SOME FEATURES OF THE NEW YORK RAPID TRANSIT TUNNEL.

It is questionable whether the citizens of New York appreciate what a truly splendid system of transportation will be at their command when the Rapid Transit Tunnel is put in operation. The new system will not merely add four new lines of track to the already large number of north and south lines which extend the full length of Manhattan Island, but it will provide a service of express trains which, in point of frequency and speed, will be positively without a rival. This is a fact that is not by any means realized, and when the road is opened it is going to come as a most agreeable surprise to the traveling public.

From the very first it has been the policy of the engineers of the road to make it a *sine qua non*, that the rapid transit road must be essentially a high-speed system, which will not merely possess an enormous carrying capacity, but will also transport passengers at a speed that has never been approached by any other road on the island. From the present terminus at City Hall Park, express trains are to be dispatched during the rush hours at two minutes' intervals. They will make stops at Fourteenth, Forty-second, Seventy-second, Ninety-sixth Streets, and the whole run to One Hundred and Fifty-seventh Street will be made in 16½ minutes. The fastest traveling at present provided for the public is by the express trains on the Ninth Avenue Elevated Railroad, on which the run, by actual timing, from Franklin Street to One Hundred and Thirty-fifth Street is made in about half an hour, the time between the same points by the local trains being forty minutes. The average running speed of the Rapid Transit express trains, including stops, will be 38 miles per hour; and this means that, at times, the speed will rise to 50 miles an hour, and occasionally over that. The local trains will have an average speed of 18 miles per hour, which is about 50 per cent greater than that of the present local trains on the Manhattan elevated roads. The express stations will be located at intervals of a little less than 2 miles, while the local stations will average about four to the mile. At one time the question of increasing the number of express stations was mooted; but the Rapid Transit Commission, by advice of its engineers, wisely decided that, since the system was to provide, primarily, an express service, it would defeat the end in view to multiply the stops. It was further urged that the high speed of 18 miles per hour of the local service rendered it unnecessary to multiply the express stations, the passenger being able to quickly cover the distance between the express stations and his own particular stopping-place, by the fast local service. That an average speed of 18 miles per hour can be maintained with stations only a quarter of a mile apart is due to the rapid acceleration which is possible by electric traction, and also to the fact that the local stations are placed a few feet above the average grade of the line—an arrangement under which gravity assists the retardation of the train in approaching the station, and increases the acceleration when the train is running down hill at starting.

Since the opening of spring weather, progress all along the line of the tunnel has been quite rapid, and the whole system presents, from end to end, a very animated appearance. There is much work now being done, moreover, of which but little evidence appears at the surface, particularly where the line runs in tunnel proper and the excavation is being carried out by drifting. Our lower front-page illustration shows one of several stretches of work of this character. The sectional view is taken at the intersection of Thirty-fourth Street and Park Avenue, at the entrance of the tunnel which is now used by the electrical cars of the Metropolitan Street Railway system. That portion of the underground road which lies south of the entrance to the tunnel is contained in one four-track subway as shown in the sectional view at the top of the page. Shortly before Thirty-fourth Street is reached, the four tracks diverge somewhat, and are carried in pairs through two separate tunnels which are located beneath and somewhat to the right and left of the old surface tunnel. This arrangement is shown in our sectional view, which is taken at the point where the Thirty-fourth Street station will be located. It will be noticed that the two tracks of each tunnel are at different elevations, the outer or local tracks being 4 feet higher than the inner express tracks. This difference of level is due to the fact that Thirty-fourth Street is not an express station, and the express tracks are therefore carried through at the normal grade of the line, the local tracks being carried at a few feet higher elevation, according to the method employed at local stations, as already explained. The Park Avenue tunnel is one of the sections of the road where there is far more work being done than appears at the surface. Two shafts have been sunk immediately to the south of the portal wall of the old tunnel to a depth of 48 feet below the Thirty-fourth Street level, and from the bottom of each shaft the tunnel is being excavated north and south by as large a force of men as can be worked to advantage against the face of the rock. As the tunnel is completed, it is lined with concrete, the track system being sunk in the floor and the roof turned with an elliptical arch, as shown in our drawing. At Thirty-fourth Street, the roof of the Rapid Transit tunnel is so near to the base of the Fourth Avenue tunnel that the concrete has been carried up to a junction with the footing of the tunnel, as shown in the drawing. Elsewhere on Park Avenue the vertical distance between the tunnels is greater, and solid rock intervenes between the foundation of the old and the roof of the new tunnel. On Thirty-fourth Street there are two lines of track belonging to the Metropolitan Street Railway Company which are operated by means of storage battery cars, and it is an interesting fact that our sectional view presents at this point no less than eight tracks on which are used three different systems of electric propulsion—storage batteries on Thirty-fourth Street, the underground trolley in the old Fourth Avenue tunnel, and the third-rail system of the Rapid Transit tunnel. In our drawing also there are shown some of the electric cabs which are becoming an important element in city transportation, so that this particular drawing may be regarded as a sort of pictorial symposium of up-to-date methods of travel.

The construction of the underground tunnel road offers a great opportunity for solving the difficult problem of properly disposing of the water, gas, electric and other mains, which at present are buried in any sort of fashion beneath the streets, and are the source of untold expense and inconvenience whenever it becomes necessary to renew or repair them. It is a pitiful commentary upon our supposed twentieth century development that these mains should be buried beneath the streets in the altogether haphazard fashion which is shown in the small sketch on our first page, which represents the condition of things at the intersection of Nineteenth Street and Fourth Avenue. It was the intention of the Rapid Transit Engineers to provide special galleries on each side of the subway, and locate the water and gas and other mains within them. Provision was made for these galleries wherever it was possible to use them, and steel was ordered and considerable excavation done in Elm Street, at a cost of about $35,000. The galleries were abandoned, however, because of opposition encountered from the heads of the Sewer, Water and Gas Departments, who raised various objections of a more or less trifling nature. The Rapid Transit Commission, considering that it was its duty to build the tunnel rather than press the question of the pipe galleries to the point of becoming involved in legal complications and delays, decided to leave the question open for future consideration. While we do not dispute the wisdom of the policy pursued by the Commission, there is every argument to be used in favor of the construction of the pipe galleries simultaneously with the building of the tunnel. At present the pipes are merely suspended from falsework during the construction of the subway, and after a section is roofed the soil is filled in around the pipes, leaving them in the unsatisfactory condition which necessitates pulling up the roadway whenever repairs or changes are to be made.

We present a typical section of the tunnel as it was proposed to construct it, with the two galleries adjacent to the tunnel and separated from it by steel and concrete walls. The larger pipes, such as the water and gas mains, would be carried on the floor of the tunnel, while all other pipes, such as those for compressed air, steam, etc., might be suspended from the roof or carried on brackets extending from the side walls. The galleries would be entered by manholes, or other suitable means of communication, and pipes could be repaired, renewed or inspected without any disturbance of the surface of the street.

Electrolytic Sugar.

Some interesting experiments in the electrolytical production of sugar have been tried by M. Dupont. The electrolyzer consists of a wooden trough divided into three compartments by means of porous partitions of porcelain, asbestos, or parchment paper. The electrodes consist of metallic plates that vary according to the object to be obtained. They may be composed of platinum, aluminium, lead, zinc, etc. In order to obtain sugar from cane or beet juice, the saccharine fluid is placed in the central compartments, and the end compartments are filled with water. Under the influence of the current, the albuminoid substances of the juice coagulate and precipitate, and the salts are decomposed. The juice becomes clear, limpid, and colorless, and no longer contains anything but sugar and some traces of organic matter. There seems to be osmosis through the partitions. In the end compartments accumulate the soda, potassa and ammonia. It is not certain that the process can be used commercially. It is probable that it will in time become useful for work on a commercial scale. It is useful now for analysis.

Thirty-six steamers will be run this year between London Bridge and Chelsea.

Engineering Notes.

A meeting of the American Society of Mechanical Engineers will be held at Milwaukee, Wis., May 28 to 31, 1901.

The Krupps are about to discharge 5,000 men from their Buckau, Essen and Kiel works. They have already dismissed 4,000 since October. The industrial depression is very marked.

The Board of Trustees of the Sanitary District of Chicago have decided to have the top of the Washington Street tunnel chiseled off sufficiently to permit of increasing the navigable depth of the river ten inches pending the settlement of the question as to when and by whom the Chicago River tunnels will be permanently lowered.

Larger freight cars are to be used on German railroads. Three-truck freight cars of 25 tons each will be tried in place of two-truck cars of 15 tons each. An experiment was tried formerly with four-truck cars, but they were too heavy and could not be used on all roads. The wear and tear on the truck is also less with the large three-truck car.

Emperor William is investigating the problem of equipping the street car lines of Berlin with fenders and safety attachments. The Emperor found that none of the devices presented met his requirements. He considered that what was wanted was a self-acting life-saving device, so that the motorman could give his undivided attention to the operation of the car.

French naval authorities are preparing for experiments to test the efficiency of rapid-fire guns against submarine boats, at a depth at which the latter are supposed to be invulnerable; a hulk to be submerged is now being constructed. It will be moored at varying depths and subjected to a plunging fire. The results will furnish a basis for guidance in the tactics of submarine boats.

There will be a very complete acetylene exhibit at the Pan-American Exposition. A special building has been constructed for the purpose, measuring 41 x 101 feet and the wing 59½ x 65 feet. Its height is 40 feet. Both the exterior and the interior of the building will be brilliantly illuminated by acetylene gas. The Ohio State Building will also be illuminated by acetylene. It will have a total of 650 jets, of which 160 will be within the structure and the balance will serve to set forth the exterior.

The New Zealand government is anxious to develop the manufacture of iron in that colony. The ore is very rich and abundant in the Taranaki and Middle Island districts. The government proposes to pay a bonus of $100,000 upon the first 20,000 tons of iron that is made. The stipulations are that the company which produces this quantity must have a capital of at least $1,000,000, and must spend $500,000 upon the erection of the necessary plant to manufacture the material. The government furthermore guarantees to purchase at least 50,000 tons of the iron or steel thus manufactured, at a price slightly in advance of the market rates, and if the metal is satisfactory will probably buy the whole of the material produced. By this means the colony will be able to obtain sufficient iron for its own needs without going beyond its own confines.

There has been a convention of Swiss, Austrian, Swedish, Norwegian and German manufacturers of calcium carbide, and they have combined in establishing price-scales and a mode of controlling the sale of their products. It is expected that by this convention the acetylene industry will be considerably strengthened. The members have adopted measures to avoid the fluctuating and ruinously low rates which, owing to heretofore sharp competition, have made the manufacture of their products unprofitable. Thirty-two of the smaller towns in Germany are now lighted by acetylene gas, and a number of other plants are in the course of erection. The gas is also extensively used by railroads for lighting passenger cars. The year's production of calcium carbide is estimated at 120,000 metric tons, equivalent to 9,500,000 gallons of petroleum.

During the passage of the steamer "Henri Rieth" from the Tees to Kustendje, she sustained damage to her propeller while at sea. Being only a single-screw steamer, her position was a helpless, if not a critical, one. It was thereupon determined to attempt tipping the craft in order to repair the propeller. A staff of Middlesbrough engineers, under the superintendence of Mr. J. W. Burton, carried out the work. The sea was quiet at the time, which served to facilitate the task considerably. The forward water tanks of the vessel were filled, and she slowly tipped up aft until her stem was lifted above the water. A staging was then erected under the stern by the engineers, and several important repairs effected to the propeller, sufficient to enable her to steam to port. The vessel was then rebalanced, and continued her journey as easily and steadily as if no untoward incident had occurred.

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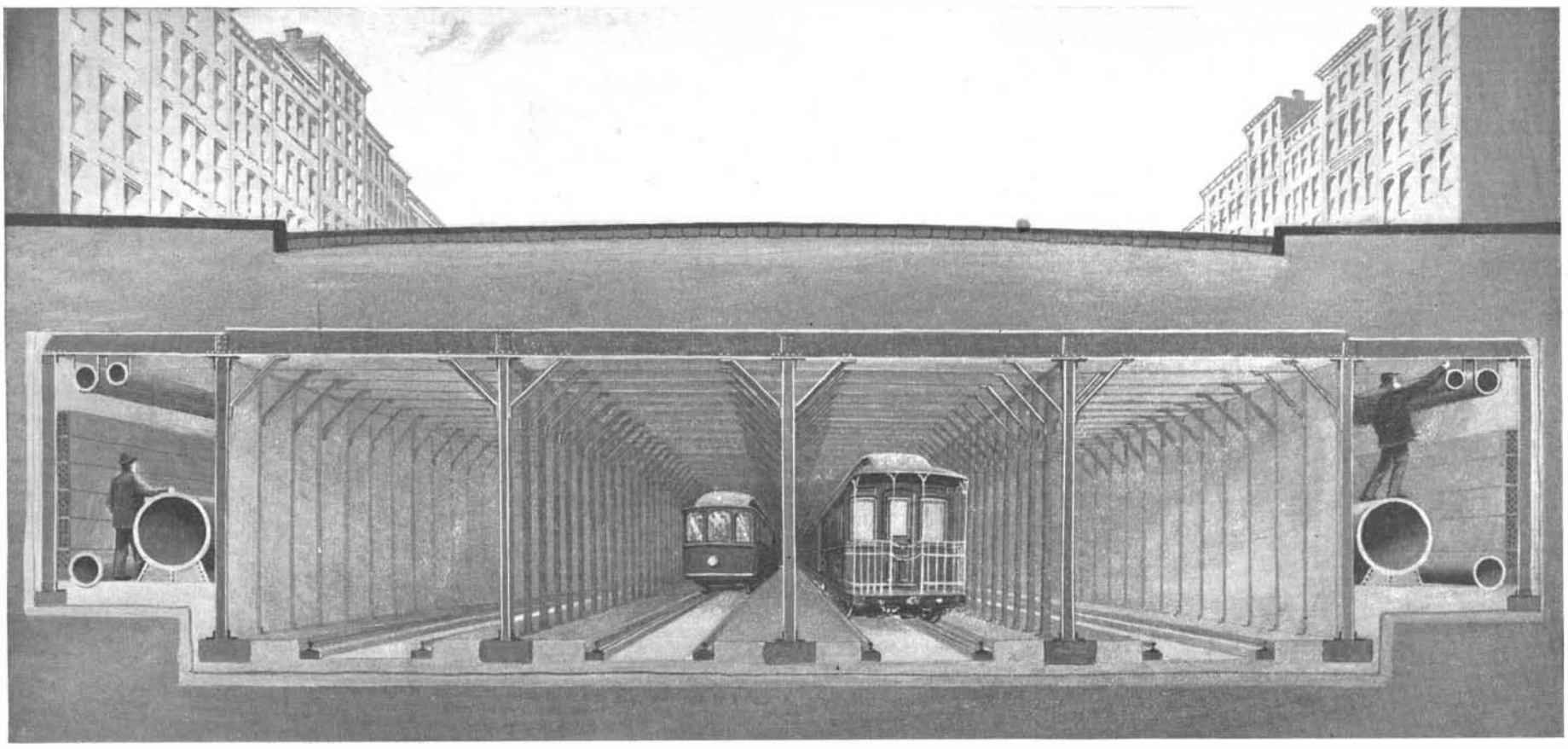
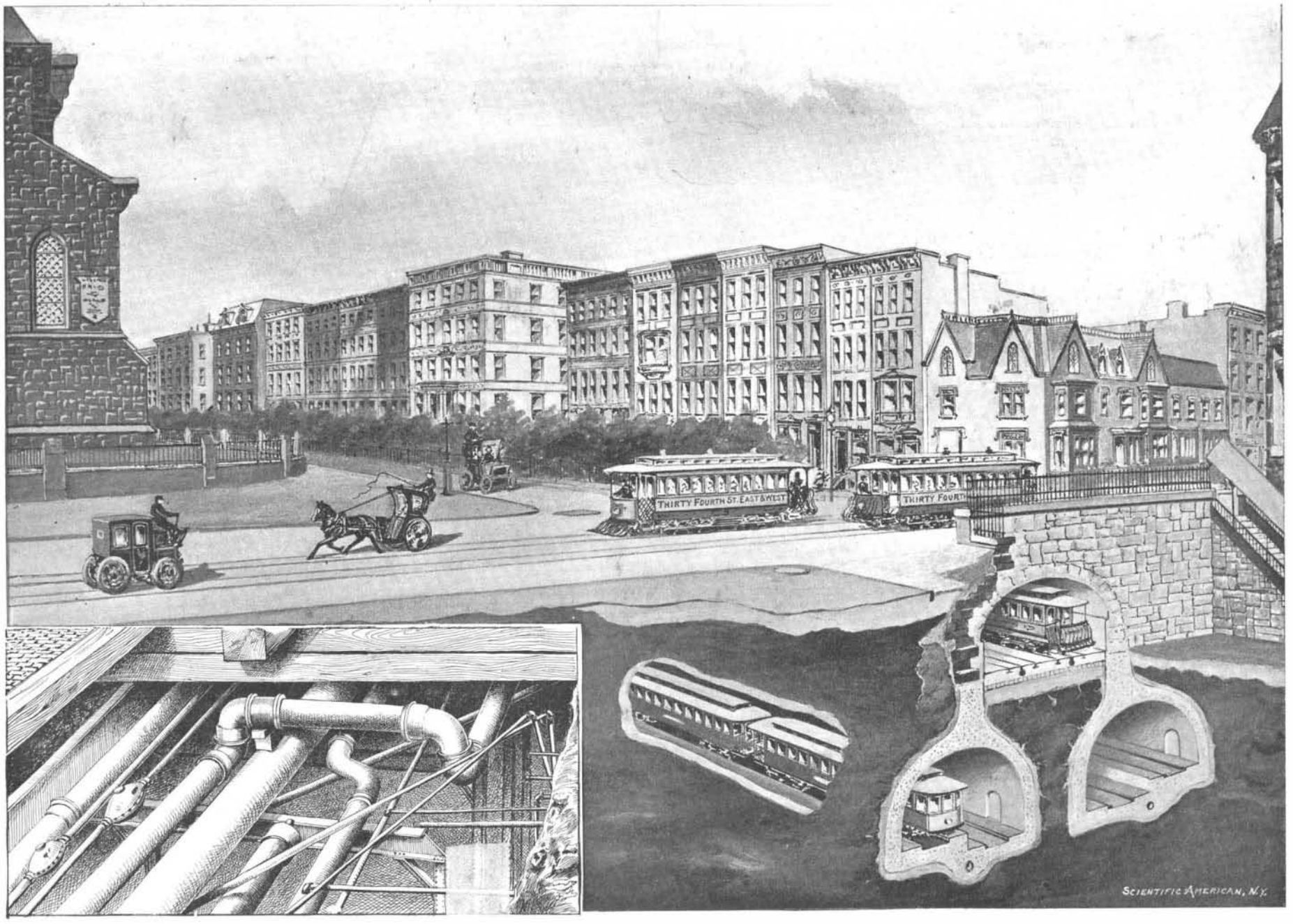


Typical Section through the Subway, Showing the Pipe Galleries as they should be Constructed.



Antiquated Method of Laying Pipes at Present A
(View at Nineteenth Street and Fourth Avenue.)

Sectional View at Thirty fourth Street and Park Avenue, Showing Eight Tracks at Three Different Levels.

SOME FEATURE[S] [O]F THE NEW YORK RAPID TRANSIT TUNNEL.—[See page 327.]