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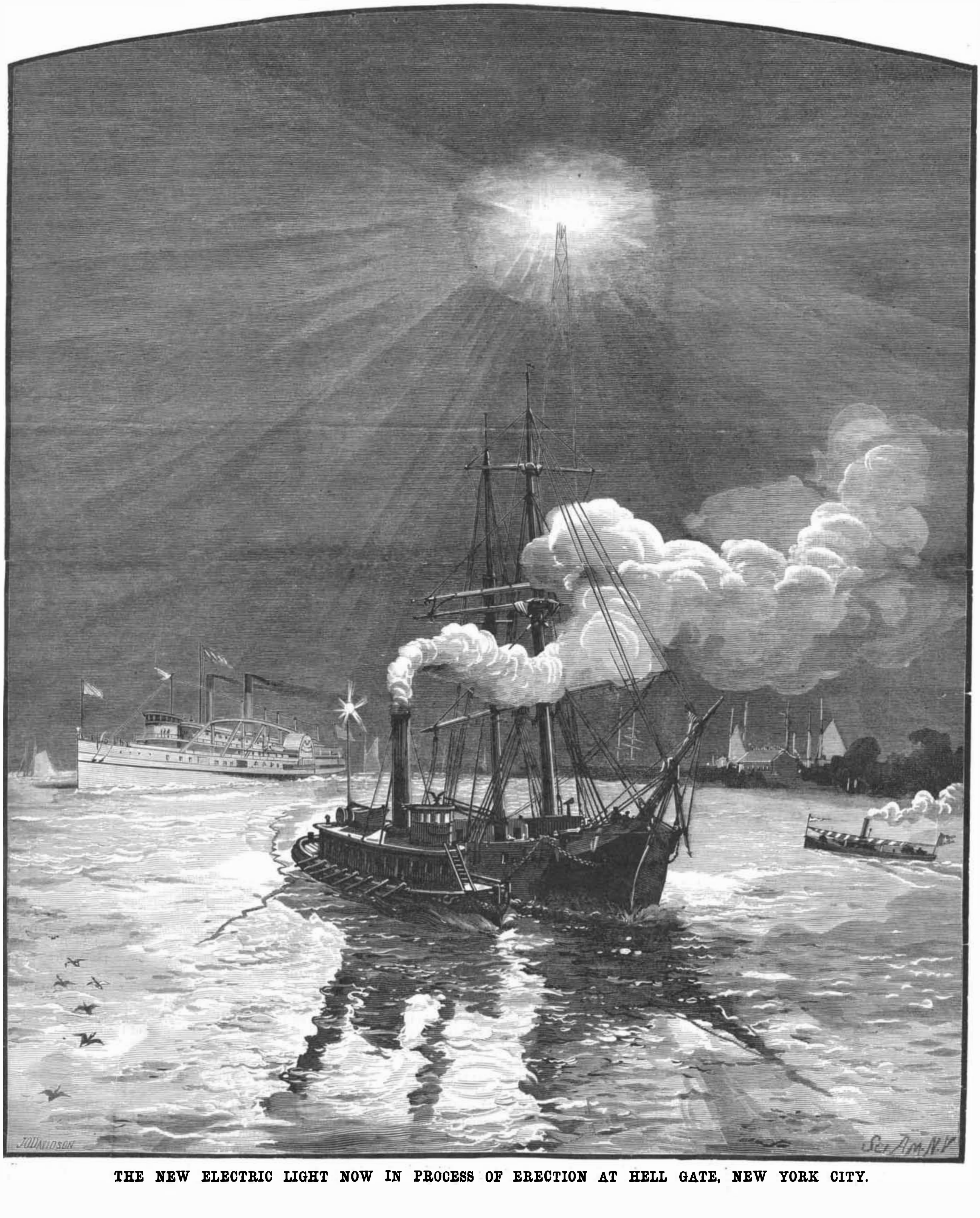
THE NEW ELECTRIC LIGHT AT HELL GATE LIGHTHOUSE.

The passage through Hell Gate, connecting Long Island Sound with the East River, has always been dangerous, the tides producing swift and powerful currents which were changed by the rocks both in and bordering the channel into treacherous whirlpools and eddies. For nearly fifteen years the work of removing these rocks has been carried on, and although not yet completed it has resulted in increasing the depth and width of the channel and lessening the risks encountered by vessels. The most formidable obstruction yet to be removed is Flood Rock, upon which work is so far advanced as to need but another appropriation to finish. Each operation connected with this great undertaking we illustrated and described during its progress.

As a needed supplement to this work, the Light House Board is now erecting, under the immediate supervision of General J. C. Duane, an iron light house that will not only illumine Hell Gate proper, but will light miles of the approach on each side. The structure will jut out from the shore at Astoria, one corner of it being at the extreme point

(*Continued on page* 178.)



THE NEW ELECTRIC LIGHT NOW IN PROCESS OF ERECTION AT HELL GATE, NEW YORK CITY.

HELL GATE ELECTRIC LIGHTHOUSE.

(*Continued from first page.*)

made by the sharp trend of the land. It will be similar in construction to the tower on Coney Island, and at an elevation of 250 feet above the base will have an electric light of great power. The tower will be completed during the summer, and will cost about $20,000.

The tower consists of four corner posts, placed so as to form the frustum of the pyramid, and united by struts and tie rods. The posts are placed 54 feet between centers each way at the base, and 5 feet at the extreme top. Each side is divided into ten panels, which decrease in height toward the top, as shown in the elevation, Fig. 1. Each column is composed of two angles united by two systems of latticing, as shown in Fig. 8, which is a section through the column of the lowest panel. In the first or lowest panel each angle iron is $6''\times6''\times\frac{3}{4}''$ and the lattice $\frac{1}{2}''$ thick; in the second each is $5''\times5''\times\frac{1}{2}''$, lattice $\frac{7}{16}''$. These dimensions are gradually reduced in each series until we reach the ninth and tenth, which are, from outside to outside, $5\frac{5}{16}''\times5\frac{5}{16}\times\frac{11}{32}''$, lattice $\frac{5}{16}''$. The first strut consists of four angles $5''\times3\frac{1}{2}''\times\frac{1}{2}''$; the second of four angles, $4''\times3''\times\frac{1}{2}''$; third of two angles, $5''\times5''\times\frac{1}{2}''$. The dimensions decrease toward the top, the ninth, upon which rests the floor of the gallery, being $2''\times2''\times\frac{5}{16}''$. The method of latticing the two lowest struts is clearly show in Figs. 4 and 5, Fig. 4 being a plan view at the end of the first strut, and Fig. 5 an elevation of the same.

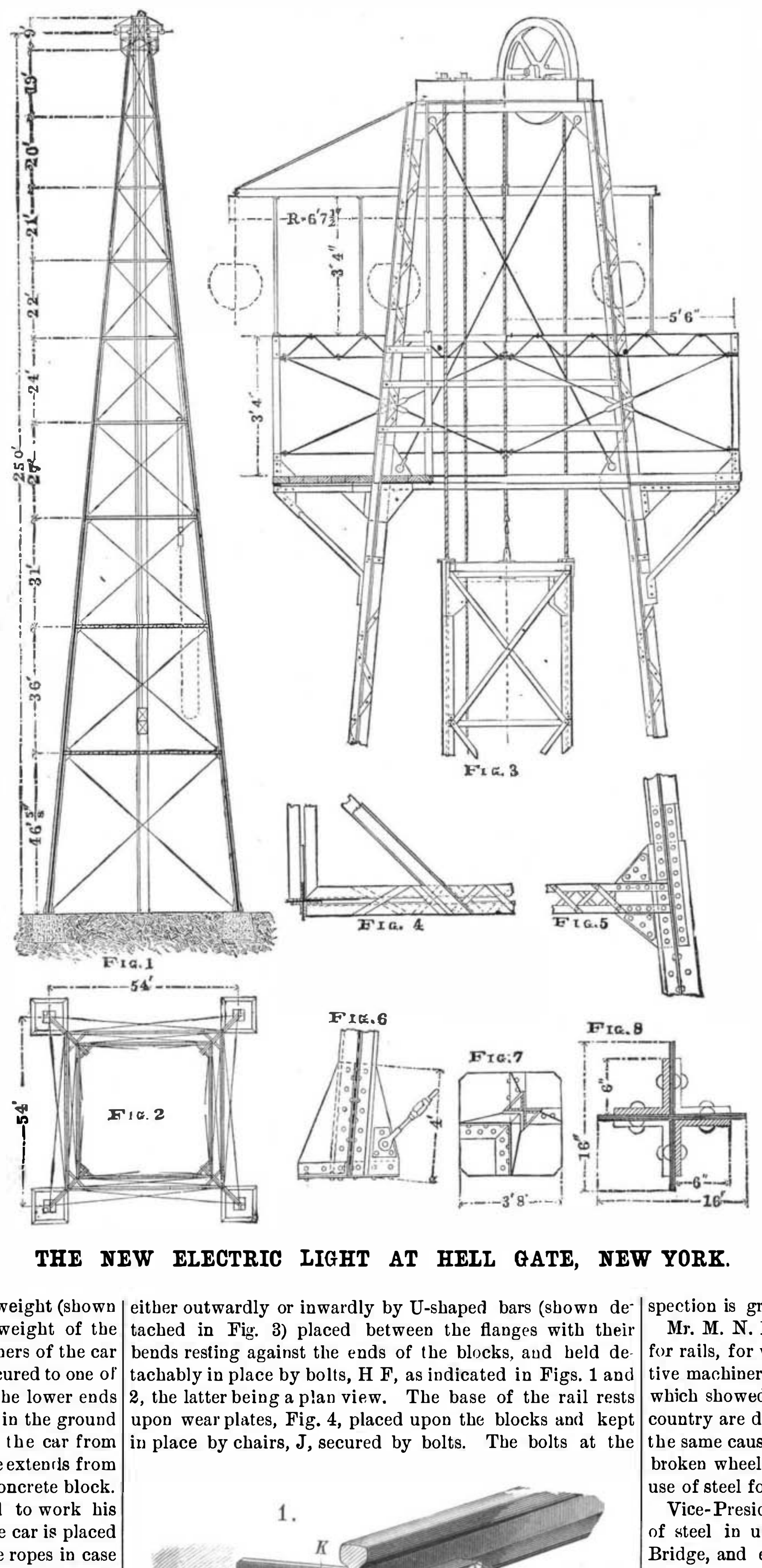
Adjoining ends of the pieces composing the columns are united to each other and to the struts, as shown in Figs. 4 and 5. At the first joint the fish plate is $5''\times5''\times\frac{5}{8}''$, the gusset plate $\frac{1}{2}''$ thick; these are reduced toward the top, the tenth series being, fish plate $2\frac{1}{2}''\times2\frac{1}{2}''\times\frac{3}{8}''$, and gusset $\frac{5}{16}''$ thick. Across each corner are braces, as shown in Fig. 4. The tension rods vary in diameter from $1\frac{7}{8}''$ for the bottom panel to $\frac{1}{2}''$ for the top. The lowest rods are 64' $6\frac{3}{8}''$ long, the top 9' $3\frac{5}{8}''$ long.

Fig. 6 is an elevation at the foot of a column, Fig. 7 being a plan of the same. Each column is anchored by bolts to a block of concrete 9' square at the base and 10' high, sunk in the ground, the distance between centers being 54'. Their position is shown in Fig. 2, which is a plan view of the tower. The gusset plates are $\frac{1}{2}''$ thick.

The gallery of the tower is 11' wide, the projecting part being supported by braces against the columns. The railing is 3' 4" in height, and is half way between the floor and a circular frame having a radius of 6' $7\frac{1}{2}''$, from which are suspended the lamps. The tops of the columns are united by cross bars as well as by struts parallel with the sides, and upon these is carried a sheave over which passes a hoisting rope, one end of which is secured to the top of the elevator car and the other end passes down one side of the tower to about the middle, where it is attached to a weight (shown in Fig. 1) which overbalances a little the weight of the car. Through two diagonally opposite corners of the car pass two guide ropes, the upper ends being secured to one of the cross bars at the top of the tower, and the lower ends being firmly held by a block of concrete sunk in the ground in the center of the base. These ropes keep the car from being swayed by the wind. Still another rope extends from the top of the tower through the car to the concrete block. By means of this rope the passenger is enabled to work his way to the top of the tower. In the top of the car is placed a safety attachment designed to clutch the side ropes in case the center rope should break. The center rope is steel, $\frac{3}{8}''$ n diameter, the two side ropes are $\frac{3}{4}''$, and the starting rope $\frac{1}{2}''$. The car is 6' $7\frac{3}{8}''$ high and 4' 7" wide.

The contract for building the light house was let to the Cooper Manufacturing Company, of Mt. Vernon, O. The Brush Electric Light Company of Cleveland, O., will furnish the dynamos and lamps. As these have not yet been completed, we are unable to furnish details.

A night view of Hell Gate and vicinity, after the tower shall have been finished, forms our frontispiece.



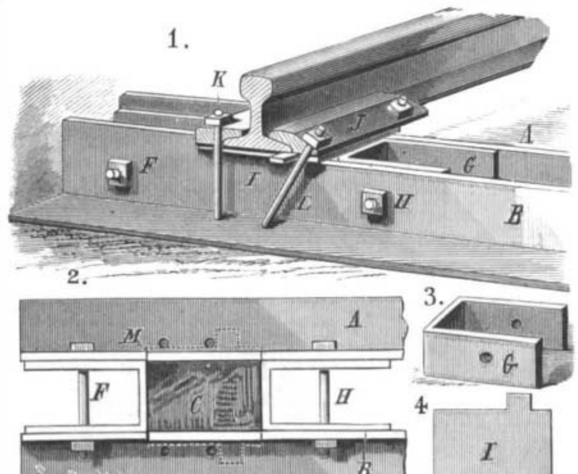
THE NEW ELECTRIC LIGHT AT HELL GATE, NEW YORK.

A Representative New England Exhibition.

The Massachusetts Charitable Mechanic Association will hold its fifteenth exhibition in Boston during the ten weeks commencing in September next. The association is now more than three-quarters of a century old, has probably the finest exhibition building in America, and its members and officers represent a large proportion of the brains and money engaged in Massachusetts manufacturing enterprise. An ample past experience enables the management to so arrange the details that there will be the least possible friction in apportioning space satisfactorily among exhibitors, and these displays have always been exceedingly attractive, at a time of year when Boston usually has large numbers of visitors from all parts of the South and West.

METALLIC RAILROAD TIE.

The base of the tie is made wide, to prevent its being pressed into the road bed. The adjoining sides of the plate are flanged, and between the flanges are placed blocks, C, of paper or other material, which are made of such a thickness as to rise a little above the upper edges of the flanges, thus serving as cushions for the rails and preventing them from touching the tie. These blocks are kept from moving either outwardly or inwardly by U-shaped bars (shown detached in Fig. 3) placed between the flanges with their bends resting against the ends of the blocks, and held detachably in place by bolts, H F, as indicated in Figs. 1 and 2, the latter being a plan view. The base of the rail rests upon wear plates, Fig. 4, placed upon the blocks and kept in place by chairs, J, secured by bolts. The bolts at the



VAN ORDEN'S METALLIC RAILROAD TIE.

outside of the rail are vertical, those upon the inside are inwardly inclined. The outer edges of the chairs rest against shoulders formed upon the vertical flanges, B, thereby preventing the rails from spreading. The wear plates are kept from moving upon the blocks by the shoulders on the flanges and the inclined bolts. With this construction the rails can be taken up and replaced without disturbing the ties, and the blocks or cushions can be taken out and renewed without disturbing either the ties or the rails.

This invention has been patented by Mr. Charles H. Van Orden, of Catskill, N. Y.

Structural Steel.

At a recent meeting of the American Society of Civil Engineers, New York, a paper on Structural Steel, by E. B. Dorsey, C.E., was read. The paper gave the results of an examination by the writer into the subject during two recent trips to Europe.

The steel used for structural purposes is called generally in England mild steel, and in Germany homogeneous iron. Experts in Great Britain generally rely more upon physical tests and the reputation of the manufacturer than upon chemical composition. The physical requirements are stated, and the manufacturer uses his discretion as to the composition which will answer these requirements.

The rules for testing steel adopted by the British Admiralty, by Lloyd's Register, and by the British Board of Trade were given. The tendency among English engineers is to use steel still softer than has heretofore been thought best. Some large builders use nothing in their boilers over 26 long tons tensile strength per square inch and 25 per cent elongation in 8 inches. Others advise the use of steel of from 23 to 25 long tons tensile strength, with the same elongation.

American engineers require from 15 to 20 per cent higher tensile strength than the English. The Siemens-Martin, or open hearth, steel is preferred by nearly all experts for structural purposes, the Bessemer steel being principally used for rails. Ship builders are decided in their preference for the open hearth steel. A much larger number of plates would be condemned of the best wrought iron than of steel. Data were given as to loss of strength in steel plates by punching. Steel can be manufactured into much heavier, longer, and wider pieces than wrought iron. Steel rivets are used on the Clyde exclusively in riveting steel. The new Forth Bridge is to be built of mild steel. The use of mild steel is extending very rapidly in Europe, and has fast superseded iron for structural purposes.

During the discussion Mr. Theodore Cooper referred to the conservative stand taken by him in a paper presented to the Society some four years since, and expressed the opinion that at the present time he would feel still more conservative in regard to the use of iron instead of steel for structural purposes, particularly for bridges or similar constructions. For boilers for ships, etc., steel has answered very well, but for structures he would be inclined as yet to advise the use of wrought iron. In compression, in his opinion, steel has not been proved to be as strong as wrought iron, and the necessity for most careful inspection is greater for steel than for wrought iron.

Mr. M. N. Forney referred to the increasing use of steel for rails, for wheel tires, and for various parts of locomotive machinery. He referred to the record of accidents, which showed that some 66 per cent of accidents in this country are due to derailment, and only 8 per cent due to the same cause in England. In this country the number of broken wheels is very great, and the tendency toward the use of steel for tires is decided.

Vice-President Paine gave details of the methods of tests of steel in use during the construction of the Brooklyn Bridge, and expressed an opinion favorable to the use of steel.

Ignoble Fate of a Steamship.

The Great Eastern has been purchased by the British Government for use as a coal hulk at Gibraltar. "How have the mighty fallen!" may well be said of this unlucky vessel. Born out of due time, she has never fulfilled the hopes of her projectors. Her only useful period was when she was employed in laying submarine cables. As a freight and passenger steamer she was a dismal failure. She was too big for any port in Great Britain but Milford Haven. Her career has been punctuated by disasters. She has been tried in a dozen capacities, and has failed in all, and now she is degraded to the humiliating function of a coal bulk. Nor is there yet any probability that the demands of commerce or transportation will ever justify the building of vessels of her size. For not only is the difficulty of finding work for such monsters almost insuperable, but, as the New York *Tribune* says, they are objected to on the practical ground that it is always unsafe to put too many eggs in one basket.

CLEAR boiling water will remove tea stains; pour the water through the stain, and thus prevent its spreading over the fabric.