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BROADWAY AND SEVENTH AVENUE CABLE ROAD.

No other city of the same size is so unfavorably situated for the equable distribution of business places and residences as the city of New York. In this city, beginning at the lower part of Manhattan Island, the business element has grown northwardly, displacing the dwellings which have filled the upper portion of the island; while Long Island, New Jersey and Staten Island have received the overflow. The lateral travel from the long narrow island to Brooklyn and the adjoining cities of Long Island, to Jersey City and other places in New Jersey, is fairly well disposed of by the bridge and ferries, but the passenger traffic lengthwise of the island has presented a problem which has not been completely solved either by the existing surface roads, the elevated roads, or the regular railways entering the upper part of the city.

It is but a few years since the old time omnibuses which coursed up and down Broadway were displaced by a horse railroad, which very speedily showed itself inadequate to fulfill the requirements. It was evident to residents, and even to visitors, that Broadway, being the principal thoroughfare, required better means of transportation than the horse cars.

Among all the available systems applicable to Broadway, the cable system was selected as being the best and most practicable, since it provides larger and better cars, a higher speed without noise or other nuisances, and gives to the traveling public the space formerly occupied by the horses. Furthermore, it renders the street more wholesome and cleanly.

At the present time Broadway, from one end to the other, is a scene of great activity, as the building of the duplex system of cable road is progressing with great rapidity, and, great as the inconvenience is, it is hoped and expected that the advantages secured will more than compensate. The road being built is 5·17 miles long, extending from the Battery to 59th Street. At

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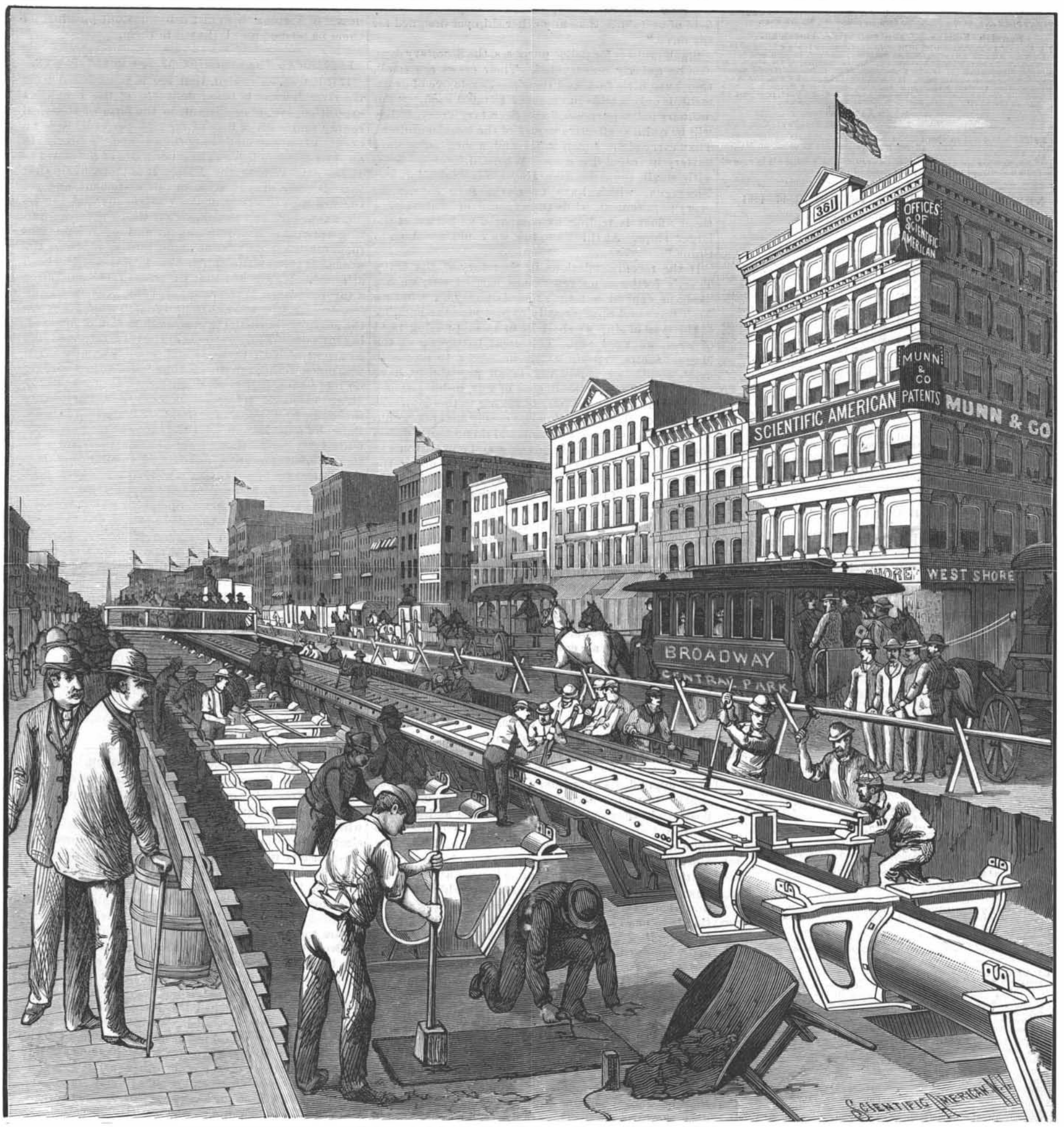

THE BROADWAY CABLE RAILWAY, NEW YORK.

BROADWAY AND SEVENTH AVENUE CABLE ROAD.

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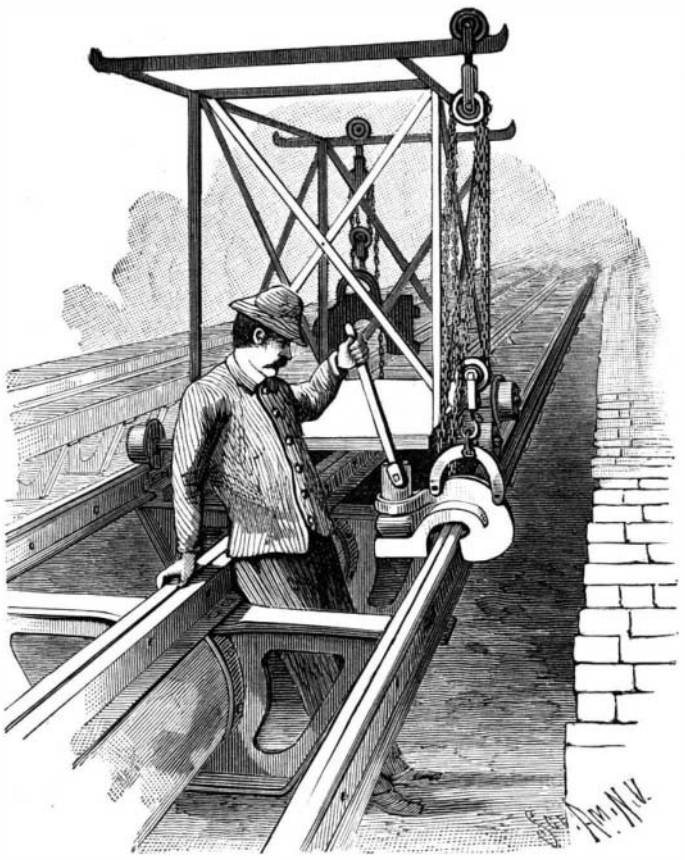
Houston Street there will be a cable loop, which will extend to the Battery and back, a distance of 4·24 miles, and another extending to a sheave pit between 36th and 37th Streets and back to the power station, a distance of 3·86 miles. There will be another power station at 51st Street, from which a single loop will extend southward to the sheave pit below 37th Street, and north to a sheave pit at 59th Street, returning to the power station, a total distance of 2·24 miles. The power required to drive this amount of cable will be about 2,000 horse power, but the machinery will be able to exert three times that amount of power in case of an emergency. The strain on each cable when in use will average about 12,000 pounds.

The construction of the road was shown in one of its stages in our issue of May 16, 1891. In our present issue we give illustrations of the work as it appears at Franklin Street and Broadway, opposite the offices of the SCIENTIFIC AMERICAN. As will be seen by reference to the engraving, the track is set upon cast iron yokes, which also hold the slot rails and encircle the ends of the sections of the sheet steel cable conduit. The yokes are 27½ inches high to top of lugs and 23 inches to rail seat, and weigh about 550 pounds each. The distance between the yokes is 4 feet 6 inches. They rest upon separate foundations of concrete, which are 45 inches long, 18 inches wide, and 6 inches deep. The conduit in which the cable runs is formed of sheet steel sections, with a backing of concrete. The pits in which the carrier sheaves are located are 42 inches deep and 31½ feet apart. The slot rail is formed of two like but oppositely arranged Z-shaped parts, leaving between them a groove, through which the grip extends from the car down into the conduit, where it engages the cable. The slot rails are braced at frequent intervals by wrought iron rods passing through the tram rails and through the slot rails. The entire construction is designed to be permanent, and everything relating to it is carefully and thoroughly done. In fact, this road is intended to be a masterpiece of its kind.

In carrying forward this great work, much of the labor has been performed at night by means of artificial light. Modern appliances have been used wherever they tend to facilitate the construction. For example, a steam concrete mixer, mounted upon wheels, so that it may be moved along the track as required, is used for preparing the concrete used in the foundations, and in filling in around the conduits. It not only does the work of a great number of men, but it does it more thoroughly and evenly. The materials are shoveled into one end of the machine, and thoroughly prepared concrete is delivered at the opposite end.

The concrete mixer is simply a heavy iron cylinder, containing a shaft carrying a series of wings or vanes, arranged spirally. These wings form, practically, an endless screw, which stirs the ingredients thoroughly while the necessary amount of water is added. At the same time it propels the concrete toward the discharge end of the machine, where it is delivered ready for use. The mixer is driven by a 6 h. p. vertical steam engine, mounted on the same platform. The capacity of the mixer is 150 cubic yards per day of ten hours. The holes for the bolts which connect the manhole curbs to the slot and tram rails are punched in the rails by means of hydraulic punches, which are supported on a car, so that they can be moved along the track as required. These simple machines readily punch 1 inch holes in the ½ inch web of the slot rail, requiring the application of hand power for about half a minute only.



PORTABLE HYDRAULIC PUNCH.

The difficulties encountered in preparing the excavations for the road were enormous. Some of the obstructions at Fulton Street were described in our issue of May 16. Another example occurs at Broadway and 14th Street. These are not by any means the only places where obstructions of this kind are met. Something of the same nature is found at almost every block. Water and gas mains have to be moved, sometimes laterally and sometimes by dropping them down below their original level, the electrical conduits require shifting, and the pneumatic tubes of the Western Union Telegraph Company are being replaced by a complete new set laid in the space between the two tracks about on a level with the foundations of the yokes, and all this is accomplished with practically no interruption of the use of the various pipes and conduits.

The yokes which support the tracks weigh, as stated, about 550 pounds each; the tram rails weigh 91 pounds per yard, and the slot rails weigh 67 pounds per yard. Each was specially designed for this work. The gauge of the track is 4 feet 8½ inches, and the distance from center to center of the tracks below 35th Street is 9 feet; above 35th Street it is 10 feet.

The diameter of the cables will be 1½ inches; the cable drums will be 12 feet in diameter; the large rope-driving drums will be 32 feet in diameter and the small ones 10 feet and 7 feet 6 inches. The engines driving these drums will have cylinders 36 and 38 inches in diameter, with a piston stroke of 60 inches.

Some of the interesting features of the road are necessarily omitted from the present article, but we expect to give full details of them at some future time. Among these features are the curves, the switches, the cars, and the grip.

POWER CONCRETE MIXER—CAPACITY, 15 CUBIC YARDS PER HOUR.

Rules and Suggestions for Transplanting Trees.

A general rule that will hold good in transplanting trees, shrubs, and grape vines, says *Farmer's Call*, is to shorten and severely prune the parts that are to remain above ground. In taking up plants that have attained any considerable size, it is unavoidable that the roots will be broken more or less and large portions of them left in the ground. This makes it necessary to preserve a proper balance between the two parts by pruning the tops accordingly. In transplanting, whether in spring or fall, the roots should be spread out as well as possible without cramping them unnaturally, and spring-planted trees in case of protracted drought may often be saved by watering them evenings, when without it they would die.

The following practical hints on this subject are from an address by Mr. Samuel Edwards before the Illinois Horticultural Society:

Deciduous trees, the roots of which have become dry in transit, can in many instances be saved by burying the entire tree in moist earth for a few days.

The prolific cause of loss is the failure to properly pack and firm soil among the roots of the newly set trees. Fine dirt should be packed in by hand and all roots covered several inches with it. Pour on a pail or two of water to wash dirt into all possible crevices. After ground settles fill in again, tramp and pound dirt firmly about the roots. Leave the surface soil loose, mulch with prairie hay, straw or other coarse litter to depth of six inches, extending a foot beyond ends of roots.

Neglect to mulch or frequent stirring surface soil kills many trees, especially if they are daily deluged by water. In a season of protracted drought, watering may be necessary. Dig a hole near the tree, water bountifully, then return the earth after water settles.

Wrap bodies of new-set trees with burlaps of any cheap material to shade from hot sun. In a hot summer, if this is not done, bark is often killed in spots on south or southwest side.