Oct. 19, 1926. 1,603,475

F. KRUCKENBERG

ARRANGEMENT FOR THE INTENSIVE TRANSPORTATION OF PERSONS

Filed Jan. 24, 1925 2 Sheets-Sheet 1

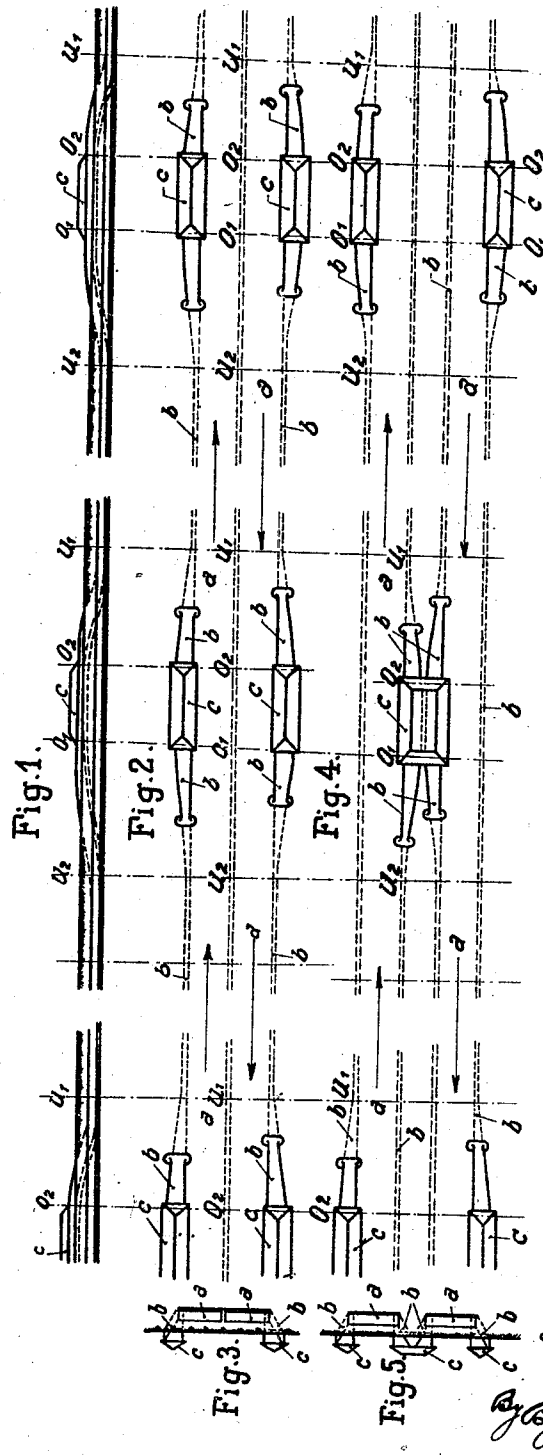


Fig. 1.

Fig. 2.

Fig. 4.

Fig. 3.

Fig. 5.

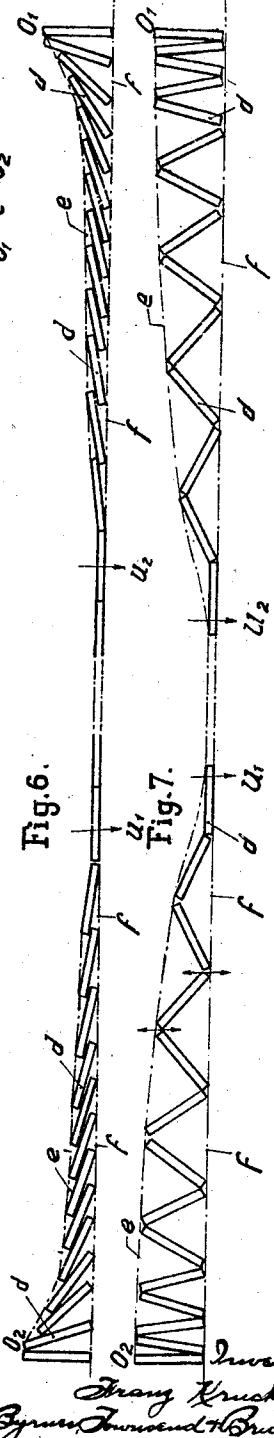


Fig. 6.

Fig. 7.

Inventor:
Franz Kruckenberg
By Byrnes, Townsend & Brickenstein,
Attys.

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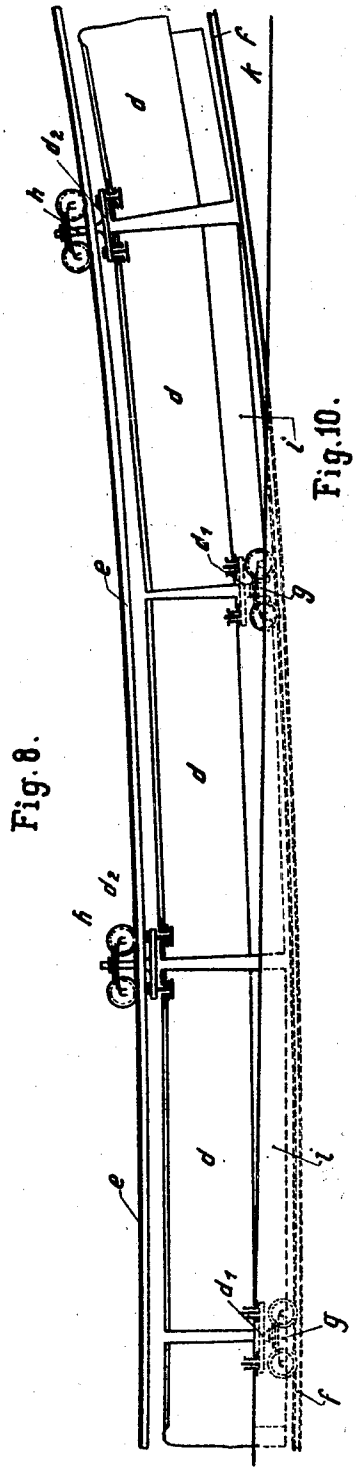


Fig. 8.

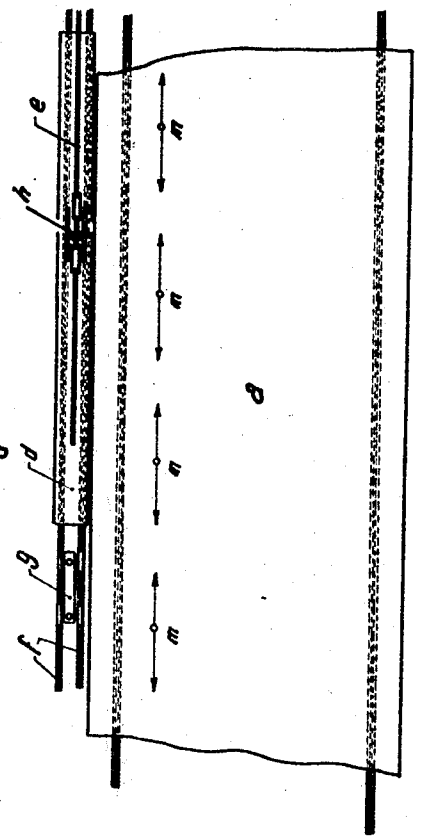


Fig. 10.

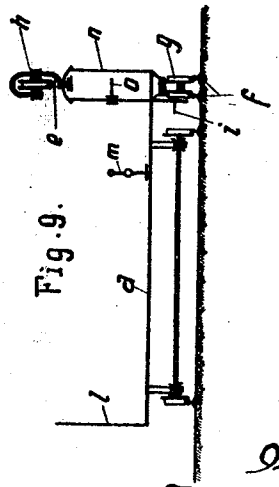


Fig. 9.

Inventor:
Franz Kruckenberg,
By Byrnes, Townsend & Brickenstein,
Attys.

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UNITED STATES PATENT OFFICE.

FRANZ KRUCKENBERG, OF HEIDELBERG, GERMANY.

ARRANGEMENT FOR THE INTENSIVE TRANSPORTATION OF PERSONS.

Application filed January 24, 1925, Serial No. 4,573, and in Germany September 29, 1924.

The steadily increasing concentration of the business traffic in most of the great towns into a relatively small area has the tendency to render inadequate at certain hours of the day all existing methods for transporting persons. On the existing underground the train frequency cannot be increased and motor cars cannot find any more room on the streets. There have already been several suggestions for filling this deficiency but they could not be carried out owing to practical difficulties.

With the present invention a solution of the practical difficulties is offered which makes possible the handling and rapid distribution of great numbers of people in a relatively short time. In this invention it is provided that a sufficiently high speed is attained and that the passengers shall not lose time waiting for other passengers to enter or leave the transport-body.

The present invention utilizes an endless band as main transporter which travels at a constant speed on rails of about 24 miles per hour. Two separate bands are employed running parallel in opposite directions. In conjunction with these main bands, auxiliary bands, hereinafter called "feederbands" are employed serving to convey the passengers between the stations and the moving main bands so that they do not have to step between bodies moving at different speeds. In order to accomplish this the feederbands are arranged so that they run beside the main bands as an endless chain or in some other convenient form, the speed being controlled so that in the station it moves at walking speed i. e., about two miles per hour, but runs beside the main bands at the same speed as these latter. In this manner it is made possible for the passengers to ascend the feederband in the station and at the same time the passengers can step between the feederband and the main band without difficulty as it runs beside it at the same speed.

This principle can be put into practice in several different ways. The feederband can be so arranged that it shortens itself in the stations as the speed decreases while it elongates when it runs over those parts of the track where connection is made with the main band. It appears to be best to form the feederband as an endless chain of cars coupled together. Two examples of chains of cars arranged according to this invention are shown diagrammatically in Figs. 1–5 of the drawings.

Fig. 1 shows the elevation of the first arrangement,

Fig. 2 the plan of Fig. 1,

Fig. 3 the section of the first arrangement,

Fig. 4 the plan of the second arrangement,

Fig. 5 the section of the second arrangement.

Figs. 6 and 7 illustrate the method of turning the cars of the feeder band through 90°.

Fig. 8 is a side elevation of the cars of the feeder band as seen from the main band.

Fig. 9 is a vertical section of the feeder band car and the main travelling band.

Fig. 10 is a plan view of the feeder band and main band.

The main bands "*a*" run parallel but in opposite directions as shown by arrows. Parallel to the track of the main bands "*a*" runs the track of the feederbands "*b*" which traverse the entrance and exit halls or stations where the passengers enter or leave them. The tracks are shown broken between "U^1" and "U^2". In practice these tracks are some hundreds of yards long. As the drawings show the width of the feederband "*b*" increases gradually when approaching the station "*c*". Further for practical reasons the feederband stations "*c*" have been arranged above the track of the main band and those parts of the feederband lying between stations. This arrangement is not essential. The feederband stations can be constructed at the same level as the main bands.

In the construction indicated in Figs. 2 and 3 the feederbands lie on each side of the two main bands which run between them in opposite directions. In the construction shown in Figs. 4 and 5, a feederband also runs on each side of each main band so that there are still further stations between those shown in Figs. 2 and 3, making four feederbands in all.

In the practical application of the arrangement shown in Figs. 1 to 5 the feederbands consist of separate cars coupled to each other in a continuous chain, their length in proportion to their width having the same ratio as their maximum to their minimum speeds. Taking the minimum and maximum speeds as 2 miles per hour and 24 miles per hour respectively, the feederband cars, sup-

posing them to have a width of two feet, would then have a length of 24 feet. These feederband cars have a movement such that they pass through the stations with their longer sides at right angles to the direction of motion and so can only be entered and left by means of their short sides. Where they make connection with the main band they run coupled together with their long sides parallel to the direction of motion so that persons enter and leave by these sides.

In order that each feederband car as it moves along the track shall be turned through 90 degrees the method shown in either Fig. 6 or 7 can be used. Of these two methods that shown in Fig. 7, in which the cars are coupled together in the manner of a folding-rule, can be carried out in a technically easier manner.

The cars "*d*" run with either end on the rails "*e*" and "*f*". These rails are superimposed between the points "U¹" and "U²", converging and diverging respectively before and after this period, having their greatest separation between "O¹" and "O²" (see also Figs. 1, 2, 4). In order that these arrangements can be constructed and so that the cars shall have sufficient stability, the rail "*f*" is arranged on the ground and the rail "*e*" above the car or vice-versa, so that the car runs with one end on the rail "*f*" and the other end suspended from the rail "*e*" or vice-versa. In practice therefore those parts of the feederband between "U¹" and "U²" are constructed as an underground railway, while the stations "*e*" from "O¹" to "O²" are at street level. The feederband cars are driven either directly or indirectly by means of the main band with which they are coupled in some convenient manner between "U¹" and "U²". In this way persons can step from one band to the other without inconvenience. The feederband is driven in the stations from "O¹" to "O²" for example by means of a belt or chain driven by the main band and giving in this case a velocity ratio of 12 to 1.

The details of the arrangement of the feederband cars shown in Fig. 7 is indicated in Figs. 8 to 10. Fig. 8 shows the feederband cars as seen from the main band, Fig. 9 a vertical section through feederband cars and main band and Fig. 10 a plan of both.

In order to obtain a folding movement of the cars, they are coupled together by means of links "*d*¹" and "*d*²" arranged respectively at the bottom and top of the car. In this way every car is at one end coupled at the bottom and at the other at the top with its neighboring car. The lower coupling links "*d*¹" rest on bogies "*g*" on the rails "*f*". The upper coupling link "*d*²" hangs from a bogie "*h*" running on the upper rail "*l*". In this way it is made possible for the feederband cars to arrange themselves in close formation either with their long sides or short sides contiguous. As Fig. 9 shows the floor of the feederband cars is at the same height as that of the main band, so that during the time that both bands are running side by side passengers may step from one to the other at will.

Fig. 8 shows that the feederband cars approaching the station "*c*" are being gradually elevated. Consequently the bogies "*d*" come up to the level of the platform "*a*", and also above it and therefore a guard "*i*" is provided below the floors of the feederband cars to prevent people from getting beneath the floor or between the bogies "*d*" of the moving cars. As soon as the feederband cars have reached such a height that the people cannot step onto them from the main band, the open sides of the feederband cars are closed by means of some suitable arrangement such as a rigid barrier raised from the floor or flexible barrier unrolling from the roof. The necessary movement can be given by means of a rail rising in a ramp from the ground. The guards "*i*" can also be arranged to rise up as soon as they are no longer needed for protecting the bogies. The feederband cars are shut on one long side by a wall "*n*" while the ends are closed by means of barriers "*o*" opening inwards and that spring shut automatically.

The main bands are closed at one side by a wall "*l*" and on the other at some distance from the edge by a railing "*m*" provided with numerous openings. The passengers normally remain between the wall "*l*" and the railing "*m*". When about to leave the main band "*a*" the passenger steps through an opening in the rail "*m*" and awaits the approach of the feederband. Since the feederband cars run at the same level and at the same speed as the main band, the passenger can pass from one band to the other without any hurry because both bands run together for several hundred yards.

When the feederband cars arrive at the station "*c*" the passengers can enter or leave the car by pushing open the barrier "*o*".

The capacity of the arrangement herein described can be estimated in the following manner. The distance between the feederband stations is about 600 yards in the case of the arrangement in Figs. 2 and 3, and each station can convey to and from the main band about 50,000 people per hour. Provided that the main band has such a width that it can conveniently receive the stream of passengers brought to it by the feederband and supposing that there are 10 feederband stations, about 500,000 persons will be transported per hour. We can suppose the speed of the main band to be about 24 miles per hour. This great capacity can be still further increased by in-

troducing between the two main bands a second pair of feederbands, so that the distance between feederband stations is halved. The fundamental idea of the invention can be varied in several ways: for instance, two separate arrangements one above the other can be employed so doubling the capacity.

What I claim is:

1. A railway for the uninterrupted conveyance of big numbers of passengers, comprising, in combination: two parallel tracks; station-platforms, continually travelling platforms running with normal conveying speed on one of said tracks and being connected with one another to form a practically endless platform constituting the primary conveying means; and other continually travelling platforms also connected with one another and running on the other track with gradually increasing and decreasing speed which is so determined that passengers can step over from the station platforms upon any of the feeder platforms passing through a station, and from the respective feeder platform upon any of the primary platforms at some distance behind the respective station, substantially as set forth.

2. A railway for the uninterrupted conveyance of big numbers of passengers, comprising, in combination: station-platforms; continually travelling platforms moving with normal conveying speed and being connected with one another to form a practically endless platform constituting the primary conveying means; and other, comparatively long and narrow, also continually travelling platforms which are also connected with one another, moving at the side of said endless primary platform and forming secondary or feeding platforms, these platforms being adapted to be turned horizontally for 90 degrees, in such a manner that each thereof can stand at right angles with respect to the direction of motion when moving through a station, its speed being then such that passengers can step over thereon from the respective station-platform, and extends longitudinally in the direction of motion outside the station, at some distance therefrom, substantially as set forth.

3. A railway for the uninterrupted conveyance of big numbers of passengers, comprising, in combination: station-platforms; continually travelling platforms moving with normal conveying speed and being connected with one another to form a practically endless platform constituting the primary conveying means; and other, comparatively long and narrow, also continually travelling platforms which are connected with one another at their ends alternately on opposite sides so as to be adapted to be placed side by side, and which move at the side of said endless primary platform and serve as feeders therefor; these feeder platforms being moved relatively to the stations, in such a way that they are situated at right angles with respect to the direction of motion when moving through a station, its speed being then such that passengers can step over thereon from the respective platform, and that they extend longitudinally in the direction of motion outside the station, at some distance thereof, substantially as set forth.

4. A railway for the uninterrupted conveyance of big numbers of passengers, comprising, in combination: two parallel tracks, the gauge of one thereof widening at the station-platforms; continually travelling platforms running with normal conveying speed on that track, the gauge of which does not widen, and being connected with one another to form a practically endless platform constituting the primary conveying means; and other continually travelling platforms also connected with one another and running on the other track, their speed being so decreased and increased by the changes of the gauge of this track that passengers can step over thereon from the respective platform and that they extend longitudinally in the direction of motion outside the station, at some distance therefrom, substantially as set forth.

5. A railway for the uninterrupted conveyance of big numbers of passengers, comprising, in combination: two parallel tracks, the gauge of one thereof widening at the station-platforms; continually travelling platforms running with normal conveying speed on that track, the gauge of which does not widen, and being connected with one another to form a practically endless platform constituting the primary conveying means; and other, comparatively long and narrow, also continually travelling platforms which are also connected with one another, moving at the side of said endless primary platform and forming secondary or feeding platforms, these platforms being adapted to be turned horizontally for 90 degrees, in such a manner that each thereof can stand at right angles with respect to the direction of motion when moving through a station, its speed being then such that passengers can step over thereon from the respective station-platform, and extends longitudinally in the direction of motion outside the station, at some distance therefrom, substantially as set forth.

6. A railway for the uninterrupted conveyance of big numbers of passengers, comprising, in combination: station-platforms; continually travelling platforms moving with normal conveying speed and being connected with one another to form a practically endless platform constituting the pri-

mary conveying means; and other, comparatively long and narrow, also continually travelling platforms which are also connected with one another, moving at the side of said endless primary platform and forming secondary or feeding platforms; bogies supporting said latter platforms at their ends; these platforms being adapted to be turned horizontally for 90 degrees, in such a manner that each thereof can stand at right angles with respect to the direction of motion when moving through a station, its speed being then such that passengers can step over thereon from the respective station-platform, and extending longitudinally in the direction of motion outside the station, at some distance thereof, substantially as set forth.

7. A railway for the uninterrupted conveyance of big numbers of passengers, comprising, in combination: two parallel tracks, the gauge of one thereof widening at the station-platforms; continually travelling platforms running with normal conveying speed on that track, the gauge of which does not widen, and being connected with one another to form a practically endless platform constituting the primary conveying means; and other, comparatively long and narrow, also continually travelling platforms which are also connected with one another, move at the side of said endless primary platform and form secondary or feeding platforms; bogies supporting said latter platforms at their ends; these platforms being at their ends and running on the track having therein alternately widening and contracting gauge, the widest gauge corresponding to the distance between the two bogies of said latter platforms, these platforms being adapted to be turned horizontally for 90 degrees, in such a manner that each thereof can stand at right angles with respect to the direction of motion when moving through a station, its speed being then such that passengers can step over thereon from the respective station-platform, and extends longitudinally in the direction of motion outside the station, at some distance therefrom, substantially as set forth.

8. A railway for the uninterrupted conveyance of big numbers of passengers, comprising, in combination: two parallel tracks; station-platforms; continually travelling platforms running with normal conveying speed on one of said tracks and being said endless primary platform and forming secondary or feeding platforms, these platforms being adapted to be turned horizontally for 90 degrees supported by bogies located at the ends thereof, and being also connected with one another moving at the side of said endless primary platform, and forming secondary or feeding platforms; rails supporting the bogies at one end of said latter platforms being overhead-rails, and these platforms being moved with continually increasing and decreasing speed which is so determined that passengers can step over from the station platforms upon any of the feeder platforms passing through a station, and from the respective feeder platform upon any of the primary platforms at some distance behind the respective station, substantially as set forth.

9. A railway for the uninterrupted conveyance of big numbers of passengers, comprising, in combination: two parallel tracks; station-platforms; continually travelling platforms running with normal conveying speed on one of said tracks and being connected with one another to form a practically endless platform constituting the primary conveying means; and other continually travelling platforms also connected with one another and running on the other track gradually increasing and decreasing speed which is so determined that passengers can step over from the station platforms upon any of the feeder platforms passing through a station, and from the respective feeder platform upon any of the primary platforms at some distance behind the respective station; and bogies at the ends of all platforms, each secondary or feeder platforms having one normally positioned bogey and an overhead-bogey, and the appertaining track comprising normally positioned an overhead rail, substantially as set forth.

10. A railway for the uninterrupted conveyance of big numbers of passengers, comprising, in combination: station-platforms; continually travelling platforms moving with normal conveying speed and being connected with one another to form a practically endless platform constituting the primary conveying means; and other continually travelling platforms and couplings connecting these platforms with one another, these platforms moving at the side of said endless primary platform, forming secondary or feeding platforms, and being moved with continually increasing and decreasing speed which is so determined that passengers can step over from the station platforms upon any of the feeder platforms passing through a station, and from the respective feeder platform upon any of the primary platforms at some distance behind the respective station, substantially as set forth.

11. A railway for the uninterrupted conveyance of big numbers of passengers, comprising, in combination: station-platforms; parallel tracks, of which that nearer to said platforms lies higher than the other track at those portions which pass through stations; continually traveling platforms run-

ning with normal conveying speed on said other track and being connected with one another to form a practically endless platform constituting the primary conveying means; and other continually travelling platforms also connected with one another, moving at the side of said endless primary platform on the partly ascending track and forming secondary or feeding platforms, and being moved with continually increasing and decreasing speed which is so determined that passengers can step over from the station platforms upon any of the feeder platforms passing through a station, and from the respective feeder platform upon any of the primary platforms at some distance behind the respective station, substantially as set forth.

12. A railway for the uninterrupted conveyance of big numbers of passengers, comprising, in combination: station-platforms; parallel tracks, of which that nearer to said platforms lies higher than the other track at those portions which pass through stations; continually travelling platforms running with normal conveying speed on said other track and being connected with one another to form a practically endless platform constituting the primary conveying means; and other continually travelling platforms also connected with one another, moving at the side of said endless primary platform on the partly ascending track and forming secondary or feeding platforms, and being moved with continually increasing and decreasing speed which is so determined that passengers can step over from the station platforms upon any of the feeder platforms passing through a station, and from the respective feeder platform upon any of the primary platforms at some distance behind the respective station, the driving power being supplied to the said secondary or feeder platforms at those portions of their path where they run with the same speed as the said primary endless platform, substantially as set forth.

13. A railway for the uninterrupted conveyance of big numbers of passengers, comprising, in combination, station platforms, parallel tracks, of which that nearer said platform lies higher than the other track at those portions which pass through stations, continually travelling platforms running with normal conveying speed on said other track and being connected with one another so as to form a practically endless platform constituting the primary conveying means, and other continually travelling platforms also connected with one another, moving at the side of said endless primary platform on the partly ascending track and forming secondary or feeding platforms and being moved with continually increasing and decreasing speed which is so determined that passengers can step over from the station platforms upon any of the feeder platforms passing through a station and from the respective feeder platform upon any of the primary platforms at some distance behind the respective station, the driving power being supplied to the said secondary or feeder platforms at those portions of their path where they run with the same speed as the said primary endless platform and being transmitted to the secondary or feeder platforms with the aid of the primary platform, substantially as set forth.

14. A railway for the uninterrupted conveyance of big numbers of passengers, comprising, in combination: station-platforms; parallel tracks, of which that nearer to said platforms lies higher than the other track at those portions which pass through stations, the ascending portions of this track commencing outside the stations at an appropriate distance therefrom; continually travelling platforms running with normal conveying speed on said other track and being connected with one another to form a practically endless platform constituting the primary conveying means; and other continually travelling platforms also connected with one another, moving at the side of said endless primary platform and the partly ascending track and forming secondary or feeding platforms, and being moved with continually increasing and decreasing speed which is so determined that passengers can step over from the station platforms upon any of the feeder platforms passing through a station, and from the respective feeder platform upon any of the primary platforms at some distance behind the respective station, substantially as set forth.

15. A railway for the uninterrupted conveyance of big numbers of passengers, comprising, in combination: station-platforms: parallel tracks, of which that nearer to said platforms lies higher than the other track at those portions which pass through stations, the ascending portions of this track commencing outside the stations at an appropriate distance therefrom; continually travelling platforms running with normal conveying speed on said other track and being connected with one another to form a practically endless platform constituting the primary conveying means; and other continually travelling platforms also connected with one another, moving at the side of said endless primary platform on the partly ascending track and forming secondary or feeding platforms, and being moved with continually increasing and decreasing speed which is so determined that passengers can step over from the station platform upon any of the primary platforms at some distance behind the respective station, each secondary or feeder platform being closed at

its two ends and at one of its longitudinal sides; and means for closing automatically also the normally open longitudinal side of each secondary or feeder platform when this has ascended on an ascending portion of the appertaining track so much that passengers can no more step over onto it from the primary platform, substantially as set forth.

16. A railway for the uninterrupted conveyance of big numbers of passengers, comprising, in combination; station-platforms; parallel tracks, of which that nearer to said platforms lies higher than the other track at those portions which pass through stations, the ascending portions of this track commencing outside the stations the appropriate distance therefrom; continually travelling platforms running with normal conveying speed on said other track and being connected with one another to form practically endless platform constituting the primary conveying means; and other continually travelling platforms also connected with one another, moving at the side of said endless primary platform on the partly ascending track and forming secondary or feeding platforms, and being moved with continually increasing and decreasing speed which is so determined that passengers can step over from the station platform upon any of the primary platforms at some distance behind the respective station, each secondary or feeder platform being closed at its two ends and at one of its longitudinal sides; and vertically movable walls adapted to close also the normally open longitudinal side of each secondary or feeder platform and being located on that side adjacent to the other track, and covering in its lowered position the bogies of the respective platform; and means for lifting automatically said walls when the platforms concerned are ascending on the appertaining track so much that passengers can no more step over onto them from the primary platform substantially as set forth.

In testimony whereof I affix my signature.

FRANZ KRUCKENBERG.