

THE PROPOSED EAST RIVER TUNNEL.

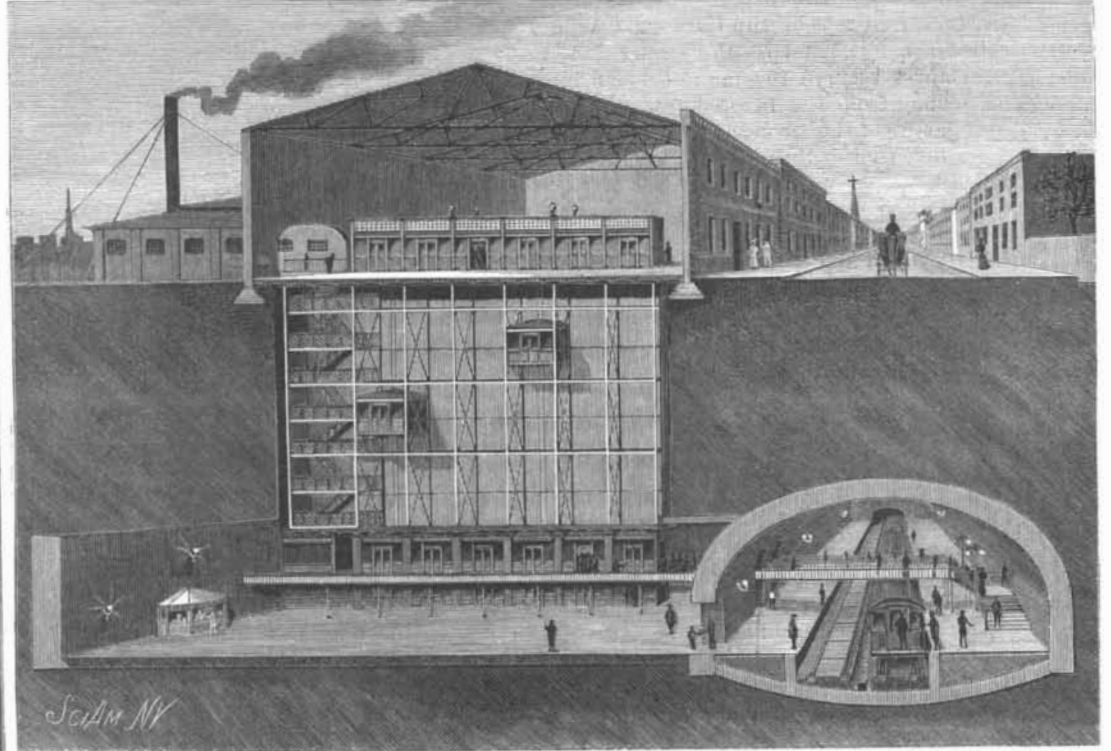
The question of building a tunnel under the East River is just now attracting a large amount of attention and, if we are to believe the press reports, a large amount of capital also. At least three tunnel companies are in the field asking for the necessary franchises, etc. The Long Island Railroad Company's scheme was the first to be mooted, and appears to be practical. The contemplated tunnel is to extend from the foot of Maiden Lane, Manhattan, to the foot of Pineapple Street, Brooklyn. It will be about 2,500 feet in length and is to lie some 30 feet below the bed of the river, or 88 feet below mean tide level. It is to

It is estimated that it will take two and a half years to build the tunnel beneath the river. The section lying beneath Manhattan will be constructed through bed-rock, at a depth sufficient to avoid interference with the foundations of the tall office buildings on the lower end of the island. The tunnel, as will be seen from the accompanying engraving, will have an elliptical roof, and its clear width from wall to wall will be 22 feet, while the height at the center will be 14 feet 6 inches. At the foot of Maiden Lane, where the tunnel begins to pass beneath the river, it will divide into two single-track iron-tube tunnels, each 14 feet 6 inches in diameter. On the Brooklyn side of the river the

the Brooklyn Bridge cars, and not unlike them in construction. They will be about 50 feet in length and will have both end and side doors, and each car will be capable of seating 60 persons. The proposed speed of the trains is to be between 25 and 30 miles an hour, under a headway of 60 seconds, and the carrying capacity is estimated at about 133,000 seated passengers. The platform length of each station will be sufficient to accommodate five cars, and to assist in stopping and getting quickly under way all stations will be placed at the summit of a grade. Every station will be served by a group of six elevators, each measuring 14 feet by 10 feet, and capable of carrying sixty passen-



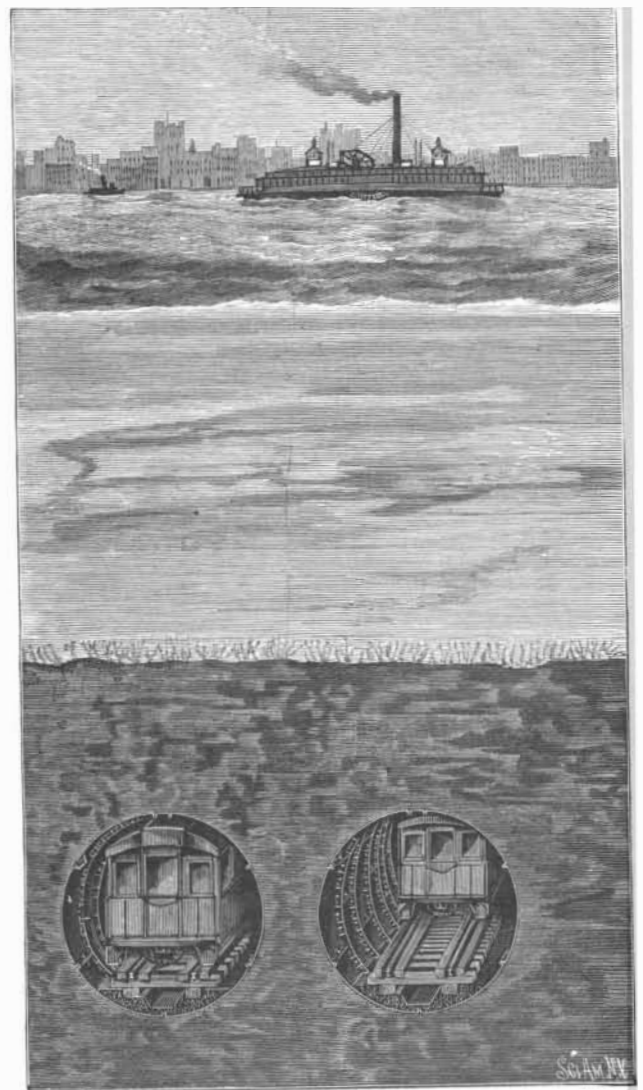
Construction Beneath Atlantic Avenue, Brooklyn.



Type of Station and Cross Section of Deep-level Tunnel.



Tunnel for Gas Mains Beneath East River.



The Twin-tube Tunnel Beneath the East River.

THE PROPOSED TWIN TUNNEL BENEATH THE EAST RIVER.

extend beneath Maiden Lane and Cortlandt Street, Manhattan Island, to the North River, and will have two stations on the island, one at Pearl Street, near the Second and Third Avenues elevated railway, and one west of Broadway, adjacent to the Sixth and Ninth Avenues branches of the same system. The extension from West Broadway to the North River is to be carried out with a view to extending it ultimately beneath the river to Jersey City. After passing beneath the East River to Pineapple Street, the tunnel will follow that street to Fulton Street and will extend beneath Fulton Street to a station near the City Hall Square, Brooklyn.

two tubes will reunite in a single double-track tunnel. The tubular portions of the tunnel will be constructed on the Greathead system, which has been so successfully used in various parts of the world. The two shields will be pushed forward simultaneously, and it is calculated that the work will progress at the rate of 5 feet per day. The tunnel will be operated and lighted by electricity, but the particular system of traction which will be employed will not be determined until the excavation is approaching completion, in order that advantage may be taken of improvements in the art which may be made during the interval. The cars to be used in the tunnel will be about the same size as

gers. At the bottom of the elevator shaft there will be two landings; the lower one on a level with the west-bound train platform while the upper one will be provided with a landing of a height sufficient to clear the tops of the cars, and a foot bridge will be built over the tracks to the opposite platform, so as to avoid any crossing of the tracks at grade. Owing to the short travel of the elevators, it is estimated that their capacity will be greater than the carrying and emptying capacity of the trains during the rush hours. The East River Tunnel is merely a part of the extensive improvements contemplated by the Long Island Railroad. From the station near the City Hall Square,

Brooklyn, the tunnel will extend to the present Flatbush Avenue station, where it will be 18 feet below the street level. From this point to the Franklin Avenue station the tracks will run through a subway and then they will rise through an open cut to an elevated structure, which will commence in the neighborhood of Nosstrand Avenue. At Ralph Avenue the road will sink into a subway, which will run under Howard Avenue as far as Manhattan Crossing, from which point it will rise to the surface and continue by an elevated structure to a point near the boundary line of the Borough of Brooklyn. At the Flatbush Avenue station the regular Pullman car and freight service will be maintained. It was not considered desirable to build the tunnel beneath the river of the large size necessary to accommodate standard railway passenger coaches.

As a matter of fact, the proposed tunnel under the East River will not be the first to be built. A tunnel 8½ feet high and 10 feet wide, as shown in the engraving, sufficiently large for persons to pass through on a handcar, already reaches at the foot of East Seventy-first Street to Ravenswood, passing under Blackwell's Island. The tunnel extends from the plant of the East River Gas Company in Ravenswood to its mains in Manhattan, a large main running through it. It was eighteen months in being built, being completed in July, 1894. It is a thorough success. There has been no trouble with it since its completion, and it shows conclusively that a passenger tunnel is practicable. The amount of seepage is small and might be reduced if it were necessary. The tunnel is 2,516.4 feet long. The top of the tunnel under the channel between Blackwell's Island and the Manhattan side of the river at the point of nearest approach to the bottom of the river is 40.93 feet below the river bed, while under the channel between the island and the Brooklyn side the nearest approach of the top of the tunnel to the river bed is 82.33 feet. The depth of water on the Manhattan side is 65 feet and on the Brooklyn side 30 feet.

The construction of the tunnel under the river bed was by the shield system. The plates composing the walls are 1¼ inches thick, 16 inches wide, and 3 feet long. The edges are deeply flanged and bolted and riveted together. The joints are filled with liquid concrete. Construction was carried on at the rate of 5 feet a day. The capacity of the tunnel is such that it could contain sufficient mains to supply the whole of Manhattan with gas.

BICYCLISTS who suffer injury to their persons or property through collisions with other users of the highways or with road obstructions should always study up on "contributory negligence" before seeking redress at law. Cases of the kind usually afford opportunity for discriminating work in drawing the line between ordinary watchfulness and prudence on the part of the plaintiff and failure to take that reasonable care of himself which is legally incumbent upon every traveler by horse, foot or wheel.

"DEUTSCHLAND"—THE LATEST AND FASTEST OF THE TRANSATLANTIC LINERS.

A striking feature which attends the competition between the steamship companies that ply between England and America is the extraordinary development which has taken place in the last decade in the great German companies, the Hamburg-American and the

tion of fast ships; but in placing the "Kaiser Wilhelm der Grosse" upon the route, the North German Lloyd Company easily moved up to first place, for this magnificent vessel in one of her early voyages achieved an average speed for the whole trip across the Atlantic of about 22.35 knots an hour and an all-day speed of 23 knots an hour.

It was only a question of time when the Hamburg-American Company would produce an answer to the "Kaiser Wilhelm der Grosse"; and such a ship is now being built at the Vulcan yards, Bredow, near Stettin, Germany. The new vessel is to surpass the "Kaiser Wilhelm der Grosse" in size, speed, accommodation, and indeed, as far as the intentions of the company go, in every point of comparison. As will be seen from the accompanying table, the new vessel, which will be named the "Deutschland," will be larger than any ship afloat at the time of her launch, except the "Oceanic," of the White Star Line, which is expected to make her maiden trip in the autumn of 1899. The "Oceanic" exceeds the "Deutschland" in every dimension and is only inferior to her in speed; but as was explained in our article on this great ship in the issue of the SCIENTIFIC AMERICAN for February 11, 1899, she is not to be reckoned among the "fliers," as the company will not aim at a speed of more than about 20 knots an hour. The "Deutschland," on the other hand, is to be capable of sustaining a sea speed of no less than 23 knots an hour, something that has never been attempted in any previous transatlantic liner. The dimensions of the vessel are as follows:

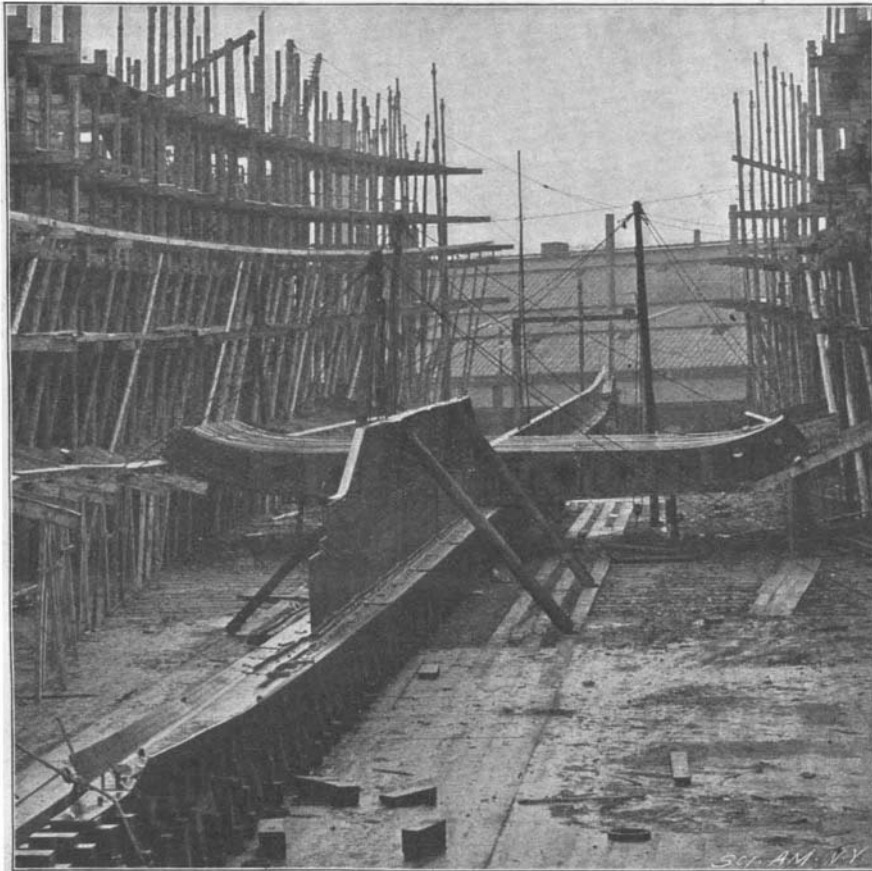
Length over all	686½ feet.
On the water line	662 "
Beam	67 " 4 inches.
Depth	44 "
Average sea speed	23 knots.

There are to be 264 first-class cabins, providing for 736 berths; 100 second-class cabins with 300 berths; and 282 steerage berths, making a total of sleeping accommodation for 1,320 people.

To realize such high speed in so large a vessel will, of course, require engines of unprecedented size and power. The "Campania" has about 30,000 horse power and the "Kaiser Wilhelm," whose model is probably finer than that of the "Campania" is credited with 28,000 horse power, but the new ship will have engines and boilers capable of maintaining, day and night, an aggregate output of 35,000 horse power. The boiler plant will consist of twelve compound boilers, each

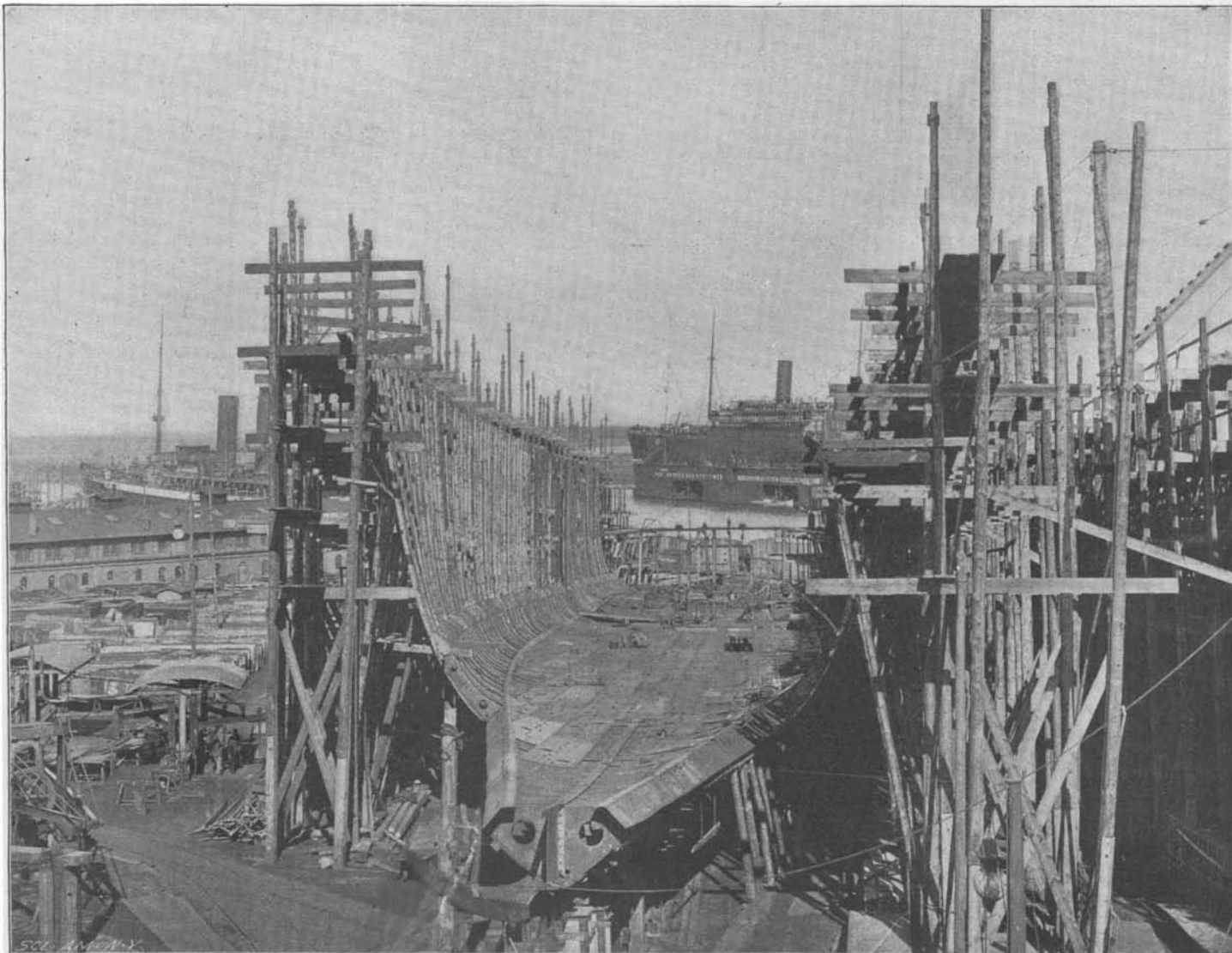
provided with eight furnaces, and four single boilers with four furnaces each; thus there will be altogether 112 furnaces to feed in the stoke hold of the vessel. The steam pressure will be 225 pounds to the square inch. While the sea speed is to be 23 knots an hour, the trial speed calls for 23½ knots an hour, and it is not unlikely that this will be exceeded by fully a knot, in which case the huge vessel will be traveling at the unprecedented speed for a large ship of 28 land miles per hour.

The passenger accommodation will possess some novel features, particularly in respect of size of the saloons and staterooms; the main saloon,



KEEL AND ENGINE FOUNDATIONS OF HAMBURG-AMERICAN LINER "DEUTSCHLAND."

North German Lloyd. Within a few years they have both moved up to the very first rank, the Hamburg-American being the largest ocean transportation company in the world. Although in this competition the features of accommodation, comfort, and safety have always received great attention, the feature of speed has been the one that has appealed most to the popular imagination. To hold the record across the Atlantic has been one of the chief aims which actuated the policy of the past. It was not until the present decade that the German companies made any effort to approach their English, French, and American rivals in the produc-



THE CONSTRUCTION OF A 23-KNOT LINER.

The "Deutschland." Length, 686½ feet; beam, 67 feet 4 inches; depth, 44 feet; horse power, 35,000; average sea speed, 23 knots.