MAKING THE CABLES ON THE NEW EAST RIVER BRIDGE, NEW YORK.

We have described from time to time, in the columns of the SCIENTIFIC AMERICAN, the four great cables which will support the massive 188-foot roadway of the new East River Bridge, and in a recent article we gave photographs showing the temporary footbridges which have been used in stringing the cables. The last of the strands has now been completed, and the four cables hung in the positions which they will permanently occupy. It would be well, therefore, before describing in detail the method of building to recapitulate some of the dimensions of these, the largest suspension cables in the world. Each cable is 18 inches in diameter and 2985 feet in length from anchorage to anchorage. When the weight of the floor system is upon them, the cables will extend in a fairly straight line from anchorage to saddles at the top of the steel towers, where the center of the cables is 333 feet above mean high water mark in the East River, while the horizontal distance from saddle to saddle across the main span is 1600 feet. The breaking strength of each cable is 25,000 tons and their combined weight is 5000 tons. The actual dead load which they will carry when the bridge is completed is 8000 tons, and they are calculated to carry a maximum moving load of 4500 tons. Each of the four cables contains 10,397 No. 8 steel wires. The specifications called for a strength of 200,000 pounds per square inch, but the actual breaking strength of the wire as determined on test, shows that the cables have an average breaking strength of 225,000 pounds per square inch; a truly marvelous result, and one which places these cables far ahead in point of tensile strength of any other structural material yet used in bridge building.

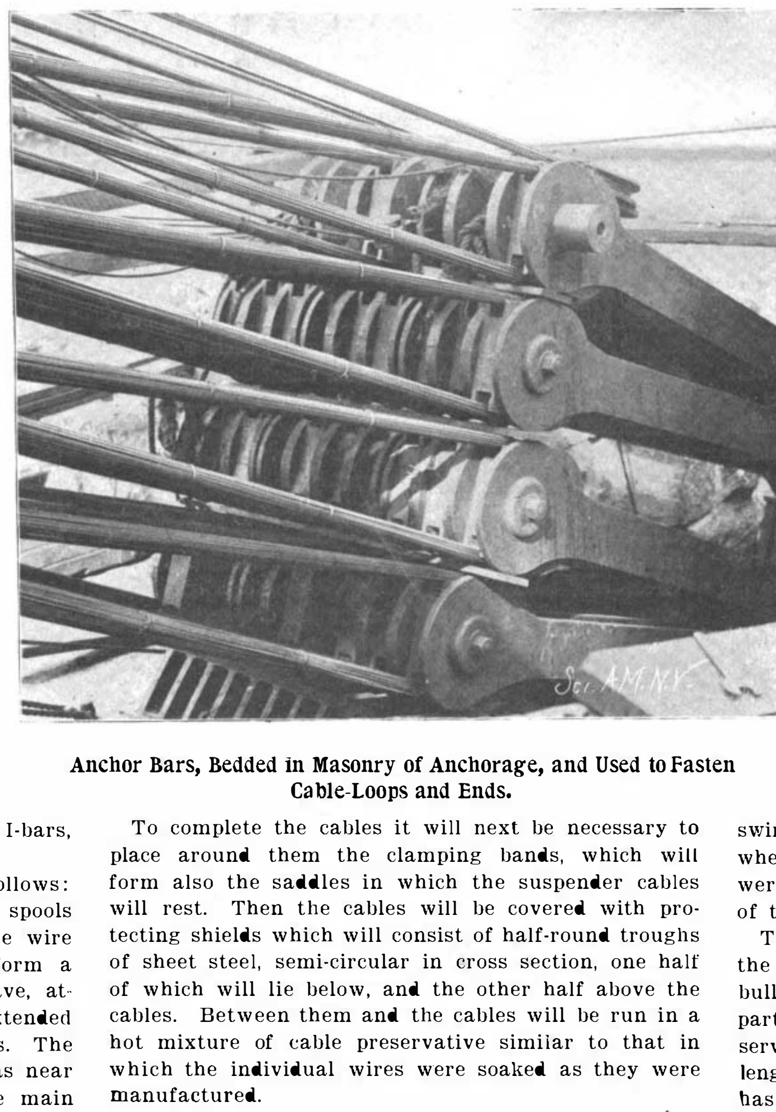
For the construction of the cables, temporary working platforms were built from the anchorages to the top of the towers and between the towers. These platforms were for the accommodation of the workmen in handling and adjusting the wires. The platforms were double-decked, the upper deck being used for the construction of the separate cable strands, which were lowered as they were completed through a distance of 15 feet to the lower platform, where they were assembled in the cable. The cable wires, which are about 3-16 of an inch in diameter, were made at the mills in 4000 foot lengths and reached the site of the bridge on 7-foot wooden reels. Each reel contained 24 of these lengths of wire, which were coupled at the ends with sleeve nuts, the joints being designed to give the full strength of the unbroken wire. The reels of wire were placed on each anchorage in bearings carried on wooden frames, which were laid in the lines of four cables. At each end the cables had to be connected with a series of massive eye-bars, which extend down through the anchorage and are bolted to a huge anchor platform at the base of the masonry. The connection consisted of massive shoes round which the wires of each strand were carried, the shoes being themselves pinned in between the ends of the I-bars, as shown in our illustrations.

The method of building each strand was as follows: The end of a wire was taken from one of the spools and made fast to the strand-shoe, and then the wire was unwound from the reel sufficiently to form a bight, which was passed around a 3-foot sheave, attached to an endless carrier cable which extended from anchorage to anchorage across the towers. The two parts of the carrier-cable were arranged as near as possible to lie in the plane of one of the main cables, and each part had attached to it a carrier sheave, in such a way that while one sheave was carrying its strand wire from New York to Brooklyn, the other was carrying its own strand wire from Brooklyn to New York. It will be evident from what we have said that each time a sheave traveled across the river, it drew with it a double wire. As a similar arrangement was provided for the other two cables, eight wires altogether were being simultaneously carried across the river when the whole system was in operation. When the carrying sheaves reached the opposite anchorage, the bights of the wires were removed from the sheaves and slipped over the strand-shoes. The rate of progress of the work was about 50 wires in each strand in ten hours, or a total of about 400 single wires each working day. When the end of the coil of wire was reached it was placed in a vise opposite to the end of the next coil of wire and the two were connected by a sleeve nut. A perfectly even tension was secured in each wire by adjusting it so that it conformed to the curve of a guide wire, which had been accurately adjusted in position by the engineers.

One of the best features of the new cables is the very excellent system of protection against weather which has been adopted. In the first place the wire is thoroughly coated at the mills with a heavy mixture of graphite and oil, and although its greasy condition rendered it extremely disagreeable to handle, the benefit will be found in the practically indestructible nature of the work.

In putting up the strands, the apportionment of labor was as follows: There were three men on each anchorage to look after the reels, put the bights on and off the carrier-wheel, splice the wires, etc. There were three men to handle the wires at the top of the tower until the strand was ready for lowering into the saddle whose duty it also was to see that the wires were hung exactly in the curve of the guide-wire already referred to. There were also three men placed between the anchorage and the top of the tower, who, as soon as the tension was adjusted, clamped the wire to the strand. The adjustment of the wire between the towers was done by seven men, and the adjustment of the wire between the other tower and the anchorage was accomplished in a similar manner to that described already. Care was taken in placing the bights of the wire around the strand-shoes to lay them in regular courses on the shoe, so that they would correspond with the position of the wires at the other end of the strand on the opposite anchorage.

As each strand was completed, its end shoe was turned from the horizontal to a vertical position and allowed to slide forward toward the tower, thereby lowering the strand to the final position of the finished cable; the shoe being finally placed in position between the anchor chain eye-bars and held in place by its end pin. The thirty-seven strands in each cable are arranged in a hexagonal cross sectional form, five strands lying on each side of the hexagon.



Anchor Bars, Bedded in Masonry of Anchorage, and Used to Fasten Cable-Loops and Ends.

To complete the cables it will next be necessary to place around them the clamping bands, which will form also the saddles in which the suspender cables will rest. Then the cables will be covered with protecting shields which will consist of half-round troughs of sheet steel, semi-circular in cross section, one half of which will lie below, and the other half above the cables. Between them and the cables will be run in a hot mixture of cable preservative similar to that in which the individual wires were soaked as they were manufactured.

The Seventeen-Year Locust.

BY F. H. BLODGETT.

When the seventeen-year locusts first made their appearance in Prince George's County, Maryland, about the 25th of May, I noticed that a number of the mature insects had their beaks perpendicular to the surface of the tree on which they were resting; but knowing that Riley and other entomologists had studied the question of their life-history very thoroughly, the thought that they might be feeding was put aside as untenable until June 5, when they were observed in similar positions in considerable numbers upon young apple trees in one of the college orchards. Some of the trees upon which the locusts were most abundant were wet over considerable areas, and careful observation revealed the fact that the wet areas appeared at places where the cicadas had recently been resting. Close observation was immediately begun, and a number of cicadas were observed with their beaks perpendicular to the surface of the bark. When disturbed, they were observed to withdraw their beaks, and immediately a drop of liquid made its appearance at the spot where the beak had been resting. In order to determine whether the beaks were actually inserted in the bark, and whether the globule of liquid came from the insect or from the tree, beaks of a number of insects were clipped off with scissors, so that they remained sticking in the bark. A piece of the bark was then cut out with the beak still retained, and photographs were taken of the beak in place. In addition to this point, sections of the beak also were made, which showed that the setæ were forced through the outer bark into the cambium layer of young apple and poplar trees to a depth of four millimeters.

On June 18, photographs were made in the field of cicadas feeding, and it was observed that ants and other sweet-loving insects gathered about the feeding cicadas, and when the latter withdrew their beaks, and the resulting liquid appeared on the bark, the ants immediately began to gather about the spot and to feed on the oozing sap. A photograph was secured only after several failures, but the failures gave an opportunity for observing minutely the method of feeding on the part of the cicada. The insect finally photographed had been feeding lower down upon the same trunk, and was disturbed by the motions made in adjusting and focusing the camera, so that it moved away from its then location, and after a time readjusted itself in the one where it was photographed. When moving, the beak is folded back between the forelegs at an angle of about 45 degrees, so that the tip is just free from the surface of the bark. As it begins to feed, the tip of the beak is brought forward, so as to become more nearly perpendicular, and is rested against the bark. The insect then "backs up," so as to bring the upper end of the beak in a perpendicular position above the tip, which is, as already stated, resting against the bark. This backward movement on the part of the insect is accompanied by a setting of the legs in a firm position. and is accompanied by an actual pulling back of the body by the hind legs rather than a mere settling closer to the bark. With the beak now in a perpendicular position, the setæ apparently are protruded through the tube which the beak forms, and this is accompanied by a slight sinking of the head, as the beak itself appears to be forced to a slight degree into the bark. Having thus inserted the sucking apparatus, the cicada drinks its fill, or until disturbed; and its source of supply is so abundant, that when the beak is withdrawn, more or less of liquid follows the withdrawal of the beak and affords an attraction for sap-loving insects. The insect is so intent upon feeding, that with care one can snip off the beak with slender scissors, so that almost its full length will remain in the bark. This is not so easily done, however, as is the snipping off of the ovipositor in place, which, owing to the depth to which it is inserted in the wood, cannot be withdrawn so readily as the slender and flexible beak. The insects seem to be sensitive to sudden motion rather than to near or strange objects in themselves, as difficulty in approaching them was almost entirely obviated when focusing cloth and other swinging or flapping articles were removed. But even when approached successfully, the feeding cicadas were likely to move just at the wrong time, on account of the movements of the camera body.

The feeding habits and the digestive organs of the cicadas are to be treated at some length in a bulletin from the Maryland State Horticultural Department during the present season, in which the observations here recorded will be treated at greater length by the State entomologist, to whom the matter has been referred.

Another New York and Chicago Railroad Record.

Four hundred and eighty-one miles in 460 minutes is the new record made on the Lake Shore and Michigan Southern by the 20th Century Limited Express. When 45 miles west of Buffalo the train was 2 hours and 28 minutes late. The track was cleared, and orders given to make up as much of the lost time as possible. The 124 miles between Brockton and Cleveland were covered in 131 minutes. The distance from Cleveland to Toledo, 113 miles, was made in 103 minutes, the speed on this stretch at one time reaching 90 miles an hour.

The train left Toledo 1 hour and 40 minutes late, making up 40 minutes on the run to Elkhart, a distance of 143 miles, arriving at Chicago 35 minutes late, making the run from Toledo to Chicago, 244 miles, in 228 minutes, including three stops—one at Elkhart, where they changed engines; one at Englewood, and one at Thirty-first Street, making an average speed from Toledo of over 64¼ miles per hour, including stops.

Congress, with the approval of the President of the United States, has provided that the World's Fair at St. Louis in celebration of the Centennial of the Louisiana Purchase, shall be held in 1904.

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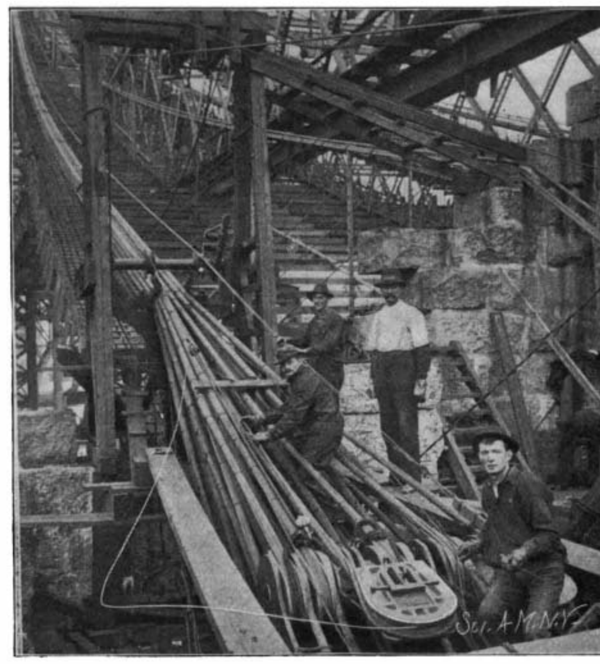
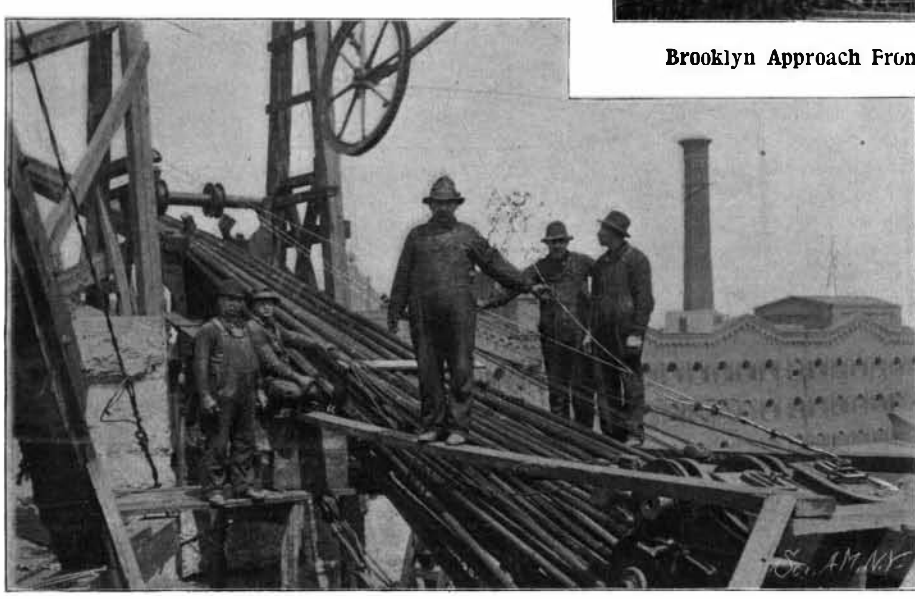
Binding Wire Strands Into Cables.

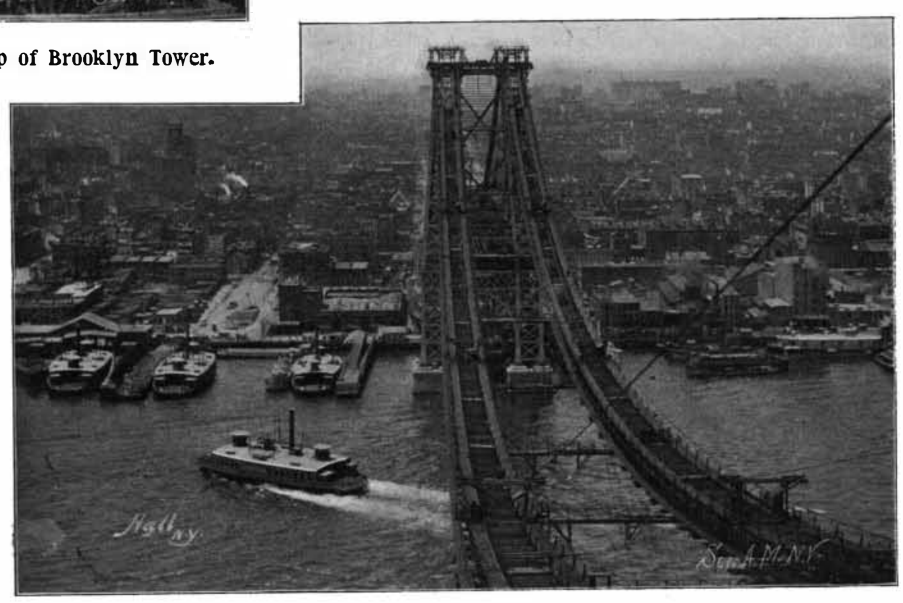
Brooklyn Approach From Top of Brooklyn Tower.



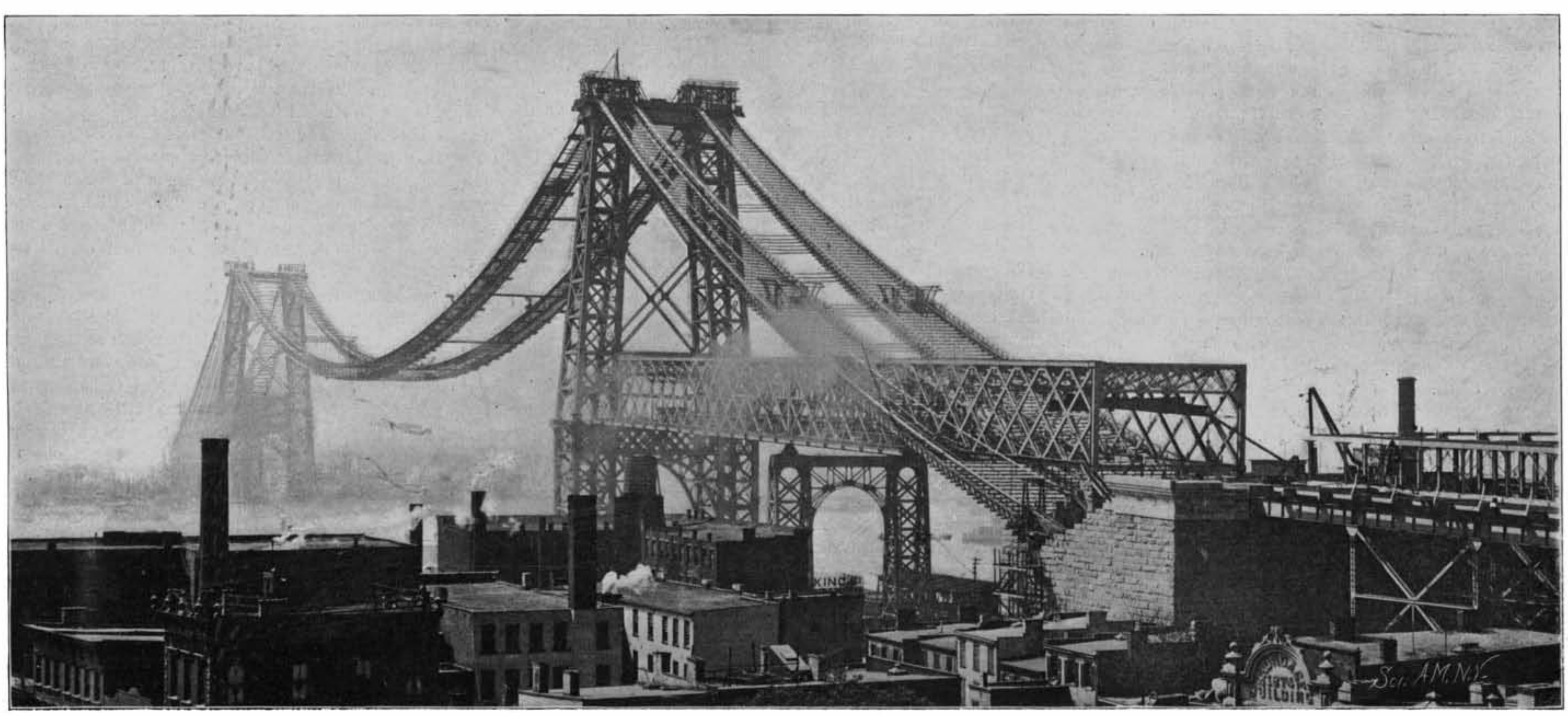
Stringing the Wires.



Compacting Wires Into Cables at the Brooklyn Anchorage.



View From Brooklyn Tower—Showing Foot-Bridge Cables and Towers and Manhattan.



PRESENT CONDITION OF THE NEW EAST RIVER BRIDGE.—[See page 55.]