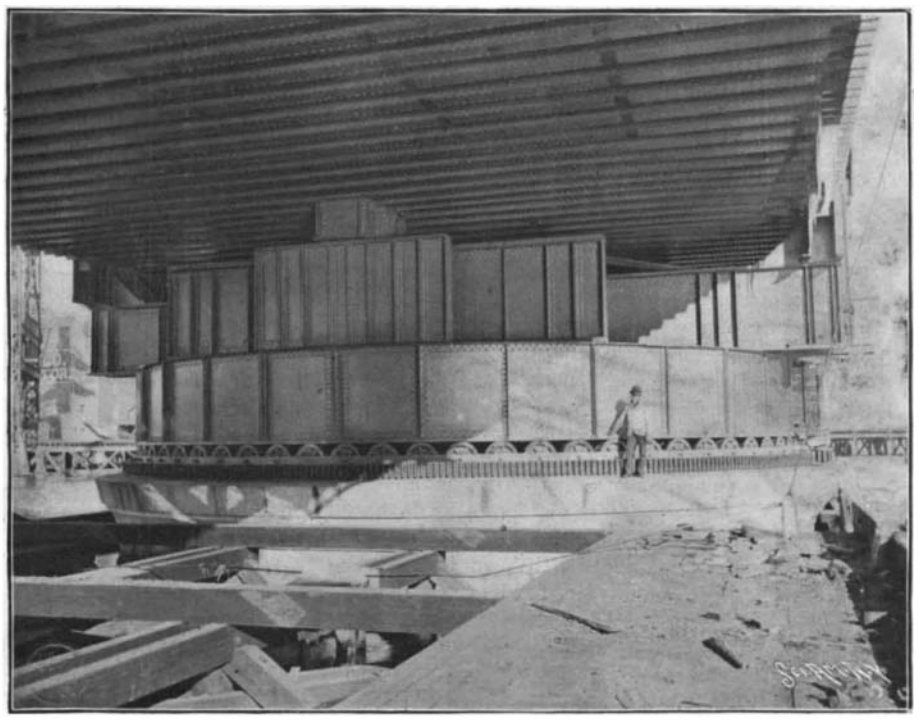
THE HARLEM RIVER DRAWBRIDGE AND THE PARK AVENUE IMPROVEMENT IN NEW YORK CITY.

New York City possesses within its limits, on Manhattan Island, a single large railroad station, known as the Grand Central Depot. Into this depot the cars of practically three lines of railroad run down from the Harlem River to Forty-second Street, a distance of nearly five miles. This distance has for a long time been traversed partly through cuts, partly through a tunnel and partly on a masonry viaduct. The upper part of Park Avenue, from 106th Street to the river, which is really a continuation of Fourth Avenue, is now being improved by the removal of the viaduct and cuts, and the substitution therefor of an elevated steel structure, on which four tracks will be carried. The effect of this will be to throw open the street below to the public, leaving a width of 140 feet unobstructed except by the three rows of columns of the overhead structure. We have already illustrated the operation of the construction of this elevated way, which is now rapidly approaching completion.

A high level bridge is now almost completed over the river, which bridge is practically the largest railway drawbridge in the world and one of the very few four track structures in existence. Our illustrations show the present aspect of the improvements and of the bridge itself.



THE DRUMS ROLLERS AND GIRDERS UNDER DRAW SPAN HARLEM BRIDGE.

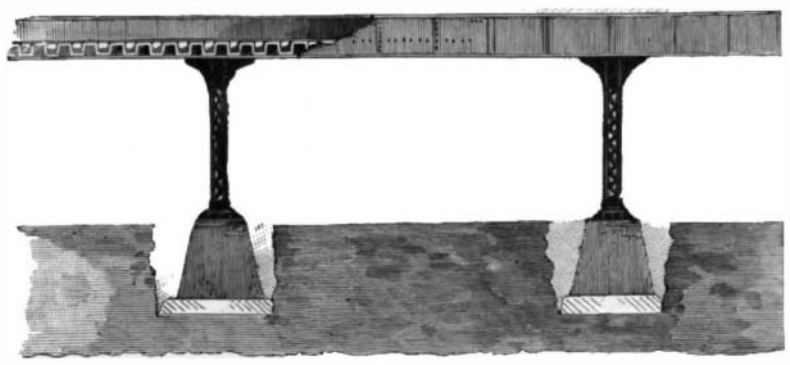
The viaduct is a steel structure carried on three rows of columns, each row supporting a longitudinal plate girder 7 feet 2 inches deep, ⅜ inch steel being used for the side and $\frac{5}{16}$ for the center girders, the theory of construction being, of course, that the center girder sustains double the weight of the lateral ones. The space between the girders is bridged over by New York Central solid floor system of cross trussing, which consists practically in a series of three-sided box girders covering the entire space, the longitudinal axis running across the structure. These act at once as roof, floor, truss and sleepers, and on them the rails will be laid. Drainage and leader pipes carry off the water, so that the street beneath the elevated way will be practically roofed over. This portion of the work is supplied by the Elmira Bridge Company, of Elmira, New York.

The small cut shows the full construction adopted on the viaduct. The high level bridge is the most impressive part of the improvements, and has the following general dimensions and features: On the north there are two bridge spans, the one farthest north being 131 feet 4¼ inches and the next 185 feet 4½ inches, these trusses being respectively 26 feet 3¼ inches and 30 feet 10¾ inches high. The draw span, measured from center to center, has a length of 389 feet, its length over all being about 400 feet. Its breadth is 58 feet 6 inches from center to center of the outside trusses, being carried by three trusses, one central and two lateral ones, the center one being the heaviest. These trusses provide two clear ways across the bridge, each 26 feet wide, and in each of the trackways are two tracks. At the center the draw span is 64 feet high and at the ends 25 feet, all measurements being taken from center to center.

The 121 foot span weighs 475 tons and the 185 foot span 850 tons, while the great draw span weighs 2,500 tons. It is of the pinned truss construction, and some idea of its dimensions may be obtained from the fact that the principal top pin of the hip, next to the tower, is 11 inches in diameter, while the bottom pin of the center truss next the tower is 12 inches in diameter. These pins are all steam forgings, turned up to shape. Other dimensions are worth citation.

The bottom chord of the bridge, which chord has a double role to fill—acting at once as a truss member when the bridge is open and also as a girder between the successive panel points, to support the weight of passing trains—is 48 inches deep. The tension members, extending from the top of the tower to the hips of the girders, consist each of eight bars of steel 10 inches by 1¼ inches, representing in the aggregate a cross section of nearly a square foot of steel. One could easily go through the whole structure and quote the dimensions, but we are merely giving enough to afford an idea of its great size. The floor of the bridge, which is carried directly by the bottom chords, is of the same solid floor system as that used in the elevated way, the troughs being 18 inches deep. The rails are laid directly on this floor.

The draw span of the bridge is carried on two concentric drums 4 feet apart, the outer one being 54 feet in diameter, the inner one 46 feet in diameter. Under each of these drums is a circle of seventy-two cast steel rollers turned to a perfectly true conical alignment, the outer rollers being 24 inches in diameter, the inner ones $20\frac{7}{16}$ inches in diameter, and both being 10½ inches face. The entire weight of the draw span when open rests upon these 144 rollers. The outer circle of rollers can be seen very clearly in the different cuts representing the bridge, especially in the one showing the center bearing. Of course, only the outer drum can be seen. The drums are stayed together by sixteen radial lattice struts, and the rollers, although journaled, so that they appear to be wheels, really act as true rollers in the operation of the bridge. On top of the drums is a series of eight steel beams, parallel and of varying length, representing chords of the circle of the drum, and on these beams the draw span, when open, is carried, so that there are provided thirty-two bearing points on the two drums, for this set of girders and for the draw span. All this is clearly shown in the view of the bridge and in the small view of the bearing. The drums are 6 feet high.



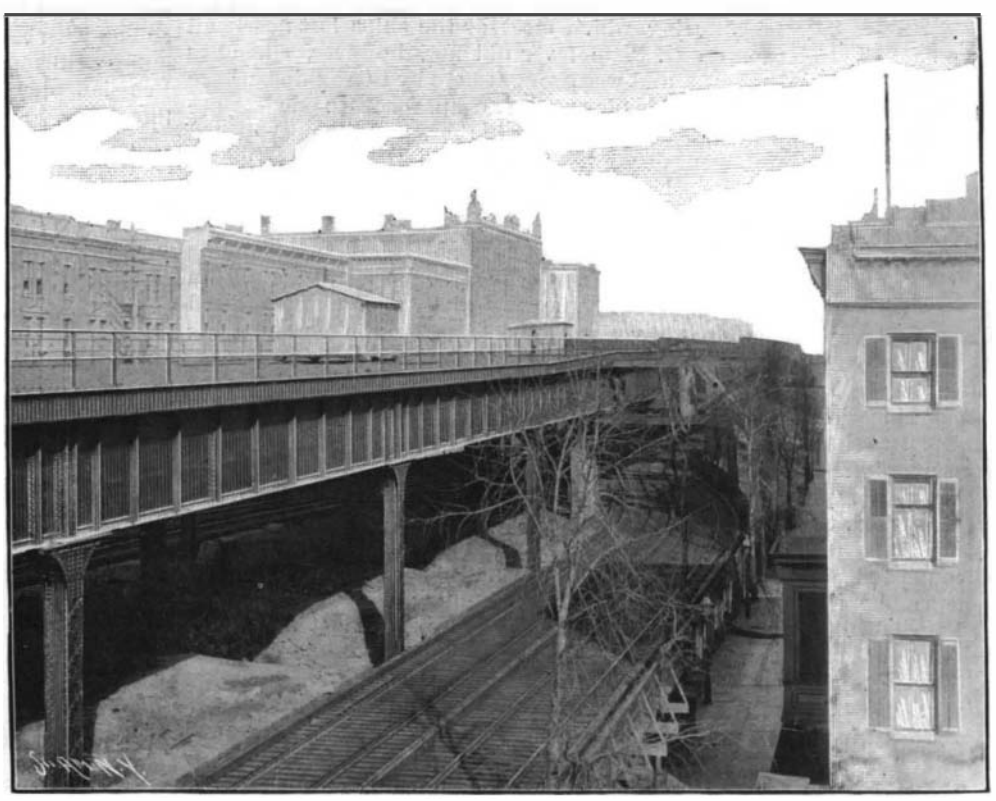
THE CONSTRUCTION OF THE ELEVATED WAY.

Merely to keep the bridge bearing in position, a center pivot casting is supplied, but the entire weight of the draw span, when open, comes upon the rollers. The center casting will have absolutely no work to do in carrying weight. The bridge is turned by steam, the engine house being situated above the tracks within the central tower of the structure. Here are installed two oscillating, double cylinder engines made by Edwards & Company, of New York. The cylinders are 10 inches in diameter and have 7 inches stroke.

The weight of the draw span is only partly taken up by the central bearings when it is closed. For each end there are levers arranged somewhat like toggle joints, which are operated from the center tower by steam power. When closed the levers are drawn together so as to take part of the weight of the ends, so that when the draw span is closed and the bridge is ready for the passage of trains the draw span acts partly as two through trusses and partly as two cantilever arms. When the draw span is to be opened, the levers are moved so as to give 3 inches clearance for the ends of the bridge. This is not all that is needed. The ends of the rails have also to be swung upward to clear the alignment chairs used to secure a perfect joint for the passage of trains.

The reverse of these operations is carried out when the span is closed. A masonry structure is shown at the end of the viaduct, where it meets the bridge. This represents architecturally a stone abutment, but really it is of little utility, having been placed there almost entirely for architectural reasons.

The draw span rollers and approaches were built by the King Iron Bridge Manufacturing Company, of Cleveland and New York. Our thanks are due to them for courtesies received in connection with this article.



NEW ELEVATED ROADWAY ON PARK AVENUE AND PRESENT TEMPORARY TRACK.

Waterproofing Brick and Sandstone.

A number of experiments were recently made to ascertain the length of time that brick and sandstone are rendered waterproof or protected by oil. The three oils used were linseed oil, boiled linseed, and crude mineral oil. The amount of oil and water taken up by the sandstone was very much less than that absorbed by the brick, although the area of the sandstone cube was much greater. Equal amounts of the raw and boiled oil were absorbed. The mineral oil, however, was taken up in much greater quantities by both brick and sandstone. By the end of twelve months the mineral oil evaporated from the bricks, but such was not the case when the other oils were used. After an exposure of four years the bricks practically retained all their oil, inasmuch as they had not lost any of their weight, and were also nearly impervious to moisture. It was noticeable that the sandstone cubes treated with linseed oil returned to their original weights, but do not appear to have lost the beneficial effect of the oils, being also practically waterproof.—Mining and Scientific Press.

As speaking tubes do not work on the English war ships owing to the rattling of the machinery, the Admiralty will try telephones.

A Costly Patent.

One of the Paige typesetting machine patents, recently issued, "breaks the record" in the history of the patent business for the great bulk and complexity of the patent itself and the intricacy of the machine it covers. It is said that over a million dollars was expended on the machine before the construction of the first one was completed. It has no less than 18,000 separate parts, and does the setting, justifying, and distributing of type in a way which would be satisfactory were it not for the cost and complexity of the machine. In the development of this invention Mark Twain is reported to have invested nearly $250,000.

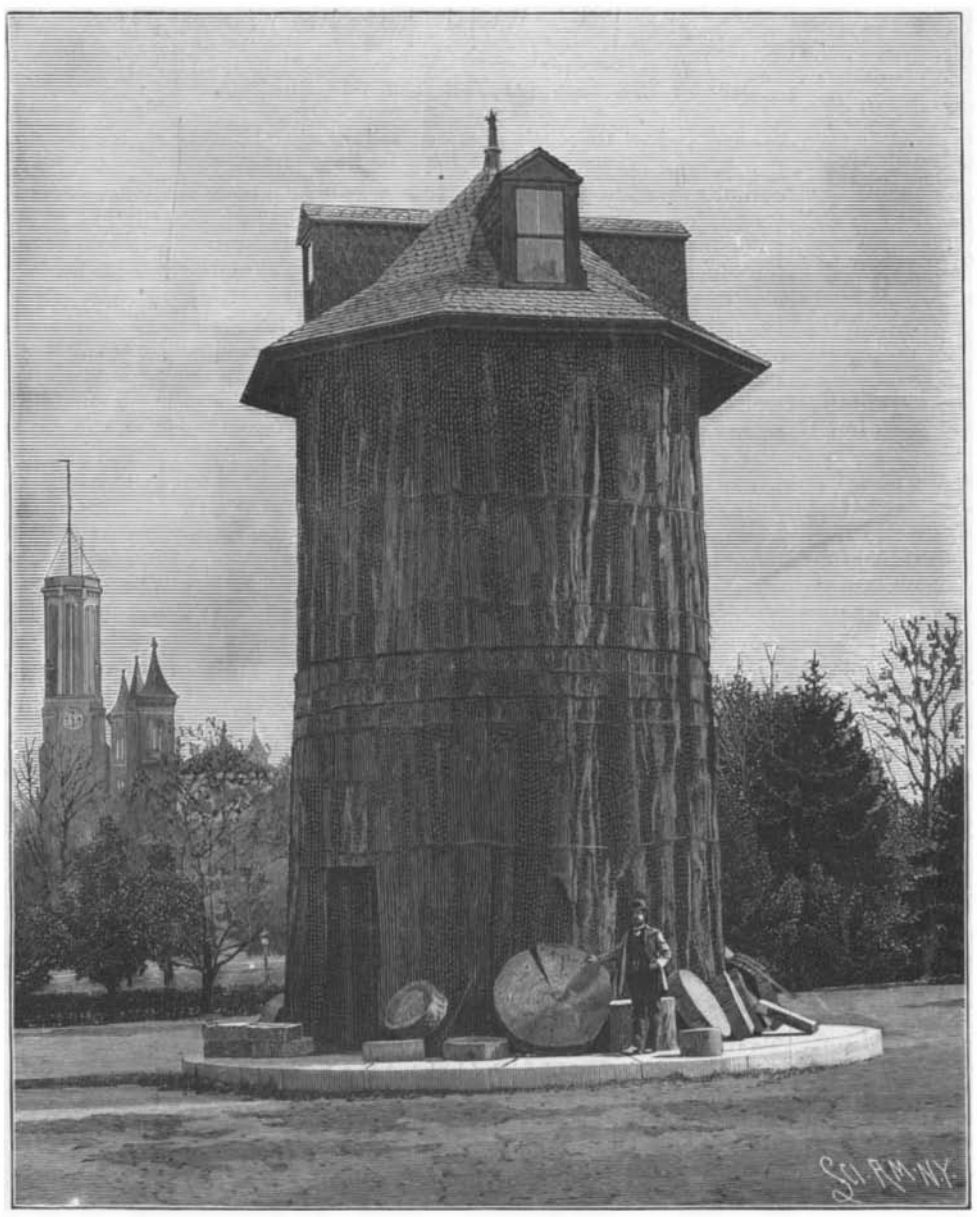
The first application filed for a patent on it contained 204 sheets of drawings, having over 1,000 separate views. During the eight years the case was pending in the office before allowance, the number of sheets was reduced to 163. When it is remembered that the majority of patents have only a single sheet of drawings, and that to require as many as ten sheets is an exception, the magnitude of the invention can be understood. The fees charged by the Patent Office are uniform for all cases, no matter how complex or how simple—$15 on filing the case and $20 additional on allowance of the patent.

When this case was filed it was turned over to an examiner who received a salary of $1,800, and he spent six weeks in studying the case before being able to take the first action. The entire specification was twice rewritten, each time by a different attorney. How much this cost the inventor is not known, but it is safe to say that the Patent Office lost heavily. It is estimated that it consumed about $1,000 worth of the time of the various Patent Office officials before maturing into a patent, and when issued the usual rule had to be followed of preparing copies for sale at the regulation price.

The large number of sheets of drawings had to be photo-lithographed and the entire body of the specifications and claims set up in type, costing for the first edition, as estimated by the ordinary rules, a few cents over $6 a copy. These copies were sold to the public at the usual price until the first edition was exhausted, when the Patent Office stopped the issue. A great many people ordered copies of this patent out of curiosity.

A TRANSPORTED CALIFORNIA "GREAT TREE."

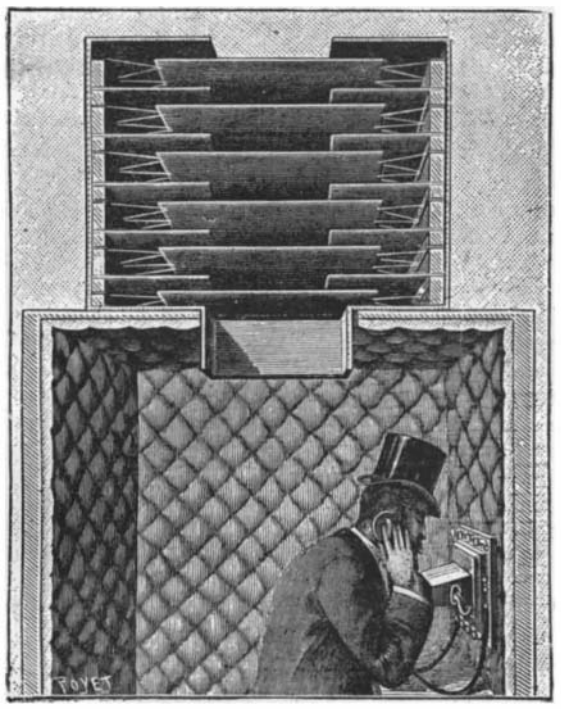
The accompanying illustration shows the great tree General Noble (named after General Noble, late Secretary of the Interior) as it now stands in the mall at Washington, D. C., between the Agricultural Department building and the Smithsonian Institution, which is shown in the distance. Among the multitudinous marvels of nature, none surpass in majesty and grandeur the great trees of California; no such trees are found in any other part of the world; they were first discovered in 1852 by a hunter, Mr. A. T. Boyd, and at once attracted general attention, and attained the widest celebrity. The genus, a species of redwood (Sequoia gigantea), was named in honor of Sequoia (pronounced Sequoyal), a Cherokee Indian of mixed blood. This specimen was 26 feet in diameter at base, 81 feet 6 inches in circumference and 300 feet in height, the section being taken about 20 feet from the ground; although considerably smaller than some others, it was found to be comparatively well preserved and symmetrical. It had to be hauled by teams of sixteen mules each, on heavy trucks built for the purpose, a distance of sixty miles on a rough mountain road; price paid for cutting, hauling and delivering on cars was $7,500; section was divided into forty-six smaller sections, some of these pieces weighing over four tons; it took eleven cars to transport it to Chicago, where it was exhibited at the Exposition; total cost of hauling and installing at the Exposition was $10,475.87; the additional expense of placing it in its present position would probably make a grand total of over $12,000. As will be seen by plan, the interior diameter is about 13 feet, and average thickness about 20 inches; a circular iron staircase leads to platform about 18 feet above; it has been roofed over and shingled with round butt shingles painted red; four dormer windows light the interior. Our engraving was made from a photograph taken specially for the SCIENTIFIC AMERICAN.



A CALIFORNIA "GREAT TREE" IN WASHINGTON.

A VENTILATOR FOR TELEPHONE CABINETS.

Telephone cabinets are so arranged as to smother sounds, as well as those who remain in them. In order that the conversation, which is to be carried on in a loud voice, shall not be heard outside, no provision is made for the least ventilation. It is well known how difficult it sometimes is in Paris to obtain communications, and it is a genuine punishment when it becomes necessary to remain ten minutes in one of these silk padded boxes.



MENIER'S VENTILATOR FOR TELEPHONE CABINETS.

We recognize the fact that the question is quite a delicate one; for, on the one hand, although for many reasons it is necessary to assure the ventilation of the cabinet, it is also indispensable to guarantee the secrets of conversation in an absolute manner, as it often has reference to important family or business matters in which those interested should alone take part. So we think it well to make known to those whom the question interests a simple and ingenious arrangement devised by Mr. H. Menier and applied for some months past in his offices.

In the top of the cabinet there is formed a wide aperture over which is placed a box open at the top and bottom. In the latter are arranged, one above the other, a series of boards, of the same size as the box, resting upon ledges and covered with cloth. In the center of each of these there is a wide square aperture. Other and smaller boards, likewise covered with cloth, but supported by cords attached to the sides of the box, are interposed between the first. This obstructive arrangement gives the air a wide circulation, and, as proved by experience, completely annuls vibrations. In order to assure himself of this latter condition, Mr. Menier installed one of these apparatus over an aperture formed in a wall separating two rooms, and found that two persons standing at the distance of three feet on each side could not converse, even in a loud voice.

This arrangement therefore completely solves, at slight expense, the double problem of ventilation and the smothering of sound.

We are indebted to La Nature for the illustration and article.

Discoveries in South Russia.

Our Odessa correspondent tells us that the curator of the St. Petersburg Imperial Archæological Committee, Mr. Goshkevitch, has made some archæological discoveries along the banks of the Dnieper (Borysthenes) and the Bug (Hypanis). Opposite the village of Kisliakovka are the ruins of the ancient town of Olbia, described by Herodotus as surrounded by a wall with many towers, and distinguished for its extensive trade and its civilization. The ramparts and inner parts are well preserved, and terra cotta figures with subjects from domestic life, pottery, and small vessels are continually being discovered by the villagers. The number of ancient sites discovered by Mr. Goshkevitch is 15. Each is situated on the steep bank of the river, which forms a natural defense against surprise attacks, and the other three sides are surrounded by ramparts in a good state of preservation, with the ruins of dwelling places within the walls. At Propastnoe, on the edge of the ravine of the same name, many ancient Greek vessels were found, and both here and on the banks of the Bug were found pieces of money of the time of Emperor Theodosius the Great, who reigned near the end of the fourth century. In the village of Kisliakovka evident traces were discovered of an ancient Greek settlement, and the curator discovered a head of a statue. The peasants a short time ago unearthed a splendid Greek statue, but, being ignorant of its value, they destroyed it, although they sell to the first buyer the coins they find at the ancient site of Olbia, and many private persons in those parts have splendid numismatic collections of the Scythian and other periods.

In a tumulus near the well-known Borysthenian burying ground was found a vault-like chamber, faced with oak blocks, and a floor made white with cement or lime. A skeleton was lying on a stone slab with extended arm bones and on the wrist a bracelet of pure gold. Around the neck were four finely worked gold and amber necklaces, and at the hip bone was a kind of knife or sword. Thirty bone arrows in a quiver, as well as a corytos or bow case, were near the skull, but the quiver crumbled away on exposure to the air. The skeleton crumbled to dust on being touched. Mr. Goshkevitch thinks it belongs to the Scythian period. In a ravine opening up into the valley of the Borysthenes (Dnieper) a considerable number of mammoth bones were discovered.

The curator has brought away to the Kherson Museum a massive piece of statuary having on its two sides crosses and cypress leaves, as well as a bunch of "prisob." This work is believed to belong to the period when the Genoese colonies were flourishing on the shores of the Black Sea.—London Times.

Elvind Astrup.

Elvind Astrup, who was Lieut. Peary's companion on his first trip across the inland ice, and who was with Mr. Peary on his second and third expeditions, started a few days before Christmas for the purpose of making a ski excursion in the mountains of Norway. Three weeks having elapsed, his friends became alarmed and sent a party to search for him. Astrup was found frozen to death in the Lille Elvedal Valley, in the Dovrefjeld Mountains. He did excellent work when with Mr. Peary and gave great promise of being an independent Arctic explorer of note.

SCIENTIFIC AMERICAN

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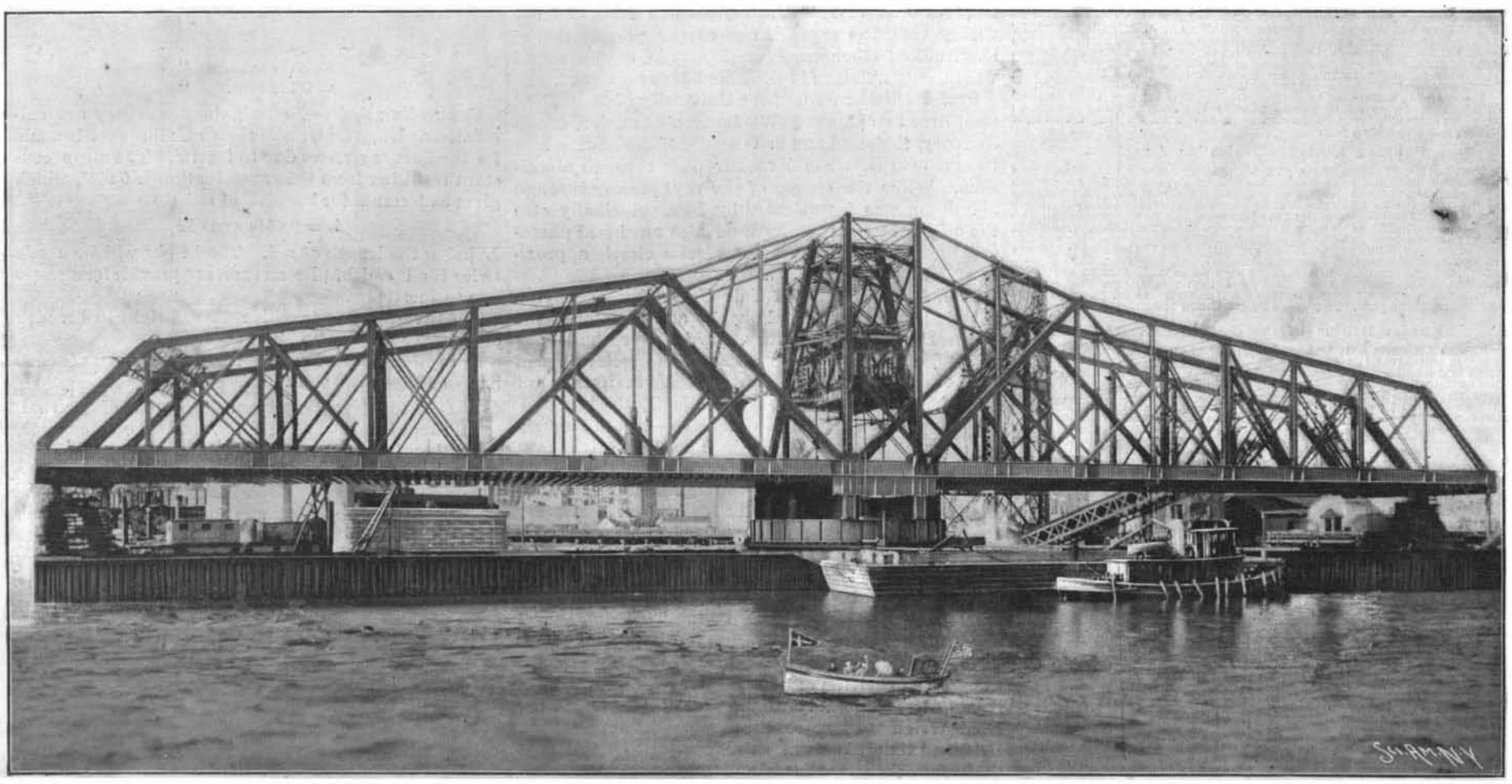
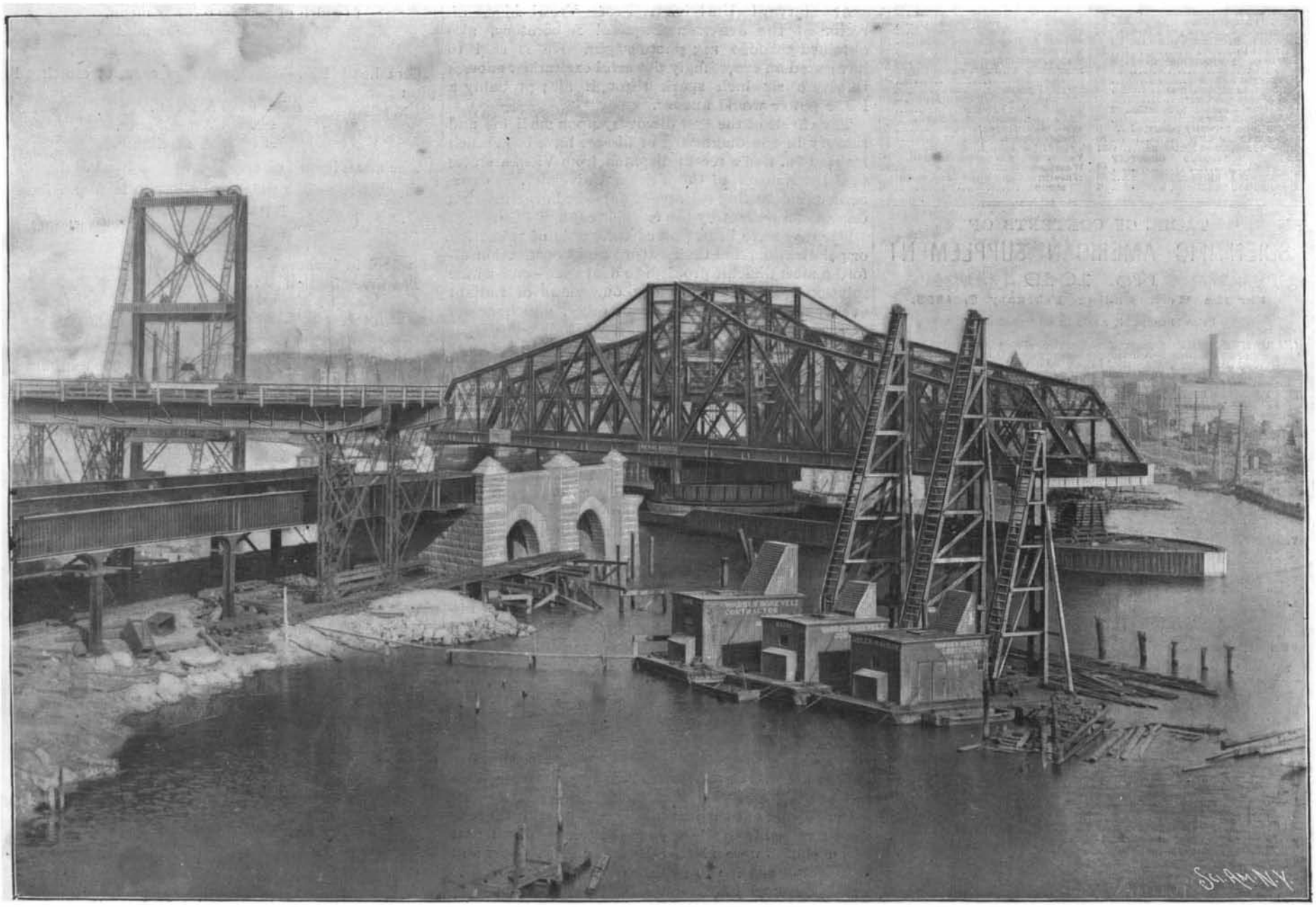
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXIV.—No. 6. ESTABLISHED 1845. | NEW YORK, FEBRUARY 8, 1896 | $3.00 A YEAR. WEEKLY.



NEW FOUR TRACK RAILROAD DRAWBRIDGE FOR NEW YORK CITY.



THE DRAW SPAN OF THE FOUR TRACK HARLEM RIVER BRIDGE, STONE ABUTMENT, AND ELEVATED ROADBED.

NEW HARLEM RIVER BRIDGE AND PARK AVENUE IMPROVEMENT, NEW YORK CITY.—[See page 88.]