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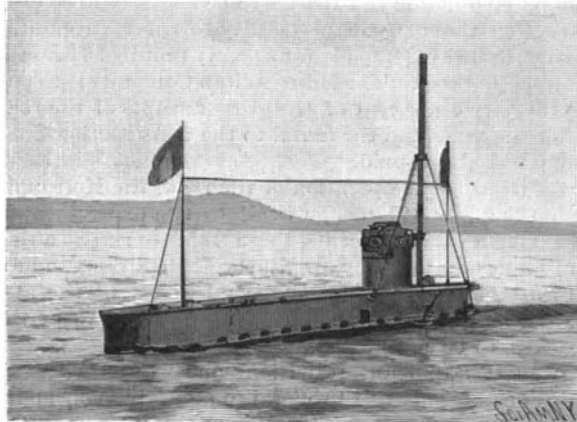
NEW YORK, APRIL 8, 1899.

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FRENCH SUBMARINE TORPEDO BOATS.

The widespread interest which has been aroused by the performances of the submarine torpedo boat "Gustave Zédé" (so named after the late inventor) is out of all proportion to the actual fighting value of this type of vessel; for, although she is probably the most successful and practical vessel of the type that has yet appeared, she has done nothing to warrant the unbounded enthusiasm with which the French people have greeted her appearance—a fact which has been pointed out by some of the most noted experts of the French navy.

However, there is evidently something which takes the popular fancy in the idea of a fighting ship that can move unseen in the depths of the ocean, and strike a fatal blow unnoticed and unsuspected by the enemy. The "Gustave Zédé" has proved her ability to travel at a moderate speed at the surface of the water; she has also shown that she can dive and proceed at a greatly reduced speed below the surface; but it has yet to be shown that she can overtake a modern warship, sink below the water, keeping still in touch with her foe, and then deliver the fatal blow unerringly. In this, as in all other vessels of the class, the weak point is the impossibility of keeping in sight a ship that is on the alert and in full command of her maneuvering powers. At the same time, as is pointed out by the naval officer quoted at the close of this article, there will probably be a sphere of usefulness for the submarine vessel



The "Gymnote" Rising After Submersion.

in assisting in the defense of a blockaded harbor. For this class of work it will rank with the torpedo and the submarine mine.

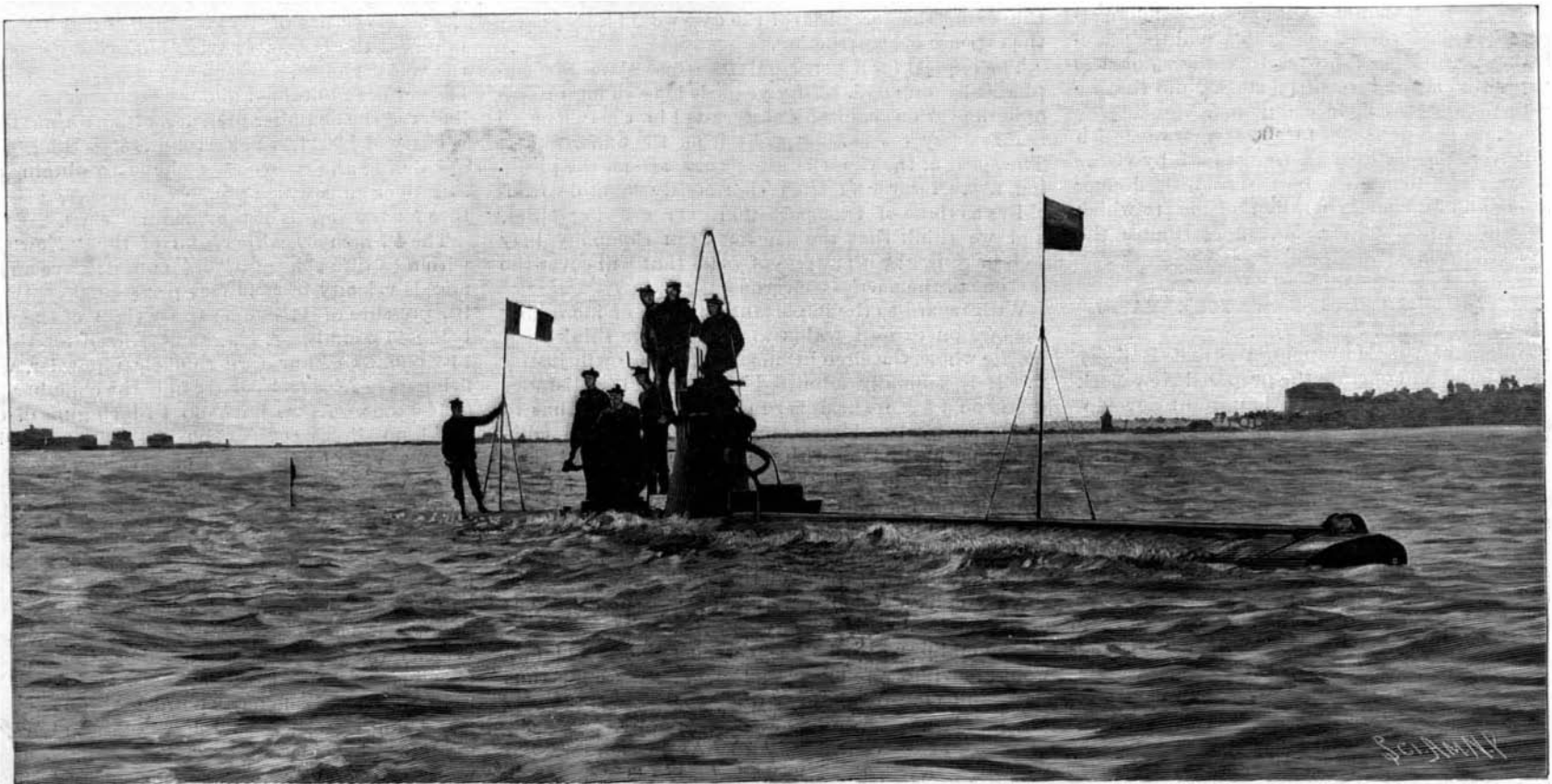
The first of the submarine boats built by Engineer Zédé was commenced at Toulon in 1886. She was named the "Gymnote," and was considered as a mere experimental vessel on which to test the principal problems connected with this type of warship; such, for instance, as those of submersion, steering, visibility, and habitability. The "Gymnote" was to all intents and purposes nothing more than a large Whitehead torpedo, 56.7 feet in length and 5.9 feet in diameter, and with a displacement of about 30 tons. It was provided with horizontal rudders to enable it to dive, maintain its desired depth below water, and rise again to the surface. It was built of steel and was driven by an electric motor of 55 horse power, the current being

supplied from storage batteries. Its speed was about 7 knots submerged, and about 9 knots when traveling at the surface of the water. The storage batteries were sufficient to run the vessel for four or five hours. Buoyancy was secured by means of watertight compartments placed fore and aft; sufficient air was stored in convenient positions within the boat to give the necessary air for the respiration of a crew of four or five men when the boat was submerged. Attached below the hull was a certain amount of ballast, which, if desired, could be released from the inside of the vessel, thereby allowing the latter

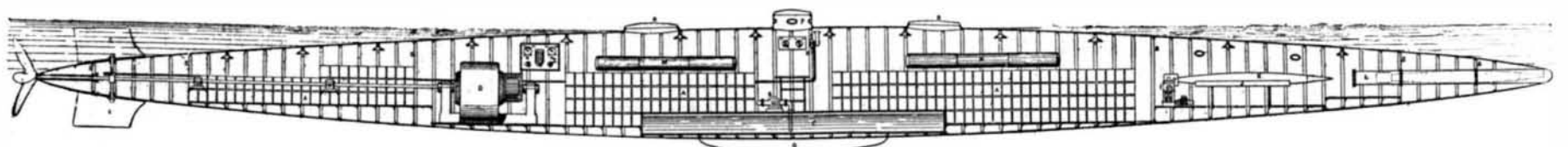
(Continued on p. 217.)



The "Gymnote" Traveling at the Surface.



The Submarine Torpedo Boat "Gustave Zédé" in the Roadstead of Toulon.



Longitudinal Section Through the "Gustave Zédé."

Length, 148 feet; diameter, 10.75 feet; displacement, 260 tons; propulsion by a 750 H. P. electric motor; submersion through the introduction of water and the use of a horizontal rudder. A, accumulators; B, submersion pump; C, submersion chamber; D, electric motor; E, switchboard; G, rudders; H, steering wheel; J, torpedo support; K, torpedo; L, torpedo tube; M, air reservoirs; P, conning tower; R, hatchways; S, water-tight bulkheads.

FRENCH SUBMARINE TORPEDO BOATS.

FRENCH SUBMARINE TORPEDO BOATS.

(Continued from first page.)

to rise quickly to the surface in case of emergency. As the boat was built merely for experimental purposes, it did not carry any torpedo or torpedo tubes. The illustrations which accompany this article show the "Gymnote" at the surface of the water, just after making one of her trial plunges, and the other shows her traveling at the surface with the crew standing upon the bridge or navigating platform which extends amidships on the upper part of the hull. This platform was added subsequently to the first construction of the vessel and does not appear in the sectional view. The tall tube which stands vertically just in front of the pilot house is the "Prismoscope," which is designed to be used when the vessel is submerged, for the purpose of keeping the enemy in sight and determining the bearings of the vessel itself. The upper part of the tube is capable of being bent at right angles and directed to any part of the horizon, so as to give the navigator below an all-round view.

The trials of this little craft were so satisfactory that Zédé determined in 1890 to build a boat of the same type, but of much larger dimensions. The vessel, which was at first known as the "Sirène," was in later years known as the "Gustave Zédé." After construction had been commenced, a few modifications were made in the original plan, such as the substitution of bronze for steel in the construction of the hull and the addition of a platform for use at the surface of the water. Particulars of the vessel are as follows: Length, 147 feet; diameter, 10.75 feet; displacement, 260 tons. The hull is of the general cigar shape, with long and sharply pointed ends, and its model conforms more nearly to the earlier patterns of the Whitehead torpedo than to the later pattern, which has a short, blunt head. The maximum speed on the surface is 14 knots, and about 8½ knots when submerged.

The vessel carries a torpedo discharge tube, which is located in the nose and lies in the longitudinal axis of the boat, and a supply of Whitehead torpedoes containing a charge of 220 pounds of guncotton. It carries a complement of ten men.

The "Zédé" has been the subject of long and tedious experiments, and for two years, during which the ship lay idle, nothing whatever was done upon her. During the last year, however, the experiments have been carried on with very promising results, and her successful experimental attacks upon the French battleship "Magenta," which were made both while the latter was at anchor and in motion, have won for this vessel a world-wide reputation. These experiments were carried out in the vicinity of the Hyeres Islands, and the series was terminated by a trip of about 40 miles from Toulon to Marseilles, during which the "Zédé" behaved exceedingly well, in spite of a somewhat rough sea. After reaching Marseilles the accumulators were still sufficiently charged to enable the boat to make the return trip to Toulon, thereby proving that their capacity is equal to a continuous run of from 75 to 80 miles. It is thus seen that the boat, if used in defense of a blockaded harbor, would have a radius of action extending 35 miles in any direction.

It has been decided to construct another vessel, to be known as the "Narval," which shall be an improved "Zédé," with a greatly enlarged radius of action. The "Narval" was put upon the stocks last year and will be pushed energetically to completion.

It is needless to say that these successful experiments with the "Zédé" have provoked widespread comment, both favorable and adverse. In the first rush of enthusiasm the average Frenchman sees himself in the possession of a weapon which neutralizes at a stroke the invincible powers of the battleship; but as a rule the professional men of the army, and particularly of the navy, have estimated the new vessel at its true worth. Vice-Admiral Dupont, an old and experienced naval officer, has recently warned his countrymen in the columns of the Gaulois against jumping to hasty conclusions regarding the possibilities of the submarine class of war vessels. He says:

"The recent trials of the 'Gustave Zédé,' the presence of the Minister of Marine at these trials, and especially the note, in a certain sense official, which gave forth to the world the success obtained, seem to me to have somewhat excited public opinion, which, always ready to overshoot the mark, will conclude, if care is not taken, by attributing to the submarine boat qualities which it cannot possess and a condition of perfection which has not yet been reached. From this point to attributing to them a part which they can never play in warfare, and forcing our naval constructions on a wrong road, is but a single step. It is necessary that, on the question of submarine vessels, the public should clearly understand that, in a naval war, they have no other than the extremely limited mission of rendering difficult and sometimes dangerous the blockade of a friendly port. It is certainly something, but that is certainly all. It is a question of a weapon offensive in

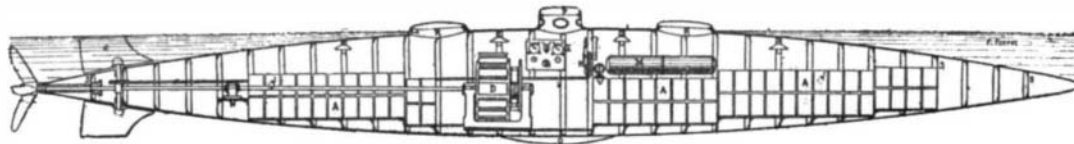
its employ, but purely defensive in its action, especially and almost exclusively necessary for those navies which cannot acquire the supremacy of the seas. The British have never been mistaken. Owing to the undoubted power of their fleet making it improbable, almost impossible, for one of their ports to be blockaded, they have concerned themselves very little with torpedo-boats, preferring to build destroyers with which to annihilate these vessels, and they only seem to have slightly concerned themselves with the submarine navigation question."

The admiral deprecates such hasty action as would be involved in the immediate construction of a fleet of submarine ships, and urges that the French government should conduct further and more exhaustive experiments with the "Zédé" in order to determine her exact powers of attack and defense.

Our accompanying illustrations show the external appearance of the submarine boat when she is traveling at the surface. The photograph from which the engraving was made was taken on the homeward trip when the "Zédé" was returning from its experiments in diving. The crew is grouped about the conning tower on the narrow deck or platform; the officer and two of the men are standing upon a kind of poop which is reached by means of a ladder. The hatches are on a level with the platform, which latter, as we have said, was added subsequently to the completion of the vessel for the purpose of facilitating the boarding and debarkation of the crew. The longitudinal section shows in detail the interior arrangements of the vessel. *L* is the torpedo discharge tube, shown with a torpedo lying within it ready for firing. To the rear of the tube is a rack, *J*, carrying a torpedo. *X*, *A*, *A*, *A*, represent the storage batteries, and *D* the motor; *P* is the conning tower, and below and forward of it is the steering wheel, *H*; *G*, *G*, are the vertical rudders for steering the vessel in a horizontal plane, and horizontal rudders which control the diving and submersion are arranged on each side of the boat.

Discovery of a Mammoth.

On February 8, a Swede and his partner, while marking their claim on Dominion Creek, discovered, according to a Dawson newspaper, a body of a mammoth 40



SECTION THROUGH THE SUBMARINE BOAT "GYMNOTE."

feet below the surface. The story was that the body was in a perfect state of preservation. Unfortunately, there were no scientists in Dawson to examine the body, but, according to press statements, it measured 44½ feet long. Its right tusk was broken, but its left tusk was perfect, so that it was probable that the right tusk may have been snapped off in the fall that caused its death. The tusk which remains measures 14 feet 3 inches in length and 48 inches in circumference. The flesh was covered with woolly hair 15 inches long, of a grayish-black color. The neck was short and the limbs long and stout, the feet short and broad, and had five toes. The flesh was cut and tasted sweet. Mammoth flesh has been tasted on other occasions. It is very unfortunate that an expert geologist was not upon the ground at the time of the find, as it is of considerable importance.

Acetylene Gas Congress.

An international exhibition of acetylene gas methods and appliances will be held in May at Budapest, Hungary, in connection with the second International Acetylene Congress. The industrial palace will be utilized for the exhibition, and silver and gold medals will be awarded. The deliberations of the congress will bear upon the theoretical and practical questions relating to carbide and the acetylene gas industry. It will discuss the standard methods for the control of carbide and acetylene gas and the best means for removing the obstacles which prevent the general use of acetylene gas. Anyone who is interested in the industry may become a member of the congress upon the payment of five florins, and he will then receive the publications of the congress. The secretary is Bela Szasz, Budapest, Hungary.

A Scheme to Fortify Hart's Island.

There is reason to believe that the United States government intends taking Hart's Island in Long Island Sound for the purpose of fortification, and that a number of disappearing guns of large caliber will be mounted on the highest point of the island, which commands the Sound. The government has already made surveys. There are a number of buildings on Hart's Island, which were formerly used by the city and State for charitable purposes. The plateau on Hart's Island is 500 feet long and 250 feet wide and stands exactly at the entrance to Long Island Sound.

Correspondence.

A Correction.

To the Editor of the SCIENTIFIC AMERICAN:

On page 178 of the SCIENTIFIC AMERICAN for March 25, I regret to see an announcement that Prof. Thomas J. See "has been designated as Chief of the Nautical Almanac, to succeed Prof. Newcomb." This statement is without a shadow of foundation in fact, and I trust you will correct it, in order to avoid misleading the very large number of persons interested in science who rely implicitly upon your valuable paper. Prof. See has been assigned to a subordinate position in the Naval Observatory, and has nothing whatever to do with the Nautical Almanac Office.

WILLIAM HARKNESS.

Professor of Mathematics, U. S. N.

March 27, 1899.

Director, Nautical Almanac.

The 1898 Stamp Issue.

To the Editor of the SCIENTIFIC AMERICAN:

During the year 1898 the United States Bureau of Engraving and Printing issued 2,500,000,000 of the common red two cent stamps—enough to go almost twice around the earth. Stacked one upon another, they would pile up 150 miles beyond our atmosphere, equal in weight to two of our big locomotives, and would make a blanket to keep the frost off the city of Washington. If these stamps worked in relays, each taking the letter as far as allowed by the postal regulations, the letter would be carried beyond the most remote star; and, at the fastest speed at the disposal of the postal authorities, would occupy millions of times the age of the earth in transit.

Washington, D. C.

C. FRANCIS JENKINS.

The Strangest Insect in the World.

To the Editor of the SCIENTIFIC AMERICAN:

With reference to Mr. Fitton's letter, page 103 of the SCIENTIFIC AMERICAN of February 18, 1899, the "night butterfly" mentioned by him evidently refers to the large moths *Hepialus virescens* and *rubriviridans*, from 4½ to 5¼ inches in expanse of wing, *virescens* being the smaller of the two; the former is a beautiful green insect with satiny white upper wings marked with irregular darker green lines, and with whitish green under wings, the latter having green upper wings with dark reddish brown markings, and under wings of a pale rust color. Both are tree borers, not root feeders, as stated by some writers, so far as

my experience goes. *Virescens* bores principally in the wood of the New Zealand currant, *Aristotelia racemosa*, or wineberry tree, as the settlers call it, and *rubriviridans* in that of the *Manuka leptospermum* and *Rata melrosideros robusta*. They are believed to be attacked by *Robertsii*, and are distinct species from the large brown moths of the genus *Pielus*, whose caterpillars are also attacked by the same fungus. With regard to the mode of attack, the root feeders might become impregnated by burrowing in the ground in search of food by the spores lodging in the folds of the skin of the neck or other parts of the body, as similarly suggested by Mr. Gray in his "Notices of Insects," pages 6, 7, or the larvæ might swallow the seed with their food; but whether the spores would survive the destroying influence of the gastric juices of the caterpillar's stomach, I could not say, unless the animals were in such an enfeebled condition by the excessive moisture of the ground as to be unable to resist the germination of the fungus, in which case both Mr. Taylor and Mr. Colenso are of opinion that it would gain the upper hand. The soil would no doubt be well supplied with spores washed into the burrows by the heavy spring rains, and as the fibrous roots spread far and wide and many lie near the surface, it may not after all be so difficult to conceive how the fungus gains a permanent hold of the bodies of the caterpillars.

Mr. Fitton states that he has observed the fungus in many stages of growth, undeveloped imagos, and remnants of moths scattered in the vicinity, the latter probably the work of the New Zealand morepork owl, *Athene Novae Zealandiae*, or, as the Maoris term it, *Kainanga*. A collection of such objects is very desirable, as it would, no doubt, tend to verify much that has been said on the subject or correct erroneous impressions. These remarks by no means settle the question, but I think it may be safely conceded that the mystery in which the vegetable caterpillar has been so long shrouded is now in a great measure solved.

GEORGE J. GRAPES.

5 Terrace Road, St John's, Newport, Isle of Wight, England.

More Workmen for the Panama Canal.

The officials of the Panama Canal Company have decided to send agents on March 24 to Jamaica for the purpose of securing 500 to 1,000 additional laborers to work on the canal.