

THE MODERN TORPEDO.

Commenting during the late Spanish war upon the efficiency of the torpedo, we said: "Although torpedo warfare has not as yet achieved results at all proportionate to the amount of thought and skill that have been devoted to it, the failure has probably been due more to a lack of opportunity or of efficient handling than to any deficiency in the torpedo itself." The startling events that marked the opening of the Russo-Japan war have established the truth of that statement, for in the hands of an alert, intelligent, and daring people, this deadly weapon, in the first half hour of hostilities, sank two of the finest battleships and one of the best cruisers of the Russian navy, and incidentally struck a blow at the naval prestige of Russia from which that country will take many years to recover. At the same time, the Port Arthur torpedo attack must be judged at its true value; and, therefore, we must not lose sight of the fact that information is finding its way to the public ear which makes it pretty evident that the Russian ships were not looking for, and were totally unprepared to receive, a torpedo attack. If this is the case, what has been proved is that if the torpedo boat can get unmolested within easy range, the torpedo is fairly sure of its mark—and this we all knew well enough before the war began.

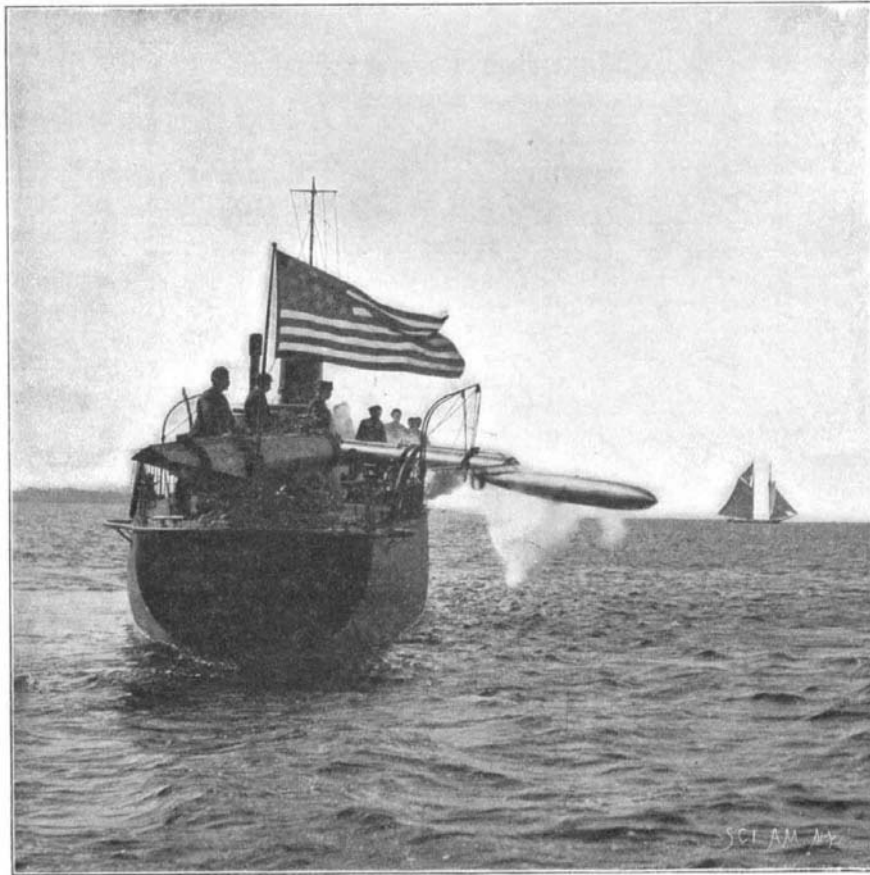
The Whitehead torpedo is undergoing constant development, the latest improvement being the introduction of the gyroscope for the purpose of keeping the torpedo more accurately upon its true course. The latest patterns include this device and are generally of larger diameter and greater length than the earlier types. We show illustrations of a Schwartzkopff torpedo, which is the type used in the Russian navy. It is merely a modification of the Whitehead and operates upon the same principles. In a later issue we shall illustrate the latest type of Whitehead as used in the Japanese navy, and illustrate in detail the operation of the Obrey gyroscope.

The torpedo here shown consists of a cigar-shaped body of phosphor-bronze or steel, divided into six separate compartments as follows: 1, the magazine; 2, the secret chamber; 3, the reservoir; 4, the engine compartment; 5, the buoyancy compartment; 6, the bevel-gear chamber.

The magazine contains the explosive charge, which

pedo strikes the water, the rotation of the little propellers releases the sleeve and leaves the firing pin ready to strike the detonating primer the moment the torpedo meets an obstruction.

The "secret chamber" is the most ingenious part of this most ingenious piece of mechanism. Its piston, pendulum, and springs perform the important work of



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TORPEDO PRACTICE AT NEWPORT, R. I.—LAUNCHING A WHITEHEAD TORPEDO FROM THE TORPEDO-BOAT "MORRIS."

regulating the horizontal rudders which keep the torpedo at the proper depth. Immediately in front of the secret chamber is a narrow compartment perforated on its walls to allow the outside water to enter. The front wall of the secret chamber carries a piston, *a*, which can move in the direction of the axis of the torpedo. The pressure of the water is resisted by three coiled springs, as shown in the longitudinal section. At a certain predetermined depth, according to the tension on the springs, the springs and water pressure will be in equilibrium; below that depth the piston

first part of its run is made on a wave line which crosses and recrosses the desired and ultimate level of immersion, the piston and the pendulum gradually bringing the torpedo to a true course. The reservoir forms the central body of the "fish." It is made of forged cast steel and is tested up to seventy atmospheres. A tuyere at its after end feeds the air to the engine. The torpedo is driven by a three-cylinder engine, with cylinders 120 deg. apart, acting on a common crank. The engine is started by means of a valve which is opened by a lever striking a projecting lug on the launching tube, when the torpedo is fired.

The buoyancy chamber is an air-tight compartment, the purpose of which is to afford the proper buoyancy to the torpedo; it carries a piece of lead ballast, by shifting which the trim can be controlled. The two tubes, *f* and *g*, carry the connecting rods for controlling the horizontal diving rudders.

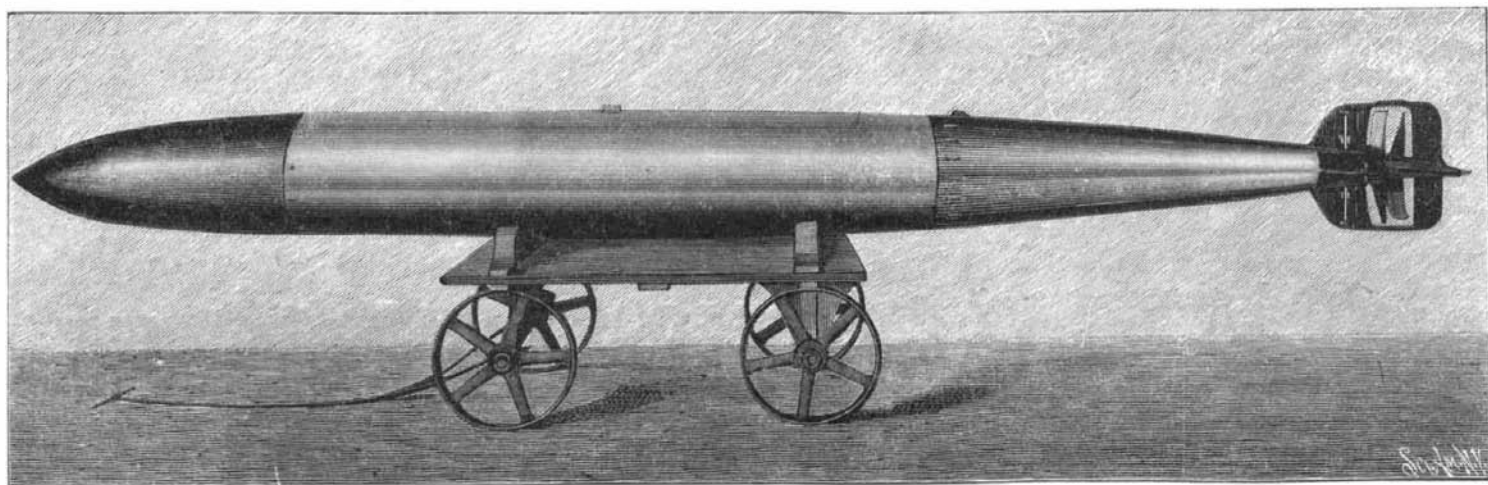
Next comes the bevel gear chamber, where is located the gear, *l*, for causing the propellers, *m*, to rotate in opposite directions. The after propeller is keyed to the main shaft; the forward propeller is keyed to a sleeve which rotates freely upon the main shaft, and the motion is reversed by means of two bevel-wheel gears which turn on a spindle at right angles to the main shaft. The "tail" consists of a stock with vertical vanes, which act as the vertical rudder, and two frames which carry the horizontal rudders.

The torpedo is fired from a launching tube by the explosion of a small charge of gunpowder behind it. This compresses the air which surrounds the rear half of the torpedo and thrusts it out of the tube without any serious jar.

The range and speed of the torpedoes vary with the size. The weapon here shown is 14 inches in diameter, 15 feet in length, carries 90 pounds of gun-cotton, and has a speed of 28 knots for a range of 800 yards. The 18-inch Whitehead torpedo is 16 feet 7½ inches in length, carries a charge of 220 pounds of gun-cotton, and has a speed of 31 knots for 1,000 yards.

The Destructive Action of Radium on Fabrics.

In a recent number of Nature Mr. Blythwood states that he happened to replace the usual mica plates used in connection with the ordinary ebonite box with a piece of cambric, so as to permit the whole of the emanations to pass out, the mica stopping the alpha



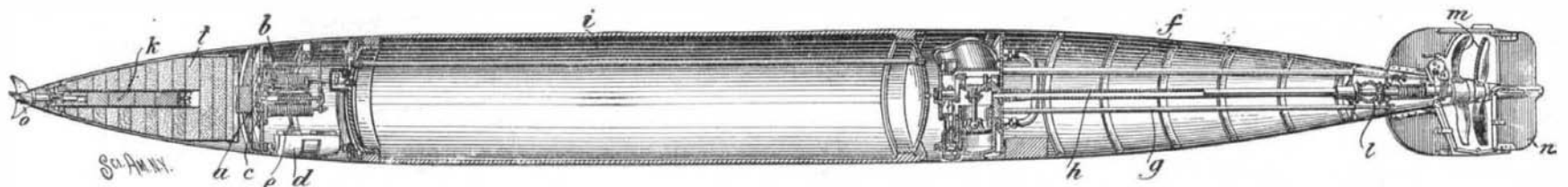
SIDE VIEW OF A 14-INCH TORPEDO.

consists of a series of disks of wet gun-cotton packed snugly together. The cartridge primer, *k*, for exploding the charge, consists of several cylinders of dry gun-cotton packed in a tube which passes through perforations in the gun-cotton disks, *t*. The foremost of the six cylinders contains a detonating primer consisting of fulminate of mercury. The small propeller at the extreme point of the torpedo is part of an ingenious safety device for preventing premature explosion in handling. When not in use, the firing pin is held in check by a sleeve; but as soon as the tor-

pedo will be driven in by the water pressure, and above it the springs will push forward the piston. To prevent too sudden oscillation in this action, the piston is connected to the rod, *e*, of a swinging pendulum, *d*. The motion of the piston is communicated by rods, which pass through the hollow stay rods of the air chamber to the horizontal or diving rudders. If the torpedo goes too deep, the piston moves back, the pendulum swings forward, and the rudders are elevated, the reverse movements taking place if the immersion is not sufficient. When a torpedo dives into the water, the

rays. In four days the cambric was rotted away. Mr. Blythwood states that he has renewed the cambric several times with the same result.

The United States Navy Bureau of Steam Engineering is about to place an order for nickel steel boiler tubes and condenser tubes, to be installed on one of the vessels plying in home waters, so that the tests which will be made can be under constant supervision. A careful comparison will be made of this material and the simple steel tubes now in use.



t, explosive charge; *k*, cartridge primer; *a*, safety device to check premature explosion; *a*, depth-regulating piston; *e*, rod of swinging pendulum *d*; *i*, compressed air chamber; *f* and *g*, tubes that contain rods connecting depth-regulating device *a*, *e*, *d*, with diving rudders; *l*, bevel gear for causing propellers *m* to rotate in opposite directions; *n*, vertical rudder.

LONGITUDINAL SECTION THROUGH A SCHWARTZKOPFF TORPEDO, A TYPE USED IN THE RUSSIAN NAVY.