regularly, considering it a privilege to contribute his services without compensation to the university. It was from the medical department of Columbian University that in 1866 he received the degree of M.D.; that of Ph.D. came to him from Columbian University in 1870, and that of LL.D. in 1894, from the same source.

His activity as a zoologist has been unceasing, and his contributions to that science have included over five hundred separate papers, most of which have been on ichthyology. Of these, many appeared in the Proceedings of the Philadelphia Academy of Natural Sciences, but since 1878 the Proceedings of the United States National Museum has been his favorite place of publication. His work has been chiefly on systematic ichthyology, especially with the arrangement of fishes in their classes, orders, and families, yielding a more natural and restricted distribution of genera, which has been almost universally accepted in the United States, and recognized in Europe. Among the most important of his contributions are "The Arrangement of the Families of Mollusks" (1871), "The Arrangement of the Families of Mammals" (1873), "The Arrangement of the Families of Fishes" (1873); the zoological portion of "Johnson's Universal Cyclopedia," the greater part of the volume on fishes and a portion of the volume on mammals of the "Standard Natural History," and the zoological text of the "Century" and "Standard" dictionaries.

Prof. Gill is a member of over seventy-five scientific societies, including the National Academy of Sciences, to which he was elected in 1873. His connection with the American Association began in 1868, and in 1874 he was made a fellow. Last year he was chosen vice president of the section on zoology, and as the senior vice president succeeded to the presidency on the death of Prof. Cope.

Oliver Wolcott Gibbs, the president upon whom the duties of presiding over this year's meeting will devolve, is also a native of New York City, where he was born on February 21, 1822. His education was likewise received in his native city. After passing through Columbia Grammar School he was graduated at Columbia College in the year 1841. Turning his attention to chemistry he studied for a few months under Dr. Robert Hare in Philadelphia, and then took a course in the College of Physicians and Surgeons in New York City, after which he spent several years in Europe studying under such famous masters as Rammelsberg, Heinrich Rose, Liebig, and Regnault. In 1848 he returned to the United States, and for a year lectured on chemistry in Delaware College, Newark, Del., whence he was called to the chair of physics and chemistry in the College of the City of New York, where he remained until 1863, and then was elected to the Rumford professorship in Harvard University, with charge of the laboratory of the Lawrence Scientific School, which place he held for a quarter of a century, and then was made emeritus. Prof. Gibbs fitted up a private research laboratory in Newport, R. I., in 1887, where he had long had his summer home, and there he still continues his chemical studies. His personality attracted a large number of students to him at the Lawrence Scientific School, including such men as Frank W. Clarke, Charles E. Munroe, Samuel P. Sadtler, Thomas M. Chatard, and others of the foremost chemists of the United States. His research work has included elaborate memoirs on the platinum metals, on the ammonia-cobalt bases, on new analytical methods, and on complex inorganic acids. It is this last research, which has extended over many years, that led to his discovery of the platino-tungstates, the vanadio-tungstates, and the molybdates. He has also contributed valuable papers to the literature of physics.

During the civil war he was in New York City, and at that time became actively associated in the workings of the United States Sanitary Commission and was chosen a member of its executive committee. In this connection he frequently met the other members of that body, and out of their daily contact grew the idea that, for the successful carrying on of their work, their meetings should "take the form of a club which should be devoted to the social organization of sentiments of loyalty to the Union." This was the inception out of which quickly matured the Union League Club, of New York City, whose original meeting was held at his residence on January 30, 1863, and of which he is to-day the senior honorary member. Prof. Gibbs has been honored at home and abroad as no other American chemist has. He has received the degree of LL.D. from Columbia and from Harvard. He has been elected an honorary member of the Chemical Society of London, and is also the only American who has ever received an election to honorary membership in the German Chemical Society. He is one of the four surviving original members of the National Academy of Sciences, and in which he has held the office of foreign secretary, becoming in 1896 the president of that body. Prof. Gibbs has long been a member of the American Association for the Advancement of Science, and as far back as 1866 was a vice president of that organization.

At the meeting held last year, when it was proposed to hold a joint meeting with the British Association, the nominating committee, in casting about for the most distinguished American scientist to represent the American Association, were prompt to recognize the fact that the president of the National Academy of Sciences was indeed the most eminent living American scientist. The wisdom of this choice was universally conceded, and the American Association quickly ratified the action of their committee.

The Precious Metals.

The product of gold and silver in the several States and Territories of the United States for the calendar year 1896 is estimated by the Director of the Mint to have been as follows:

State or Territory.	Gold Fine oz.	Gold Value.	Silver Fine oz.	Silver Coining val.
Alabama	275	$5,700	....	....
Alaska	99,414	2,055,700	145,300	$187,863
Arizona	125,978	2,604,200	1,913,000	2,473,373
California	737,036	15,235,900	600,000	776,533
Colorado	721,320	14,911,000	22,573,000	29,185,293
Georgia	7,305	151,000	600	776
Idaho	104,263	2,155,300	5,149,900	6,658,457
Iowa	48	1,000	....	....
Maryland	15	300	..	....
Michigan	1,800	37,200	59,000	76,283
Minnesota	39	800	...	...
Montana	209,207	4,324,700	16,737,500	21,640,404
Nevada	119,404	2,468,300	1,048,700	1,355,895
New Mexico	23,017	475,800	687,800	889,277
North Carolina	2,143	44,300	500	646
Oregon	60,517	1,251,000	61,100	78,998
South Carolina	3,062	63,300	300	388
South Dakota	240,414	4,969,800	229,500	296,727
Tennessee	15	300	....	....
Texas	387	8,000	525,400	679,305
Utah	91,908	1,899,900	8,827,600	11,413,463
Vermont	48	1,000	....	...
Virginia	169	3,500	...	....
Washington	19,626	405,700	274,900	355,426
Wyoming	692	14,300	100	129
Total	2,568,132	$53,088,000	58,834,800	$76,069,236

The increase in the production of gold over 1895 was $6,478,000, while the production of silver shows an increase over that of 1895 of $4,018,000.

Foreign Papers Published.

There are 2,200 daily and 15,000 weekly papers published in the United States, and twenty-three different languages other than English are represented in the newspaper press of this country, says the New York Sun.

There is only one newspaper published in the Russian language in the United States. There are five newspapers, all weekly, in the Portuguese language. Of these three are in California and two are in Massachusetts, at New Bedford and at Boston. There are four daily newspapers in the Polish language, published at Chicago, Buffalo, Milwaukee, and Baltimore. Besides these there are seven weekly Polish papers at Chicago, six in Pennsylvania, one at Cleveland, one at Toledo, and three at Detroit. Most of the periodicals in the Spanish language are trade papers, but there is a daily paper in New York, and at Key West is another. There are four Spanish papers in Arizona and twelve in New Mexico.

One Armenian paper is published in the city of New York, and there are two Chinese weekly papers in San Francisco. Five newspapers are published in the Finnish language, two in the mine regions of Michigan and one each in Illinois, Minnesota, and New York. There are two daily Bohemian papers in New York, two at Chicago, and one at Cleveland. There are three Danish papers in Chicago, one in Omaha, one in Racine, Wis., and one in Portland, Ore. The Danish papers are, almost exclusively, designed for circulation among the farmers, and few of them have any city circulation, though there is one Danish paper published in New York.

The indisposition of the French to acquire any other language must account for the large number of French papers published throughout the Union, even where the French population is inconsiderable. There are French daily papers (read chiefly by French Canadians) at Fall River, Lowell, and New Bedford, and one published at Woonsocket, R. I. There are also French papers in New York and San Francisco and New Orleans. Eight other French papers, all weekly, are published in the smaller towns of Louisiana.

Seven newspapers are published in the Slavonic language, and of the four in Welsh three are in Utica and its neighborhood. Thirty Swedish newspapers are published, but no daily papers among the number; eleven Norwegian, seven of them in Minnesota; five Hungarian, one Greek, one Gaelic, one Arabic, and eighteen Dutch, nine of which are in Michigan, where the Hollanders are numerous, one only being published at the East, in Paterson, N. J. There are two Italian daily papers in New York and two in San Francisco, but outside of these two cities the Italian press in the United States amounts to very little. There are four papers published in the Lithuanian language, and twelve, three of them dailies, in the Jewish jargon. German newspapers are published in nearly every State, and German dailies in nearly every large city.

THE FOUNDATIONS OF THE EAST RIVER BRIDGE, NEW YORK.

Work upon the new East River suspension bridge, which is to connect New York and Brooklyn at a point about a mile and a half to the north of the present bridge is now well under way, and by the courtesy of the engineers we are enabled to present our readers with illustrations and particulars which show the progress that has been made at the present writing.

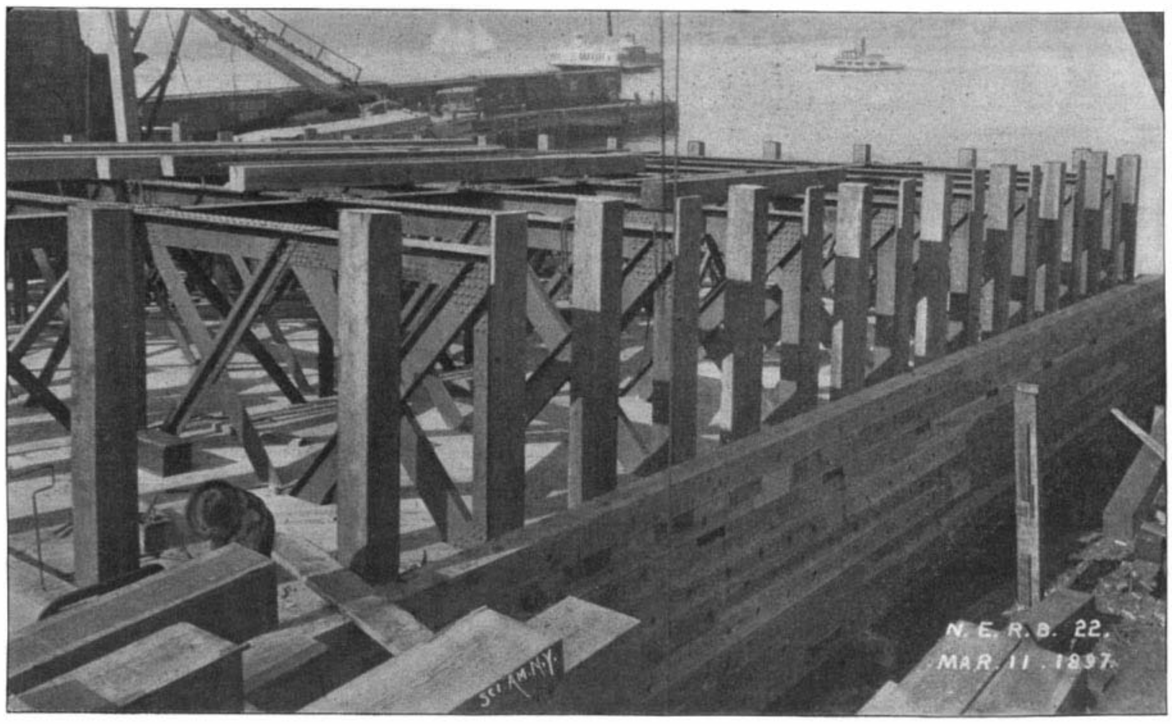
In our issue of September 12, 1896, will be found a bird's eye view showing the bridge as it will appear when finally completed and its relation to the surrounding districts. The terminus of the Brooklyn approach will lie on the block between South Fourth and South Fifth, Driggs and Roebling Streets, and the New York terminus will be located on the northern half of the block lying between Delancey and Broome, Clinton and Attorney Streets. The foundations of the bridge will be four in number, two under each tower, and they will rest upon timber and concrete caissons, sunk by the pneumatic process, upon which piers of solid masonry will rise to a height of 23 feet above high water. Above these will be built up the massive plate steel towers, each consisting of four corner posts, or legs, strongly tied together, the two groups of four on each pier being also connected by massive transverse lattice trusses and intermediate ties and struts. The top of the towers will be 335 feet above the river. The center span, 1,600 feet in length, will be carried upon four 18 inch steel wire cables, and the latter will be carried inshore 590 feet, where they will be anchored to massive masonry anchorages, each of which will be 150 feet square and 100 feet high. The shore spans will consist of independent trusses carried by the main towers, the anchorages and a pier intermediate between the former. The bridge will be stiffened against deformation under moving loads by a pair of continuous lattice trusses 40 feet deep. Between the trusses will be six elevated railroad and trolley tracks, and on the outside of each truss will be a roadway for vehicle traffic. Two walks for pedestrians will also be provided. These will be placed inside the trusses and above the trolley tracks. The total width of the floor will be 118 feet. There will be no terminal stations to this structure, as there are to the Brooklyn Bridge, the aim of the city authorities being to provide a broad, continuous thoroughfare, over which trains, vehicles, and pedestrians may pass without any interruption.

It can be well understood that in building a structure of these vast dimensions, whose term of life should be reckoned by the thousand years, the most important consideration is the foundations, inasmuch as upon these the stability of the whole structure depends, and when they have once been put in, they are forever beyond the reach of alteration or repair. It is conceivable that faulty design or poor material in the superstructure might be remedied, even after the bridge was completed—so great is the skill and resourcefulness of the modern engineer; but blunders in the design or construction of the piers of a 1,600 foot suspension bridge would probably wreck it beyond all hope of recovery.

The foundations of the new bridge will consist of timber caissons filled in with concrete. Owing to the varying depth of the rock below the surface of the river, no two of the caissons will be of the same dimensions, although they will all be similar in construction. The structure which is shown in the accompanying illustrations is the north caisson of the New York tower, and the description of the plant and methods employed in sinking it to place will apply also to the work on the other three. The borings show that the bed of the river consists mainly of sand, with some clay and bowlders. Below this, at a depth which varies from 45 to 71 feet below high water, is a very irregular surface of gneiss rock, similar to that which is found on Manhattan Island. The caisson will be sunk through the sand until it touches the rock, which will then be blasted away and "stepped" until the edge has come to a fair bearing on all sides. When this has been done, the space between the rock and the roof of the caisson will be carefully filled in with concrete.

Roughly speaking, the caisson, with its attached coffer dam, may be described as a huge boxlike structure, 60 feet by 76 feet on the sides and 19 feet deep, fitted with a bottom, which is placed, not at the lower edge of the sides, but 7½ feet above it. The space below the bottom or "roof," as it is called, constitutes a working chamber in which the blasting and excavation of the river bottom is carried out. Its walls are two feet nine inches thick and consist of two courses of 12× 12 inch timbers, the outer course being horizontal and the inner vertical, on the outside of which are two layers of 3 inch plank and one layer of the same thickness is laid on the inside.

The bottom of the walls is furnished with a cutting edge, which extends continuously around the whole caisson. It is built up of ½ inch steel plates, and it extends two feet below the bottom of the lower timbers, being stiffened at every two and a half feet of its length by knee braces. The lower twelve inches of the edge is also stiffened with reinforcing plates, which brings its total thickness up to two inches. It should be mentioned that the cutting edge is not intended for literally cutting through the river bottom, as its name would imply, but it is put in to enable the workmen to use their tools close up to the outside of the caisson, and, indeed, just a few inches beyond it. The wall proper is nearly a yard thick, and if a bowlder were lodged beneath it—supposing the cutting edge were not in use—it would be a more difficult operation to get at it than it is when the wall is only, as in this case, two inches in thickness. The shoulder, moreover, gives room to shore up if it should be necessary.



CONSTRUCTION OF CAISSON, SHOWING STEEL TRUSSES ABOVE THE ROOF.

The roof of the working chamber is five feet in thickness, and consists of the following material: First, there are two courses of three inch plank, laid in opposite directions; then a layer of 12 × 12 timbers, followed by a layer of 12 × 14 timbers, laid crosswise; above this are two courses of three inch plank laid diagonally, and above these are two more layers of 12 × 12 timbers. All the joints in this working chamber and in the side walls are carefully calked and white-leaded, so as to make it perfectly airtight. The roof, and indeed the whole caisson, is stiffened with a series of massive plate steel riveted trusses, eight in all, which extend entirely across it from wall to wall. They are placed immediately above and transversely to the first course of 12 × 12 inch timbers, the successive upper layers being framed in carefully between the struts and ties of the trusses. The timbers of the whole caisson, both walls and roof, are securely drift-bolted together, and every care is taken to make this structure both rigid and waterproof. The details of this construction are clearly seen in the sectional view, showing the sinking of the caisson, and in the views taken during its construction. The working chamber is also strengthened with two solid bulkheads two feet four inches thick, which extend entirely across it, dividing it into three compartments, openings being left to allow the workmen to pass through. At the level of the bottom of the walls is a massive framework or gridiron of 16 × 16 inch timbers, which is bolted together and to the side walls with one and one-half inch tie rods. At each intersection vertical posts reach from this frame to the roof, and the whole system is tied together and stiffened against lateral distortion by diagonal struts and tie rods, as shown in the sectional view. The object of this mass of bracing and truss work is not merely to enable the roof to carry the superincumbent load of the masonry, but to enable the whole caisson to endure without distortion the heavy transverse strains to which it is subject when it gets "hung" upon any projecting point of the uneven rock bottom.

INTERIOR OF WORKING CHAMBER BEFORE ROOF IS BUILT ON.

The steel trusses, which are 9 feet 3 inches deep and weigh 10 tons each, are a novel feature in this class of work. They were rendered necessary by the shallowness of the caisson, which was in turn due to the unusually short distance to solid rock.

The roof is pierced with seven shafts, each about 3 feet diameter, for the passage of men and materials, and also with a number of pipes, from 1 inch to 5 inches diameter, for supplying air and water, blowing out sand, and for carrying the electric light wires. The shafts are circular in section and are put on in lengths of 8 feet, as the masonry is built up.

The caisson was built up as described to its full height of 19 feet, on launching ways, and previous to the launch a cofferdam or temporary wall, 10 feet in height, was added above the structure, and bolted to it with angle plates and tie rods. The object of this is to keep the water away from the masonry while the caisson is being sunk to the bed of the river. When the caisson rests on the sand and the masonry pier is well above high water, the cofferdam will be unbolted and floated away. After that, as the caisson is sunk, masonry will be added, so that the top will be always kept above high water.

In the cut showing the caisson being towed to the site, the wall of the cofferdam can be clearly distinguished from that of the caisson.

Preparatory to launching the caisson, the river bottom at the site was dredged out to a depth of 25 feet, and a fairly level bed was prepared on which it might rest. The caisson was then launched and towed to the site and sunk by filling the crib above the roof with concrete. The latter is carefully rammed in between the steel trusses and the crib timbers, and finished off flush with the top wall of the caisson. The weight of this concrete and a few courses of the masonry pier proved sufficient to sink the caisson to the bed of the river.

The next operation is to clear the working chamber of water, and this is done by the simple expedient of forcing air into it until the river bottom has been laid bare. The workmen, who are known by the expressive name of "sand hogs," are then sent down the center shaft and begin the work of excavation. The sand is blown out through four inch pipes by means of air pressure, the column of sand and water in the pipe being rendered buoyant by admitting compressed air through a small pet cock near the roof. A water jet is used to loosen the sand at the mouth of the blow pipe, and it is carried out in a swift and steady stream. When harder material, such as clay or bowlders, is met, it is taken out in buckets through hoists reserved for that purpose. The top of each shaft is provided with an air lock, which is simply a closed chamber with an airtight door at top and bottom. The upper door is opened, the workman enters the chamber, and the door, which opens inward, is closed after him. Air is then admitted to the chamber until the pressure rises to that in the shaft, when the lower door, being relieved of pressure, can be opened. The man then descends by the ladder into the working chamber. The operation of the material locks is the same, the wire rope passing through a stuffing box in the outer doors.

As the material is excavated the caisson will sink from its own weight, and the process is carried on until it has been carried down to a solid rock foundation. The next step will be to fill up the void represented by the working chamber. For this purpose concrete will be sent down the shafts and tamped in place, the filling-in commencing at the walls and being carried on toward the center. The last of the work will be done by a single man, who will place the last shovelfuls at the base of the shaft. All the shafts will then be filled with concrete, and after this is done the masonry piers will be carried up to their full height and capped ready to receive the steel towers.

It is expected that a suitable rock bottom will be found at a depth of about fifty-six feet below high water.

The plant concerned in these operations is quite extensive, as will be seen from our front page engraving. By a piece of good fortune a substantial river pier is standing exactly on the axis of the bridge, and, therefore, between the two piers, which will be 97 feet 6 inches center to center. Upon this has been erected an engine and boiler house, which contains three large boilers, two Ingersoll air compressors, a Knowles water pump and an electric light plant. In front of this is located the concrete mixer and the derricks for handling the excavated material and passing in the concrete. Work is also carried on from scows on the end and side of the caisson, the stone for the piers being brought, already cut to the required size, on scows from a point up the Hudson River and lifted directly into place on the piers.

The estimated time of sinking the caisson to place is three months, and it is expected that the whole bridge, which is to cost about $7,500,000, will be completed in about five years.

We are indebted for our particulars to the courtesy of Mr. L. L. Buck, the chief engineer of the undertaking, and Mr. E. G. Freeman, the resident engineer on the New York end of the bridge.

How to Find Out if a Room is Damp.

To ascertain whether or not a room is damp, a kilogramme of fresh lime should be placed therein, after hermetically closing doors and windows. In twenty-four hours it should be weighed, and if the kilogramme has absorbed more than ten grammes of water (that is, more than one per cent), the room should be considered damp and classed as unhealthy. The question of the dampness of dwellings is a frequent cause of dispute between landlord and tenant, and is naturally solved in the negative by the former. The question can be settled in the future by the test of the hydration of lime, which will give irrefutable proof of the validity of such complaint.—New York Dietetic and Hygienic Gazette.

ACCORDING to Nature, the firing at Portsmouth, on June 26, was distinctly heard at Hungerford, Wiltshire, a distance of forty-five miles as a crow flies, and also at Great Malvern.

SCIENTIFIC AMERICAN

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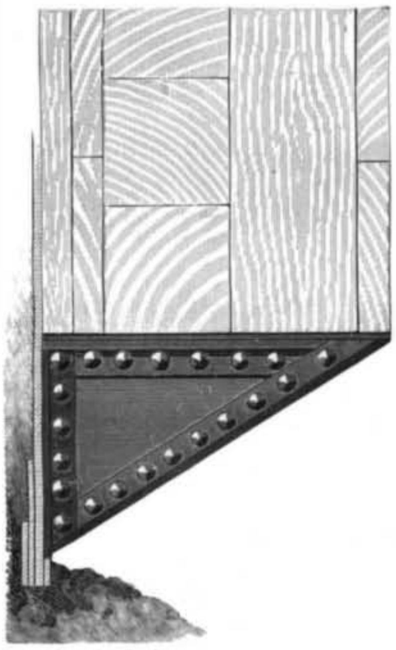
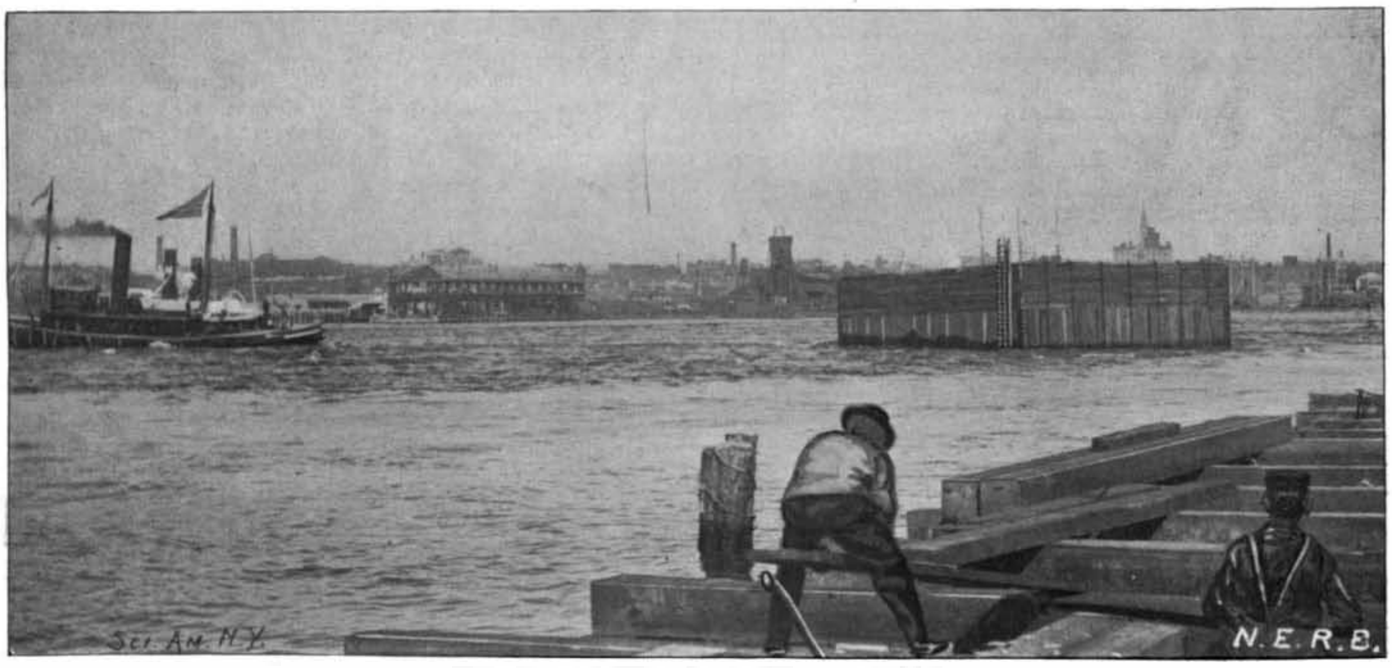
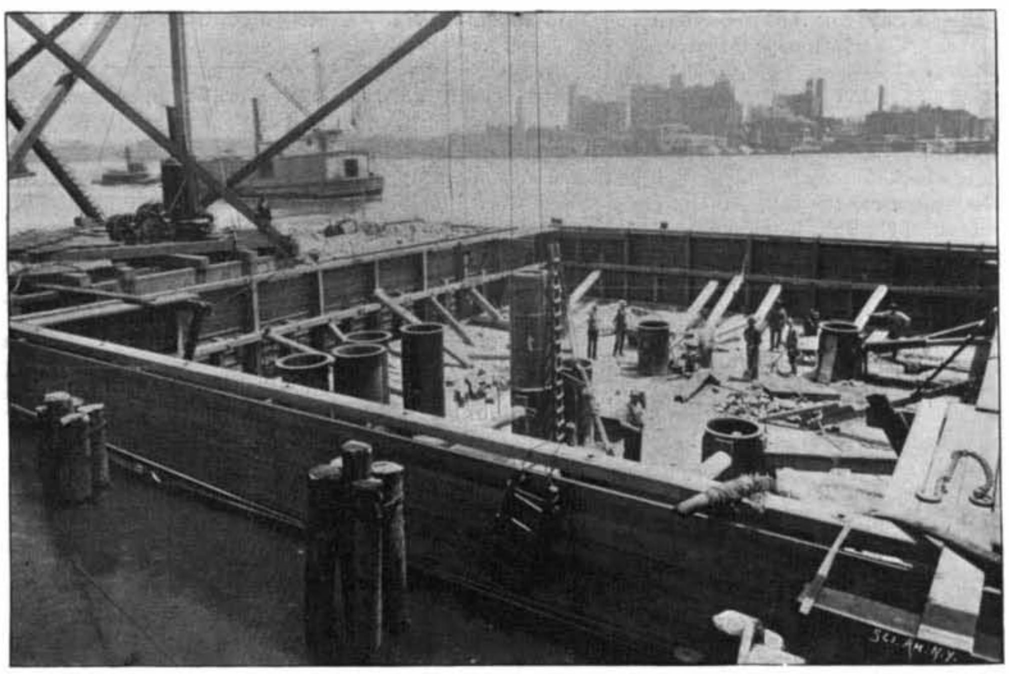


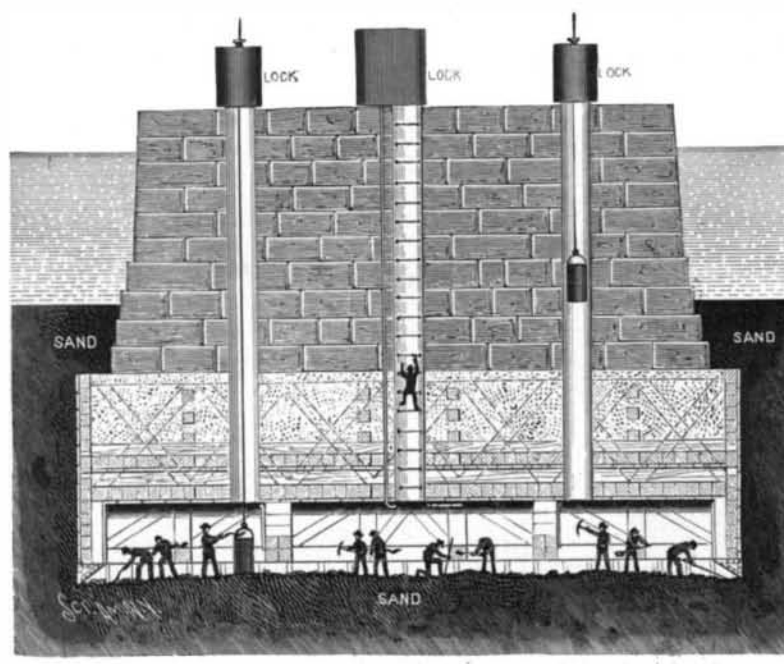
THE CUTTING EDGE.



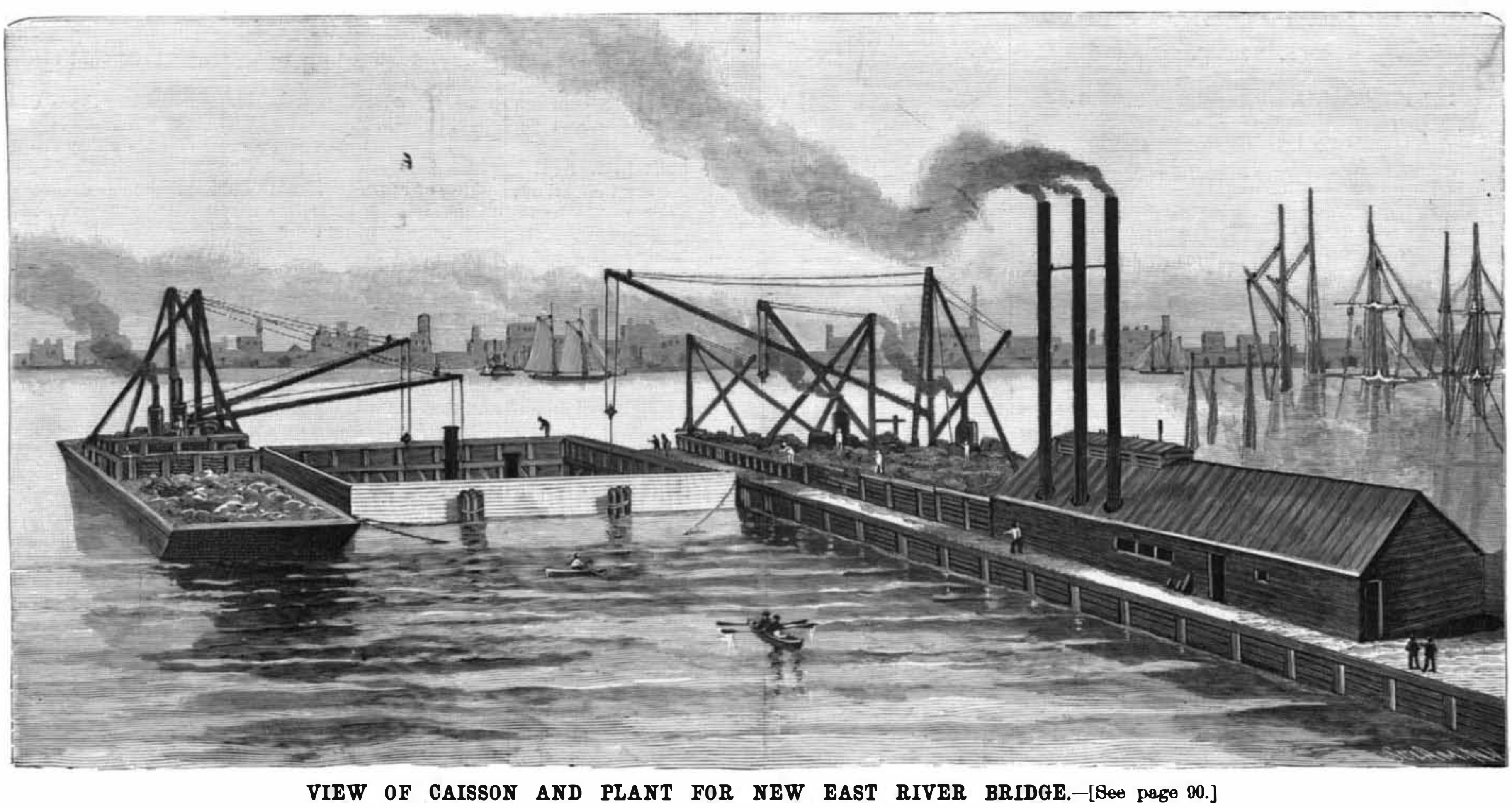
TOWING THE CAISSON TO SITE OF BRIDGE.



CAISSON IN POSITION, WITH TEMPORARY COFFERDAM ATTACHED.



SECTIONAL VIEW OF CAISSON AND PIER.



VIEW OF CAISSON AND PLANT FOR NEW EAST RIVER BRIDGE.—[See page 90.]