Tunnel Digging Is Begun in Los Angeles

The Hollywood-Glendale-San Fernando Valley Tunnel Will Eliminate 1,000 Daily Car Movements from Streets in the Congested District—An Expenditure of Approximately $3,500,000 Is Planned—The Length Will Be 5,025 Ft.

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WORK was commenced on May 3, 1924, by the Pacific Electric Railway on its Hollywood-Glendale-San Fernando Valley tunnel in Los Angeles. Excellent progress is being made, and unless unforeseen difficulties arise, it is expected that operation over the new route will be undertaken in about 18 months. The severe traffic congestion which has been causing anxiety in Los Angeles for some time past will be relieved by the elimination of more than 1,000 daily movements of electric cars in the narrow streets of the business district. The subway will shorten the route between Hill Street and Hollywood by about 7,500 ft.

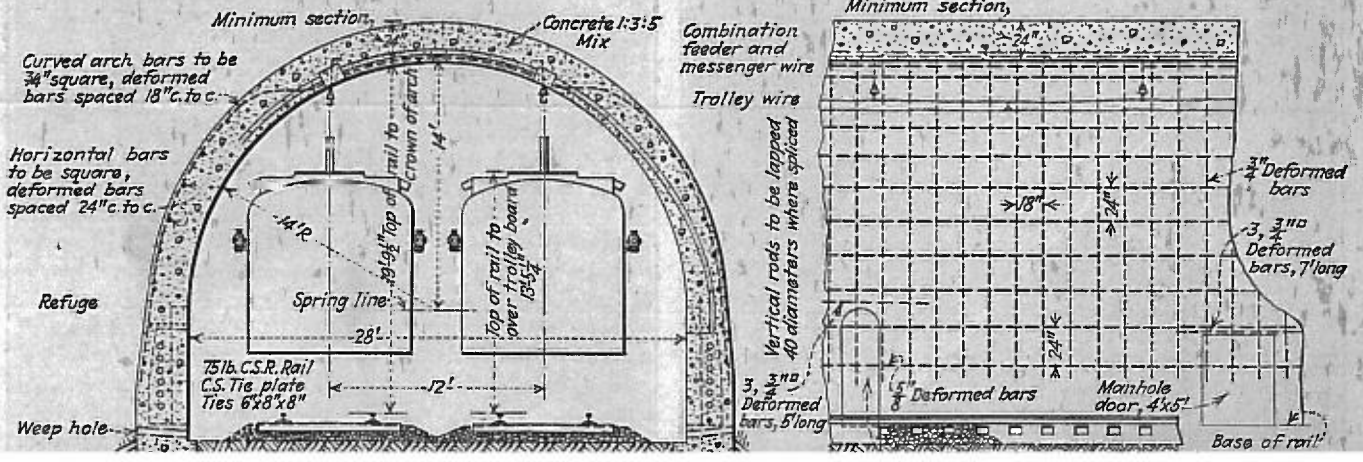
At present the Hollywood service of the Pacific Electric Railway is operated on a 45-second headway during the rush hours. Besides this, the company operates through this part of the city three-car interurban trains for the Glendale and San Fernando Valley district on a 7-minute headway. Delays on account of motor vehicle congestion were such that it was thought impracticable to operate cars on a shorter headway. The territory served by these lines has had a remarkable growth during the past three years, and it was felt that additional transportation facilities should be provided. With this object in view, the subway is now being built.

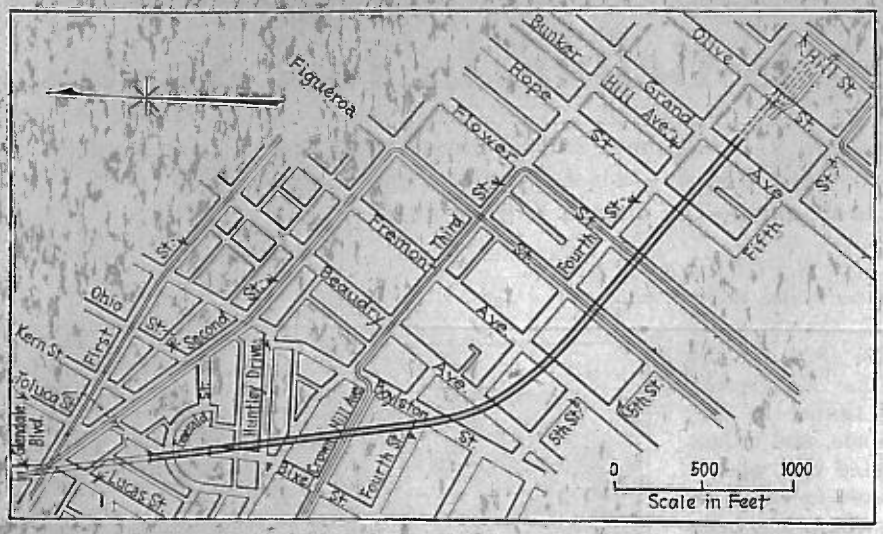
The new route begins at the present Hill Street terminal of the Pacific Electric Railway and extends westerly and northerly to First Street and Glendale Boulevard. The length of the subway is 4,225 ft., exclusive of an open cut of 500 ft. at one end and 300 ft. at the other end. It begins at grade at Hill Street and comes out to grade again at the northerly portal about 600 ft. south of the intersection of First Street and Glendale Boulevard. The gradient is such that little trouble is expected with the drainage of the tunnel.

Subway operation will not only shorten the mileage considerably but also reduce the running time by 10 or 15 minutes. The Hollywood service will be operated in two-car or three-car trains, at a speed of 30 to 35 m.p.h. in the tunnel. Fifty new cars were placed in this service during 1923 and fifty more of the same type were added during the early part of the present year. The entire order of 100 cars entailed an expenditure of $2,000,000.

Beginning the Excavation at the West Portal of the New Hollywood-Glendale Tunnel in Los Angeles

The subway project was one of the issues involved





Route of the New Tunnel from Hill Street Terminal to Glendale Boulevard and First Street

in the decision of the California State Railroad Commission granting a fare increase to the Pacific Electric Railway in January, 1922. At that time the commission ordered the company to construct a tunnel for its Hollywood, Glendale and San Fernando Valley service. Rerouting after the completion of the tunnel will eliminate 778 car movements per day on Hill Street and 301 on Sixth Street. The plan involves also an important expansion of trackage at the Hill Street terminal. Structures now standing adjacent to the terminal are to be removed. Five passenger loading and unloading tracks, each with a capacity of six cars, will be constructed. The method of handling traffic at this point will be similar to that followed at the Sixth and Main Streets terminal of the railway.

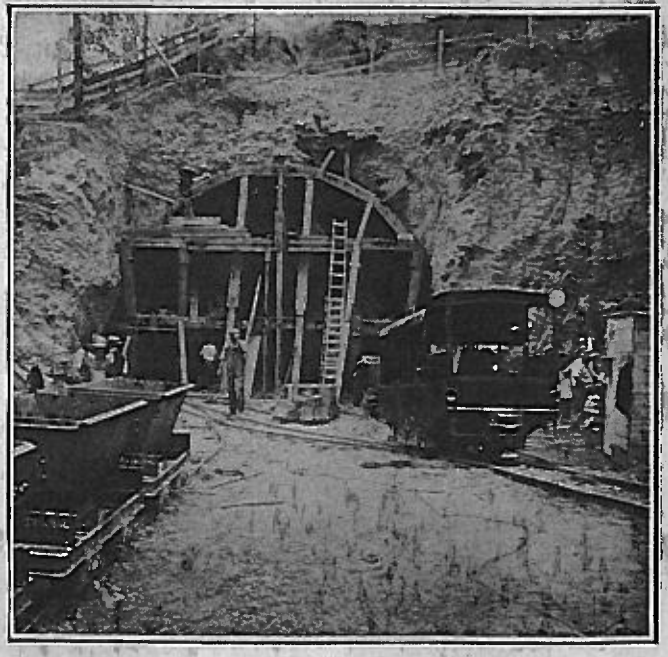
The tunnel is of semi-circular cross-section. It will be double tracked throughout and equipped for overhead trolley operation. An inside width of 28 ft. is provided, while the height is 21 ft. 3½ in. from the subgrade to the spring of the arch. Reinforced concrete will be the material used in construction. A 1:3:5 mixture has been decided upon with ¾-in. and 1-in. steel reinforcing bars.

In commencing the bore, the first drive was made from the northerly portal. Somewhat later a second drive from the midway section was undertaken. The latter will be carried in the direction of the initial bore and also in the opposite direction toward the easterly portal at Hill Street. Soil encountered in digging has been principally blue shale clay. The tunnel is being driven by the drift method of excavation. The character of the earth required that the two lower drifts proceed in advance of the two upper drifts. Altogether the excavation work involves approximately 135,000 cu.yd. of earth.

It is planned to use the skip method of disposing of spoil removed from the midway section. Near the center of the subway will be built a circular vent shaft 8 ft. in diameter and extending 6 ft. above the natural surface of the ground. During construction this shaft will be utilized for removal of excavated material, and after completion of the tunnel it will serve for purposes of ventilation. An air compressor plant furnishes air for operating the pneumatic tools used in boring the tunnel. Compressed air from this source is used also to remove the gases formed in drifts Nos. 1 and 2. The core of the tunnel will be removed with steam shovels.

Several innovations have been introduced in the construction of this subway. Taking advantage of the open cut 300 ft. in length at one end of the tunnel, a large timber bunker was erected for use in disposing of the excavated earth. From the tunnel entrance a portable light railway track extends up the right-hand side of the cut and onto the bunker. Typical mining equipment is used for hauling. Gasoline-operated locomotives and small steel dump cars having a capacity of 1 cu.yd transport the material excavated from the tun-

In Digging the New Los Angeles Subway, Excavated Material Is Removed by a Light Railway and Dumped Into Timber Bunkers, from Which It Is Hauled Away by Motor Trucks



Gasoline Locomotive and Dump Cars Used in Tunnel Construction to Remove the Spoil from the Portals. A Central Shaft Will Also Be Used for the Purpose

nel to the bunker. Motor trucks pass under the bunker and are loaded by gravity, so that no time is wasted by trucks or trains waiting for transfer of the material.

On the left-hand side of the open cut at the west end another large timber bunker has been erected. This is used for storing sand, rock and gravel. The top of the bunker is level with a spur track on which construction material is brought to the job, thus permitting the handling of rock and sand directly from the cars into the storage bunker. A concrete mixing plant is located under the base of the material storage bunker. The mixture is carried into the tunnel for placement in the form by Universal air-operated mixing and placing machines.

Reinforcing steel placed in the tunnel is spaced 18 in. vertically and 2 ft. horizontally. The average section of reinforced concrete work completed at one time is 20 ft. in length. This average will probably not be changed much during the entire tunnel construction job.

On each side of the subway will be six 4-in. fiber ducts. These conduits will carry two 20-pair telephone cables, two 600-volt feeder lines, and will provide facilities for the installation later of two 15,000-volt, three-phase, high-tension circuits. On the opposite side, the six ducts will carry two circuits for the block signal system.

Manholes will be spaced 300 ft. apart on tangent track and 200 ft. apart on the curves. These will be 4 ft. x 5 ft. in size and will facilitate maintenance and permit making carry-off connections to the electrical lines. Combination refuge and telephone recesses are spaced 1,000 ft. apart on one side of the subway only. Ordinary refuge recesses are spaced 50 ft. apart on each side. Electric lights will be installed in the manholes and refuge niches.

The construction of the subway is under the supervision of E. C. Johnson, chief engineer Pacific Electric Railway. The contracting work is being done by Twohy Brothers of Portland, Ore. W. R. Fontaine, tunnel engineer, is acting in the capacity of consulting engineer for the contractors. Both he and Mr. Johnson have had extensive previous experience in tunnel construction.

Three-color automatic d.c. electric block signals will be installed. These signals will be so arranged that trains can be operated through the tunnel on a 25-second headway. The Hill Street terminal track layout will be controlled by a 32-lever electric interlocking plant. An ample number of spare levers to accommodate future extensions will be provided.

When the Pacific Electric Railway was preparing its plans for this subway project various civic bodies started a movement to locate the downtown terminal under Pershing Square in the heart of the business district. This location would have been more central than the one eventually chosen, and could have been utilized at a later date for subway construction to other parts of the city. The railway management was agreeable to this suggestion and prepared new plans for the utilization of part of the space under the square. The plans were indorsed by the Los Angeles Chamber of Commerce, the Los Angeles Traffic Commission, the Community Development Association and the Engineers and Architects' Association.

Inasmuch as Pershing Square was city property, however, it was necessary to secure a favorable vote of the people before it could be used for such a purpose. In due course a referendum was held and the proposa received the permission of the public by an overwhelm ing majority. The city charter, however, gave the cit council final jurisdiction in this matter, and in spite o the popular approval which the project had received this municipal body refused to sanction it. Althoug the railway plan contemplated no interference wit the trees, shrubbery or general beauty of the park, a all of the facilities were to be underground, the pla had to be abandoned. Had it not been for the dela thus incurred, the subway would probably be nearin completion at the present time.

Pavement Cutters Used to Break Ice

THE city of Buffalo by attaching special bits to it paving breakers and clay diggers has found a par tial solution to the problem of freeing the streets of ic in winter. Considerable trouble has been experienced i many cities because of ice forming in the gutters and later causing the streets to be flooded. Years ago when general contracting was inactive during the winter months and labor was therefore available and not too expensive it was possible to put enough men to work to break up the ice quickly. Nowadays, however, labor is just as scarce during the winter as at other times of the year and it is only by means of modern labor-saving devices that cities can break up ice and remove snow in their streets.

Pneumatic Pavement Cutters Break Up Ice in Buffalo, N. Y.

Electric railways are often faced with a similar problem. Following a sudden drop in temperature ice may form in places where the tracks are lower than the rest of the pavement, and quite frequently a ridge of ice is formed between the rails and damage to motor cases results. Nearly every railway is equipped with a portable air compressor, paving breaker, jack hammers, clay diggers and various other pneumatic tools used in track construction and paving work. These machines are available for breaking up ice in the way described and their use involves no additional capital expenditure.