G. W. JACKSON.

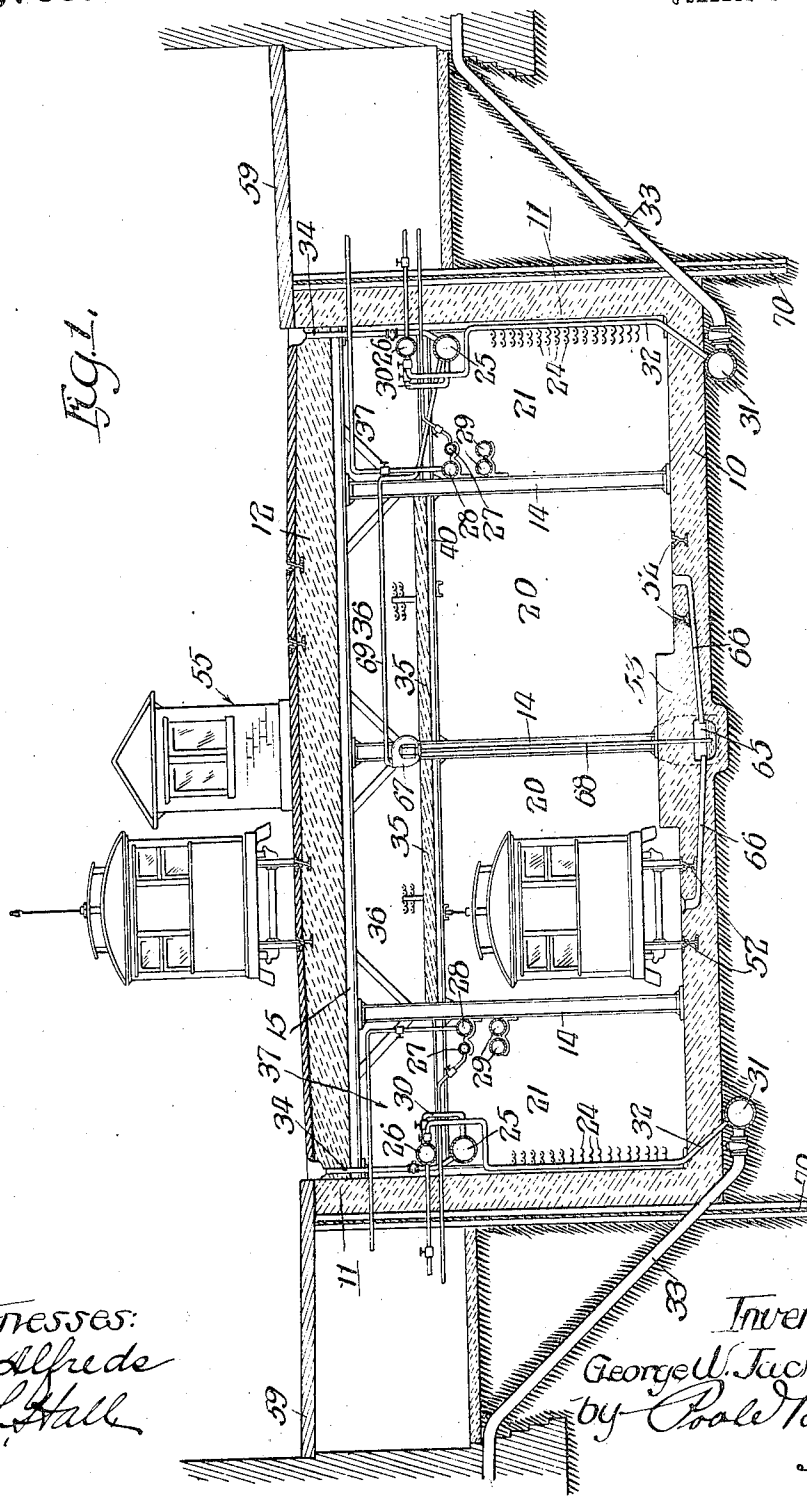
UNDERGROUND SUBWAY FOR STREET RAILWAYS, &c.

APPLICATION FILED JULY 6, 1908.

922,768. Patented May 25, 1909.

6 SHEETS—SHEET 1.

Fig. 1.



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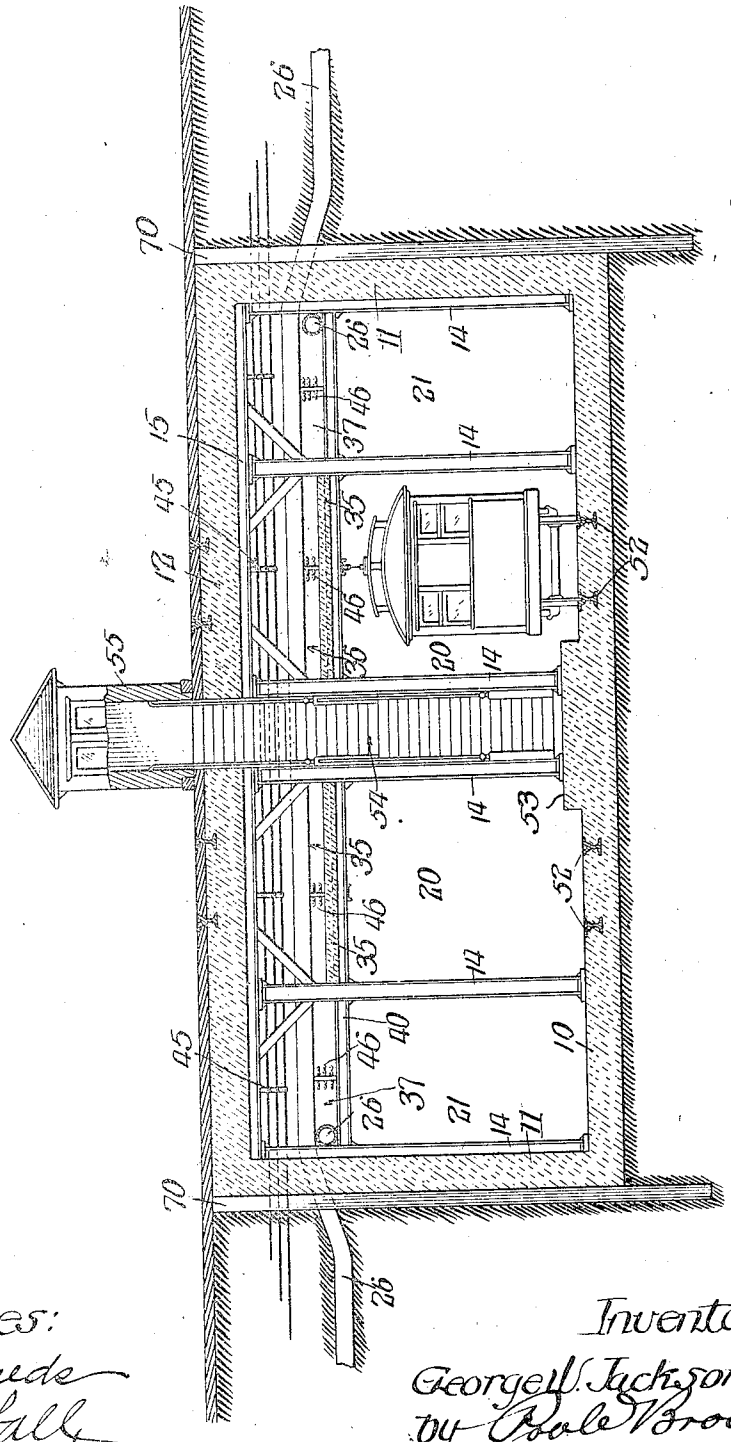
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6 SHEETS—SHEET 2.

FIG. 2



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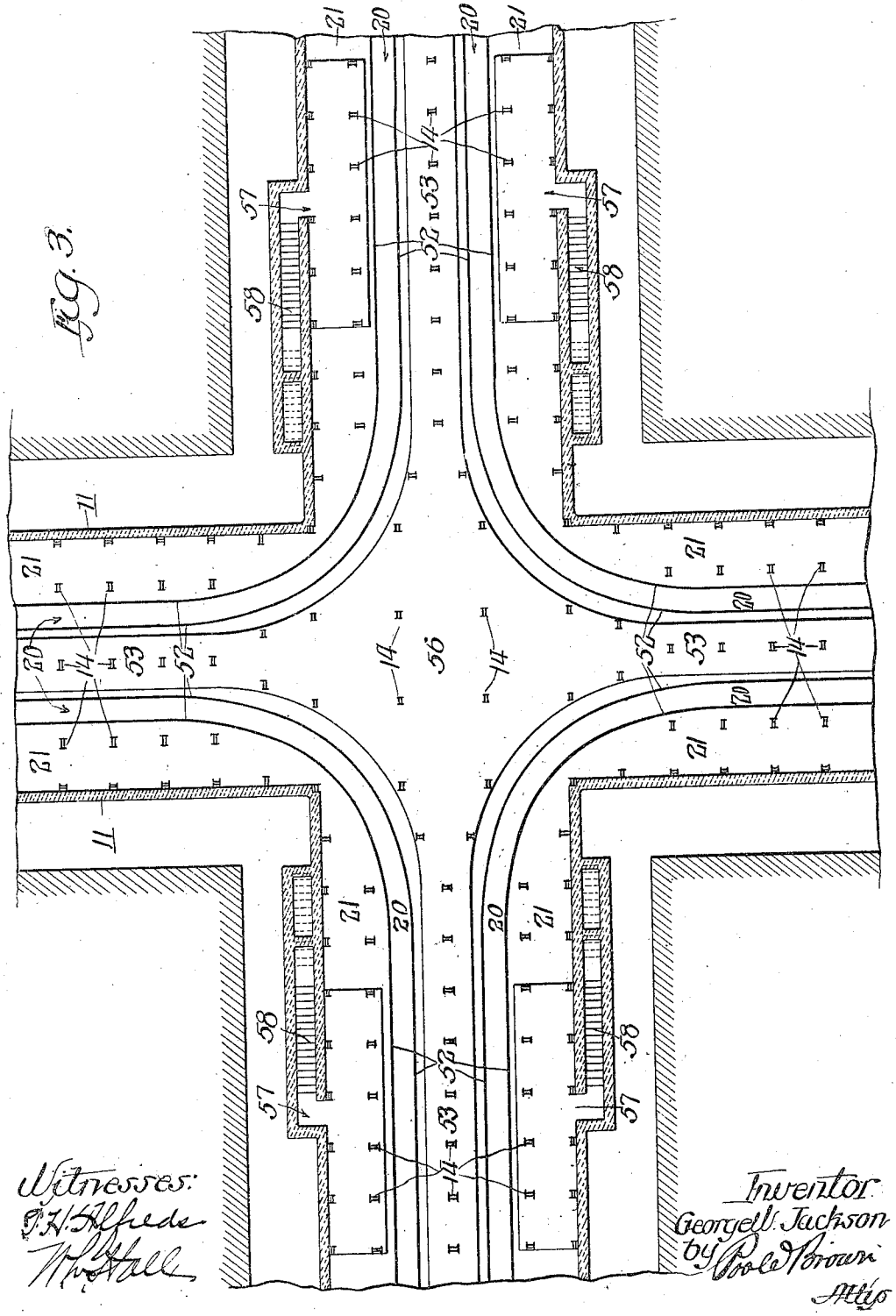
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6 SHEETS—SHEET 3.

Fig. 3.



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6 SHEETS—SHEET 4.

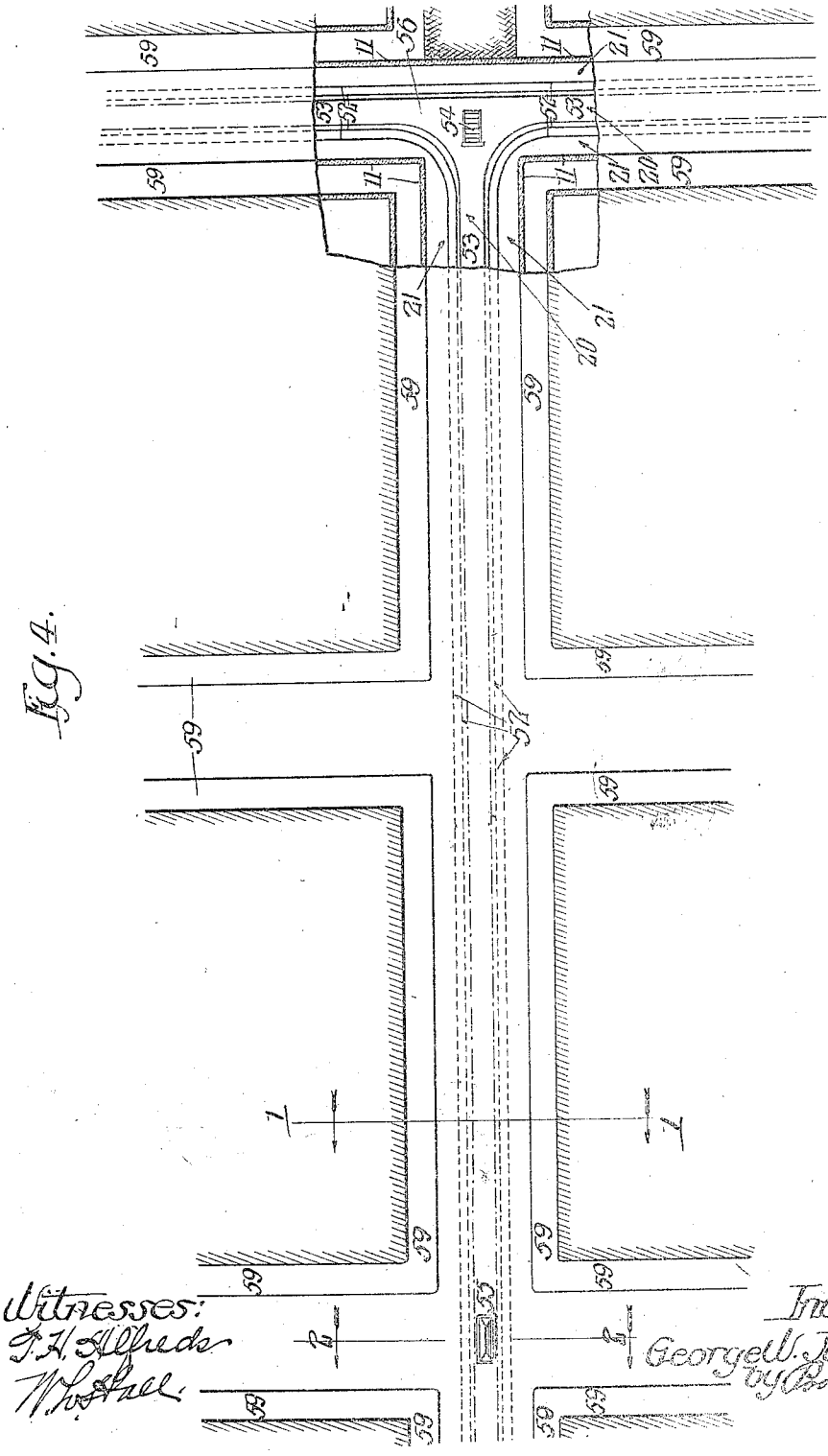


Fig. 4.

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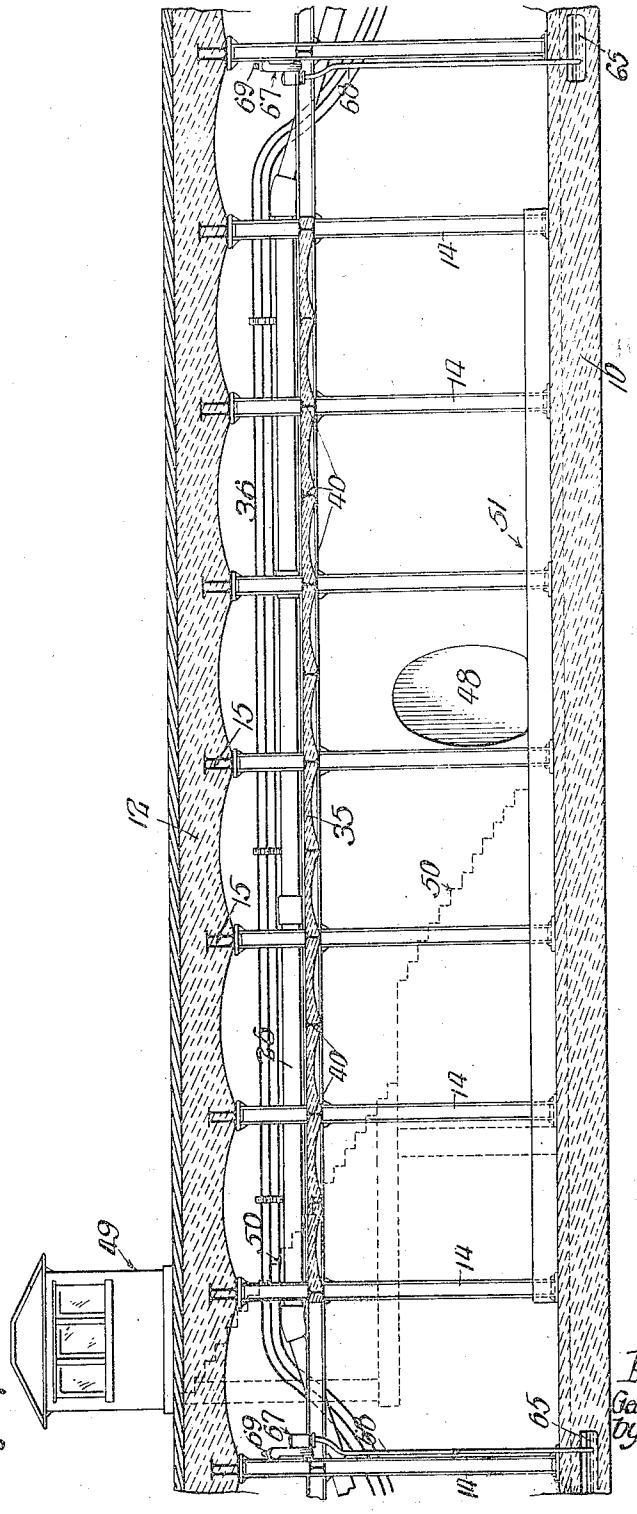
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6 SHEETS—SHEET 5.

Fig. 5.



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6 SHEETS—SHEET 6.

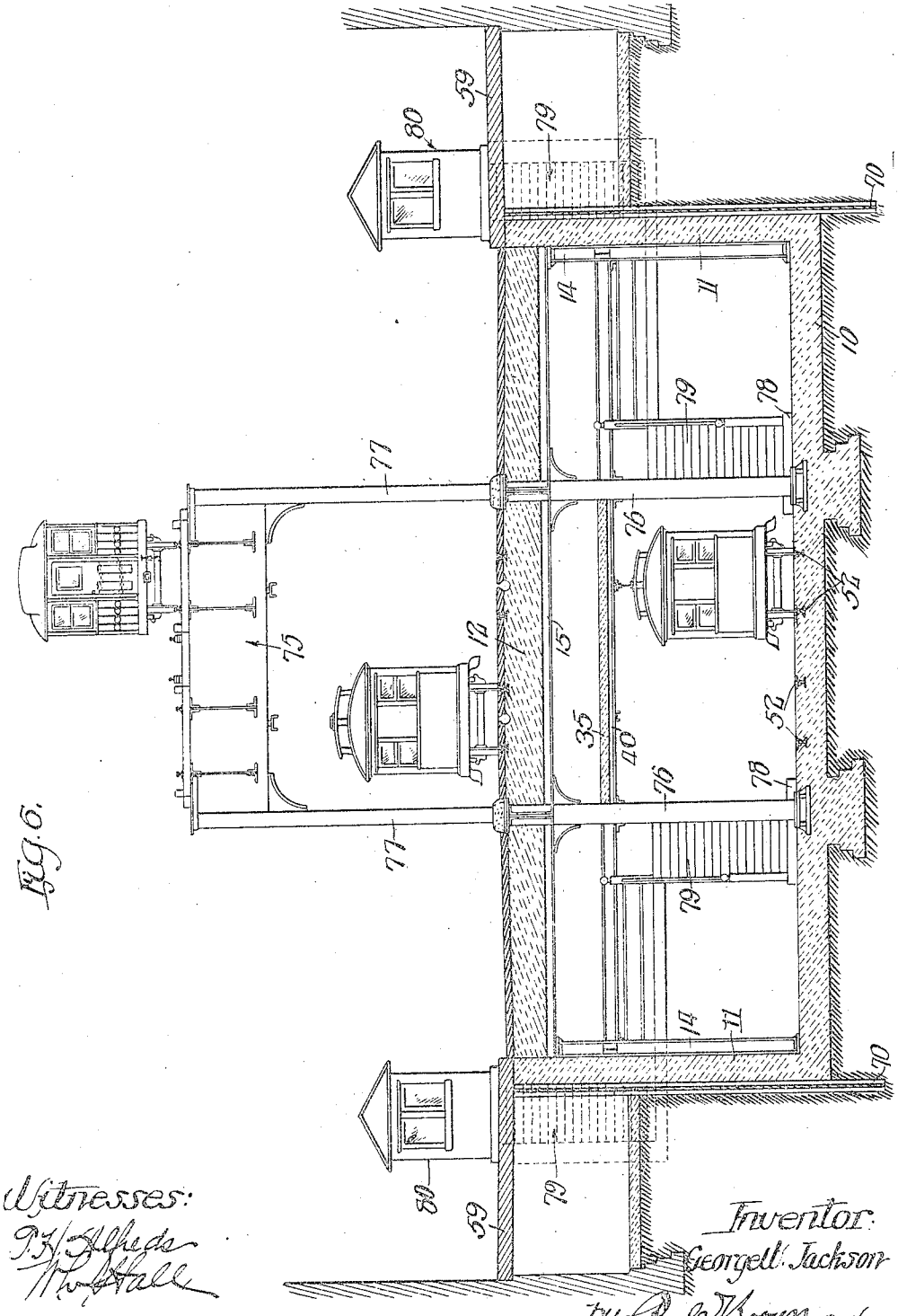


Fig. 6.

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UNITED STATES PATENT OFFICE.

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UNDERGROUND SUBWAY FOR STREET-RAILWAYS, &c.

No. 922,768. Specification of Letters Patent. Patented May 25, 1909.

Application filed July 6, 1908. Serial No. 442,033.

To all whom it may concern:

Be it known that I, GEORGE W. JACKSON, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Underground Subways for Street-Railways and the Like; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the numerals of reference marked thereon, which form a part of this specification.

This invention relates to subways built under the streets of cities for traction purposes and the invention consists in the matters hereinafter set forth and more particularly pointed out in the appended claims.

Among the objects of the invention is to provide a subway which is so constructed and arranged as to afford accommodations below the street grade for car tracks of a traction system and also to receive various city and corporation utility appliances, such as electric wires, sewers, pneumatic tubes and other pipes which are ordinarily buried in the streets in a way that necessitates the excavation of the streets to gain access thereto. So far as is concerned this feature of the invention, the object of the invention is to provide within the subway spaces and passages to receive and carry such utility appliances, so arranged that ready and convenient access may be had thereto for the purpose of repairing, renewing and supplementing the appliances, and which also afford convenient means for disposing of such utilities over side entrance ways to the subway or over or beneath intersecting pipes and wires at the intersections of streets.

Other objects of the invention are to provide improvements in the subway structure itself, and to so arrange the car tracks relatively to the means of approach to the trains in the subway as to afford open spaces or walks in the subway through which passengers may pass from one train to another at the intersections of two lines of subways and which will permit passengers to walk through the subways to make connections at distant points or to pass comfortably through the subway from one street to another in the event that the superjacent street or streets are congested for any reason.

Other objects of the invention will appear from the following description.

As shown in the drawings:—Figure 1 is a transverse section of a double track subway embodying my improvements, taken on line 1—1 of Fig. 4, illustrating the means for carrying the city and corporation utility appliances. Fig. 2 is a section, taken on line 2—2 of Fig. 4, omitting certain of the public utility appliances illustrated in Fig. 1, and illustrating the manner of carrying the public utility appliances of an intersecting street across the subway. Fig. 3 is a diagrammatic plan view illustrating the manner of bringing adjacent corners of a plurality of subway loops together, and showing a convenient manner of arranging open areas or platforms between the tracks so as to provide for free passage from one train to another and to provide walks or passages between the tracks from one street to another. Fig. 4 is a diagram or plat of a street and subjacent subways and intersecting streets, showing the manner of arranging between parallel tracks in the subway a central walk extending from one intersecting street to another. Fig. 5 is a longitudinal section of the subway having a side entrance, showing one side wall of the subway and the means for supporting thereon city and corporation utility appliances, as electric wires and the like, and the manner of carrying the same over the side entrance to the subway. Fig. 6 is a transverse section of a subway built beneath a street over which is located an elevated railway structure, showing the manner of supporting the elevated structure from the structure constituting part of the subway.

Fig. 1 is a typical cross-section of one form of double track subway made in accordance with my invention, and this form will be first described, references being made from time to time to other figures of the drawings to more fully explain constructions not fully shown in Fig. 1 and to explain modifications or variations.

The subway shown in Fig. 1 is made of a width to extend from side to side of the street, occupying the total cross-sectional area of the street from curb to curb. The walls of the tunnel may be made of any suitable masonry construction, concrete and like cementitious material being preferred. The subway comprises a floor or bottom wall 10, vertical side walls 11, 11 located at the curb lines of the street, and a top wall or roof 12 which constitutes a foundation for the street pavement. The roof is supported

from the floor of the subway through the medium of posts 14, 14 and said roof embraces in its construction metal beams or girders 15, 15 which are supported on the upper ends of the posts, and which in turn supports the material constituting the roof and the street pavement above. The posts 14, 14 are arranged in rows longitudinally of the subway to divide the subway into two parallel passages 20, 20 located near the center of the subway and two lateral aisles 21, 21, located adjacent to the side walls 11 of the subway. The said passages or aisles 21 are provided to accommodate the various city and corporation utility appliances which are usually buried in the street. For instance, racks 24, 24 of any suitable character may be supported on the side walls of the subway to carry electric cables. I have also indicated the location and the manner of supporting a storm water sewer 25, a high pressure water main 26, steam and brine mains 27, 28 and pneumatic tubes 29. The said high pressure water main and storm water sewers are shown as constituting parts of a combined high pressure and sewer system illustrated in my copending application, Serial No. 442,034, filed on the 6th day of July 1908, the high pressure water main being connected with the storm sewer by a flush pipe 30, and is connected also with a lower subsoil sewer 31 by a flush pipe 32 and which sub-soil sewer receives sewage from adjacent buildings through a building service pipe 33. The storm water sewer receives drain water from the street through a drain water pipe 34.

In addition to providing the side or lateral passages 21 to receive some or all of the utility appliances mentioned, I have arranged to provide passages or spaces just beneath the main roof 12 of the subway, which are designed to receive certain of said utility appliances under varying local conditions which may be encountered, as will hereinafter more fully appear. A portion of said upper passages or spaces are located between the main roof 12 and horizontal partitions or sub-roofs 35, which are made solid to prevent the leakage of water through the main roof to the car passages or sections 20. Between said sub-roof and the main roof are longitudinal spaces or passages 36. The upper parts 37, 37 of the side passage 21 are divided from the lower parts of said passages at the level of the sub-roofs or partitions 35 by horizontal beams or girders 40 which affords support for a portion of the utility appliances carried in the subway. It will be evident that the spaces 36 and 37 do or may communicate with each other entirely across the subway. Therefore, said spaces may be utilized to carry electric wires, pipes and other utility appliances which extend parallel with the line of the subway, or transversely across the line of the subway at intersections where the pipes and wires of a transverse street cross the pipes and wires of the street beneath which the subway is built. This general mode of arranging the intersecting utility appliances is best indicated in Fig. 2, in which is shown intersecting high pressure mains 26 laid along the intersecting streets and, in which is also shown upper and lower cable carrying racks 45, 46, one set of which is designed to carry the cables transversely across the line of the subway and the other of which is designed to carry the cables which extend parallel with the line of the subway, and which may or may not be diverted upwardly thereto from the lower level of the lateral aisles or passages 21.

As shown in Fig. 5 ingress to and egress from the subway is had through a side entrance 48 which is reached from a side street entrance 49 by means of stairways 50, 50, said side entrance opening onto a platform 51 at the outside of the track, over which passengers alight from and board trains on the tracks 52. When such side entrance is provided it will be necessary or desirable to divert or carry such of the utility appliances as are in the side aisles or passages 21 to the overhead passages 36 or 37 and over the entrances 48 and side platforms 51. In such instances the upper side spaces or passages 37 will desirably be separated from the side passages proper by sub-roofs or partitions like the sub-roofs 35 between the car passages and upper passages 36.

As shown in Figs. 1, 2 and 3, the subway is provided with a central platform 53 located between the car tracks 52 by which the passengers leave and board the train. Said platform is herein shown as reached by a flight of stairs 54 leading from a street entrance 55 located at the center of the street. The manner of entering the tunnel will, of course, depend upon the local conditions prevailing which permit or require the use of a side or central entrance. When the central entrance is used no necessity will ordinarily arise for diverting the wires or pipes upwardly between street intersections. Where a central platform 53 is provided and the car tracks are located throughout the subway at the distance apart shown in cross-section in Figs. 1 and 2, such central platform may continue throughout the length of the subway either as a platform or a modified construction of a walk, as shown in Figs. 3 and 4, whereby passengers may alight from the trains and walk through the subway to another train or to a distant street intersection before climbing to the street grade and thus, in the latter instance, avoid crowded or congested conditions of the superjacent streets. Another advantage of the central platform or walk is illustrated in Fig. 3, illus-

trating an intersection where the tracks 52 of two or more different loops are brought with the corners of said loops adjacent to each other at such intersection. As shown in said Fig. 3, four of such loops are brought together, with each subway at each side of said intersection carrying two tracks belonging to two different loops. The arrangement illustrated provides a central areaway 56, on which may be built a platform, over which passengers may transfer from one train to another, thus largely avoiding congestion at such transfer points. Such arrangement also provides means whereby passengers may walk from one branch to another of the subway to distant intersecting streets beneath which the subway extends to reach a particular street intersection desired, and thus avoid overhead crowded streets, as shown in Figs. 3 and 4.

As shown in Fig. 3, side entrances 57 to the subway are also provided which are reached by flights of stairs 58 leading from the street grade near the curb lines of the street. A central entrance may also be provided which leads by suitable stairways to the central areaway 56. Thus in the particular arrangement illustrated of bringing the loops together at two intersecting subways, it will be seen that passengers may enter the subway, from both sides of the street, and may also enter the subway at the center of the intersecting streets to the centrally located platform or areaway 54, it being understood that the cars will be arranged for entrance thereto from both sides. This arrangement provides for taking care of large crowds with despatch and with safety and comfort to the passengers. It will be observed, from an inspection of Fig. 4, that the same general advantages will be found to exist in cases where but two or three corners of loops are brought together or where one side of a loop, which continues through one of the branches of the subway, extends past the adjacent corners of two adjoining loops. In the last proposed variation one member of two different loops leads from one of the subways to the joining subway, while the side of another loop is designed to extend continuously through such joining subway past the adjacent corners of said loops. It will be obvious that many and varied arrangements may be made to bring the members of different loops of a subway system adjacent to each other to provide for prompt and easy transfer from one loop to another, and that in all such cases the central platform 54 is of great importance as providing for free and easy transfer from one line to another.

At the intersection of the subways, as shown in Fig. 3, utility appliances, which are carried in the side aisles or passages 21 of the subway, will need to be diverted upwardly into the upper passages or spaces 26 and 27 immediately beneath the roof of the subway to carry the same over intersecting tracks of the loops and also over the entrance ways at the sides of the subway which are indicated in said figure. It will thus be manifest that the arrangement of the overhead passages shown provides means for carrying the city and corporation utility appliances in the subway in such manner that such appliances are always free for access to repair, replace and supplement the same, and that the provision of the upper passages immediately beneath the roof of the subway provides means whereby the said utility appliances may be readily carried over each other at intersecting points and over the railway tracks and side entrances to the subway.

The subway is provided centrally thereof or at other suitable points with catch basins or sumps 65 which are designed to receive drain water from the floor of the subway through pipes 66 located with their receiving ends at proper draining levels in the floor. The water is pumped from said tanks or sumps by means of electrical, or other suitably operated pumps 67, located, as herein shown, above the sub-roof of the subway and connected by pipes 68 with said sumps, and discharging at their other sides through pipes 69 into the storm water sewer 25, whereby the water drained into said catch basins or sumps is pumped into said storm water sewer.

In constructing the subway, the foundations of buildings along the street are protected by first driving rows of sheet piling 70 adjacent to the curb lines or at the sides of the subway, after which the earth between the walls constituted by the sheet piling is excavated and the walls of the subway constructed. The said sheet piling walls 70 may remain to constitute a metal sheet lining or reinforcement for the side walls of the subway, which not only strengthens the walls of the subway but also serves to prevent the shifting of the earth at the sides thereof and the impairment of foundations of adjoining buildings. The side walls of the subway are pierced at points where service pipes or wires are to be led out of the subway to adjacent buildings.

In Fig. 6 I have shown a construction and arrangement of the subway which may be employed where the subway is built beneath a street over which is located an elevated structure 75. In this arrangement the car tracks in the subway will be located close together in a single passage between posts 76, 76 which are located beneath and vertically in line with the columns 77 of the superjacent elevated track structures, whereby said latter columns and the elevated structure may be carried by the posts or columns 76 of the subway structure. This arrangement greatly simplifies the construction of a

subway beneath a street over which is located an elevated railway and provides a practical and strong foundation for the elevated structure. In this instance the trains are approached from platforms 78, 78 at the sides of the car tracks, access to which is had through the medium of stairways 79, 79 leading to street, and entrances 80, 80 located on the sidewalk 59. In other respects, the construction of the subway is essentially the same as that heretofore described.

It will be obvious that the details of construction herein shown may be modified within the spirit of my invention to adapt the subway to various local conditions, and I do not limit the invention to such structural details except as hereinafter made the subject of specific claims. For instance, the lateral aisles or passages 21 may be divided from the track passages or sections of the subway by walls and the upper sections 37 of said lateral aisles may be separated from the lower parts thereof by partitions like the horizontal partitions or sub-roofs 35. Moreover, a single track subway may be constructed with a lateral passage or aisle and the spaces beneath the roof to receive the utility appliances, and said lateral passages or aisles may be otherwise located relative to the track sections or passages for the double tracks.

I claim as my invention:—

1. A subway for traction uses comprising a bottom and side walls and a roof, and provided with a passage for car tracks and laterally at one side thereof with a lateral passage having means for supporting utility appliances, a passage immediately beneath the roof of the subway arranged to receive utility appliances extending either longitudinally or transversely of the subway.

2. A subway built beneath a street for traction purposes comprising a floor, side walls and a roof, posts supporting the roof from the floor arranged in rows to divide the subway into passageways for car tracks and lateral spaces having means for supporting therein public utility appliances, said car tracks being separated at the longitudinal center of the subway by a central platform, and a stairway leading from the center of the street to said central platform.

3. A subway built beneath a street, the central portion of which is divided into two passages to receive car tracks, and a central space or walk between said car tracks extending between streets which intersect the street beneath which the subway is built to provide a passage in the subway from one intersecting street to another.

4. A subway for traction purposes comprising a floor, side walls and a roof, and posts supporting the roof from the floor and arranged in rows to divide the subway into centrally located passages to receive car tracks, and two lateral passages having means for supporting therein public utility appliances, and a horizontal or sub-roof between said car track passages and the main roof, and said aisles being provided in line with said horizontal partition with horizontal supports, the whole dividing the upper part of the subway into a space through which is adapted to extend public utility appliances of streets which intersect the subway, and into which are adapted to be carried or deflected certain of the public utilities carried in the lateral passages or aisles.

5. A subway for traction purposes comprising a floor, side walls and a roof, posts supporting the roof from the floor and arranged in rows to divide the subway into a car space and a lateral passage or aisle provided with means for supporting therein public utility appliances, a storm water sewer arranged in said aisle, a catch basin located in the floor of the subway into which water from the subway floor is drained, and a pump for pumping said water from said catch basin into the storm water sewer.

6. A subway for traction purposes built beneath a street comprising a floor, concrete side walls reinforced by metal sheet piling, and a roof supported from the floor by posts, said posts being arranged to provide within the subway passages to receive car tracks and lateral passages or aisles in which to locate public utility appliances.

7. A subway built beneath a street comprising a floor, side walls and a roof, the latter supporting the foundation of the street pavement, posts supporting the roof from said floor, said posts being arranged in rows to divide the subway into parallel passages to receive car tracks and a lateral passage or aisle, a storm water sewer supported in said lateral passage or aisle, a high pressure main supported also in said aisle, a subsoil sewer located beneath the floor of the subway, and flushing pipes connecting said high pressure water main with said storm water sewer and subsoil sewer for flushing the latter.

8. In a subway construction, two intersecting subways divided into centrally located passages to receive car tracks and lateral passages or aisles to receive public utility appliances, walks located centrally between the tracks of each subway and communicating with a central areaway or space at the intersection of the two subways.

9. In subway constructions, two intersecting subways built beneath intersecting streets, parallel car tracks arranged in each subway, the tracks of each subway extending from one subway laterally into an intersecting subway but not crossing another car track, said car tracks being separated by a central walk or space which extends from one intersecting street to another and communicating at the intersection of the subways with a central areaway or space.

10. The combination with a subway built beneath a street, and an overhead elevated structure, said subway comprising a floor, side walls and a roof, the latter of which is supported from the floor by posts, and the elevated structure being provided with posts or columns which rest on and are supported by the posts of the subway.

In testimony that I claim the foregoing as my invention I affix my signature in the presence of two witnesses, this 21st day of May A. D. 1908.

GEORGE W. JACKSON.

Witnesses:
M. W. CLUXTON,
J. C. MOORE.