No. 744,457. PATENTED NOV. 17, 1903.

E. BALTZLEY.

TRAVELING CONVEYER.

APPLICATION FILED JULY 3, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

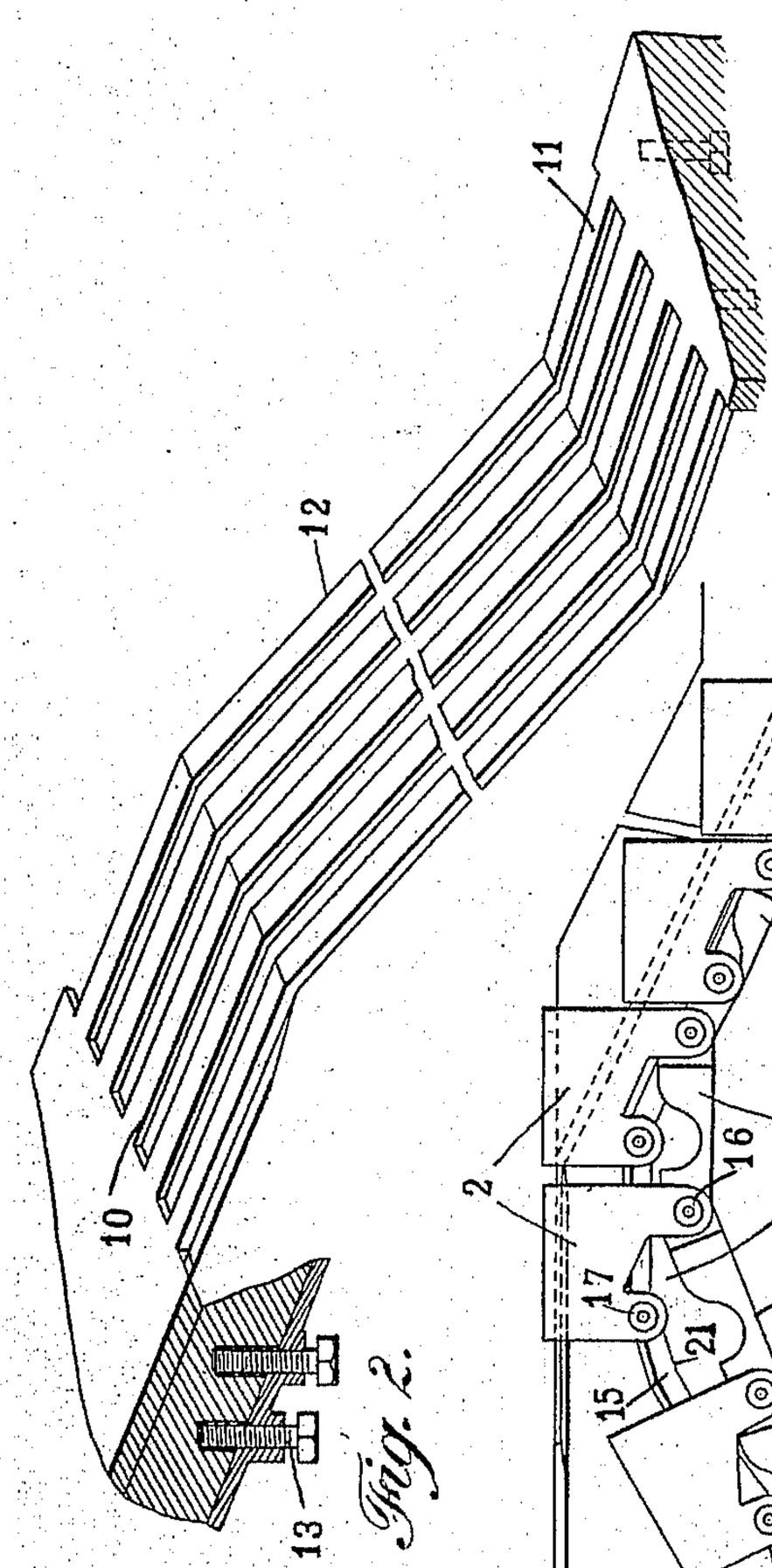

Fig. 2.

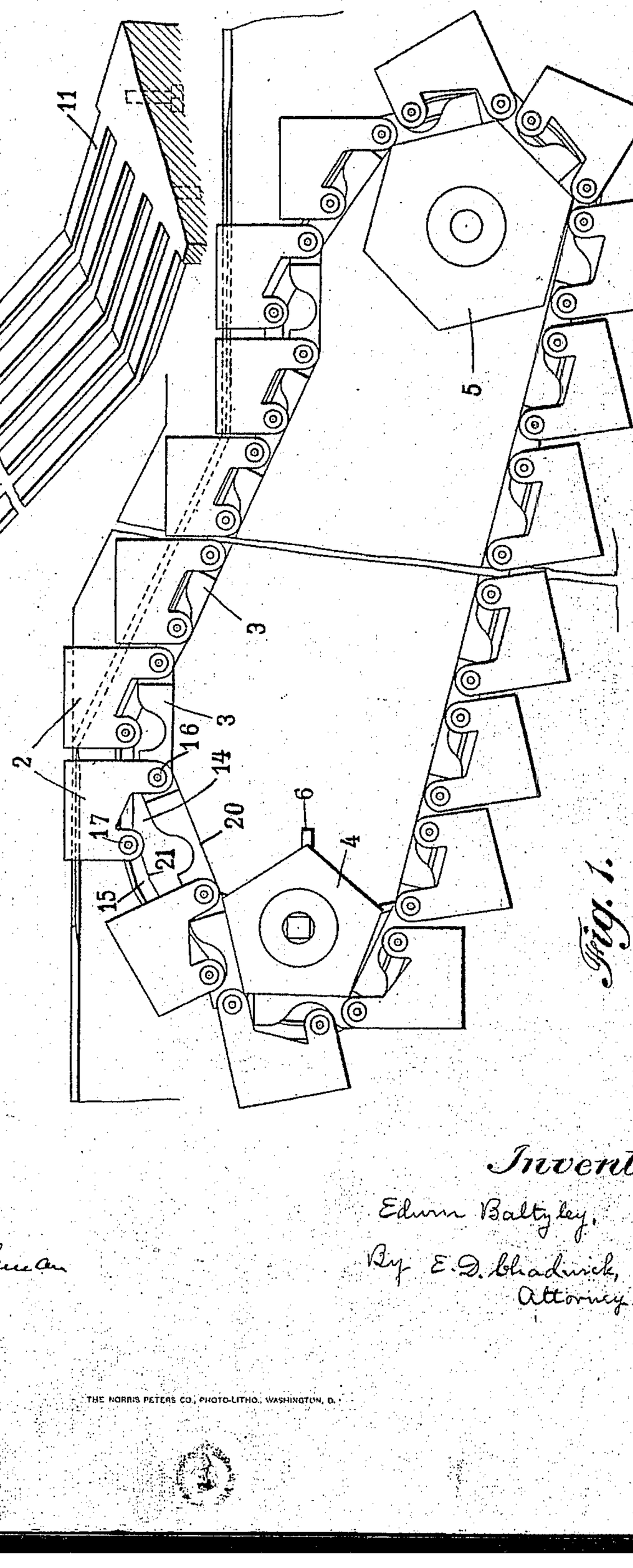

Fig. 1.

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Edwin Baltzley.
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150. CONVEYERS- POWER DRIVEN.

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NO MODEL. 3 SHEETS—SHEET 2.

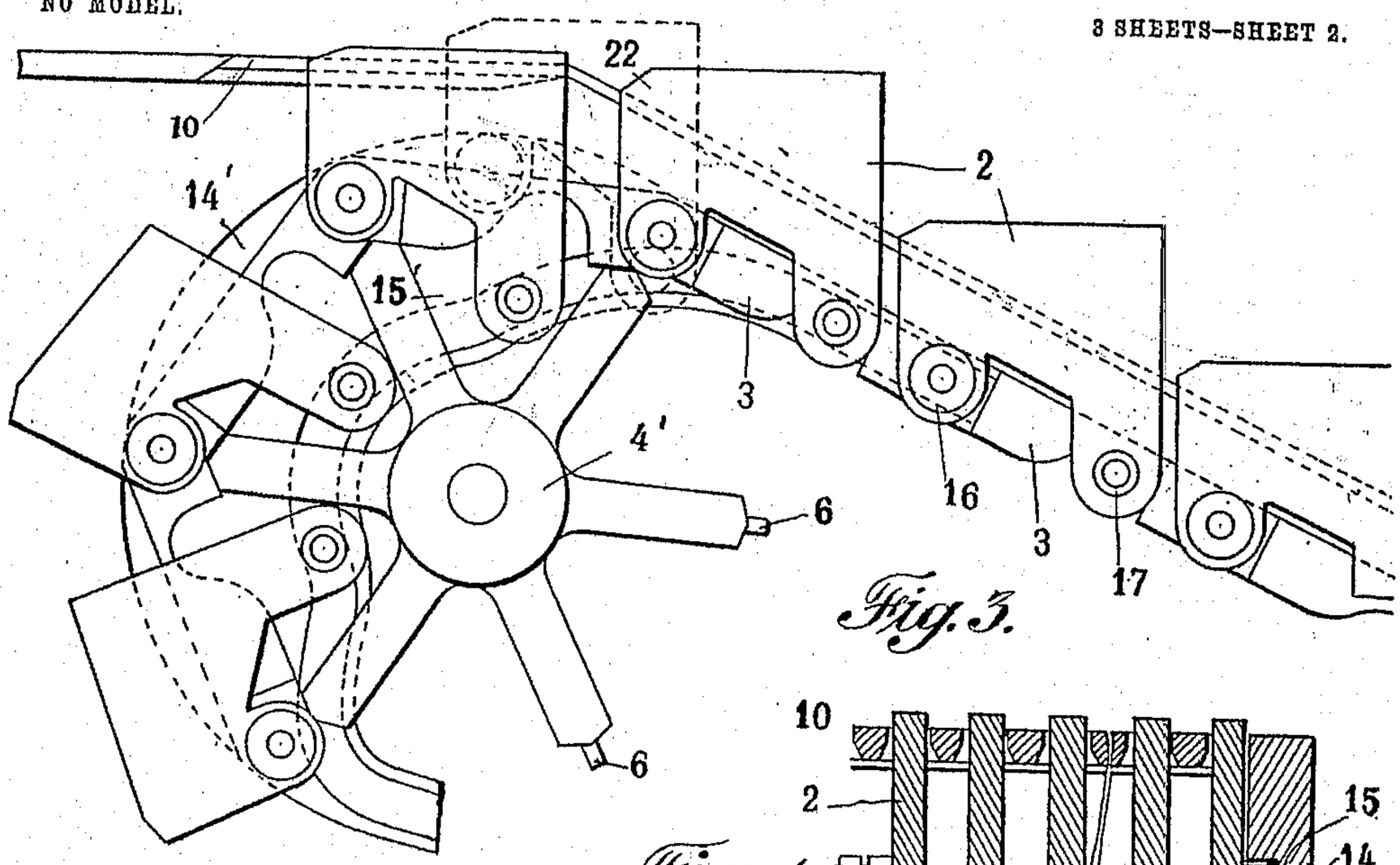

Fig. 3.

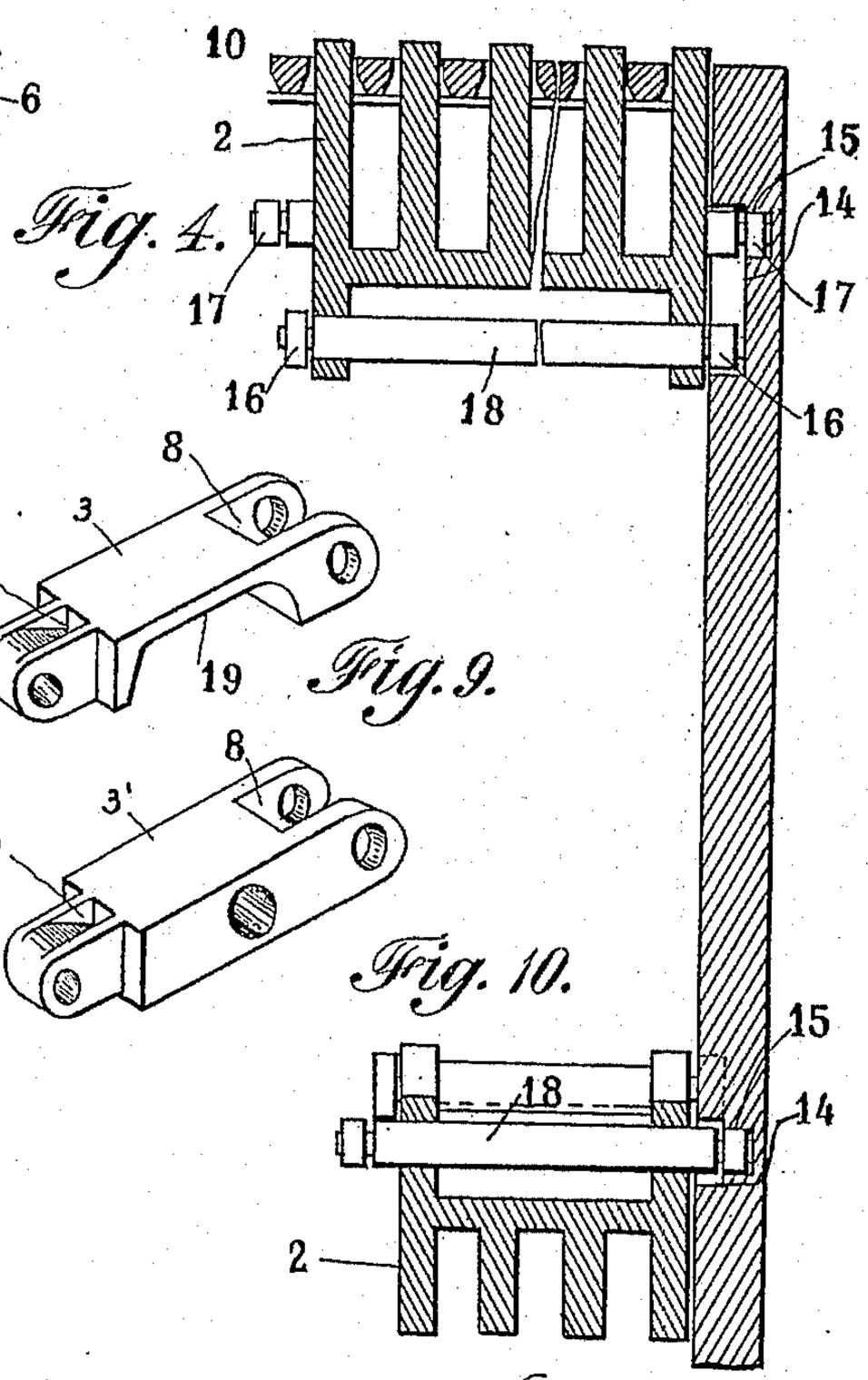

Fig. 4.

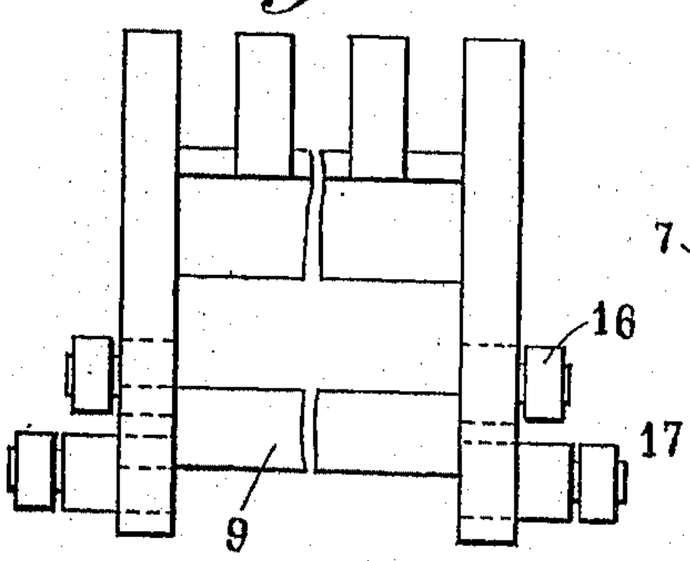

Fig. 7.

Fig. 9.

Fig. 10.

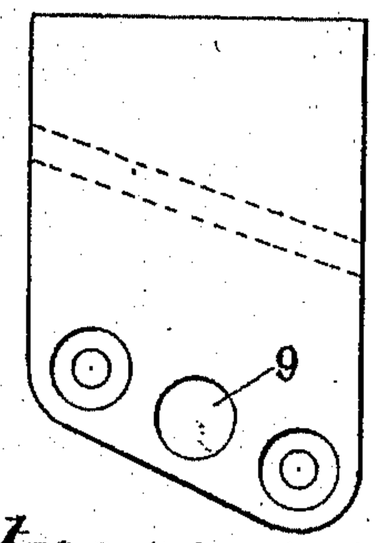

Fig. 8.

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198. CONVEYERS- POWER DRIVEN.

No. 744,457. PATENTED NOV. 17, 1903.

E. BALTZLEY.

TRAVELING CONVEYER.

APPLICATION FILED JULY 3, 1903.

NO MODEL. 3 SHEETS—SHEET 3.

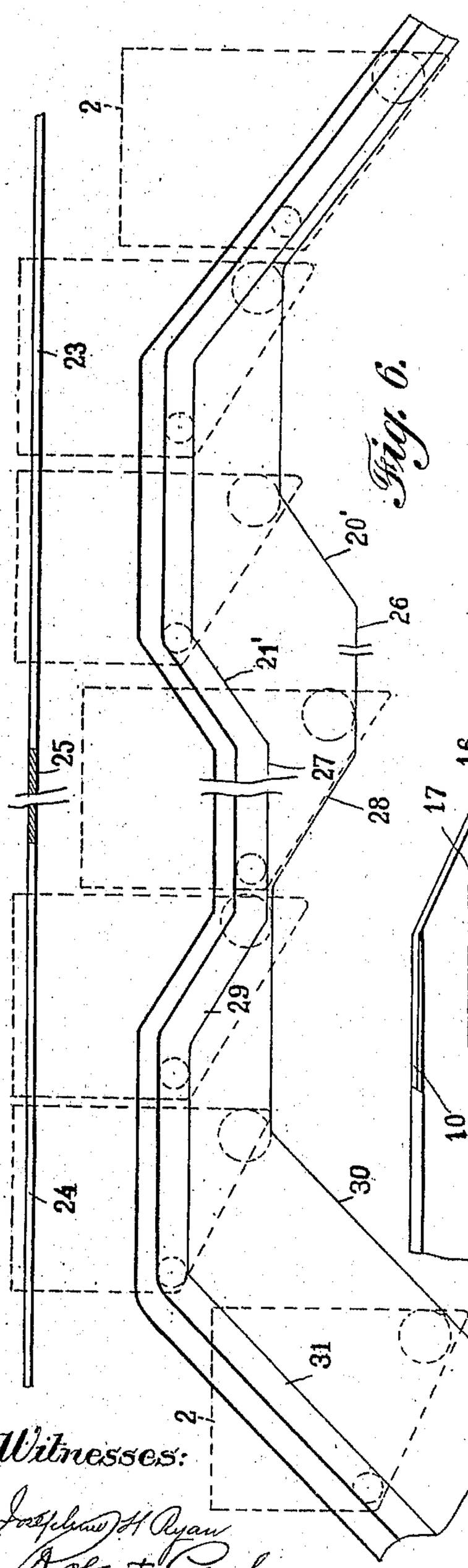

Fig. 6.

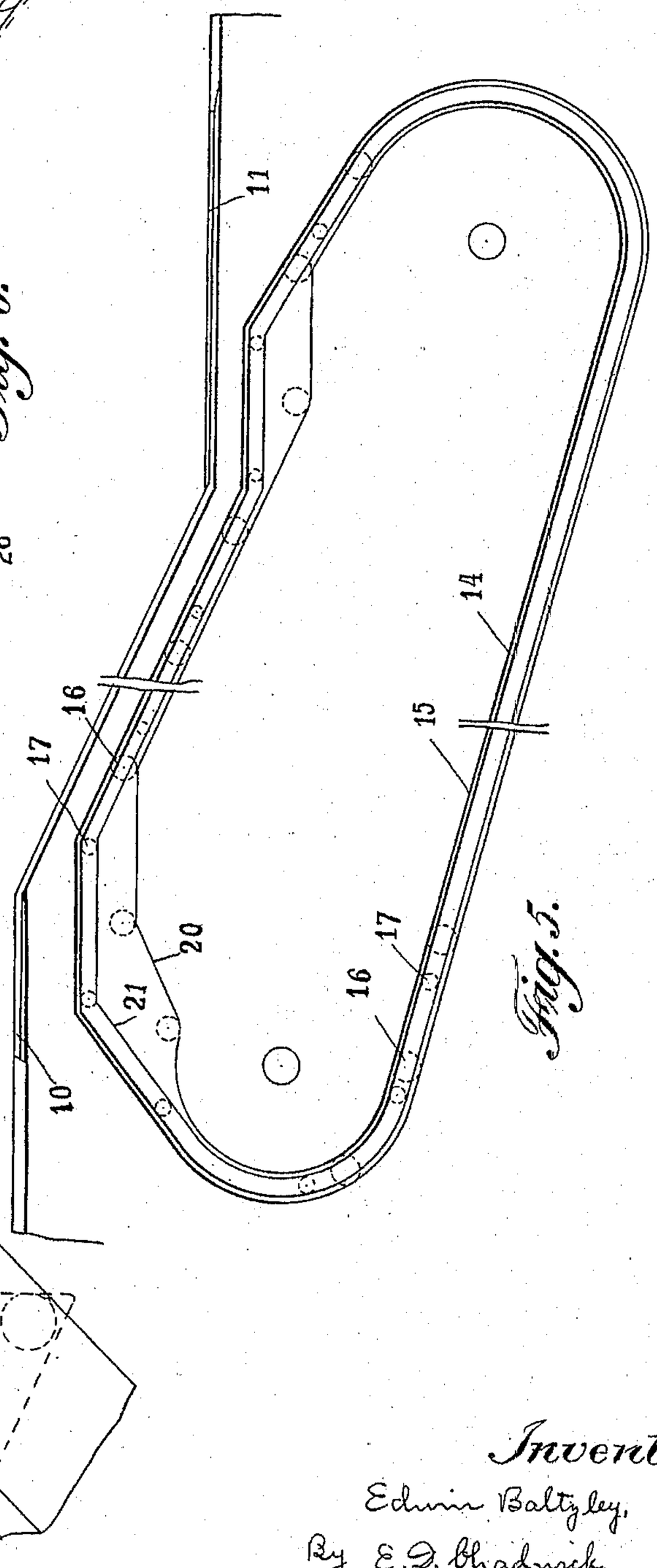

Fig. 5.

Witnesses:

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Edwin Baltzley,

By E. G. Bradwick,

Attorney.

No. 744,457. Patented November 17, 1903.

UNITED STATES PATENT OFFICE.

EDWIN BALTZLEY, OF WASHINGTON, DISTRICT OF COLUMBIA.

TRAVELING CONVEYER.

SPECIFICATION forming part of Letters Patent No. 744,457, dated November 17, 1903.

Application filed July 3, 1903. Serial No. 164,108. (No model.)

To all whom it may concern:

Be it known that I, EDWIN BALTZLEY, a citizen of the United States, and a resident of Washington, in the District of Columbia, have invented certain new and useful Improvements in Traveling Conveyers, of which the following is a specification.

This invention is designed to provide certain improvements in traveling conveyers of that type in which a series of treads forming or connected to an endless belt is propelled continuously in a predetermined path in such manner that a person standing on one of the tread-surfaces will be carried thereby from one point to another without effort on his part.

My improvements relate more particularly to conveyers in which the tread-surfaces are grated and are arranged to coöperate with stationary grated landings at the points where passengers step upon and leave the traveling belt, and are herein shown and described as embodied in an escalator or traveling stairway for carrying persons from one elevation to another, such being the most common use for conveyers of the type above referred to.

The main features of my invention, however, relate to the taking on and landing of passengers regardless of the direction in which the passengers are carried between the landings. In prior escalators provision has been made for carrying passengers for a suitable distance in a horizontal direction at the upper and lower ends of the flight subsequently to picking them up from or prior to depositing them upon a landing, the passengers being picked up on or deposited by the tread-surfaces, as the case may be, while the latter were moving at the maximum horizontal speed attained by them during their travel, this speed being of course equal to the normal speed of the endless chain or belt of which the tread-surfaces are elements. In such case a passenger must evidently experience a maximum change of motion in getting on or off the escalator and, by reason of the danger to the passenger which would result from giving a high speed to the belt such speed has necessarily been slow, and the capacity of these prior escalators has been correspondingly limited.

A main object of my invention is to provide an escalator or similar traveling conveyer which will pick up and deposit passengers without causing them to undergo so abrupt a change of motion with a given belt speed, as has been necessary heretofore, and thus to minimize the discomfort and danger to the passengers when they are taken up and deposited or, what amounts to the same thing, to increase the capacity of the conveyer, assuming that the horizontal speed heretofore employed at the points of taking up and landing passengers is a safe and practicable speed. With this object in view I provide means whereby the grated treads are caused to interleave with the grated landings at a greater elevation than the surfaces of the latter, the horizontal speed of the tread-surfaces being then gradually reduced until said surfaces disappear through the grated landings, and thus deposit the passenger on the latter, so that the passenger when deposited upon the landing is caused to undergo a change of motion which corresponds with that of the reduced horizontal speed of the treads and is less than would be imparted by the actual belt speed. Conversely, in picking up a passenger from a grated landing the grated tread-surfaces of my conveyer rise through the landing while moving at a less horizontal speed than the actual belt speed, and after the passenger has thus been picked up by the treads his horizontal speed is gradually increased, and he is then carried up or down the flight or in any other desired direction.

It is one of the features of my invention that the grated tread-surfaces of my conveyer are caused to interleave with and travel for a suitable distance above the surface of the landing prior to disappearing through the same, so that the passenger is carried completely over the landing before being deposited thereon, and his feet come in contact instantaneously with a stationary part from which he can move off forwardly in a natural manner without undergoing any confusing imparted motion.

My invention also includes certain constructional features and details, such as steps, guides, and other parts hereinafter described.

My improvements as embodied in an escalator are illustrated in the accompanying drawings, which are diagrammatic in their nature and are not intended to represent with exactness the details of commercial construction.

In the drawings, Figure 1 is a side elevation of the moving parts of one arrangement of my escalator, showing also landings properly related to the upper and lower ends thereof. Fig. 2 is a perspective view of the landings, showing also an intermediate grating which I prefer to employ, together with means for adjusting the landings vertically. Fig. 3 is a side elevation similar to Fig. 1, showing the upper end of an escalator of modified construction. Fig. 4 is a transverse section through the guideways at one side of the escalator, showing the relation of the steps thereto and to the upper landing. Fig. 5 is an elevation showing guideways employed with the construction shown in Fig. 1. Fig. 6 is a view showing an arrangement of the guideways and related landings suitable for use at the upper end of an ascending and descending escalator. Figs. 7 and 8 are respectively a rear view and a side elevation of a step. Figs. 9 and 10 are perspective views illustrating different forms of links.

Referring to the drawings, my traveling conveyer is therein represented as composed of a number of steps or tread-sections 2, each of which is pivotally connected with an endless belt composed of connected links 3, so that the steps provide in their operation an endless series of tread-surfaces. This belt will preferably consist of two or more chains of links, so that if a link in one chain breaks the remaining chain or chains will hold the steps in proper relation. The endless series of links and steps shown in Fig. 1 passes over two sprocket-wheels 4 and 5, located, respectively, at the ends of the escalator and is driven by power applied to either of the sprocket-wheels in any suitable manner. In the drawings the upper sprocket-wheel 4 is shown as the driving-wheel, being provided with a number of spurs or teeth 6, each adapted to enter a socket 7 cut in each of the links when driving the endless belt in one direction and to enter the mortises 8 in said links when the belt is driven in the opposite direction. The constructions shown in the drawings are adapted to be driven in either direction to provide an ascending or descending escalator, as may be desired.

Each of the steps 2 is so pivoted to the endless belt of links that it is capable of an independent pivotal movement sufficient to enable it to assume various angles with respect to the path of the belt, and thus to follow guideways, whereby the tread-surfaces are maintained in proper position to support a passenger so long as he remains thereon. In Fig. 1 the rear sides of the steps are pivoted to the links, regarding this figure as showing an ascending escalator, while in Fig. 3 the forward sides of the steps are pivoted to the links. The step shown in Figs. 7 and 8 is provided with a central axis 9, adapted to serve as a connection with the links, and with either of these arrangements the steps may be pivoted to either end of the links or to the center thereof, the former construction being shown in Figs. 1 and 3, and a link 3′ suitable for the latter construction being shown in Fig. 10. In each case the links are located between the downwardly-extending ends of the steps.

The tread-surfaces of the several steps are grated, as shown in Figs. 4 and 7, and at or near the ends of the escalator are located grated landings 10 and 11, arranged to interleave with the grated steps successively. By preference the grated landings are connected by an inclined grating 12, as shown in Fig. 2. These grated landings are preferably made adjustable by suitable means, such as screws 13, so that they can be moved up or down to adjust them to any desired height with respect to the maximum elevation of the tread-surfaces at the landings.

The steps 2 are guided in their travel and their tread-surfaces are kept level while exposed above and between the landings by means of suitable guides or guideways 14 and 15, in which travel antifriction-rollers 16 and 17, journaled on the ends of each step, near its front and rear sides. In case these rollers are journaled on axes 18, extending from end to end of the steps, as shown in Fig. 4, each link 3 is provided with a recess 19 to receive the axis at the free side of the corresponding step and provide for a sufficient pivotal movement thereof. These guideways are located outside the vertical plane of the ends of the steps, as shown in Fig. 4, and one of them, as 15, is preferably contained within the boundaries of the other, being narrower than the latter and extending farther inward. These guideways preferably coincide with each other in direction on the ascending or descending incline and along the return-path of the belt; but at the ends of the incline these guideways diverge in such manner as to keep the tread-surfaces substantially parallel with the landings for a short distance from each end of the incline.

The path of the steps at the ends of the incline is such that the grated treads enter the landing toward which they are moving at a distance above the surfaces of the latter, and after the interleaving of the treads with the landing has been accomplished the horizontal speed of the tread-surfaces is reduced by causing the steps to move in a path forming a suitable angle with the horizontal landings, whereby the belt speed as communicated to the treads is divided between the vertical and the horizontal, thus reducing the latter component of the motion of the treads. This results in diminishing the horizontal velocity of the passenger, so that when he is deposited upon the grated landing by the disappearance of the tread-surfaces through the same he is caused to undergo a less change of motion than would be experienced if he were landed at the actual belt speed. This result is accomplished according to the construction shown in Fig. 1 by providing the guideways 14 and 15 with inclined portions 20 and 21, down

which the rollers on the steps move successively at the actual belt speed, or substantially so, and during their movement along these inclined portions the tread-surfaces pass through the landing. At the lower end of the inclined portions of the guideways the belt and steps reach the upper sprocket-wheel and pass around the same and then back to the lower sprocket-wheel.

According to the arrangement shown in Fig. 3, the sprocket-wheel 4′ itself takes up the belt and the forward ends of the steps successively at the upper end of the inclined grating and becomes a guide therefore throughout the succeeding half-revolution of the sprocket-wheel, considering this figure to show an ascending escalator, the free ends of the steps being guided by the inner guideway 15′ to preserve their tread-surfaces horizontal. With this arrangement the successive tread-surfaces reach the position of maximum elevation when that arm of the sprocket which engages them reaches a vertical position and then begin to descend at an angle to the horizontal, thereby gradually reducing the horizontal component of the belt speed and effecting the landing of the passenger, as above described. In this figure I show the steps journaled to the belt at their forward or front side, while in Fig. 1 the rear side of each step is journaled to the belt, as previously described. With the construction shown in Fig. 3 it is not essential that there should be any guideways for the journaled ends of the steps from the point at which they are engaged by the sprocket-wheel 4′ onto the lower sprocket-wheel, because at said point the sprocket-wheel itself becomes a guide for the steps, and the outer guideway 14′ may be widened at this point to free it from frictional contact with the rollers carried by the steps, but in practice I prefer to make the guideways continuous, so as to control the steps throughout their travel. The inner guideways especially should be continuous throughout the path of the belt for the purpose of preventing the rollers 16 from getting into them. To this end also the rollers 16 are preferably made somewhat larger than the roller 17, as shown in Fig. 3.

It will be understood, in connection with the foregoing description of the landing of a passenger at a reduced horizontal speed, that at the taking-on landings the same constructions will result in picking up a passenger at a less horizontal speed than the actual belt speed and therefore with less danger and discomfort to the passenger.

It is desirable to land passengers at the earliest practicable instant after they reach the level of a landing, for that is the psychological instant for landing, and the passenger naturally follows the sequential movements of a finished ride along the incline by taking a step and walking off in the forward direction open to him as soon as the end of the incline is reached. If the landing of the passenger is delayed beyond this point, an act of decision is required in getting off the moving tread and walking away which is more or less confusing, especially when the escalator is crowded with passengers. At the lower end of a descending flight it is desirable to give the steps a horizontal movement for a distance at least equal to the width of a step before landing a passenger in order to remove him from the path of the step next following the one he is on, and the arrangement shown in Fig. 1, which may be either an ascending or descending escalator, makes provision for doing this and also provides for a similar horizontal movement before landing at the upper end of the flight in case it is used as an ascending escalator. It is not necessary, however, to provide for so much of a horizontal movement at the upper end of an ascending flight, and in this case the landing may be accomplished more quickly, as by the construction shown in Fig. 3.

I prefer to bevel the forward upper corners of the steps, as at 22, in order to provide against any possible danger of an advancing step striking the heel of a passenger after he has landed in case he has failed to walk forward and off the landing. This bevel is sufficient to pass under the heel of a passenger and lift his foot by a wedging action until the step has disappeared beneath the grating.

The arrangement shown in Fig. 1 when used either as an ascending or as a descending escalator provides also for taking up a passenger from either landing at a horizontal speed which is less than the natural belt speed and then moving him horizontally a short distance at the actual belt speed prior to ascending or descending the incline, as the case may be. This arrangement is desirable, because opportunity is thereby provided for imparting to the passenger the maximum speed at which he enters upon the incline in either direction, and he is not obliged to accommodate himself to a change of motion so close to the end of the incline as might cause confusion and danger of falling.

In Fig. 6 I have shown an arrangement whereby a continuous conveyer comprising grated steps, such as previously described, may be employed for carrying passengers in either direction, provision being made for landing and picking up passengers going in either direction at the top of the incline. In this arrangement the grated portions 23 and 24 of the landing extend in opposite directions from a central portion 25, which need not be grated and which may serve as a passage-way across which passengers may pass in a lateral direction. In this figure the flight shown on the right is assumed to be the ascending flight, the steps, guideways, and links being constructed and arranged as shown in Fig. 1 and the guideways being provided with inclined portions 20′ and 21′ for effecting a reduction of the horizontal speed of the passenger prior to landing him, as pre-

viously described. After a step has passed down the inclined portions 20′ and 21′ it reaches horizontal portions 26 and 27, along which it travels entirely beneath the central portion 25 of the landing, and it then passes into inclined portions 28 and 29, which cause the grated surface of the step to rise through the portion 24 of the landing at a reduced horizontal speed suitable for picking up a passenger. The step then moves horizontally for a short distance until it is free from the landing and then passes down the descending incline, the guideways for this incline being shown at 30 and 31. These latter guideways, it will be noted, are not practically coincident, as are the guideways on the ascending incline; but this fact is merely an incidental result of journaling the rollers to the ends of the steps at unequal distances from the tread-surfaces of the steps, and it is to be understood that the guideways will in all cases be laid out and arranged so as to preserve the tread-surfaces in the desired position, according to the location of the rollers on the steps.

I am aware that in prior constructions of this general character grated tread-surfaces have been caused to interleave with stationary grated landings while moving in a horizontal direction; but this interleaving action and the landing of the passenger has occurred while the surfaces of the treads and the landing were flush, or substantially so, in which case the toe of the passenger first engages the landing, and his foot is thereafter driven onto the landing by the traction of his heel upon the advanced treads. By my construction, however, in which the tread-surfaces enter the grated landing above the surface of the latter and then pass down through it, the passenger is deposited instantaneously on the stationary landing without friction or previous contact of his feet with the landing, so that the entire surface adjacent to his feet at the instant of landing is wholly stationary, and no confusion can result from contact of his feet with two parts, one of which is stationary and the other in motion.

I claim as my invention—

1. The combination with a series of treads forming an endless belt and having grated surfaces, and means for propelling the same continuously in a predetermined path, of a grated landing arranged to interleave with the tread-surfaces successively, and means for causing said tread-surfaces to pass through the upper surface of the landing at a less horizontal speed than the horizontal speed of said tread-surfaces at adjacent points of their exposed travel.

2. The combination with a series of treads forming an endless belt and having grated surfaces, and means for propelling the same along an incline, of a grated landing located adjacent to the upper end of the incline and arranged to interleave with the tread-surfaces successively, and means for causing said tread-surfaces to pass through the upper surface of the landing at a less horizontal speed than the actual propelling speed.

3. The combination with a series of treads forming an endless belt and having grated surfaces, and means for propelling the same along an incline, of a grated landing located adjacent to the upper end of the incline and arranged to interleave with the tread-surfaces successively, and means for causing said tread-surfaces to pass through the surface of said landing after having traveled above said landing throughout their lengths.

4. The combination with a series of treads forming an endless belt and having grated surfaces, and means for propelling the same, of a grated landing, and means for causing said tread-surfaces to interleave with and travel forwardly over said landing and subsequently to pass through the upper surface thereof at a less horizontal speed than the longitudinal speed of said tread-surfaces adjacent to the landing.

5. The combination of a series of steps forming an endless belt and having grated tread-surfaces, a grated landing arranged to interleave with said surfaces successively, guideways for said steps, and means for propelling the latter along said guideways, each of said guideways comprising a downwardly-inclined unloading portion located beneath said landing.

6. The combination of a series of steps forming an endless belt and having grated tread-surfaces, a grated landing arranged to interleave with said surfaces successively, guideways for said steps each comprising an inclined portion located beyond said landing, an inclined portion located beneath the landing, and a third portion connecting said inclined portions and extending substantially parallel with the landing, and means for propelling said steps along said guideways.

7. The combination with a series of treads forming an endless belt and having grated surfaces, and means for propelling the same, of a landing having grated end portions, and means for causing said tread-surfaces to interleave with the grated ends of said landing successively and to pass downward and beneath the central portion thereof.

8. The combination of a series of steps forming an endless belt and having grated tread-surfaces, a landing having grated end portions, guideways for said steps comprising horizontal portions arranged to cause said steps successively to interleave with the landing with their tread-surfaces above the level of said landing, an intermediate horizontal portion arranged to cause the tread-surfaces of said steps to pass beneath the central portion of said landing, inclined portions connecting said horizontal portions, and inclined portions serving as ascending and descending inclines respectively, and means for propelling said steps along said guideways.

9. The combination with a series of steps having grated tread-surfaces and forming an endless belt, and means for propelling the same, of guideways for said steps located adjacent to the ends thereof, one of said guideways being wider than the other and the latter guideway being located within the former, and guides connected to said steps and movable in said guideways.

10. In a traveling conveyer, the combination of a chain composed of a series of connected links and a series of steps each pivoted midway between its front and rear sides to one of said links.

11. In a traveling conveyer, the combination of a series of links connected to form an endless chain, and a series of steps each pivoted to the center of one of the links.

12. In a traveling conveyer, the combination of a series of connected links forming an endless chain, a series of steps each pivotally connected thereto, each of said links being provided with a socket, and means for propelling said chain comprising a spocket-wheel having projections adapted to enter said sockets successively.

13. In a traveling conveyer, the combination of a series of steps having downwardly-extending end portions provided with bearings on their outer faces, and an endless belt located between said end portions and pivotally secured thereto.

In testimony whereof I have hereunto subscribed my name this 1st day of July, 1903.

EDWIN BALTZLEY.

Witnesses:

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JOSEPHINE H. RYAN.