THE NEW EAST RIVER BRIDGE FIRE.

The recent fire on the new East River Bridge was a most unusual, and certainly very spectacular, disaster, which would never have happened had the company which has the contract for the construction of the cables showed a reasonable amount of dispatch in carrying on the work. To understand the nature of the accident, it may be as well to explain to what point the work of erecting the East River Bridge had progressed. As is well known to the readers of the SCIENTIFIC AMERICAN, the towers have been erected, the main cables have been swung, the approach to the bridge on the Brooklyn side is practically completed, and that on the Manhattan side about half completed. For the accommodation of the workmen in stringing the cables, temporary foot-bridges were strung across over the towers from anchorage to anchorage. All the wires of the four great cables, each 18½ inches in diameter, were strung early last summer and since that time the bridge gangs of the company who are building the cables have been engaged wrapping the cables with a protective covering designed to prevent oxidation; and in covering the wrapped cables with the sheet-steel plates, which are intended to form the outermost covering and shed the water freely in rainy weather. The greater part of this work has been done, and the saddle clamps on which the double suspenders at each panel point of the bridge are supported have, most of them, been put in place and the suspender cables slung over them. The foot-bridges are carried upon four wire cables 2¼ inches in diameter, each of which extends in one length over the towers from anchorage to anchorage.

SUMMIT OF THE MANHATTAN TOWER, SHOWING INJURED PORTION OF ONE OF THE MAIN CABLES.

At the top of each tower, 335 feet above the water, a broad timber platform has been erected, which serves both as a working platform for the workmen and for the temporary storage of material used in construction. There has also been erected over each tower an extremely heavy framework of 12x12 timbers, which was used in temporarily carrying the strands during the stringing of the cables. On the towers at the time of the accident there was stored a considerable amount of waterproofing material, a composition made of oxidized linseed oil, asphaltum, and varnish gums. The fire broke out about five o'clock in the afternoon, and under the influence of a fresh breeze rapidly gained headway, and enveloped the whole of the platforms and timber structure at the top of the Manhattan tower in flames. After the fire had been in progress for a considerable time, the cables carrying the footbridges became so heated that they parted at the towers, with the result that these cables with their timber platforms fell back toward the Manhattan anchorage and toward the Brooklyn tower, much of the wreckage falling into the river. One of our illustrations shows the mass of cables and timber work as it finally lodged near the Manhattan anchorage, while others show the distorted wreck of the footway as it appeared the morning after the disaster, suspended above the East River.

The fire burned with great fierceness, and the 335-foot tower showed up against the black sky like some gigantic torch, affording a pyrotechnic display of weird and spectacular beauty. The fire department made a determined effort to get their hose to the top of the tower; but the work was rendered very difficult by the great height, and by the fact that masses of burning timber and red-hot bolts were continually falling through the towers. Great fears were expressed lest the heat had risen to a point at which it had wrought permanent injury to the main cables, an event which might have necessitated the taking down of the cables and their rebuilding at a cost of a great sum of money and with the loss of a year or two of valuable time. It was therefore with great relief that, on inspecting the main cables and the saddles, it was found that no material damage had been done to the tower and the saddles, and that only the outer layers of wires in the cables had been injuriously affected by the heat. At first thought it may seem strange that a fire which was sufficient to heat the footbridge cables to the point of rupture should have had no greater effect upon the main cables; but it must be borne in mind that the former were carried upon timber saddles and were consequently exposed to the fiercest heat of the conflagration. Moreover, they were only 2¼ inches in diameter, and their mass was so small, relatively, that it quickly became raised to the temperature of the fire. The main cables, on the other hand, because of their great mass, were able to absorb, transmit, and radiate the heat in such quantities, that only the outer layers of wire were raised to a temperature at which they were annealed and their tensile strength reduced. In absorbing and dissipating the heat, they were assisted by the great mass (30 tons) of the cast-steel saddles in which they rested.

On removing the covering plates and waterproof wrapping, it was found that the outer wires for a distance of from 20 to 30 feet across the saddles were warped. This effect can be seen in one of the accompanying photographs, which was taken at the summit of the Manhattan tower the morning after the fire. The report of Mr. Nichols, the engineer of the bridge, states that the heat on the two southernmost cables melted out the protecting material in the saddles and burned off the slushing material from the cables throughout the length of the saddles to a depth of three to five wires. The process of repairing the damage consists in cutting out for a length of say 25 feet the two to three hundred wires affected, and testing them for tensile strength in the testing machine. The cables will be cut down into in this way until the wires begin to show their original strength. New lengths of wire will then be spliced in, the ends being connected by sleeve nuts and drawn up until the desired tension is reached, the splices being staggered in the cable, so that they will

WRECKAGE OF FOOTBRIDGE AT MANHATTAN ANCHORAGE.

THE WESTERLY HALF OF MAIN SPAN, SHOWING WRECKAGE HELD IN THE SUSPENDER CABLES.

SCIENTIFIC AMERICAN

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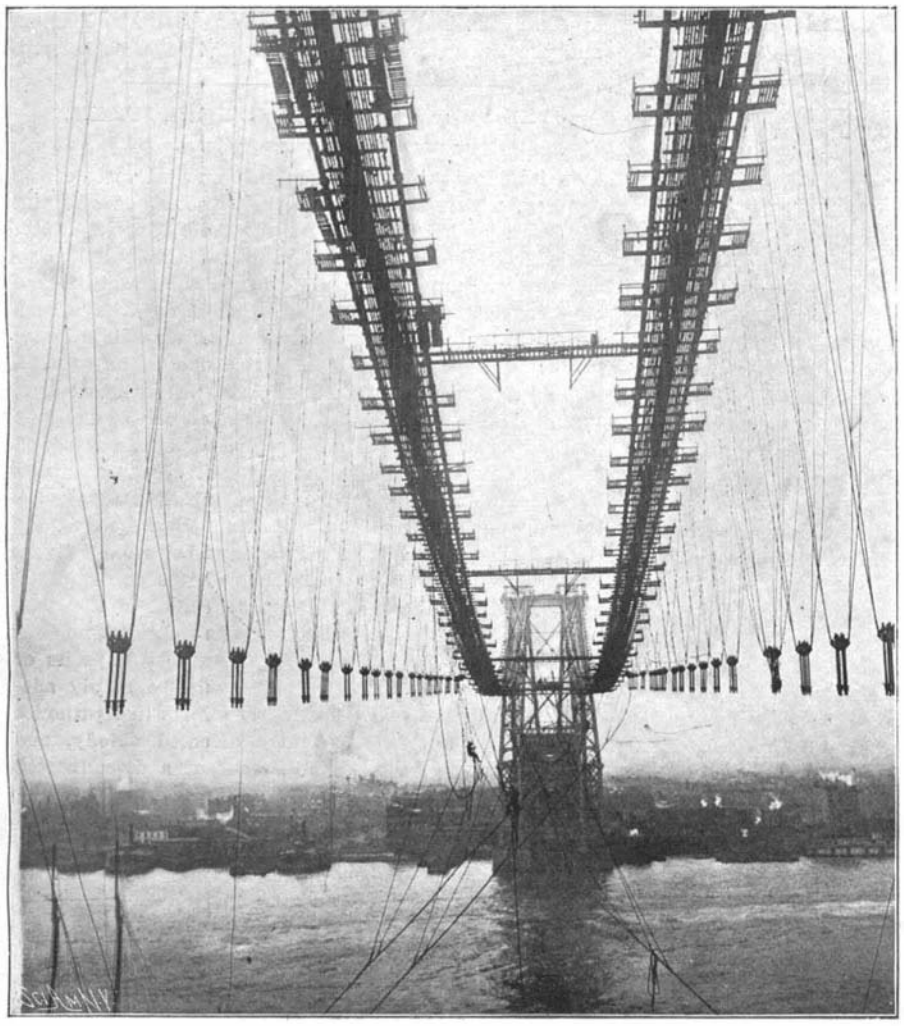
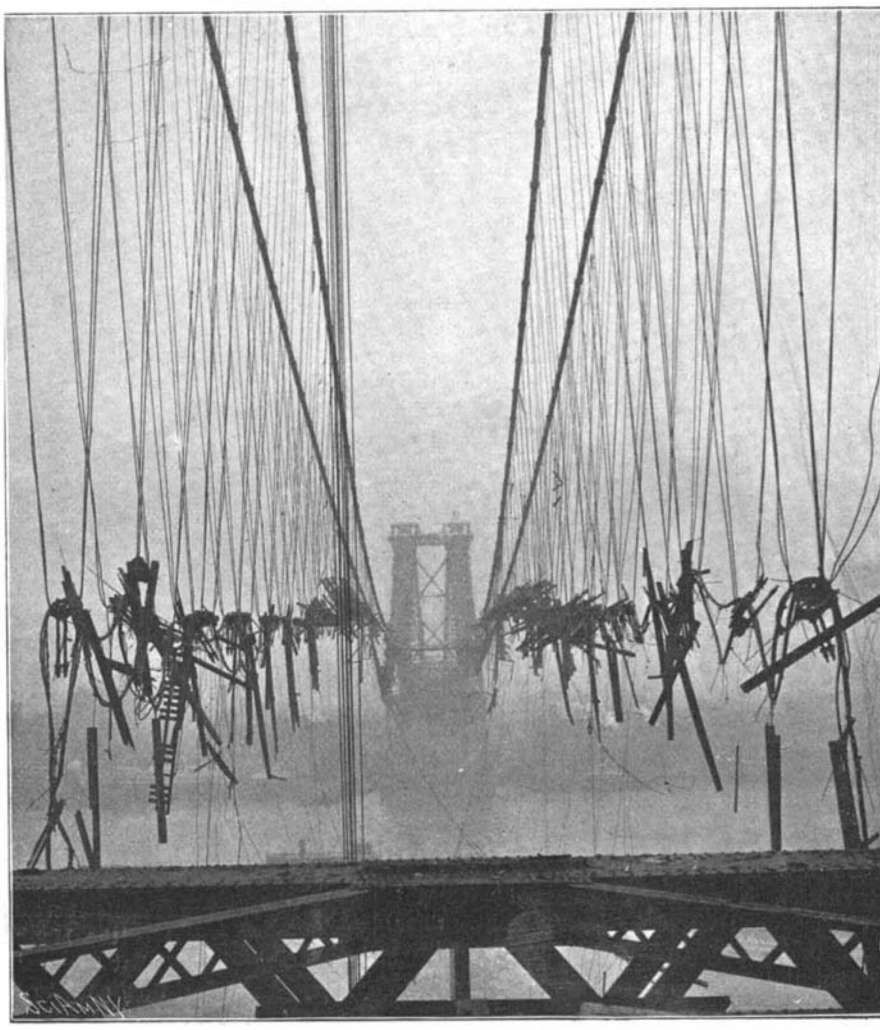


View Before the Fire, Showing Footbridges, and Suspenders in Place.

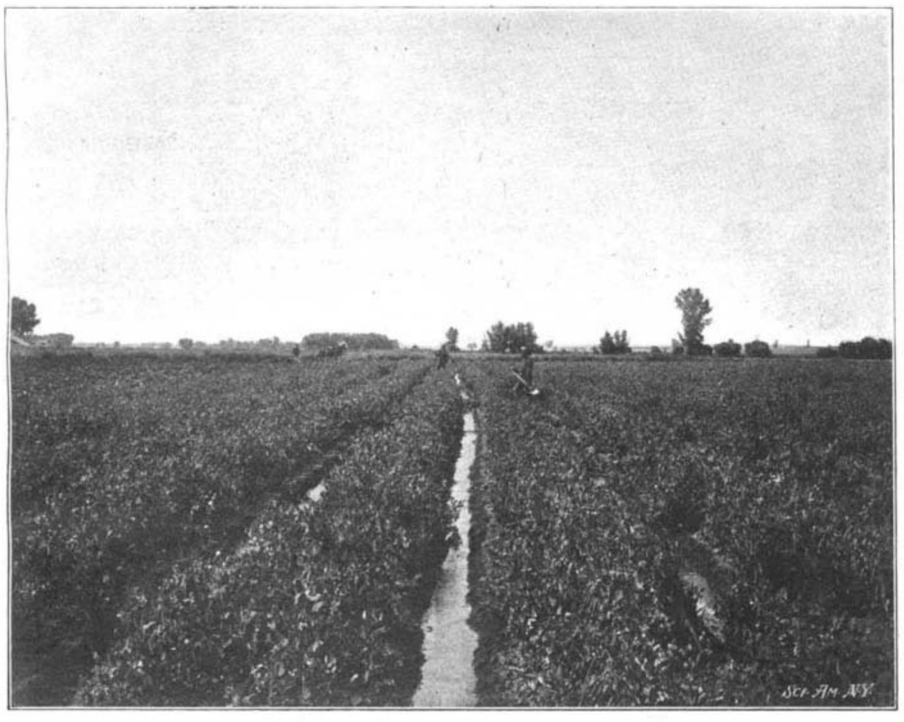


View From Same Position After the Fire, Showing Wreck of Footbridges.

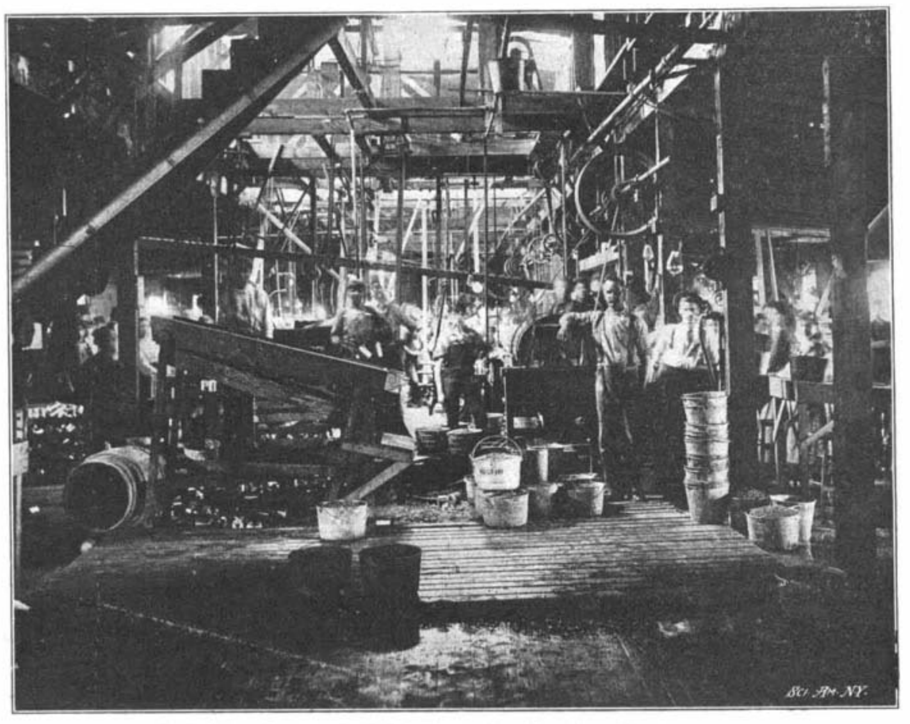
THE NEW EAST RIVER BRIDGE AFTER THE FIRE. THE MANHATTAN [illegible]ER, WHERE FIRE OCCURRED IS IN THE FOREGROUND.—[See page 344.]

not occur at the same point of section. The certainty that this repair work will fully restore the original strength of the cable is assured by the fact that the cables are only strained at present by their own load, each wire in the cable being under a tension of only 200 pounds, whereas when the suspended structure is built each wire will be under a tension of 1,500 pounds. Moreover, such was the high quality of the steel in the wires, that although the specifications called for 200,000 pounds breaking strength per square inch, the wire when tested by the city's engineers showed a breaking strength of from 220,000 to 223,000

The Cultivation of Asparagus on a Large Scale.



A Portion of a 2,500-Acre Bed of Peas at Longmont, Colo.



Interior of a Typical Western Pea-Canning Factory.

Huge Loads of Peas on the Vine, After Their Arrival at the Thrashing Quarters.

THE RAISING OF PEAS AND ASPARAGUS IN THE WEST.—[See next page.]

pounds. Hence the wires can suffer a reduction of strength of 10 per cent and yet be within the demands of the specifications.

The city may consider itself fortunate, then, that as far as the ultimate strength of the completed bridge is concerned, it will suffer no permanent harm from the fire. The loss will be one of time, and for this the contractors for the cables will have to make good at a rate of so many thousand dollars a month, as specified in the contract. Fortunately, the footbridges had done their work and were about to be removed. The suspender cables are practically all hung, and as soon as the wreck of the footbridges has been removed, the work of building the floor and roadways of the bridge will proceed.

THE RAISING OF PEAS AND ASPARAGUS IN THE WEST.

To the Easterner, used to his garden bed of peas a few feet square, the idea of growing this product in beds of 2,500 acres and of harvesting and thrashing peas like so much wheat, is a revelation. The West just now holds in store many such agricultural surprises for those from a distance.

In Longmont, Col., the land is prepared for peas just as it is for wheat. The regular wheat drills are used in sowing peas. Two rows of peas are sowed and then a space equal to that occupied by two rows is skipped, thus leaving 21 inches between the double rows for cultivation and irrigation purposes. When the sprouts begin to appear above ground, a harrow is run over them for the purpose of removing the small weeds, and this operation is repeated a number of times during the early part of the season; but a small per cent of the peas are torn out by this process. When the pea-vines become large enough to cultivate, a corn cultivator is used in throwing earth up to them; when five to six inches in height, a furrow for water is made between the rows. The water is brought to the head of the rows in the highest part of the field by a broad ditch. This ditch in turn is a lateral from a main ditch of 30 to 40 feet in width and carrying water from a mountain stream.

The harvesting of peas is begun at the time favorable to the best results, and regardless of the few blossoms and flat-podded peas, all are mowed down by a cutter which runs just beneath the ground. Then the hayracks arrive and great loads of peas on the vines are hauled to the nearby canning factory and are ready for the thrashing operation. The thrashing is done by means of machines constructed especially for this purpose.

When the peas have been shelled by means of these machines, they next are put through grading machines which sort out the different sizes. The very small peas which are thus obtained represent the immature ones, which would be of much larger size if harvested and packed at a later date. After grading the peas in the manner referred to, they are next parboiled or blanched and are then put upon zinc-lined tables. Here they are looked over by a force of girls, who pick out not only the occasional old peas or weed seeds that may have crept in, but also all broken peas. After this operation the peas are washed again and are then ready to go into cans.

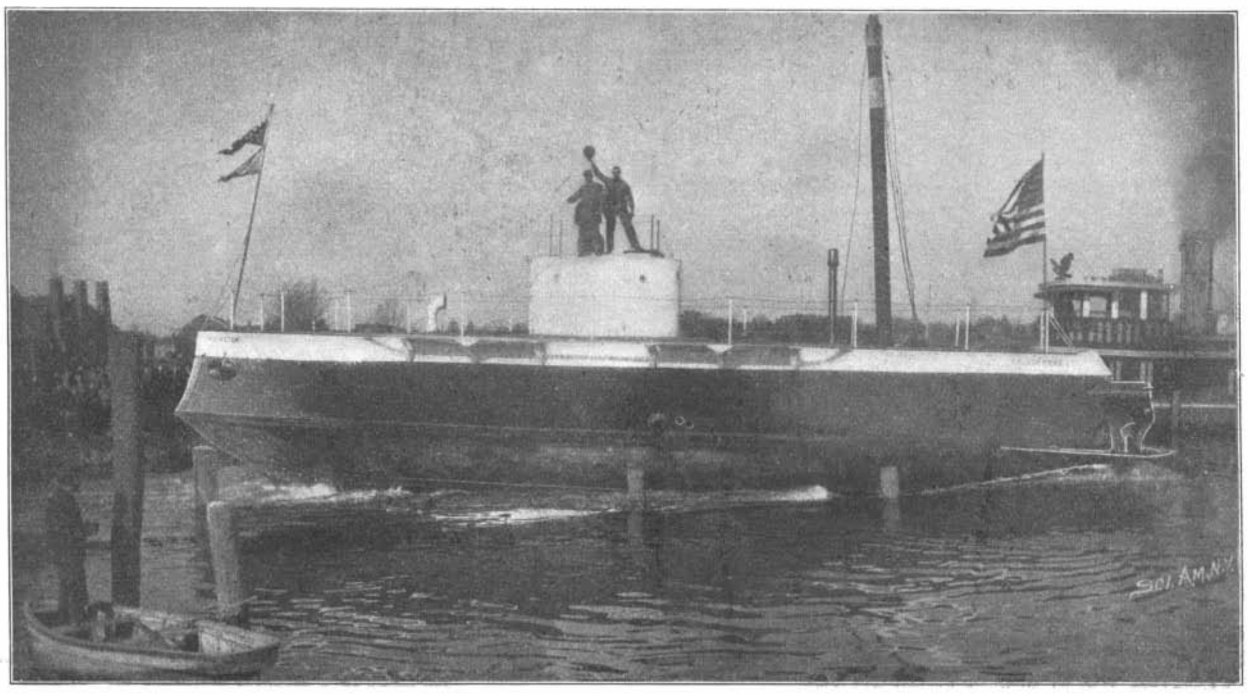
The filling of the cans is accomplished by means of machinery. Each machine fills twelve cans at one time. At the factory at Longmont 40,000 cans are filled in a day. After the cans are filled with peas a weak brine is added, and then the capping machines are put into service. These machines solder the caps on the cans at the rate of 40,000 per day. After capping, the cans are put into iron retorts; the lids of these retorts are bolted down, and the peas are cooked in the cans by means of steam. The labeling of the cans then takes place; this is accomplished by machinery.

In the line of agriculture, Longmont boasts, further, of the largest asparagus bed in the world. This bed comprises 120 acres and contains three-fourths of a million plants. The rows are about six feet apart, and the plants are 12 to 15 inches apart in the rows. The growing of asparagus of late has been attracting a great deal of attention throughout the United States. The Agricultural Department at Washington has been giving it especial attention, and has issued a bulletin to farmers dealing especially with asparagus culture. This bulletin is known as Farmers' Bulletin No. 61. At Long Island and New Jersey asparagus growing has been carried on for many years, but as the great West is being opened it admits of this cultivation upon a much larger scale than could be carried on in the more thickly populated sections of the country. The accompanying photograph of the asparagus field at Longmont gives some idea of the extent of the industry and its employment of both teams and men.

As asparagus is grown to a greater or less extent in many parts of the world, and as it has been known since the early days of the Romans, there are many authorities in many lands who have written upon its culture, and widely diversified have been the methods outlined. There are to-day advocates of both deep and shallow planting. There is also a difference of opinion among growers as to the distance necessary between the plants. It is conceded that, as a rule, the rows should run north and south, so as to secure the full benefit of the sunshine. Loosening the soil at the bottom of the plants and placing manure about their roots has been largely abandoned while, instead, the tops are now given the bulk of attention.

The bulletin sent out from Washington contains many interesting points about asparagus, including its history, a few points of which we will epitomize: Asparagus was first known to the Romans as a medicinal plant. It then grew to a great size. Pliny was able to record spears of asparagus weighing three to the pound. The Gauls, Germans and Britons learned of its value from the Romans and engaged in its cultivation. In France, Holland, Germany and Hungary it was early gathered for the wealthy classes by the peasantry. The earliest settlers brought asparagus seed to America and found the soil and climate suitable. Besides Long Island, New Jersey, and Colorado, asparagus is now cultivated to quite an extent in the Mississippi valley and on the Pacific slope. The demand for asparagus to-day is greater than the supply.

One more agricultural novelty in Colorado demands attention. It is an 80-acre currant patch. As far as is known, this is the largest currant patch extant. It is situated like the asparagus bed at Longmont. In this currant patch there are 135,000 plants set out in rows seven feet apart. The plants are three and a half feet apart in the rows. One hundred and fifty hands, old and young, are employed at picking time. One and one-fourth cents per pound is paid for picking, which enables expert pickers to make as high as $2.50 per day. A currant bush in Colorado will produce at least a gallon of currants. Some produce 10 gallons. Owing to irrigation, it is claimed that the berries are superior in flavor to those grown under other conditions.



LAUNCH OF THE SUBMARINE BOAT "PROTECTOR."

THE SUBMARINE BOAT "PROTECTOR."

BY WALDON FAWCETT.

The submarine torpedo boat "Protector," which was recently launched at Bridgeport, Conn., and is now nearing completion, is the invention of Mr. Simon Lake, who has been a student of underwater navigation for over twenty years. His first experimental undertaking in the field was made with a vessel only fourteen feet long, but in which three men remained submerged at one time for the interval of one hour and fifteen minutes. Later he built the "Argonaut," which served to first bring Mr. Lake's inventions to widespread public attention. The "Argonaut" as originally constructed was only 36 feet in length; but after use in an experimental manner for about a year, the craft was enlarged to a length of 66 feet, with 10 feet beam and 120 tons displacement. This vessel has been in almost continuous use for wrecking and kindred operations for about three years past, and has traveled thousands of miles under her own power along the Atlantic coast, and in the Chesapeake and Delaware Bays and Long Island Sound.

During the Spanish-American war Mr. Lake sought to interest the United States government in his inventions, but was unsuccessful. However, of his own accord, he gave a most convincing demonstration of the practical usefulness of such a vessel for mining operations, by means of an exhibition with the "Argonaut" at the mine fields abreast of Fortress Monroe, Va., and as a result of this disclosure of the possibilities of the invention, the United States Navy Department encouraged the construction of the "Protector."

The "Protector," which is covered by more than two hundred patents, most of which are essentially basic, is in design radically dissimilar to any other submarine boat. The divergence in design is perhaps most noticeable in the hull, which, in the case of the "Protector," is shipshape instead of cigar-shaped. The "Protector" is about 70 feet in length, 11 feet beam, and, when submerged, will have a displacement of 170 tons. In the center of the upper deck of the boat is an elliptical conning tower protected by an armored sighting-hood.

The motive power of the boat is furnished by gasoline engines actuating twin screws, when running awash or on the surface, and by means of storage batteries when submerged. The facilities for gasoline storage give the vessel a steaming radius (on the surface) of over 1,500 miles. The surface speed of the vessel is eleven knots, and it is claimed that she can maintain a subsurface speed of seven knots under any conditions. The storage batteries for utilization for underwater propulsion may be recharged directly from the gasoline engines when the latter are engaged in propelling the boat on the surface.

The "Protector" may be operated submerged at the full speed of seven knots for three hours continuously, without recharging the storage batteries. The air tanks, charged at a pressure of 2,000 pounds to the square inch, are capable of supplying sufficient air to enable a crew of six men to remain submerged for sixty hours. Incidentally it may be noted that the head space in the hull is such as not to necessitate the maintenance of cramped positions by the members of the crew, and the sleeping quarters are very satisfactory, consisting of folding berths somewhat on the order of those with which the ordinary sleeping car is equipped.

The armament of the "Protector" will consist of three 18-inch Whitehead torpedoes, for the discharge of which she has three tubes, one being located on either side of the bow and the third in the stern. The submerging of the boat is accomplished by the same general plan adopted in other submarine craft—the admission of water to submerging tanks. When submerged, however, save for the armored sighting-hood, the boat has a reserve buoyancy, and in order to totally submerge it is necessary to employ the hydroplanes, of which there are two on either side of the vessel. In explanation of the action of these hydroplanes, it may be stated that when the hydroplanes are tipped, the force of the passing water upon the inclined surfaces bodily shoves the craft below the surface, while a horizontal rudder at the stern serves to preserve automatically the balance of the boat.

The vessel will be surprisingly speedy in its changes of station. To change from ordinary cruising condition to that of deck awash will require but three seconds, and an equal interval will suffice for submergence from the awash condition to the exposure of only the sighting-hood. Complete submergence may be accomplished in less than a minute. The "Protector" can, if desired, be sent to the bottom without any interruption of the operation of the batteries; but in all probability the plan to be usually followed will provide for the stoppage of the machinery. The actual descent will be accomplished either by the admission of water to the tanks or by drawing the vessel down by the use of wire cables attached to two anchors,