whom it may concern:

Be it known that we, BENJAMIN RATCLIFFE ADKINS, residing at Finchley, in the county of Middlesex, and WILLIAM YORATH LEWIS, residing at Highbury, in the county of London, England, subjects of the King of Great Britain and Ireland, have invented Improvements in Passenger Elevators and Conveyers, of which the following is a specification.

This invention relates to improvements in passenger elevators and conveyers of the kind commonly known as "continuous stairways," and has for its object to provide an elevator that shall occupy but little time in conveying passengers from its starting to its landing floor and shall occupy but little space, shall be capable of use without discomfort by passengers, and in which the risk of injury to passengers by the operating mechanism or otherwise shall be minimized.

An elevator or conveyer according to this invention comprises one or more rotary screw-threaded shafts, which extend in the direction in which it is intended that the passengers shall be conveyed and the pitch or pitches of whose thread or threads varies or vary so that each of the treads or platforms which engage with the shaft or shafts is caused to travel from a starting-place toward a landing-place with a velocity that increases as the tread or platform in question leaves the starting-place, and decreases as it approaches the landing-place.

Elevators or conveyers according to this invention are suitably applicable for the conveyance of passengers from one point to another along a level, a vertical, or an inclined course, in the case of a vertical or an inclined course, the direction being either up or down.

The invention consists in various novel features of construction and in combinations and arrangements of parts, all as hereinafter described and emphasized in the claims.

Figures 1 and 2 of the accompanying illustrative drawings show, respectively, in side elevation and plan a passenger-elevator constructed according to this invention and designed to convey passengers up an inclined course from a lower to a higher level. Figs. 3 and 4 show in central vertical section, respectively, the lower end and the higher end of the apparatus. Fig. 5 shows in plan a portion of the apparatus, and Fig. 6 is a transverse section corresponding to the line A B of Fig. 5. Figs. 1 and 2 are drawn to a smaller scale than the remaining figures.

a a are two screw-threaded shafts which are arranged with their axes parallel and inclined to the horizontal a transverse distance apart, according to the width of the elevator, and whose threads *b* are of corresponding varying pitch, but of opposite hands. At its lower end each shaft *a* is supported in a suitable bearing *c*, and at its upper end and at intermediate points it rests upon bearings *d*, that each comprise two somewhat broad rollers *e*, Fig. 6, and a casting *f*, in which such rollers are mounted to rotate, the arrangement of the rollers being such that the upper portion of the shaft is free for engagement with the treads or platforms, as hereinafter described.

The treads or platforms are conveniently each built up of a series of bars or strips *g*, that are secured edgewise upon a metal plate *h*, arranged transversely across the tread, the space between adjacent strips being equal, approximately, to the thickness of a strip. The rear or trailing end of the tread is hinged to a rod or axle *j*, that forms one member of a framing, consisting of the said rod *j*, a similar rod or axle *k*, and side plates *m*. Mounted on the ends of said rods or axles *j* and *k* are wheels *n*, which run in a pair of double channels or guide-tracks *o*, that are each formed as a closed loop whose longitudinal members extend the whole length of and are parallel to the shafts *a*. To the rod or axle *k* are fixed two arms *p*, which extend toward the screw-threaded shafts and upon the free ends of which are mounted rollers *q*, that are so arranged as to be acted upon by the screw-threads *b* of the shafts *a* in such manner that when the shafts are rotated each in a proper direction the framing *j k m*, with tread *g h*, will be caused to travel in the direction in which the shaft extends at a speed that varies with the varying pitch of the shaft's screw-threads. The said variations are such that each tread is moved at a slow speed at and near the starting end and at and near the landing end of the elevator; but between these ends the speed is considerably increased and subsequently reduced. The shafts *a* are rotated in opposite directions, and as the screw-threads of the shafts are of opposite hand, side thrust due to the angularity of the thread of one shaft acting on the driving-roller *q* at one end of the tread-framing is counteracted by

the side thrust due to the opposite angularity of the thread of the other shaft acting on the driving-roller *q* at the opposite end of the tread-framing.

The disposition of the guide-tracks *o* in relation to the wheels *n* is such that the treads *g*, upon which a passenger may stand, remain horizontal throughout the entire journey from the starting-place to the landing-place.

In order to land a passenger without shock on the higher level, platform-rollers *r*, which are mounted to rotate upon pins fixed to metal side brackets *s* at the ends of each tread, are caused to work in a pair of auxiliary guide-tracks *t*, that are provided at the higher level. The arrangement and curvature of these auxiliary guide-tracks *t* are such that each tread as it nears the end of its upward journey is caused to turn about its rod or axle *j*, and so to maintain a horizontal position while the wheels *n* and framing *j k m* follow their normal course, guided by the loop-like double channels or guide-tracks *o*, and the length of the said auxiliary track is such that several treads are simultaneously more or less acted upon. The shape of the auxiliary tracks is also such that several treads as they reach the higher level extend one immediately behind another in a horizontal plane.

u are fingers or projections which extend from the stationary landing-floor *v* and enter between the strips or bars *g* of the treads, the arrangement being such that as a tread leaves the landing-floor a passenger or passengers who had been standing thereon while making the journey would be left supported by the stationary fingers or projections *u* when the tread tilted downward and passed on below the landing-floor.

At the starting-floor *w* there is provided a further pair of auxiliary guide-tracks *x*, with which the rollers *r* of the treads are adapted to engage and which are so shaped and located relatively to the main guide-tracks *o* that each tread just before it reaches the starting-floor *w* is turned about its rod or axle *j*, so as to be parallel to the plane containing the longitudinal axes of the shafts *a*, Fig. 3, and is caused to move forward in this position until its forward edge is above the floor *w*, when it is caused to resume a horizontal position convenient for a passenger to step upon it and proceed standing to the higher-level landing-floor *v*.

It will be seen upon reference to Fig. 3 of the drawings, that by moving the treads into an inclined plane at the starting-floor, as above described, gaps between the edge of the fixed starting-floor and the treads are avoided.

1 1 are banisters secured to fixed guards 2 2, that are arranged one at each side of the elevator close to the treads, so that passengers are prevented from stepping or slipping off the ends of the treads and thereby possibly being injured.

Each tread is provided at each of its ends with a handle 3, that is secured to the corresponding metal side bracket *s*, which bracket is located outside the guard 2, and the arrangement is such that at the starting-floor when the treads are caused to assume their horizontal position, as hereinbefore described, the handles 3 project above the banister 1 in a convenient position to permit their being gripped by a passenger, and they retain this position during the whole journey to the landing-floor.

The distance between the treads will vary correspondingly with the variations of the pitch of the screw-threads *b*, so that when they are between the starting and landing floors and traveling at the greatest speed, as hereinbefore stated, the distance between the treads is somewhat considerable, and in order to fill up the space which might otherwise be a source of danger to passengers there are provided between the treads risers, which while filling up the space before mentioned allow the treads to be moved a varying distance apart.

In the elevator illustrated the risers are built up of a number of uniform strips or slats 4, arranged parallel to one another and each freely hinged to and depending from the rod or axle *j* of the tread-framing *j k m*. The depending slats 4 pass between the strips or bars *g* of the lower or following tread and rest against the rod of axle *k* of the framing thereof, so that when the treads move apart the strips 4 of the risers hinged to a forward tread work between the strips or bars *g* of the following rearward tread.

To keep the treads in motion when their respective driving-rollers *q* pass out of engagement with the screw-threads of the shafts *a* at the landing end of the journey, the treads, as before stated, are caused to assume a position one immediately behind another, in which the forward edges 5 of the side brackets *s* of each rear tread are in contact with the rod or axle *j* of the tread-framing immediately in front thereof, so that each tread is pushed along until its wheels *n* enter the upper curved end portions of the double channels or guide-tracks *o*, whence it passes by gravity down to the lower longitudinal portions of the said tracks *o*. To again bring the treads into gear with the screw-threads of the shafts, the free ends of the strips or slats 4, constituting each riser, or some of them, are formed as hooks 6, that are adapted to engage the rod or axle *k* of the tread-framing at its rear, and the screw-threaded shafts *a* are extended beneath the stationary starting-floor *w* a distance such in relation to the length of the riser members 4 that the hooked free ends of the riser members of a tread that is just being brought above the front edge of the starting-floor bring the next rearward tread into engagement with the screw-threads *b* of the shafts.

Should not the inclination of the lower longitudinal members of the loop-like tracks *o* be such that the treads travel down by gravity, they will, as shown in Fig. 1, be pulled down by the engagement of the riser-hooks with the rods *k*. *z* represents metal strips or rails, which extend the whole length of the elevator parallel with the channels or guide-tracks *o*, excepting at the auxiliary or diverting tracks *t* and *u*, at which parts they follow the path and form the upper flanges of such auxiliary or diverting tracks. These strips or rails serve to maintain the treads in their horizontal position during ascent and prevent their tilting right back upon their descent and when traveling round the curved ends of the guides *o*, their arrangement being such that during ascent the projections or rollers *r*, attached to the hinged treads, only come into contact therewith when the treads begin to move out of the horizontal position, as when approaching the upper end of the journey or by any action of the passenger or of forces produced by the acceleration of the speed. The strips or rails *z* also extend along the lower or return tracks and serve to prevent the hinged treads from tipping downward under the action of gravity during the return journey, thus saving space.

Driving of the screw-threaded shafts may be effected by an electric or other motor, either direct, coupled, or geared.

In the example of elevator illustrated driving of the shafts *a* is effected, through bevel gearing 7 and a transverse shaft 8, by means of one or other of two electric motors 9. 10 10 are clutches which enable either motor 9 to be put in or out of action.

It will be seen that as each of the treads in the arrangement hereinbefore described when it is in engagement with the screw-threads is a separate unit and is independent of and does not form a chain with the others there is no necessity for the introduction of any adjusting devices with respect to the length of the riser-strips, the extreme ends of the threads *b b* at or near the lower ends of the shafts *a* being arranged (see Fig. 3) in such a way as to insure the correct engagement of each tread in relation to the following one, even though there be considerable variation in the length of these riser-strips.

As will be obvious, parts of the apparatus hereinbefore described can be variously modified without departing from the essential features of the invention. Thus the risers to be used between the treads may be constructed in various forms to adapt them to fill the varying length of the spaces between the successive treads. It will also be obvious that parts of the apparatus can be used in connection with elevators or conveyers the treads or equivalent portions of which are driven otherwise than by one or more screw-threaded shafts.

What we claim is—

1. In a passenger elevator or conveyer, the combination of a rotatable shaft provided with a screw-thread, treads or platforms of which each is adapted to support a passenger standing thereon, and means whereby said treads or platforms are caused to be engaged by said thread.

2. In a passenger elevator or conveyer, the combination of a rotatable shaft formed with a screw-thread of varying pitch, treads or platforms of which each is adapted to support a passenger standing thereon, and means whereby said treads or platforms are caused to be engaged by said thread.

3. In a passenger elevator or conveyer, the combination of a rotatable shaft formed with a right-handed screw-thread, a similar rotatable shaft formed with a corresponding but left-handed screw-thread, treads or platforms of which each is adapted to support a passenger standing thereon, means whereby said treads or platforms are caused to be engaged by said threads, and means for rotating said shafts simultaneously in opposite directions but at corresponding speeds.

4. In a passenger elevator or conveyer, the combination of a rotatable shaft formed with a right-handed screw-thread of varying pitch, a similar rotary shaft formed with a corresponding but left-handed screw-thread, treads or platforms of which each is adapted to support a passenger standing thereon, means whereby said treads or platforms are caused to be engaged by said threads, and means for rotating said shafts simultaneously in opposite directions but at corresponding speeds.

5. In a passenger elevator or conveyer, the combination of a rotatable shaft formed with a screw-thread that is of small pitch at or near starting and landing places for passengers but is of increased pitch between said places, treads or platforms of which each is adapted to support a passenger standing thereon, and means whereby said treads or platforms are caused to be engaged by said thread.

6. In a passenger elevator or conveyer, the combination of a rotatable shaft formed with a right-handed screw-thread that is of small pitch at or near starting and landing places for passengers but is of increased pitch between said places, a similar rotatable shaft formed with a corresponding but left-handed screw-thread, treads or platforms of which each is adapted to support a passenger standing thereon, means whereby said treads or platforms are caused to be engaged by said threads, and means for rotating said shafts simultaneously in opposite directions but at corresponding speeds.

7. In a passenger elevator or conveyer, the combination of a rotatable shaft formed with a screw-thread of varying pitch, treads or platforms of which each is adapted to support a passenger standing thereon, means whereby

said treads or platforms are caused to be engaged by said thread, and means for retaining each of said treads or platforms in a horizontal or approximately horizontal position during a journey from a passengers' starting-place to a passengers' landing-place.

8. In a passenger elevator or conveyer, the combination of treads or platforms of which each is adapted to support a passenger standing thereon, and means for causing each of said treads or platforms to travel from a passengers' starting-place to a passengers' landing-place at a speed that increases as the tread or platform in question leaves said starting-place and decreases as it nears said landing-place.

9. In a passenger elevator or conveyer, the combination of treads or platforms of which each is adapted to support a passenger standing thereon, means for causing each of said treads or platforms to travel from a passengers' starting-place to a passengers' landing-place at a speed that increases as the tread or platform in question leaves said starting-place, and decreases as it nears said landing-place, and means for retaining each of said treads or platforms in a horizontal or approximately horizontal position during a journey from said starting-place to said landing-place.

10. In a passenger elevator or conveyer, the combination of treads or platforms of which each is adapted to support a passenger standing thereon, carriers on which said treads or platforms are mounted, means for causing each of said carriers to travel from a passengers' starting-place to a passengers' landing-place at a speed that increases as the carrier in question leaves said starting-place and decreases as it nears said landing-place and to be then returned to its original position, and means for guiding each of said carriers on its way from said starting-place to said landing-place.

11. In a passenger elevator or conveyer, the combination of treads or platforms of which each is adapted to support a passenger standing thereon, frames by which said treads or platforms are carried, means for causing each of said frames to travel from a passengers' starting-place to a passengers' landing-place located at a level different from that of said starting-place at a speed that increases as the frame in question leaves said starting-place and decreases as it nears said landing-place and to be then returned to its original position, and means for guiding each of said frames so as to adapt it while on its way from near said starting-place to near said landing-place to support its tread or platform horizontal or approximately horizontal.

12. In a passenger elevator or conveyer, the combination of treads or platforms of which each is adapted to support a passenger standing thereon, carriers to which said treads or platforms are hinged at their trailing ends, wheels mounted on said carriers, guides in the form of closed loops in which said wheels are adapted to work, a rotatable screw-threaded shaft or shafts that extends or extend in the direction in which it is intended that a passenger shall be conveyed, and a part or parts secured to each of said frames and adapted to be engaged by the thread or threads of said shaft or shafts.

13. In a passenger elevator or conveyer, the combination of treads or platforms of which each is adapted to support a passenger standing thereon, means for driving each of said treads or platforms at different speeds at different portions of its travel from a passengers' starting-place to a passengers' landing-place, and means adapted to extend across and obstruct the space between each of said treads or platforms and the succeeding one thereof notwithstanding the variation of the said space that will be produced by the varying velocities of said treads or platforms.

14. In a passenger elevator or conveyer, the combination of treads or platforms of which each is adapted to support a passenger standing thereon, means for driving each of said treads or platforms at different speeds at different portions of its travel from a passengers' starting-place to a passengers' landing-place, and a riser device for each of said treads or platforms and articulately connected therewith and extending therefrom and having with the next succeeding one of said treads or platforms a connection adapted to allow of longitudinal motion of said riser device in relation thereto.

15. In a passenger elevator or conveyer, the combination of treads or platforms of which each is adapted to support a passenger standing thereon, and comprises a plurality of parallel bars or strips means for driving each of said treads or platforms at different speeds at different portions of its travel from a passengers' starting-place to a passengers' landing-place, and for each of said treads or platforms a riser device which comprises a plurality of strips or slats mounted between the aforesaid bars or strips and articulately connected with the corresponding one of said treads or platforms and extending therefrom to and having with the next succeeding one of said treads or platforms a connection adapted to allow of longitudinal motion of said riser device in relation thereto.

16. In a passenger elevator or conveyer, the combination of treads or platforms of which each is adapted to support a passenger standing thereon and comprises a plurality of parallel bars or strips, for each of said treads or platforms, a frame comprising two rods which are opposite to each other and on one of which the corresponding ones of said bars or strips are mounted to rotate partially, means for driving each of said treads or platforms at different speeds at different portions of its

travel from a passengers' starting-place to a passengers' landing-place, and for each of said treads or platforms a riser device which comprises a plurality of strips or slats mounted between the aforesaid bars or strips and resting on that one of said rods of the succeeding one of said treads which is opposite to the rod thereof on which are mounted its said bars or strips.

17. In a passenger elevator or conveyer, the combination of a rotatable shaft formed with a screw-thread of varying pitch, a similar shaft arranged opposite and parallel to the aforesaid shaft, treads or platforms of which each is adapted to support a passenger standing thereon, means for rotating said shafts simultaneously, and means whereby each of said treads or platforms is caused to be engaged at or near its opposite ends with the threads of said shafts respectively.

18. In a passenger elevator or conveyer, the combination of a rotatable shaft formed with a screw-thread of varying pitch, a similar shaft arranged opposite and parallel to the aforesaid shaft, treads or platforms of which each is adapted to support a passenger standing thereon, means for rotating said shafts simultaneously, means whereby each of said treads or platforms is caused to be engaged at or near its opposite ends with the threads of said shafts respectively, and means for retaining each of said treads or platforms in a horizontal or approximately horizontal position during the journey from a passengers' starting-place to a passengers' landing-place.

19. In a passenger elevator or conveyer, the combination, with a passengers' starting-place and a passengers' landing-place located at a level different from that of said starting-place, of treads or platforms of which each is adapted to support a passenger standing thereon, for each of said treads or platforms a carrier on which it is mounted and to which it is articulately connected, means for driving said carrier from said starting-place to said landing-place, means for guiding said carrier so as to adapt it on its way from near said starting-place to near said landing-place to support its tread or platform horizontal or approximately horizontal, and means for guiding each of said treads or platforms so as to keep it horizontal or approximately horizontal when said carrier has ceased to be guided as aforesaid.

20. In a passenger elevator or conveyer, the combination with a passengers' starting-place and a passengers' landing-place located at a level different from that of said starting-place, of treads or platforms of which each is adapted to support a passenger standing thereon, for each of said treads or platforms a carrier on which it is mounted and to which it is articulately connected, means for driving said carrier from said starting-place to said landing-place, means for guiding said carrier so as to adapt it on its way from near said starting-place to near said landing-place to support its tread or platform horizontal or approximately horizontal and then to cause said carrier before reaching said landing-place to move parallel or approximately parallel thereto and means for guiding each of said treads or platforms so as during the movement of its said carrier parallel to said landing-place as aforesaid to form or constitute part of a continuation of said landing-place.

21. In a passenger elevator or conveyer, the combination, with a passengers' starting-place and a passengers' landing-place located at a level different from that of said starting-place, of treads or platforms of which each is adapted to support a passenger standing thereon, for each of said treads or platforms a carrier on which it is mounted and to which it is articulately connected, means for driving said carrier from said starting-place to said landing-place and then under said landing-place and back to said starting-place continuously, means for guiding said carrier so as to adapt it on its way from near said starting-place to near said landing-place to support its tread or platform horizontal, or approximately horizontal, and means for guiding each of said treads or platforms so as on reaching said landing-place to pass down under said landing-place on its way back to said starting-place.

22. In a passenger elevator or conveyer, the combination of treads or platforms of which each is adapted to support a passenger standing thereon, means for driving each of said treads or platforms at different speeds at different portions of its travel from a passengers' starting-place to a passengers' landing-place, a carrier on which each of said treads or platforms is mounted, parallel tracks extending from a passengers' starting-place to a passengers' landing-place located at a level different from that of said starting-place, and devices secured to said carrier respectively near the forward and trailing edges thereof and adapted in conjunction with said tracks to guide said carrier so that the positions that it will assume on its way from near said starting-place to near said landing-place will be such that its tread or platform will be horizontal or approximately horizontal.

23. In a passenger elevator or conveyer, the combination of treads or platforms of which each is adapted to support a passenger standing thereon, means for driving each of said treads or platforms at different speeds at different portions of its travel from a passengers' starting-place to a passengers' landing-place, a carrier on which each of said treads or platforms is mounted, parallel tracks extending from a passengers' starting-place to a passengers' landing-place located at a level different from that of said starting-place, devices secured to said carrier respectively near the forward and trailing edges thereof and adapted

in conjunction with said tracks to guide said carrier so that the positions that it will assume on its way from near said starting-place to near said landing-place will be such that its tread or platform will be horizontal or approximately horizontal, and means adapted to engage with each of said treads or platforms on the cessation of the guidance of its carrier as aforesaid and thereby to move it in relation to its carrier and to keep it horizontal on approaching said landing-place.

24. In a passenger elevator or conveyer, the combination of treads or platforms of which each is adapted to support a passenger standing thereon, means for driving each of said treads or platforms at different speeds at different portions of its travel from a passengers' starting-place to a passengers' landing-place, a carrier on which each of said treads or platforms is mounted, parallel tracks extending from a passengers' starting-place to a passengers' landing-place located at a level different from that of said starting-place, devices secured to said carrier respectively near the forward and trailing edges thereof and adapted in conjunction with said tracks to guide said carrier so that the positions that it will assume on its way from near said starting-place to near said landing-place will be such that its tread or platform will be horizontal or approximately horizontal, and means adapted to engage with each of said treads or platforms on the cessation of the guidance of its carrier as aforesaid and thereby to move it in relation to its carrier and to keep it horizontal on approaching said landing-place and then to turn it down under said landing-place.

25. In a passenger elevator or conveyer, the combination, with a passengers' landing-place, of treads or platforms of which each is adapted to support a passenger standing thereon, for each of said treads or platforms a carrier to which it is articulately connected, a pair of guides comprising an upwardly-inclined portion adapted to lead said carrier upwardly toward said landing-place with said tread or platform thereof horizontal or approximately horizontal a downwardly-inclined portion adapted to lead said carrier downwardly therefrom and a connecting portion at or near said landing-place and adapted to lead said carrier from the upper end of said upwardly-inclined portion to the upper end of said downwardly-inclined portion, and comprising a straight or approximately straight portion adapted to guide two or more of such carriers horizontally or approximately so one behind another, and an auxiliary pair of guides adapted, while said two or more carriers are being guided as aforesaid by said straight or approximately straight portion, to keep the treads or platforms thereof in the same horizontal plane or approximately so one behind another as they approach said landing-place.

26. In a passenger elevator or conveyer, the combination, with a passengers' landing-place, of treads or platforms of which each is adapted to support a passenger standing thereon, for each of said treads or platforms a carrier to which it is articulately connected, a pair of guides comprising an upwardly-inclined portion adapted to lead said carrier upwardly toward said landing-place with said tread or platform thereof horizontal or approximately horizontal, a downwardly-inclined portion adapted to lead said carrier downwardly therefrom, and a connecting portion at or near said landing-place and adapted to lead said carrier from the upper end of said upwardly-inclined portion to the upper end of said downwardly-inclined portion, and guides adapted to turn each of said treads or platforms in relation to its said carrier so as to keep it horizontal or approximately horizontal during its travel along said connecting portion of said guides toward said landing-place and on reaching said landing-place to turn it downward into or toward its direction of motion.

27. In a passenger elevator or conveyer, the combination of treads or platforms of which each is adapted to support a passenger standing thereon, driving-gear adapted to propel each of said treads or platforms at different speeds at different portions of its travel from a passengers' starting-place toward a passengers' landing-place, a pair of guides comprising a portion adapted to lead said treads or platforms along said driving-gear, a return portion adapted to lead said treads or platforms backward toward said starting-place, and a connecting portion adapted to lead said treads or platforms from the first-mentioned portion to the secondly-mentioned portion on their way back to said starting-place and comprising an upwardly-directed or horizontal part so located in relation to said driving-gear that each of said treads or platforms will when located thereon be unconnected directly with said driving-gear, and means whereby each of said treads or platforms will when located as aforesaid be pushed forward by a succeeding tread or platform.

28. In a passenger elevator or conveyer, the combination, with a passengers' starting-floor, of treads or platforms of which each is adapted to support a passenger standing thereon, for each of said treads or platforms a carrier on which the corresponding one of said treads or platforms is mounted and to which it is articulately connected, means for guiding each of such carriers from under said starting-floor to a passengers' landing-place with its tread or platform horizontal or approximately horizontal, and means for turning each of said treads or platforms in relation to its said carrier while below said starting-floor so that on passing said starting-floor it will be in a position parallel or approximately parallel to the direction of motion of its said carrier and for maintaining it in the said position until its

rear edge is opposite to said floor and for then quickly moving it into a horizontal or approximately horizontal position.

29. In a passenger elevator or conveyer, the combination with a passengers' starting-place and a passengers' landing-place, of treads or platforms of which each is adapted to support a passenger standing thereon, means for guiding each of said treads or platforms continuously from said starting-place to said landing-place and back to said starting-place, driving means with which each of said treads or platforms is adapted to engage and which is adapted to drive each of said treads or platforms at a velocity which decreases and increases as the tread or platform in question respectively approaches and leaves said starting-place and decreases as it nears said landing-place, and means adapted both to allow of the mutually relative movement of each two adjacent treads or platforms due to their variations of velocity as aforesaid and also to connect each of said treads or platforms to the next succeeding one thereof so as to cause the former when engaged by said driving means to be followed into engagement therewith by said succeeding tread or platform.

30. In a passenger elevator or conveyer, the combination, with a passengers' starting-place and a passengers' landing-place, of treads or platforms of which each is adapted to support a passenger standing thereon, means for guiding each of said treads or platforms continuously from said starting-place to said landing-place and back to said starting-place, driving means with which each of said treads or platforms is adapted to engage and which is adapted to drive each of said treads or platforms at a velocity which decreases and increases as the tread or platform in question respectively approaches and leaves said starting-place and decreases as it nears said landing-place, and a hook or hooks articulately connected to each of said treads or platforms and adapted both to allow the tread or platform to which it is or they are so connected to move in relation to the next succeeding one of said treads or platforms as required by the variation of their velocity as aforesaid and also to cause the former tread or platform when engaged by said driving means to be followed into engagement therewith by said succeeding tread or platform.

31. In a passenger elevator or conveyer, the combination of a rotatable shaft provided with a thread having a pitch that gradually decreases toward a passengers' starting-place and from there to a passengers' landing-place first gradually increases and afterward gradually decreases, treads or platforms of which each is adapted to support a passenger standing thereon and to engage said tread, means for guiding said treads or platforms along said shaft and from said landing-place back to said starting-place, and means for causing the movement of each of said treads or platforms in engagement with said tread to bring into engagement therewith the next succeeding one of said treads or platforms.

32. In a passenger elevator or conveyer, the combination, with a passengers' starting-place and a passengers' landing-place located at a level different from that of said starting-place, treads or platforms of which each is adapted to support a passenger standing thereon, for each of said treads or platforms a carrier on which it is mounted and to which it is articulately connected, driving-gear adapted to engage each of said carriers and thereby to propel it in the direction from said starting-place toward said landing-place, means for guiding each of said carriers so as during its propulsion as aforesaid to keep it in engagement with said gear and its tread or platform horizontal or approximately horizontal, means for guiding each of said carriers upward or horizontally or approximately so after ceasing to be in engagement with said driving-gear, and means adapted to enable each of said treads or platforms to push forward the next thereof in front of it when being guided upward or horizontally or approximately so as aforesaid.

33. In a passenger elevator or conveyer, the combination, with a passengers' starting-place and a passengers' landing-place located at a level different from that of said starting-place, of treads or platforms of which each is adapted to support a passenger standing thereon, means for guiding each of said treads or platforms so as to keep it horizontal or approximately horizontal on its way from near one of said places to near the other thereof, means for propelling each of said treads or platforms at different velocities at different parts of its said way, and for each of said treads or platforms a handle secured thereto so as to project vertically or approximately vertically upward therefrom when the tread or platform in question is horizontal or approximately horizontal.

34. In a passenger elevator or conveyer, the combination, with a passengers' starting-place and a passengers' landing-place located at a level different from that of said starting-place, of treads or platforms of which each is adapted to support a passenger standing thereon, means for guiding each of said treads or platforms so as to keep it horizontal or approximately horizontal on its way from near one of said places to near the other thereof, means for propelling each of said treads or platforms at different velocities at different parts of its said way, fixed guards which extend from one of said places to the other thereof and between which said frames or platforms are adapted to work, and for each of said treads or platforms a handle arranged outside one of said guards, and secured to said tread or platform so as to project vertically or approximately vertically upward therefrom when the tread

or platform in question is horizontal or approximately horizontal.

35. In a passenger elevator or conveyer, the combination, with a passengers' starting-place and a passengers' landing-place located at different levels, of treads or platforms of which each is adapted to support a passenger standing thereon, carriers to which said treads are hinged at their trailing ends, wheels mounted on said carriers, double guides in the form of closed loops which are so located that their upper longitudinal members extend from the lower of said places to the upper thereof and in which said wheels are adapted to work so that during a journey from said lower to said upper of said places each of said treads will be kept horizontal or approximately horizontal, two rotatable shafts which extend from near one of said places to near the other thereof and of which one is provided with a right-handed screw-thread of comparatively slow pitch at and near the said places and of intermediate quicker pitch and the other provided with a similar but left-handed screw-thread, arms fixed to said carriers and extending toward said shafts, a roller mounted on the outer end of each of said arms and adapted to be engaged by said screw-thread of the corresponding one of said shafts, fixed guards which extend from one of said places to the other thereof and between which said treads or platforms are adapted to work, handles secured to said treads or platforms and arranged outside said guards, means whereby the gaps of varying amount between consecutive treads will be filled up, and means whereby said screw-threaded shafts can be simultaneously rotated at the same speed but in opposite directions.

36. In a passenger elevator or conveyer the combination, with a passengers' starting-place and a passengers' landing-place located at different levels, of treads or platforms adapted to support a passenger standing thereon, carriers to which said treads are hinged at their trailing ends, wheels mounted on said carriers, double guides which are in the form of closed loops so located that their upper longitudinal members extend from a lower stationary platform to an upper stationary platform and in which said wheels are adapted to work so that during a journey from the lower to the upper of said places each of said treads will be kept horizontal or approximately horizontal, two rotatable shafts which extend from near one of said places to near the other thereof and one of which is provided with a right-handed screw-thread of varying pitch and the other is provided with a similar but left-handed screw-thread, arms fixed to said carriers and extending toward said shafts, a roller mounted on the outer end of each of said arms and adapted to be engaged by said screw-threads of the corresponding one of said shafts, fixed guards which extend from one of said places to the other thereof and between which said treads or platforms are adapted to work, handles secured to said treads or platforms and arranged outside said guards, arms fixed to said treads, rollers mounted on the last-mentioned arms, an auxiliary guide which is located near the upper of said places and in which said last-mentioned rollers are adapted to work, and means whereby said screw-threaded shafts can be simultaneously rotated at the same speed but in opposite directions.

37. In a passenger elevator or conveyer, the combination, with a passengers' starting-place, of treads or platforms of which each is formed of a plurality of strips placed edgewise across the treads or platforms in question and adapted to support a passenger standing thereon, carriers to which said treads or platforms are hinged, wheels mounted on parts of said carriers, for each of said carriers strips or laths hinged to and depending therefrom and extending between the strips of an adjacent tread or platform, a guide which is in the form of a loop and in which said wheels are adapted to work, a passengers' landing-place provided with projecting fingers adapted to extend between the strips of each of said treads, fixed guards that extend from one of said places to the other thereof and between which said treads or platforms are adapted to work, and means for causing each of said treads to be moved at a varying speed from said starting-place to said landing-place.

38. In a passenger elevator or conveyer, the combination, with a passengers' starting-place and a passengers' landing-place located at different levels, of treads or platforms of which each is adapted to support a passenger standing thereon, carriers to which said treads are hinged at their trailing ends, wheels mounted on said carriers, double guides which are in the form of closed loops so located that their upper longitudinal members extend from the lower of said places to the upper thereof and in which said wheels are adapted to so work that during a journey from the lower to the upper of said places each of said treads or platforms will be kept horizontal or approximately horizontal, two rotatable shafts, that extend from near one of said places to near the other thereof and of which one is provided with a right-handed screw-thread of varying pitch and the other is provided with a similar but left-handed screw-thread, arms fixed to said carriers and extending toward said shafts, rollers mounted on the outer end of each of said arms and adapted to be engaged by said screw-thread of the corresponding one of said shafts, means whereby after each of said rollers have become disengaged from said screw-threads at the upper of said places they will be brought into position for reëngagement therewith near the lower of

said places and means whereby said screw-threaded shafts can be simultaneously rotated at the same speed but in opposite directions.

39. In a passenger elevator or conveyer, the combination, with a passengers' starting-place and a passengers' landing-place located at different levels, of treads or platforms of which each is adapted to support a passenger standing thereon, carriers to which said treads are hinged at their trailing ends, wheels mounted on said carriers, double guides which are in the form of closed loops so located that their upper longitudinal members extend from the lower of said places to the upper thereof and in which said wheels are adapted to work so that during a journey from said lower to said upper place said treads or platforms will be kept horizontal or approximately horizontal, arms fixed to said treads or platforms, rollers mounted on said arms, an auxiliary guide which is located near the upper of said places and in which said rollers are adapted to work, an auxiliary guide which is located near the lower of said places and in which said rollers secured to said treads or platforms are adapted to work, and means for causing each of said treads or platforms to be moved at a varying speed from said lower to said upper place.

40. In a passenger elevator or conveyer, the combination with a passengers' starting-place and a passengers' landing-place located at different levels, of treads or platforms of which each is adapted to support a passenger standing thereon, carriers to which said treads are hinged at their trailing ends, double guides in the form of closed loops which are so located that their upper longitudinal members extend from the lower of said places to the upper thereof near to which the upper longitudinal members of said loop-shaped guides are for a portion of their length horizontal or approximately horizontal, wheels mounted on said carriers and so adapted to work in said guides that during a journey from said lower place to said upper place each of said treads or platforms is kept horizontal or approximately horizontal, two rotatable shafts which extend from near one of said places to near the other thereof and of which one is provided with a right-handed screw-thread of varying pitch and the other is provided with a similar but left-handed screw-thread, arms fixed to said carriers and extending toward said shafts, rollers mounted on the outer ends of said arms and adapted to be engaged by the screw-threads of said shafts, means whereby when said treads or platforms travel beyond the upper ends of said screw-threaded shafts they will be pushed forward one behind another along said horizontal or approximately horizontal portions of said loop-shaped guides, arms fixed to said treads or platforms, rollers mounted on the last-mentioned arms, an auxiliary guide which is located near the upper of said places and in which the last-mentioned rollers are adapted to work, and means whereby said screw-threaded shafts can be simultaneously rotated at the same speed but in opposite directions.

41. In a passenger elevator or conveyer, the combination, with a passengers' starting-place and a passengers' landing-place located at different levels, of treads or platforms of which each is adapted to support a passenger standing thereon, carriers to which said treads are hinged at their trailing ends, double guides in the form of closed loops which are so located that their upper longitudinal members extend from near the lower of said places to the upper thereof, near to which the upper longitudinal members of said loop-shaped guides are for a portion of their length horizontal or approximately horizontal, wheels mounted on said carriers and so adapted to work in said guides that during a journey from the lower to the upper of said places each of said treads will be kept horizontal or approximately horizontal, two rotatable shafts which extend from near one of said places to near the other thereof and of which one is provided with a right-handed screw-thread of varying pitch and the other is provided with a similar but left-handed screw-thread, arms fixed to said carriers and extending toward said shafts, rollers mounted on the ends of said arms and adapted to be engaged by said screw-threads, fixed guards which extend from one of said places to the other thereof and between which said treads or platforms are adapted to work, handles secured to said treads or platforms and arranged outside said guards, means whereby when said treads or platforms travel beyond the upper ends of said screw-threaded shafts they will be pushed forward one behind another along said horizontal or approximately horizontal portions of said loop-shaped guides, arms fixed to said treads or platforms, rollers mounted on the last-mentioned arms, an auxiliary guide which is located near the upper of said places and in which said rollers are adapted to work, and means whereby said screw-threaded shafts can be simultaneously rotated at the same speed but in opposite directions.

42. In a passenger elevator or conveyer, the combination, with a passengers' starting-place and a passengers' landing-place located at different levels, of treads or platforms of which each is adapted to support a passenger standing thereon, carriers to which said treads or platforms are hinged at their trailing ends, double guides in the form of closed loops which are so located that their upper longitudinal members extend from the lower of said places to the upper thereof near to which the upper longitudinal members of said loop-shaped guides are for a portion of their length horizontal or approximately horizontal, wheels mounted on said carriers and so adapted to work in said guides that during a journey from the lower

to the upper of said places each of said treads or platforms will be kept horizontal or approximately horizontal, two rotatable shafts which extend from near one of said places to near the other thereof and of which one is provided with a right-handed screw-thread of varying pitch and the other is provided with a similar but left-handed screw-thread, arms fixed to said carriers and extending toward said shafts, rollers mounted on the outer ends of said arms and adapted to be engaged by said screw-threads, fixed guards that extend from one of said places to the other thereof and between which said treads or platforms are adapted to work, handles secured to said treads or platforms and arranged outside said guards, means whereby when said treads or platforms travel beyond the upper ends of said screw-threaded shafts they will be pushed forward one behind another along said horizontal or approximately horizontal portions of said loop-shaped guides, arms fixed to said treads or platforms, rollers mounted on the last-mentioned arms, an auxiliary guide which is located near the upper of said places and in which the last-mentioned rollers are adapted to work, an auxiliary guide which is located near the lower of said places and in which said rollers secured to said treads or platforms are adapted to work, and means whereby said screw-threaded shafts can be simultaneously rotated at the same speed but in opposite directions.

43. In a passenger elevator or conveyer, the combination, with a passengers' starting-place and a passengers' landing-place located at different levels, of treads or platforms of which each is adapted to support a passenger standing thereon, carriers to which said treads or platforms are hinged at their trailing ends, wheels mounted on said carriers, double guides in the form of closed loops which are so located that their upper longitudinal members extend from the lower of said places to the upper thereof and in which said wheels are adapted to work so that during a journey from the lower to the upper of said places each of said treads or platforms will be kept horizontal or approximately horizontal, two rotatable shafts that extend from near one of said places to near the other thereof and of which one is provided with a right-handed screw-thread of varying pitch and the other is provided with a similar but left-handed screw-thread, arms fixed to said carriers and extending toward said shafts, rollers mounted on the outer ends of said arms and adapted to be engaged by said screw-threads, arms fixed to said treads or platforms, rollers mounted on the last-mentioned arms, an auxiliary guide which is located near the upper of said places and in which the last-mentioned rollers are adapted to work, an auxiliary guide which is located near the lower of said places and in which said rollers secured to said treads are adapted to work, and means whereby said screw-threaded shafts can be simultaneously rotated at the same speed but in opposite directions.

44. In a passenger elevator or conveyer, the combination with a passengers' starting-place and a passengers' landing-place located at different levels, of treads or platforms of which each is adapted to support a passenger standing thereon, carriers to which said treads or platforms are hinged at their trailing ends, wheels mounted on said carriers, double guides in the form of closed loops which are so located that their upper longitudinal members extend from the lower of said places to the upper thereof and in which said wheels are adapted to work so that during a journey from the lower to the upper of said places each of said treads will be kept horizontal or approximately horizontal, two rotatable shafts which extend from near one of said places to near the other thereof and of which one is provided with a right-handed screw-thread of varying pitch and the other is provided with a similar but left-handed screw-thread, arms fixed to said carriers and extending toward said shafts, rollers mounted on the outer ends of said arms and adapted to be engaged by said screw-threads, fixed guards that extend from one of said places to the other thereof and between which said treads or platforms are adapted to work, handles secured to said treads or platforms and arranged outside said guards, arms fixed to said treads or platforms, rollers mounted on the last-mentioned arms, an auxiliary guide which is located near the upper of said places and in which said rollers are adapted to work, an auxiliary guide which is located near the lower of said places and in which said rollers secured to said treads are adapted to work, and means whereby said screw-threaded shafts can be simultaneously rotated at the same speed but in opposite directions.

45. In a passenger elevator or conveyer the combination, with a passengers' starting-place and a passengers' landing-place located at different levels, of treads or platforms of which each is adapted to support a passenger standing thereon, carriers to which said treads or platforms are hinged at their trailing ends, double guides in the form of closed loops which are so located that their upper longitudinal members extend from the lower of said places to the upper thereof near to which the upper longitudinal members of said loop-shaped guides are for a portion of their length horizontal or approximately horizontal, wheels mounted on said frames and so adapted to work in said guides that during a journey from the lower to the upper of said places said treads or platforms will be kept horizontal or approximately horizontal, parts secured to said treads or platforms and adapted when said carriers are at said horizontal or approxi-

mately horizontal portion of said loop-shaped guides, to come into contact with and push forward the adjacent advance carrier, arms fixed to said treads or platforms, rollers mounted on the last-mentioned arms, an auxiliary guide which is located near the upper of said places and in which said rollers are adapted to work, and means whereby said screw-threaded shafts can be simultaneously rotated at the same speed but in opposite directions.

46. In a passenger elevator or conveyer, the combination, with a passengers' starting-place and a passengers' landing-place located at different levels, of treads or platforms of which each is adapted to support a passenger standing thereon, carriers to which said treads or platforms are hinged at their trailing ends, wheels mounted on said carriers, double guides in the form of closed loops which are so located that their upper longitudinal members extend from the lower of said places to the upper thereof and in which said wheels are adapted to work so that during a journey from the lower to the upper of said places said treads or platforms will be kept horizontal or approximately horizontal, a guard-rail also in the form of a closed loop and so arranged as to limit the tilting of said treads or platforms about their pivots, two rotatable shafts which extend from near one of said places to near the other thereof and of which one is provided with a right-handed screw-thread of varying pitch and the other is provided with a similar left-handed screw-thread arms fixed to said carriers and extending toward said shafts, rollers mounted on the outer ends of said arms and adapted to be engaged by the screw-threads of said shafts, arms fixed to said treads or platforms, rollers mounted on the last-mentioned arms, an auxiliary guide which is located near the upper of said places, and in which said rollers are adapted to work, an auxiliary guide which is located near the lower of said places and in which said rollers secured to said treads are adapted to work and means whereby said screw-threaded shafts can be simultaneously rotated at the same speed but in opposite directions.

47. In a passenger elevator or conveyer, the combination, with a passengers' starting-platform, of treads or platforms of which each is formed of a plurality of strips placed edgewise across the corresponding tread or platform and is adapted to support a passenger standing thereon, carriers to which said treads or platforms are hinged, wheels mounted on parts of said carriers, strips or laths hinged to and depending from said carriers and adapted to extend between the said strips of an adjacent tread or platform, a guide in the form of a loop in which said wheels are adapted to work, for each of said carriers a hook or hooks secured thereto and adapted to engage the next succeeding one of said carriers, a passengers' landing-place provided with projecting fingers adapted to extend between the strips of each of said treads or platforms, and means for causing said treads or platforms to be moved at a varying speed from said starting-place to said landing-place.

48. In a passenger elevator or conveyer, the combination, with a passengers' starting-place, of treads or platforms of which each is formed of a plurality of strips placed edgewise across the corresponding tread or platform, and adapted to support a passenger standing thereon, carriers to which said treads or platforms are hinged at their trailing ends, wheels mounted on parts of said carriers, a guide in the form of a closed loop in which said wheels are adapted to work, strips hinged to and depending from each of said carriers and extending between strips of an adjacent tread or platform, for each of said carriers a hook or hooks secured thereto and adapted to engage the next succeeding one of said carriers, a passengers' landing-place provided with projecting fingers adapted to extend between said strips of each of said treads or platforms, two rotatable shafts which extend from near one of said places to near the other thereof and of which one is provided with a right-handed screw-thread of varying pitch and the other is provided with a similar left-handed screw-thread, arms fixed to said carriers and extending toward said shafts, rollers mounted on the outer ends of said arms and adapted to be engaged by said screw-threads of said shafts, fixed guards which extend from one of said places to the other thereof and between which said treads or platforms are adapted to work, handles secured to said treads or platforms and arranged outside said guards, arms fixed to said treads or platforms, rollers mounted on the last-mentioned arms, an auxiliary guide which is located near the upper of said places and in which said rollers are adapted to work, an auxiliary guide which is located near the lower of said places and in which said rollers secured to said treads are adapted to work, a guard-rail in the form of a closed loop so arranged as to limit the turning of said treads or platforms about their hinges, and means whereby said screw-threaded shafts can be simultaneously rotated at the same speed but in opposite directions.

49. In conveying apparatus, a rotatable shaft formed with a right-handed screw-thread, a similar rotatable shaft formed with a corresponding but left-handed screw-thread, supports, means whereby said supports are engaged by said threads, and means for rotating said shafts simultaneously in opposite directions but at corresponding speeds.

50. In conveying apparatus, a rotatable shaft formed with a right-handed screw-thread of varying pitch, a similar rotary shaft formed with a corresponding but left-handed screw-thread, supports, means whereby said supports are engaged by said threads, and means

for rotating said shafts simultaneously in opposite directions but at corresponding speeds.

51. In conveying apparatus, a rotatable shaft formed with a screw-thread that is of small pitch at or near starting and landing places but is of increased pitch between said places, supports and means whereby said supports are engaged by said thread.

52. In conveying apparatus, a rotatable shaft formed with a right-handed screw-thread that is of small pitch at or near starting and landing places but is of increased pitch between said places, a similar rotatable shaft formed with a corresponding but left-handed screw-thread, supports, means whereby said supports are engaged by said threads, and means for rotating said shafts simultaneuosly in opposite directions but at corresponding speeds.

53. In conveying apparatus, a rotatable shaft formed with a screw-thread of varying pitch, supports, means whereby said supports are engaged by said thread, and means for retaining each of said supports in a horizontal or approximately horizontal position during a journey from a starting-place to a landing-place.

54. In conveying apparatus, supports, means for driving each of said supports at different speeds at different portions of its travel from a starting-place to a landing-place, and means adapted to extend across and bridge the space between each of said supports and the succeeding one thereof notwithstanding the variation of the said space that will be produced by the varying velocities of said supports.

55. In conveying apparatus, supports, means for driving each of said supports at different speeds at different portions of its travel from a starting-place to a landing-place, and a riser device for each of said supports and articulately connected therewith and extending therefrom and having with the next succeeding one of said supports a connection adapted to allow of longitudinal motion of said riser device in relation thereto.

56. In conveying apparatus, supports comprising a plurality of parallel bars or strips, means for driving each of said supports at different speeds at different portions of its travel from a starting-place to a landing-place, and for each of said supports, a riser device which comprises a plurality of strips or slats mounted between the aforesaid bars or strips and articulately connected with the corresponding one of said supports and extending therefrom to and having with the next succeeding one of said supports, a connection adapted to allow of longitudinal motion of said riser device in relation thereto.

57. In conveying apparatus, guideways having straight runs, supports coöperating with said guideways, operating means coöperating with said guideways at said straight runs to operate said supports along said guideways and means loosely connecting said supports to operate said supports from one another when disconnected from said operating means.

58. In conveying apparatus, guideways having straight runs, supports coöperating with said guideways, screw operating means coöperating with said guideways at said straight runs to engage and operate said supports along said guideways, said supports operating one another when disengaged from said screw operating means.

59. In conveying apparatus, guideways having straight runs, supports coöperating with said guideways, screw operating means adjacent said straight runs to engage and operate said supports along said runs at varying speed and said supports operating one another along said guideways when disengaged from said screw operating means.

60. In conveying apparatus, guideways comprising straight runs, supports coöperating with said guideways and means to operate said supports along said straight runs with substantially uniform change of speed during portions of said runs.

61. In conveying apparatus, supports, carriers movably mounted on said supports, a screw-shaft having a thread of varying pitch operating said supports at varying speed and one support engaging and operating another during part of its travel when disengaged from said screw-shaft.

62. In conveying apparatus, supports, carriers on which said supports are movably mounted, right and left handed screw-shafts having threads of varying pitch to operate said carriers at varying speed, one support engaging the adjacent support when disengaged from said screws.

63. In conveying apparatus, supports and a screw-shaft having a thread of varying pitch to operate said supports at varying speed.

64. In conveying apparatus, supports and right and left handed screw-shafts having threads of varying pitch to operate said supports at varying speed.

65. In conveying apparatus, guideways comprising straight runs, supports coöperating with said guideways and means to operate said supports along said straight runs with substantially uniform change of speed adjacent an end of said run.

66. In conveying apparatus, guideways comprising straight runs, supports coöperating with said guideways, means comprising a screw member to operate said supports at varying speed along said straight runs.

67. In conveying apparatus, guideways, supports coöperating with said guideways and means comprising a screw member to move said supports along said guideways with a substantially uniform change of speed through portions of said guideways.

68. In conveying apparatus, supports, and a

screw-shaft provided with a thread having substantially uniformly varying pitch throughout a part of the same to operate said supports with substantially a uniform change of speed throughout a part of their travel.

69. In conveying apparatus, supports and oppositely-rotating right and left handed screws provided with threads having substantially uniformly varying pitch throughout part of the same to operate said supports with substantially uniform change of speed during part of their travel.

70. In conveying apparatus, supports, carriers upon which said supports are movably mounted, means to operate said supports and carriers and guides engaging said supports and maintaining them in substantially horizontal position while moving in curved paths.

71. In conveying apparatus, supports, carriers on which said supports are movably mounted, guideways having curved portions coöperating with said carriers and auxiliary guides engaging said supports and maintaining them in substantially horizontal position while moving around the curved portions of said guideways.

72. In conveying apparatus, guideways, supports coöperating with said guideways, a guard adjacent said guideways and coöperating with said supports at one side of the same, handles mounted on said supports and projecting beyond said guard and means to move said supports along said guideways at varying speeds.

73. In conveying apparatus, guideways, supports coöperating with said guideways, a guard adjacent said guideways and coöperating with said support at one side of the same and supporting devices mounted on said supports adjacent said guard.

Signed at 75 to 77 Cornhill, London, England, this 20th day of February, 1903.

BENJAMIN RATCLIFFE ADKINS.
WILLIAM YORATH LEWIS.

Witnesses:
PERCY E. MATTOCKS,
WM. D. BROWN.