

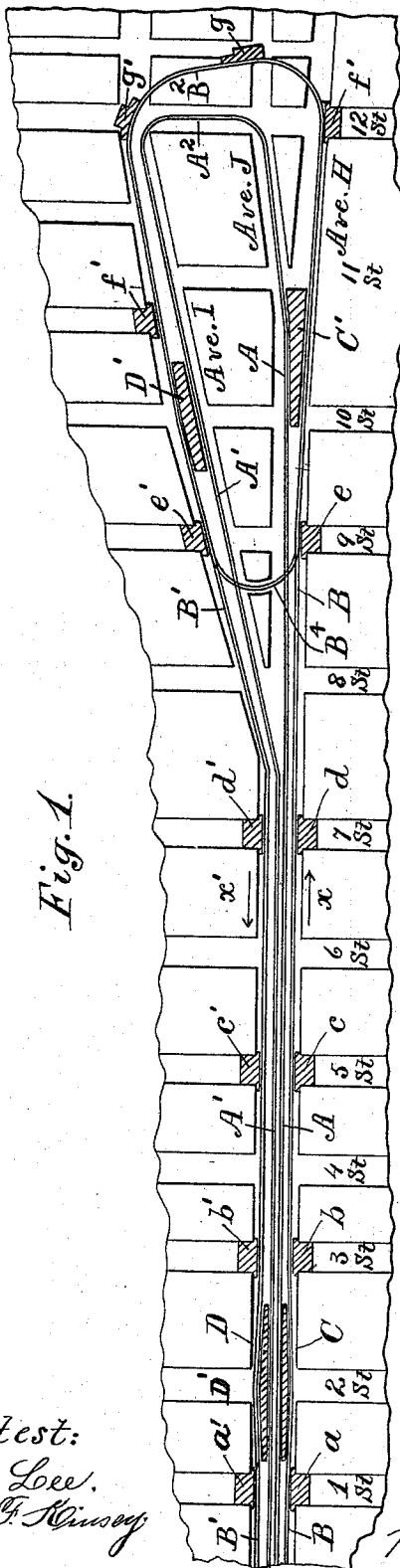
(No Model.)

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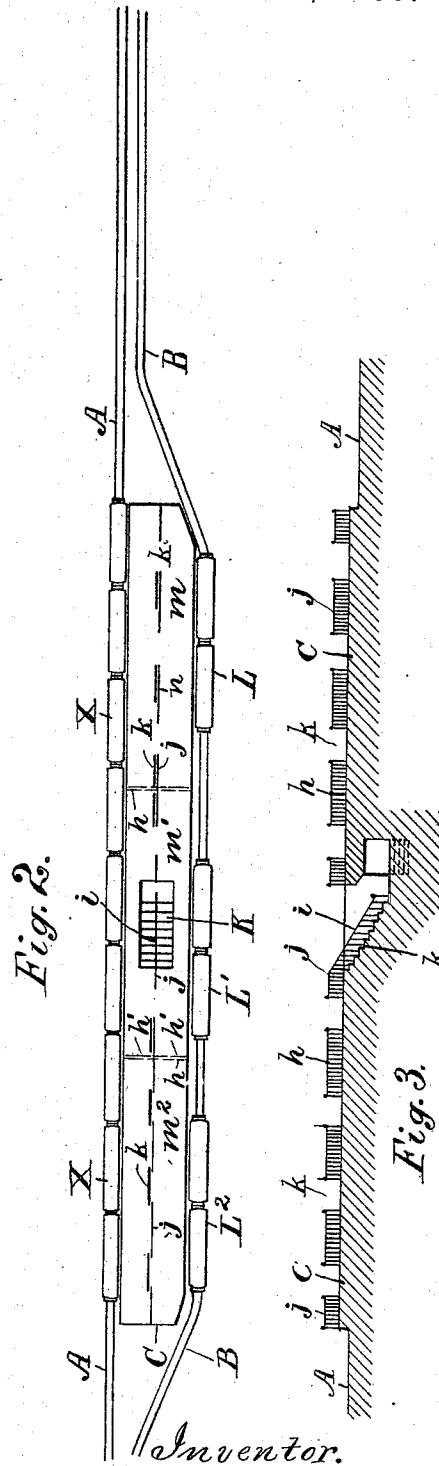
B. F. CARPENTER.
BI-TRANSIT RAILWAY SYSTEM.

No. 570,451.

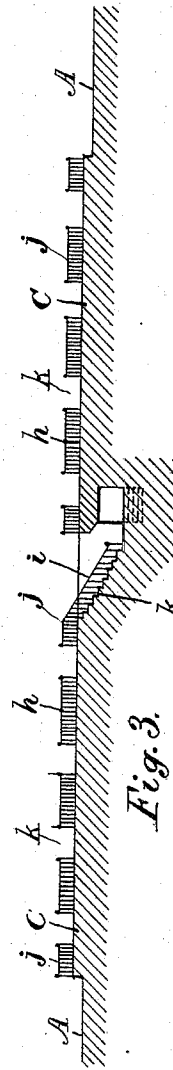
Patented Nov. 3, 1896.



Attest:
L. Lee.
Edw. F. Kinsey



Benjamin F. Carpenter,
per Thos. L. Crane, Atty.



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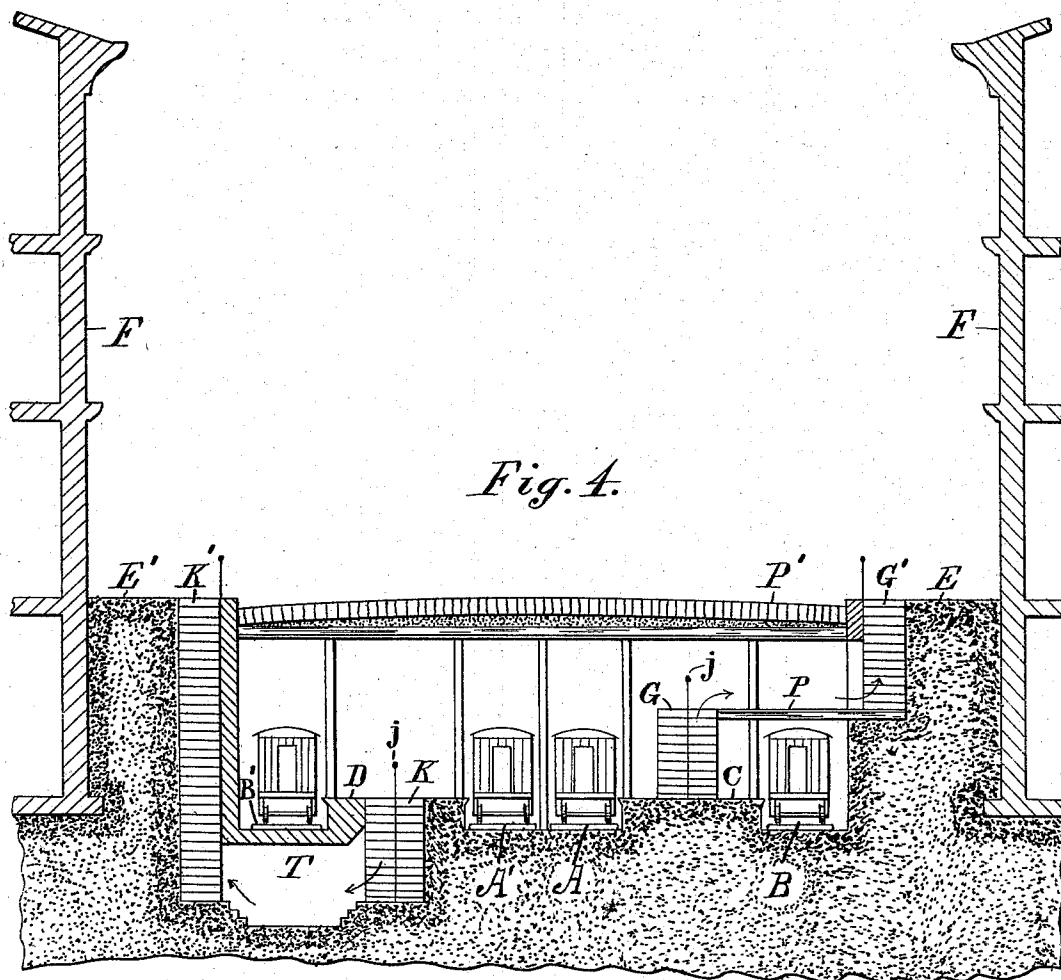


Fig. 4.

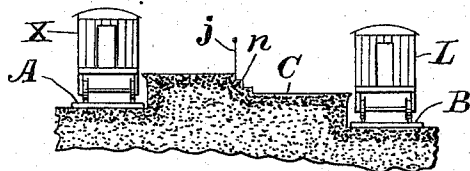


Fig. 5.

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Inventor.
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per Thos. S. Crane, Atty.

UNITED STATES PATENT OFFICE.

BENJAMIN F. CARPENTER, OF ROSELLE, NEW JERSEY.

BITRANSIT RAILWAY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 570,451, dated November 3, 1896.

Application filed October 7, 1895. Serial No. 564,877. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN F. CARPENTER, a citizen of the United States, residing at Roselle, Union county, New Jersey, have invented certain new and useful Improvements in Bitransit Railway Systems, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

My invention relates to the improvement of rapid-transit facilities for passengers in large cities.

It has been common in cities to convey passengers by the use of one track with turnouts, or by two tracks in one street or adjacent streets, one for cars running in one direction, the other for cars running in an opposite or returning direction. On such tracks but one kind of traffic can be maintained, either rapid trains stopping at long intervals or slow trains stopping at shorter intervals. A mixed service is secured by running the slow trains on sidings and thus clearing the tracks for an occasional fast train. The service under such conditions is very unsatisfactory and dangerous. The slower trains are detained in favor of the faster trains and the rapid trains are only available at points remote from each other.

In the present invention I secure a practicable service by providing four tracks, two for express-trains running in opposite directions and two for local trains running in opposite directions, with local stations at frequent intervals and transfer-stations at less frequent intervals, where the express-trains can receive and deliver passengers from or to the local trains. To make such transfer easily and quickly, I deflect the tracks from one another at the transfer-stations and locate what I term "island" platforms (to serve as transfer-platforms) between such local and express tracks as carry trains in the same direction. A conjunctive or coöperative service is thus maintained, and such arrangement and operation I term the "bitransit" system. To avoid crossing the adjacent tracks at grade, the island platforms are, where necessary, connected to the street by staircases.

While experience demonstrates the practicability of running short local trains at reduced speed with a headway of one minute

such a headway for rapid trains would be likely to produce accidents. It is therefore evident that the fast trains, to handle the same traffic and operate conjointly with such local trains, would require a greater number of cars in each train. In most cities the express-trains would be required to deliver a majority of their passengers near the most crowded business portion of the city and the heaviest transfer of passengers from the local trains would necessarily occur at such point. It may be assumed, for illustration, that all the passengers in the express-train would be transferred at such point and that all the local passengers for the express-trains would be received at such point, and although this might not occur literally in practice the proportions of delivery would be the same in any analogous case. With such assumption, if five local trains, each having two cars and running under a headway of one minute, should deliver all their passengers to a certain transfer-platform in five minutes one express-train with five minutes' headway would require ten cars to accommodate the accumulated passengers, and the reverse would occur in delivering from the express-trains.

When an express-train of ten cars reaches a platform, there may be but one local train ready to receive passengers, and if an ordinary undivided platform were used there would be a rush for such local train and only one-fifth of the passengers could be accommodated.

My invention provides means for regulating the movement of passengers upon the transfer-platforms so as to prevent such crowding and to facilitate the safe and convenient transfer of the passengers to and from each train. For this purpose I provide a transfer-platform of sufficient length to accommodate the longest express-train and divide such platform transversely across its entire width into sections of the same length as a local train or a certain part thereof. The express and local tracks running in the same direction are brought to the opposite sides of such platform, and the local trains are stopped opposite to the different sections of the platform, so as to receive or deliver each a certain part only or given proportion of the express-passengers. The passengers delivered from certain cars of

the express-train would thus be positively confined to a certain section of the platform, and as the other passengers from the express-train would be excluded from such section there could be no excessive crowding when a local train was stopped opposite one section of the platform; but the number of passengers admitted to such local train would bear a due proportion to its normal capacity. The reverse would be equally true, as the passengers from different local trains which would accumulate at the transfer-platform to enter an express-train upon its arrival would be delivered from such local trains to different sections of the platform and would have no opportunity to crowd into the same portion of the express-train, but would be compelled to enter that portion immediately opposite a single section of the platform.

To provide for the contingency of an express-train being late and to prevent each section of the platform from delivering to a local train more passengers than the latter can accommodate, partitions with sliding gates may be extended longitudinally through the platform-sections and the passengers from separate express or local trains be confined upon opposite sides of such partitions. Gateways can also be made in the partitions which separate the sections from one another and one of the sections be provided with a suitable outlet, so that when the trains have moved from the platform the passengers in any of the sections may have a passage to the street.

It is not essential that the tracks at the opposite sides of the transfer-platform should be at the same level, as the platform may be divided transversely in the manner described and each section provided with adequate staircases to permit the free movement of the passengers from the local to the express trains within such section. The express-trains may be located outside of the local tracks, in which case the approach to the local tracks will be through openings in the center of the street, or the express-tracks may be arranged between the local tracks and the approach to the way-stations will then be at the sides of the street. In such a bitransit system it is evident that two tracks for trains running in the same direction can be in one street and two tracks for trains running in an opposite or return direction can be in the same street or in another street. It is also evident that all the tracks can be located separately in different streets or at different levels in the same street, provided the proper tracks are brought together at suitable intervals upon the opposite sides of transfer-platforms, where the passengers could be controlled in the manner described. The transfer-platforms are thus adapted to operate under all the varying circumstances which are found in surface roads, elevated roads, or underground railways. The requirements of the traffic will determine the distances of

the stations of both series of trains, and their relations in cooperation, considering the traffic, will indicate the frequency of the transfer-platforms. The frequency of the platforms and the running of the trains should be so balanced that one series of cars will only deliver such number of passengers as can be conveniently accommodated in the other series to avoid a congestion of passages.

The various features of my invention may be understood by reference to the annexed drawings, showing the invention in diagrammatic form.

Figure 1 is a plan of four tracks provided with way-stations and certain transfer-platforms. Fig. 2 is a plan of one of the platforms upon a larger scale with tracks and trains at its opposite sides. Fig. 3 is a longitudinal section of the platform through the stair-passage from the center section. Fig. 4 is a cross-section of a street with four tracks and train thereon, with transfer-platforms represented between the outer lines of track and staircase connections from the same to the street; and Fig. 5 is a cross-section of a transfer-platform having tracks at different levels upon its opposite sides with trains thereon.

In Fig. 1, A and B represent the up-tracks, the direction of movement being indicated by the arrows x , and A' and B' represent down-tracks, the direction of motion being indicated by the arrows x' . The express-tracks A A' are located between the local tracks B and B', so that the way-stations a a' b b' , &c., may be at the sides of the street and readily accessible. The express-tracks A and A' are connected by a loop A² and the local tracks B and B' by a loop B². The local stations a to g , inclusive, are located upon the up-track and the stations a' to g' , inclusive, upon the down-track.

C C' designate the transfer platforms or stations between the up-tracks, and D D' those located between the down-tracks.

Various streets—First, Second, Third, &c.—are shown at right angles to the tracks, and avenues H, I, and J, extending in the same direction as the tracks, the avenues I and J branching from the avenue H at different points.

Four tracks in Fig. 1 are shown extended through the same avenue H to Eighth street, where the up-tracks continue to Eleventh street and then proceed by separate loops to the returning or down tracks in the avenue I.

It will be noticed that the local stations a a' b b' , &c., are numerous and attached to the local tracks for collecting and distributing passengers, while the transfer-stations C C' D D' are farther apart and arranged between the local stations a mile (more or less) apart, so as to make rapid runs without stopping.

A passenger on a local train at a desiring to get to station g will be transferred to an ex-

press-train across the transfer-platform C. He will then be carried by the express-train to the transfer-platform C', where he will be retransferred to a local train and proceed to station g.

The local stations and trains will be used to receive the passengers at a convenient point and discharge them at their destination, while the express-train serves to carry them rapidly over a greater part of their journey.

Figs. 2 and 3 show a transfer-platform divided into three sections m , m' , m'' by partitions h , formed with gates h' , and the middle section provided with a stairway i , leading to the street. Longitudinal divisions j are shown extended lengthwise of the sections, with gates k to permit passage when required. An express-train X is shown at one side of the platform, with a local train L opposite section m of such platform and other local trains L' and L'' opposite the other sections. The partitions h are extended to the edges of the platform, so that when the gates h' are closed passengers can pass only to and from the cars adjacent to a given section.

The passengers upon their discharge from an express-train would be confined in the several sections of the platform and would be delivered to separate local trains, which would be stopped successively at the several sections m , m' , and m'' , so as to collect the passengers from such portions of the express-train. The confinement of the passengers within the separate sections of the platform would prevent them from crowding to any particular part of the express-train or to any selected local train. The passengers would be restricted to the cars directly opposite such platform and crowding into the cars would be avoided, as the number of passengers admitted would correspond with the accommodations.

Should an express-train be delayed until a full train-load had accumulated upon the platform, the passengers of each section would be moved toward the express side of the same and the gates k in the partitions j would be closed, thus enabling the section to accommodate another set of passengers from the local trains. When the passengers upon the express side of the partitions j had been removed by express-trains, the gates k would be opened and the passengers upon the opposite side of the partitions moved across to make room for others upon the local side until the traffic was restored to its normal working condition. While the platforms divided into sections are intended chiefly as transfer-platforms, they can be provided, if desired, with means of entrance from and exit to the street, and thus serve as combined express and way stations. In some locations this would be a desirable arrangement, and one or more stairways would be provided to connect the platform with the street. As the platform is provided with tracks upon both sides and may thus be termed an "island"

platform, it is evident that in order to avoid crossing the tracks at grade passengers must be provided with a passage over or under the tracks to reach the street. Fig. 4 illustrates the proper arrangement for either of such cases, the railway being shown underground, with the street-sidewalks E and adjacent house-fronts F, and staircases extended upward and downward, respectively, from the platforms C and D.

Staircases G and G' connect the platform C and the sidewalk E with a bridge P over the local track B, thus connecting the platform with the street, as desired.

In the case of a surface road the staircase G would lead downward instead of upward to connect the platform with the street-level. The platform D and its adjacent sidewalk E' are shown connected, by staircases K and K', with a tunnel T beneath the track B'. Such an arrangement is suitable where the head room above an underground road would not permit the use of a bridge P beneath the pavement P' upon the street overhead. In the case of an elevated road only the staircase K would be required to connect the platform with the street.

The longitudinal partitions j are shown upon the platforms C and D in Fig. 4, and the staircases G and K arranged to receive or deliver passengers upon either side of said partition, thus enabling passengers upon either side of the partition to reach the street at pleasure or to enter that portion of the section which communicates with either train (express or local) that they may wish to board.

The staircase K is shown in Fig. 2 with its upper landing extending equally at both sides of the partition j and a railing i extended down the staircase to prevent passengers from passing through the staircase from one side of the section to the other. The same arrangement would be employed whether the stairs extended upward, as shown at G in Fig. 3, or downward, as shown at K. The partitions h and j would in practice be made of open railing, with open-work gates of sufficient height to confine the passengers within the desired space, and sliding gates (which are represented diagrammatically by a single line $h'k$ in Fig. 2) would be employed to open the passages when required.

The arrangement of the tracks upon different streets in Fig. 1 is merely illustrative, as it is obvious that the arrangement may be varied to suit different conditions. The lateral arrangement of the tracks within certain limits is immaterial if the general direction of the tracks is the same for the local and express trains and suitable points of meeting are provided with transfer-platforms.

One of the sections upon the transfer-platform may, if desired, have a space railed off to serve for station purposes and connected with the street by a suitable staircase, such space being provided with a ticket-office and also with a waiting-room, if desired, so that

the platform may be in all respects adapted to receive passengers for transportation by either the express or local trains.

In most cities where rapid transit is required the business-houses are concentrated in a certain district, which may be one terminus of the route, and the passengers are collected from other portions of the route and delivered chiefly in the district adjacent to such terminus. The local trains in this terminal district are thus heavily loaded in the morning when passengers are being delivered to such district and also at night when passengers are being transported from such district to reach the residence portion of the city, while the local traffic in other portions of the route is comparatively light. To furnish greater transportation facilities upon the local tracks in such a business district, I connect the local tracks by a loop at the margin of such district and during the crowded part or parts of the day run a certain proportion of the local trains around said loop and back again through such district. Such a loop B⁴ is shown near Ninth street in Fig. 1, connected with the local tracks B and B' by switches B³. When the local tracks are outside of the express-tracks, as shown in the drawings, the loop would be laid at a different grade from the express-tracks A A', so as to pass over or under the same; but when the local tracks are between the express-tracks the loop could be laid at the same grade.

On the general line of the route the location of the tracks vertically is immaterial within certain limits if the local and express tracks are brought approximately to the same level at the transfer-platform, as the two edges of a platform may, if required, be arranged at different levels, as shown in Fig. 5, and connected by broad staircases *n*. It is desirable in any case that the transfer should be but a short distance and the platform so arranged that the transfer may be easily and quickly made. The entire system is thus adapted to furnish practicable rapid transit not only to the extreme ends of the city, but to a considerable number of intermediate points, which in turn are rendered accessible to all other points by the use of the local trains and the transfer-platforms.

The construction of the transfer-platforms secures the delivery of the passengers from a single express-train to a number of local trains without crowding any of the latter, and also prevents the crush of passengers into an express-train when they have been accumulated from a number of local trains in advance of its arrival.

From the above description it will be perceived that my invention furnishes a new method of handling the passengers to secure quick delivery at various points between the ends of an express route, as the passengers which enter the local train at their starting-point are after their transfer to the express-trains delivered near their destination to lo-

cal trains which have started in advance of the one first boarded by them. The local train which is last taken by the passenger and which delivers him to his destination may thus be termed an "advanced" local train. The method I refer to consists in running the express and local trains upon adjacent tracks in the same direction, receiving the passengers upon the local trains at frequent intervals, transferring such passengers at less frequent intervals to express-trains, and from the express-trains back again to advanced local trains, which discharge them at their destination.

It will be understood that the division of the transfer-platform into sections corresponding with short trains or parts of a long train are very desirable where there is a heavy traffic. It is also evident that in sparsely-settled portions of the route such regulating means could be dispensed with. Such partitions upon the transfer-platform are required to perfectly operate my bitransit system, but my method of operating the trains is not dependent upon this particular feature of the invention.

It is immaterial whether the express-tracks be arranged between the local tracks or upon the outer side of the same, as such arrangement must depend upon the means of access to the local trains. In wide streets where there are park-spaces in the center the stations for local tracks may be located in the center of the street and such tracks placed between the express-tracks.

Where four tracks are arranged underground, the way-trains may be kept near the surface, conveniently accessible for passengers, while the express-trains may be put much lower and the express and local tracks brought to the same or approximately to the same level where transfer-platforms are arranged.

It is evident that the relative vertical positions could be reversed and express-trains run upon an elevated structure, while the local trains might run on or near the surface and the two be brought to approximately the same level at suitable points in the grade.

My invention renders rapid-transit trains available for persons at all points along the route. If passengers were required to board the rapid-transit trains at stations a mile apart, but few could avail themselves of such trains, as more time would be lost by walking to such stations than would be gained by the use of the trains. By combining the local and express trains with transfer-platforms in the manner described I provide means for receiving and distributing the passengers from the local stations with all the advantages that accrue from using the express-trains.

Various means have been devised heretofore to secure safe and convenient access from a station at the outer side of the tracks to the inner tracks for passengers using a four-track railway, such means usually involving the lowering of one track or raising

another from the general grade, so that the passengers might pass over or under the same. In the present invention I avoid changing the grade of the tracks for such purpose by locating the passenger-platform between the tracks and deflecting from one another at certain points to an unusual degree the tracks for trains running in the same direction to introduce such island platforms.

Owing to the space occupied by four tracks they would ordinarily be run as close together as possible, and if carried in the middle of the street the outer tracks would be deflected over or under the sidewalk, where the transfer-platforms were introduced, as at D' in Fig. 1. If two tracks were run along each side of the street, the inner track might be deflected over the middle of the street to accommodate such platforms, the introduction of the latter involving in either case the separation of the tracks in an unusual degree for the express purpose of introducing the platforms. Safe and convenient access to the transfer-platforms is then effected by extending staircases upward or downward to the street, (as the case may be,) and the platforms thus furnish not only the shortest and easiest means of transfer between the cars of the slow and fast trains, but may, when required, afford means of access to and from the street and accommodations for station purposes with ticket-office and waiting-room. Platforms between tracks have been used upon roads having two tracks only, with trains running in opposite directions upon such tracks; but in such case the passengers are usually permitted to cross the track at grade when the trains are not passing. With four tracks great danger would be incurred with such an arrangement, and my invention furnishes an entirely novel feature in the combination of an island platform with a four-track railroad for express and local trains when the platform is located between any two of the tracks having trains running in the same direction.

The deflecting of the tracks, the location of platforms between the tracks for trains running in the same direction, and the connecting of such platforms with the street by staircases running upward or downward are all of them important features in adapting my bitransit system to use in ordinary thoroughfares; but the essential part of my invention is the combination of two local tracks having stations at frequent intervals throughout their lengths with trains running in opposite directions thereon at small headway, with two adjacent express-tracks having trains running thereon at greater headway in the same direction as upon the said adjacent local tracks, and transfer-platforms constituting express-stations located at less frequent intervals than the local stations between the express and local tracks upon which the trains are running in the same direction, as such arrangement may be operated to first

receive passengers upon the local tracks at frequent intervals, to then transfer them to the express-trains, and finally from the express-trains back again to advanced local trains for delivery to their destination.

The object of the loop is simply to transfer the trains from the up-track to the down-track at a given point, and such tracks may be connected with the same effect by suitable switches. Where there is not sufficient space to insert a loop, it will be understood that such switch connections are an entire equivalent for the loop claimed herein.

It is evident that the construction which I have devised to rapidly handle large numbers of passengers is not required upon railroads connecting distant points, but is distinctly limited to the use of roads which connect densely-populated districts and which require throughout their entire length frequent local stations to accommodate passengers who are traveling but a short distance.

I am aware that an island-platform, that is, one located between two lines of track, has long been used, and do not therefore claim the same broadly, nor any of the other mechanical elements of my invention singly, but only the succession of such platforms combined with tracks, trains, and stations, and operated in the manner herein set forth.

So far as I am aware no construction has heretofore been provided which would convey passengers rapidly (by the coöperation of an express-train) from any of the local stations upon such a road to any other local station, and it will be understood that my invention involves the conjunctive use of the local and express trains upon a road provided with such frequent local stations.

Where actual rapid transit is furnished between all the stations, the traffic upon the local trains and the distance through which passengers would use such trains would be very greatly diminished, and such trains could therefore be materially shortened, which would enable them to coöperate with express-trains of reasonable length, in which the number of the cars would be, in relation to the number of cars in the local trains, in proportion to the headway of the two trains. During the crowded hours of the day when a great demand is commonly made upon the express accommodations the lengths of the express and local trains would bear substantially such proportion, but at other hours of the day the express traffic might be lighter and the express-trains made somewhat shorter.

As my invention is especially designed to facilitate the transportation of passengers during the crowded hours of business I have made specific claim to local and express trains running under different headway and having the number of their cars in proportion to such headway.

Having thus set forth the nature of my invention, what I claim herein is—

1. The bitransit railway system comprising

two local tracks having stations at frequent intervals throughout their length with trains running in opposite directions thereon at small headway, two adjacent express-tracks with trains running thereon at greater headway in the same direction as upon the said adjacent local tracks, and transfer-platforms constituting express-stations located at less frequent intervals than the local stations, between the express and local tracks upon which the trains are running in the same direction, the whole arranged and operated substantially as set forth, to first receive passengers upon the local trains at frequent intervals, to then transfer such passengers to the express-trains, and finally from the express-trains back again to advanced local trains for delivery to their destination, substantially as herein set forth.

2. The bitransit railway system comprising a local track with local stations at frequent intervals and trains running at small headway, an express-track with trains running at greater headway in the same direction as upon the local track, the length of the trains being substantially in proportion to their headway, and transfer-platforms located between the express and local tracks at greater intervals than the local stations, said platforms being divided transversely into successive sections to receive and separate the passengers moving to and from successive portions of the express-train, substantially as herein set forth.

3. The bitransit railway system comprising a local track with local stations at frequent intervals and trains running at small headway, an express-track with trains running at greater headway in the same direction as upon the local track, the length of the trains being substantially in proportion to their headway, and transfer-platforms located between the express and local tracks at greater intervals than the local stations, said platforms being divided transversely into successive sections of the same length as the local train, as and for the purpose set forth.

4. The bitransit railway system, comprising two local tracks located upon a given route with two express-tracks between the same, with local trains upon the local tracks running at small headway, and express-trains upon the express-tracks running at greater headway in the same direction as the trains upon the adjacent local tracks, local stations at frequent intervals upon the outer sides of the local tracks, the said local tracks being deflected from the express-tracks at less frequent intervals, with island transfer-platforms constituting express-stations arranged between the local and express tracks at such deflected portions, the whole arranged and operated substantially as set forth, to first receive passengers upon the local trains at frequent intervals, to then transfer such passengers to the express-trains, and finally from the express-trains back again to ad-

vanced local trains for delivery to their destination, substantially as herein set forth.

5. The bitransit railway system, comprising two local tracks located upon a given route with two express-tracks between the same, with local trains upon the local tracks running at small headway, and express-trains upon the express-tracks running at greater headway in the same direction as trains upon the adjacent local tracks, local stations at frequent intervals upon the outer sides of the local tracks, the said local tracks being deflected from the express-tracks at less frequent intervals, with island transfer-platforms constituting express-stations arranged between the local and express tracks at such deflected portions, and a loop connecting the local tracks intermediate to their ends, the whole arranged and operated to run the express-trains throughout the given route, and to run the local trains in part throughout the given route, and in part around the said loop, to furnish greater transportation facilities upon a given portion only of the local tracks, substantially as herein set forth.

6. In a bitransit railway system, the combination, with two tracks for local traffic, with two tracks, for express traffic running between the same in substantially the same direction throughout a given route, with local stations at frequent intervals upon the local track and transfer-platforms connecting the express and local trains running in the same direction at less frequent intervals, of a loop connecting the local tracks intermediate to their ends, and crossing the express-tracks at a different grade from the same, the whole arranged and operated by running the express-trains throughout the given route, and the local trains in part throughout the said route and in part around the said loop, to furnish greater transportation facilities upon one end or portion of the given tracks, substantially as set forth.

7. In a railway system, a transfer-platform divided by suitable means across its entire width into sections of suitable length to receive the passengers from a given portion of a railway-train, and having such sections provided with longitudinal partitions and gates therein, as herein set forth.

8. In a bitransit railway system, the combination, with express and local tracks with trains running in the same direction, of an island-platform arranged between the said tracks and divided by partitions into successive sections adapted to receive passengers from successive portions of such trains, and a staircase connecting the said platform with the street, and forming the sole means of access thereto, substantially as herein set forth.

9. In a bitransit railway system, the combination, with express and local tracks with trains running in the same direction, of a transfer-platform arranged between the said tracks and divided by partitions into successive sections adapted to receive passengers

from successive portions of such trains, a staircase connecting one of the said sections with the street, and gates or doors in the said partitions to connect all the sections at will
5 with such staircase, as and for the purpose set forth.

10 10. In a bitransit railway system, the combination with express and local tracks with trains running in the same direction, of a transfer-platform arranged between the said tracks and divided by partitions into sections adapted to receive passengers from certain

cars only of such trains, such sections having longitudinal partitions and gates therein, and a staircase communicating with the platform 15 upon both sides of such longitudinal partition, as and for the purpose set forth.

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

BENJAMIN F. CARPENTER.

Witnesses:

THOMAS S. CRANE,
L. LEE.