

THE STRALAU-TREPTOW TUNNEL UNDER THE RIVER SPREE.

The first submarine tunnel ever constructed in Germany extends beneath the River Spree, between Stralau and Treptow, and has been in active use since its formal opening, in 1899. Although the tunnel is but 453 meters (493.77 yards) long, its construction was no simple task, for the quicksand of which the soil beneath the Spree is largely composed was removed with some difficulty.

The preliminary work was begun in the summer of 1895. But the actual work of removing the soil in the line of the tunnel was not commenced until the end of February, 1896, because the tunneling-shield was delivered too late. Despite this delay, 160 meters (524.8 feet) of soil had been excavated by the end of autumn of that year. A second interruption of the work was caused by the deliberations of the authorities as to whether the street railway should be extended so as to pass through the tunnel under the river. Finally work was again resumed in September, 1897; and in February, 1899, the last shovel-ful of soil was removed and the last rivet driven.

The tunnel crosses the line of the river approximately at right angles, the width of the stream at that point being 195 meters (212.55 yards). So deep is the tunnel that between its roof and the river-bed there is still a layer of sand some 3 meters (9.8 feet) in thickness. The lowest point of the tunnel lies 12 meters (39.36 feet) below the mean water level of the Spree. In the direction of Treptow to Stralau the tunnel is built on a downward inclination (1:20), but becomes more level as it passes under the river (1:600).

The tunnel tube is composed of cast-iron annular segments varying in width from 500 to 650 millimeters (20 to 26 inches), and having flanges

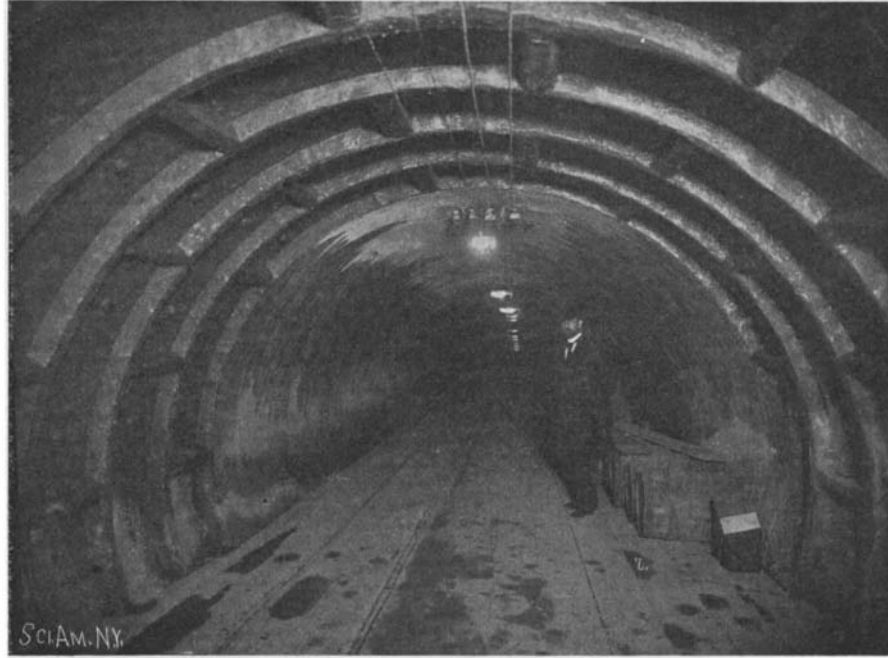
which are connected by screw-bolts. Between the rings or annular segments flat, iron straps are laid, which appear externally as corrugations and serve as reinforcing and stiffening members. Externally the tube is covered with an 8-centimeter (3.2-inch) layer of cement, and internally with a 12-centimeter (4.8-inch) layer. The clear breadth of the tunnel is, therefore, reduced to 3.75 meters (12.3 feet), and barely leaves room for a narrow passageway along the tracks. The rails are embedded in the cement of the tunnel-bottom.

The tunnel was built in the usual way, the shield having been pressed forward as the work advanced. The completed portion was divided from the working-chamber by a partition provided with two air-locks for the entrance of laborers. Compressed air was used

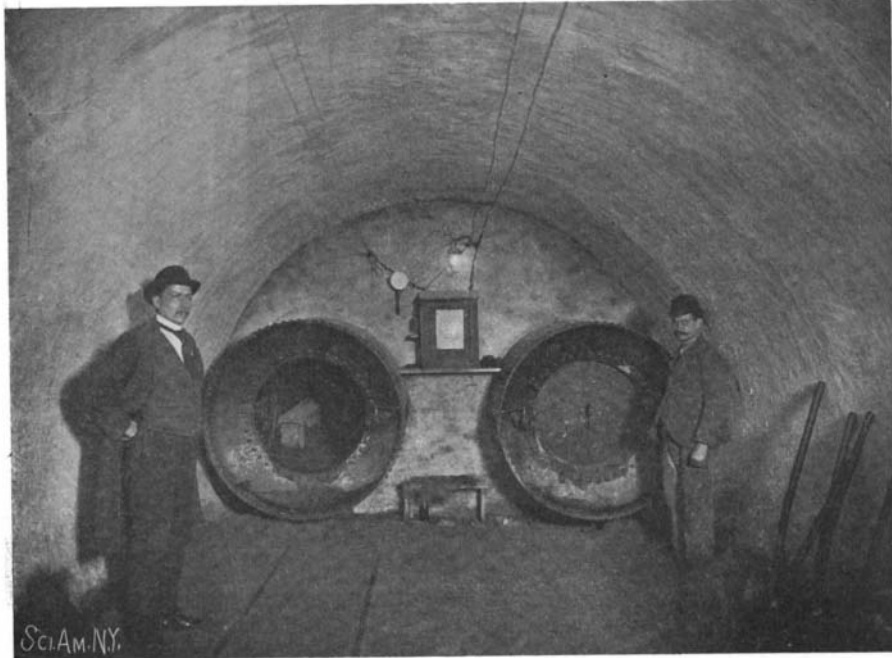
for ventilation. In front of the working-chamber the shield was placed, forming a second chamber between its inclined front wall and its vertical rear wall. Through openings in the front wall, which could be closed by slide valves, the sand was excavated and thrown back into the chamber. When sufficient sand had thus been removed to leave a small and clear space, the shield was pushed forward by sixteen hydraulic jacks. In the new tunnel space which had thus been formed an additional ring was built after the pistons of the hydraulic rams had been withdrawn. In the narrow annular space between the tunnel and shield, cement was packed. Thus 374 meters (407.66 yards) were cleared beneath the Treptow shore and the river-bed. The 80 meters left on the Stralau shore were built on the subway plan; that is, a trench was dug, the walls of which were lined with piles or planks shored in the usual manner, and cement laid along the bottom of the trench. For a length of 30 meters (98.4 feet) it was found that the plank walls could not resist the action of the quicksands. The section was, therefore, divided by partitions into three compartments, which were separately completed.

During the work of constructing the tunnel telephone wires were carried along the line so that those at work could communicate with the power house. Aside from minor mishaps, which were unavoidable owing to the imperfect working of new machinery, and lack of experience on the part of the laborers, no serious accident occurred during the progress of the work. The cost of the tunnel is about \$425,000, or \$850 per yard.

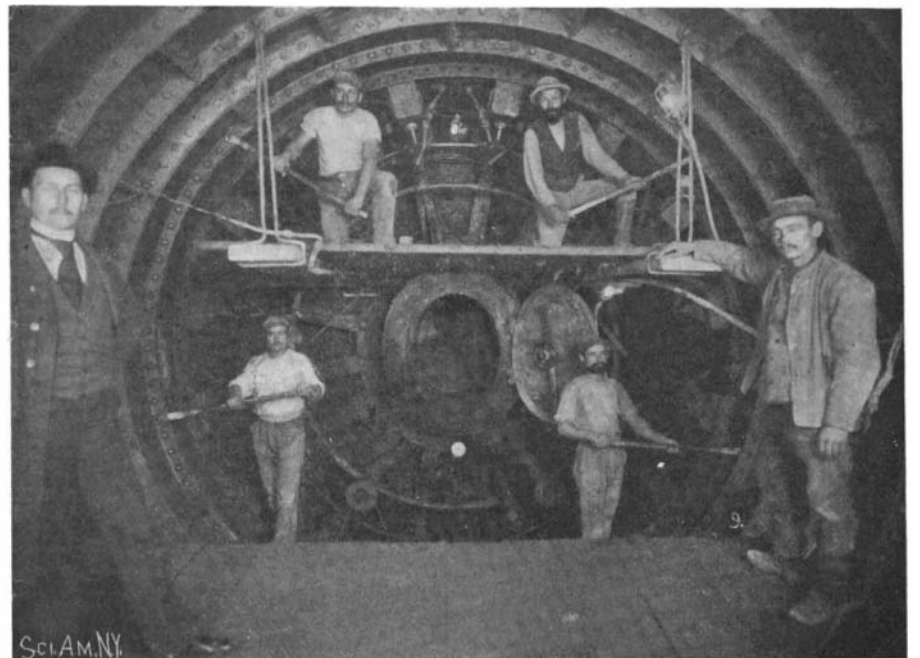
Turpentine mixed with wax is known to give very good floor wax. A cloth squeezed out in turpentine restores the luster to oilcloth.



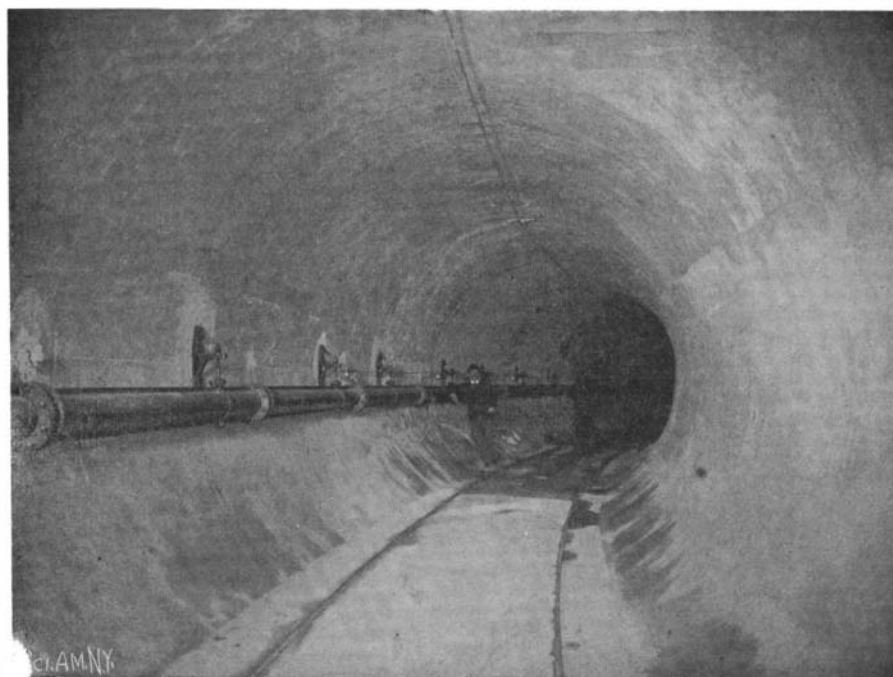
Section of Completed Tunnel.



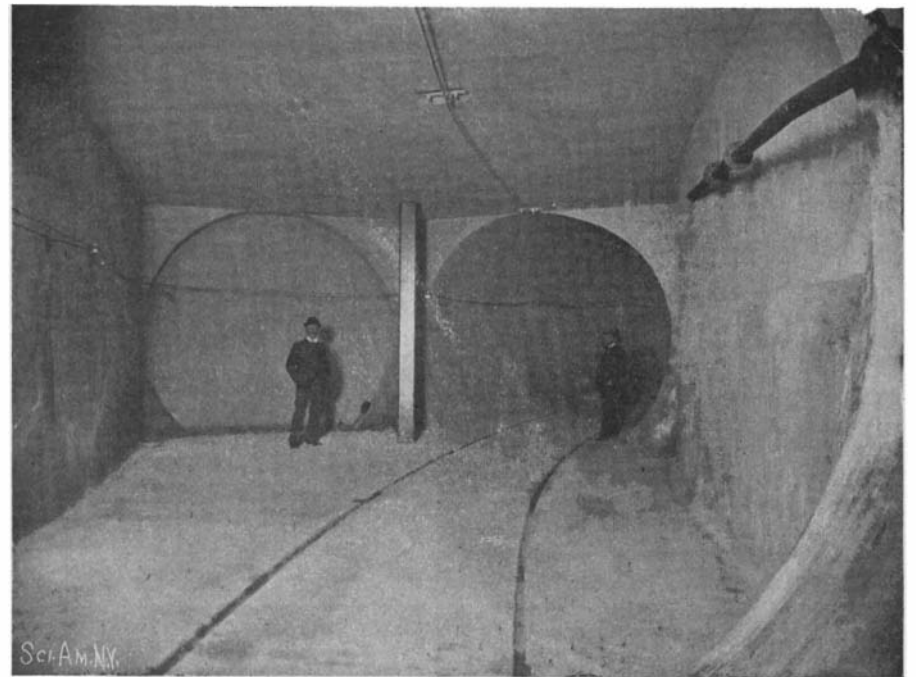
Entrance to the Lock-Chamber.



Rear Face of Shield.



▲ Bend in the Tunnel.



Commencement of a Double-Tube Section.

THE STRALAU-TREPTOW TUNNEL BENEATH THE RIVER SPREE.