Providing an Ocean Liner with Listening Ears

AN ocean liner is coming close to port and a dense fog blankets the sea; yet the engine is running at a scarcely noticeable reduced speed.

"What a reckless pilot!" might be your thought. But if you stepped into the cabin where the navigating officer is listening to what the telephone receivers have to say, a remarkable condition is disclosed. Not only every vessel within a radius of about fifty miles whose propellers are working, but every lighthouse signal station or bell buoy, can be heard. From the direction of the sound and its intensity, the inbound steamer can be safely steered through the fog. Not only that, but the depth of water in which it is moving can be gaged, provided the water is not more than one hundred fathoms deep. "How is this wonderful result accomplished?" asks the uninitiated.

The captain of the *Breckinridge* and H. C. Hayes, one of the inventors, listening in on the hydrophone

Installed on a ship the hydrophone indicates the approximate depth of the water, as well as discloses the presence of other craft. It can also be used to communicate with passing aircraft, and is, in all, a wonderfully useful instrument.

The hydrophone, as used for sounding the depth of the water, consists of a set of microphones which are placed in a tank in the keel of the vessel, totally submerged.

In the forward part of the vessel, at a known distance from the ship's center, is the registering part of the instrument, consisting of a dial that points out certain angles of a semicircle. Aft is the propeller, the noise of which is reflected from the bottom of the water.

The angle of reflection equals the angle of incidence, in sound as well as in light, and this angle is indicated on the dial.

The reflected sound, reaching the microphones, causes the dial to move with the shifting of the ship's position, as the sound is sent back from the various planes of the sea-bottom.

A simple calculation, arrived at from a table, enables the navigator to chart the region over which the vessel is passing.

The One-Man Submarine Is Here

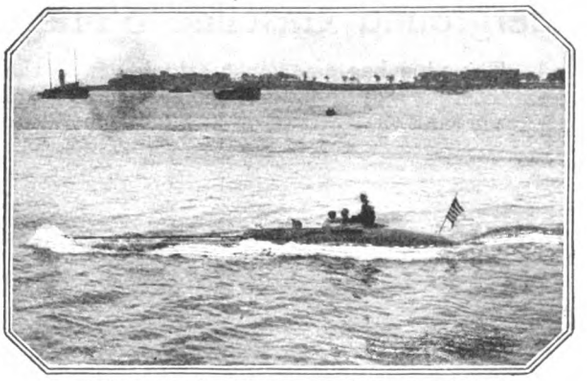
OUT from the fleet darts the *Sea Hornet*. It is a mere speck, barely visible, like a small raft moving at great speed, showing only six inches of surface above the water.

The *Hornet* is a one-man submarine which travels at a speed of 30 knots and carries a torpedo charged with from 300 to 500 pounds of T.N.T. The length of the submersible is 40 feet and its weight is 8500 pounds. The crew consists of one man. He pilots the craft and directs and fires the torpedo.

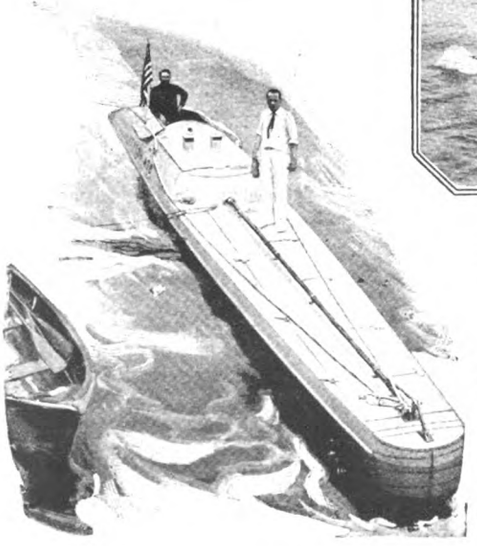
In firing, the gate at the bow is raised by means of a latch controlled from the conning-tower, thus admitting the water to the torpedo-chamber. The mechanism of the torpedo is started and the deadly missile is directed upon its course. Then the gate is closed and a powerful pump operated to remove the water from the compartment. Just forty-five seconds are required to get the submarine ready to speed up its engine of 200 horsepower. At 30 knots an hour it swings back to the protection of the fleet to receive a new charge.

This interesting invention was designed by W. B. Shearer. The miniature submarine can travel on the surface, and from its size might be mistaken for a motor-boat. Submerged, its forward deck is entirely concealed and barely six inches of the rear portion of the boat projects above the water.

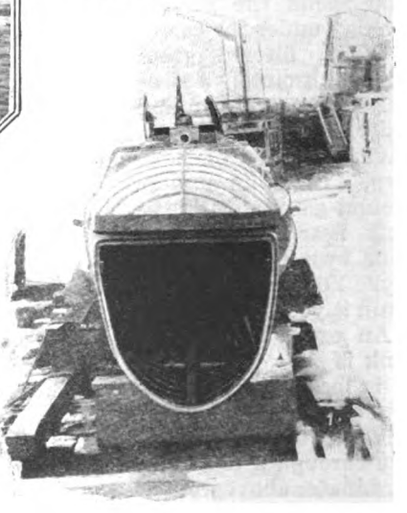
Only from the air would it be easy to detect the *Sea Hornet* going on her "lawful occasions."



When she is submerged, the forward deck of the minature submarine is entirely concealed and barely six inches of the rear portion of the boat projects above the water



The one-man submarine is scarcely larger than a motor-boat. It is a trim little craft above the water, with a speed of thirty knots an hour



The gate in the bow of the submarine opens, the torpedo shoots out, and the gate closes. A powerful pump ejects the water that entered the torpedo-chamber