

NEW YORK AND BROOKLYN RAPID TRANSIT SUBWAY.

The new section of the Rapid Transit Subway now under construction from City Hall Park, Manhattan, to Flatbush and Atlantic Avenues, Brooklyn, is in some respects the most important link in the whole rapid transit subway scheme. Indeed, it was only the restrictions imposed by what is known as the "debt limit" that prevented the Rapid Transit Commissioners from incorporating this section in the original contract for the Subway. As soon, however, as the legal borrowing powers of the city permitted, tenders for the construction of this line were invited, and the contract was let in the present year to the construction company which has the first work in hand. Such excellent progress has been made on the first contract, that it is confidently expected by the contractors that they will have trains running over the greater part of the road by the first of January, 1904. As the result of the introduction of a new system of construction for the side walls and roof of the Subway, it is expected by the contractors that they will have the new line finished from City Hall Park to the Battery in eighteen months time. The tunnel beneath the East River will take about three years to construct.

The new extension, which will be a two-track structure, will start from the end of the present Subway at the intersection of Park Row with Broadway, and it will extend beneath Broadway to the Battery, where there will be a loop for the use of the Manhattan trains, that will make the return trip to Harlem and beyond. On this portion of the line there will be four stations: at Fulton Street, at Rector Street, Bowling Green, and on the loop at South Ferry opposite the Staten Island Ferry terminal. In some particulars the construction of the Broadway line will be similar to that of the Subway already built. The new method of construction will be applied to the roof of the Subway, which, instead of being composed of steel I-beams placed transversely to the line of the Subway, with concrete arches turned in between the I-beams, will be formed of a mass of concrete of uniform thickness with 1¼-inch steel bars embedded in the concrete near its under and upper surfaces. These bars will lie transversely to the center line of the Subway, and will afford the necessary tensile strength to the concrete mass. The side walls will be of the same construction as in the completed Subway, and will consist of vertical I-beams, spaced 5 feet apart, with concrete arches between them, and a backing of brick or terra cotta, as the case may be. The I-beams will be retained in the side walls down Broadway, in order to provide unyielding abutments for shoring the foundations beneath the tall buildings that line that thoroughfare.

The southerly end of the Bowling Green station platform will be located on the west side of State Street, about opposite the center of the new Custom House, and at this point will commence the terminal loop, which will extend below Battery Park, as indicated on the accompanying plan. The station will be on the outer side of the loop, and in general will lie opposite the terminal stations of the various ferries that center at South Ferry. There will be two tracks throughout the loop, the outer of which will be devoted to the through travel, the inner tracks being used for the storage of trains.

At the point where the loop commences, the two tracks of the Brooklyn connection will switch off from the Broadway tracks, and will be carried through the loop in a separate tunnel, on a descending grade to pass beneath the East River. These tracks will lie in a single tunnel until they approach the South Ferry station, when they will separate and each track will be carried in its own tube until the Brooklyn shore is reached, when they will unite again in a single tunnel. This arrangement is shown very clearly in the plan and in the large sectional view taken through the station and through the two East River Tunnel tubes.

Considered as a transportation center, South Ferry, already an important point, will become one of the most important points of concentration in the world. The situation is shown very clearly in the front page drawing referred to. In the first place, we have the elevated system, which here receives and dispatches its trains from and to the four great arteries of elevated travel that extend through Manhattan Island. Immediately below these is the stopping and starting point for the cars of the great Metropolitan Street Railway system; while in the next plane below them will be the station of the Rapid Transit Subway, through which will pass the subway traffic of the Bronx and Manhattan Island, and also the suburban cars of the New York Central, Harlem, and the New Haven Railroads. In the fourth plane of travel we see the two tubes of the Brooklyn extension, through which will circulate the traffic between Manhattan and Long Island. The East River tunnel tubes will descend on a grade of 3.1 per cent until they reach the center of the East River, when they will rise on the same grade to enter Long Island beneath Joralemon Street. In Brooklyn, the subway will pass below Joralemon Street to the Borough Hall, where there will

be a station; it will then pass beneath Fulton Street with a station at Hoyt Street, to Flatbush Avenue, where there will be another station, and will continue up Flatbush Avenue to a station at the junction of Flatbush and Atlantic Avenues. The construction of the tubes beneath the river will differ according to the quality of the material that is passed through. Where the excavation is through rock the tubes will be built of sheet steel, with an internal lining of 15 inches of concrete; but where the excavation is through sand or gravel, or any of the softer materials, the tube will be built in sections of segmental, heavy, cast-iron plates, with strong internal ribs, the sections being strongly bolted together as construction proceeds, and the completed tube being lined internally with beton, which is filled in flush with the inner edges of the ribs.

In conclusion, reference should be made to the added importance which is given to this loop, and also to the loop which has been constructed below City Hall Park, by the announcement of the New York Central and Hudson River Railroad Company that they intend to run two connecting tracks from their system at Forty-second Street, to connect with the Subway under Fourth Avenue. By this connection the suburban trains of the New York Central, the Harlem, and the New Haven roads, which are to be operated electrically, will be able to proceed to City Hall Park, or to the Battery, or to Brooklyn, as may be desired, and suburban residents living as far out as Peekskill, White Plains, and Portchester, will be enabled to travel from their respective homes to their places of business in New York or Brooklyn without change of cars. It is but due to the engineers of the Rapid Transit Commission to state that the possibility of a connection of the New York Central tracks with those of the Rapid Transit Subway is due to their forethought in making special provision for this connection at Forty-second Street and Park Avenue. With a view to accommodating the tracks from the New York Central Road, the Rapid Transit Commission engineers separated the two-track tunnels which run beneath Park Avenue from Thirty-fourth Street to Forty-second Street, and swung them over to right and left, leaving room for future tracks between them. At the same time they suggested to the New York Central Company the advisability of making this connection; and although the latter company rejected the overtures at that time, they have recently announced that as part of the scheme for depressing their terminal station at Forty-second Street, they are contemplating the construction of two tracks from this terminal, to connect with the Rapid Transit tracks on Park Avenue between Thirty-fourth and Forty-second Streets. The importance of this work, and the advantage of having the Subway tunnels located in such position that the connection of the two systems can be carried out at once, will be evident.

Opening of the Nile Reservoir.

The great Nile reservoir and dam were opened on December 10, in the presence of the Khédive.

The opening ceremony took place in the afternoon, when the Khédive turned a key which put the electric machinery in motion, whereupon the sluice gates were opened and a great body of water rushed through them.

The Duchess of Connaught then laid the last stone of the dam.

It is estimated by Lord Cromer, the British Agent in Egypt, that the Assouan dam, which has cost about \$12,500,000 will increase the agricultural earning power of Egypt \$13,000,000 every year—in other words, that it will pay a percentage of over 100 every twelve months. The dam will permit the additional irrigation of 1,600,000 acres, and it is estimated that it will provide an additional revenue to the Egyptian government of \$1,900,000 a year.

The Current Supplement.

German electrical machinery for iron and steel plants is the subject of a copiously illustrated article treated by Mr. Frank C. Perkins, in the current SUPPLEMENT, No. 1407. Other articles on electricity deal with electrical waves and the human brain, and the deterioration of storage battery plates. The Manhattan-Brooklyn branch of the Rapid Transit Subway, treated on another page of the SCIENTIFIC AMERICAN, is fully discussed. Automobilists will doubtless read with interest an account of the Charron, Girardot, and Voigt Gasoline Automobile. Mr. R. L. Ardrey historically surveys the harvesting machine industry. Another article of historical interest is a chronological account of the piano and organ. Wood paving is made the subject of a paper by Mr. B. T. Wheeler. "The Animal Worship of Ancient Times" is the subject of an article which deals with many curious customs, which will doubtless be of unusual ethnological interest. In his presidential address to the Belfast meeting of the British Association for the Advancement of Science, Prof. James Dewar incidentally discussed the attitude of Tyndall toward evolution.

Automobile News.

Mr. Edge believes it would be an excellent thing to search for a substitute for the pneumatic tire, which is the cause of a great deal of the trouble encountered in automobilism. But whatever device may be taken up in its place, it must not only minimize the effect of jolting upon the occupants of the automobile, but also relieve the engine from the strains which the pounding of hard tires upon a rough road would impose.

As a result of the failure of the human time-keepers at the Deauville races, when one of the stop-watches became deranged and lost seven seconds, thereby much astonishing the world by new records, some new automatic apparatus has been considered necessary. Among the devices of this character which have recently been proposed is an electrical time-keeper. The apparatus consists of a box containing a chronometer regulated to work without gaining or losing. The mechanism includes toothed wheels, which unwind a reel of thin tape or paper marked off in millimeters.

A device which does not seem to receive from the makers the attention which it merits is the sprag, the iron rod suspended from the rear axle to hold the car on a grade in case brakes do not operate or are not in use. Too often the sprags fitted to heavy large cars are altogether too slender for the purpose; often they are stout enough, but so short that the car would be certain to ride over them. It is not often that the sprag is needed, but when it is wanted the need is great and immediate, and not only the car, but the lives of its occupants may depend upon the apparently insignificant device.—N. Y. Times.

The first section of steel roadway proposed by Gen. Roy Stone before the Automobile Club last March was laid recently in Murray Street between Broadway and Church Street. Another half-mile section is to be laid shortly uptown on St. Nicholas or Seventh Avenue, and a third section will afterward be put down in the suburbs. Thus the new roadway will receive a thorough test under all kinds of traffic. The mile of specially rolled steel rails was presented to the Club by Mr. Schwab, and is being laid at the Club's expense under the supervision of Major F. B. Jones, U. S. A. Full particulars of this novel form of roadway were published in SUPPLEMENT No. 1371.

In an interview with a representative of the European Herald, S. F. Edge, the winner of the Coupe Internationale, made some remarks that should be of interest to every chauffeur. He stated that the great value of the pneumatic tire is its absorption of the obstacles to speed offered by the ordinary road. Every time a solid tire strikes an object in the road, there is more work for the engine to do, and a consequent loss of speed. A pneumatic tire, on the other hand, leaps over a stone or ridge in the road, the tire allowing the obstacle to sink into its elastic surface. Thus, the amount of power necessary to surmount the obstacle is diminished. It might be thought that it surely would not take much power to lift an automobile over such stones and ridges as may be encountered in an ordinary road; but when it is considered that an automobile at high speed frequently covers 40 yards in a second, and that many such little obstacles would probably be found in this distance, it is evident that with no pneumatic tires to lift the automobile over them there would be a serious decrease in the efficiency of the engine and a consequent falling off of speed.

Roller chains, according to the Mechanical Engineer, when used on automobiles, require regular attention to keep them in good order. Carefully cleaned and lubricated, and properly adjusted, they will run with smoothness and absence of sound. A writer in a contemporary describes a method which he has adopted with success, as follows: Every 200 or 300 miles, more or less, according to the weather experienced, the chains should be removed from the car and soaked in a flat dish filled with kerosene. If moved about in this bath all dirt and stale lubricant will quickly be removed, and the chains can then be hung up to drain. It is a good plan to have a false bottom of perforated zinc to the bath, so that the dirt may sink through it, leaving the kerosene clean and clear for future use. The chains should then be transferred to another tray containing thick grease, and placed on a stove. As the grease melts, the air in the links of the chains will be driven out by the heat and replaced by the lubricant. When the air ceases to rise to the top in bubbles, the tray can be removed from the fire and allowed to partially cool, when the chain should be lifted out, hung up, and well wiped over, to remove the superfluous grease. Chains treated thus, the writer states, will run quietly and smoothly for a considerable distance, will attract very little dust, and outlive those treated by any other method. Any good grease can be used, but the best consists of sperm oil, in which sufficient beeswax has been dissolved to render it, when cold, of the consistency of the ordinary grease sometimes used in change speed gear boxes. A small quantity of best powdered graphite may be added with advantage.

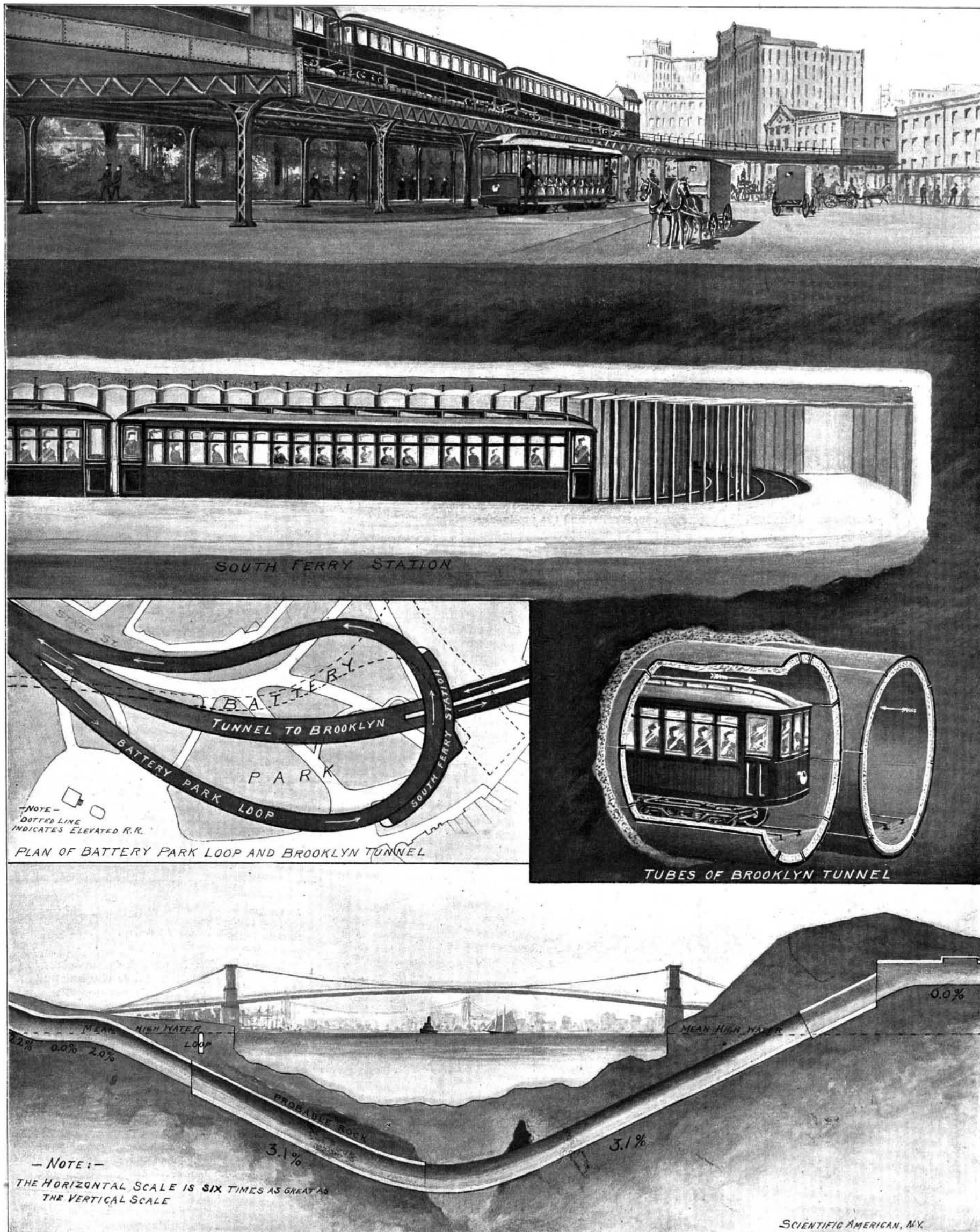
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyright, 1902, by Munn & Co.]

Vol. LXXXVII.—No. 25.
ESTABLISHED 1845.

NEW YORK, DECEMBER 20, 1902.

[8 CENTS A COPY.
\$3.00 A YEAR.]



RAPID TRANSIT SUBWAY AT THE BATTERY, AND EAST RIVER TUNNEL, NEW YORK.—[See page 444.]