

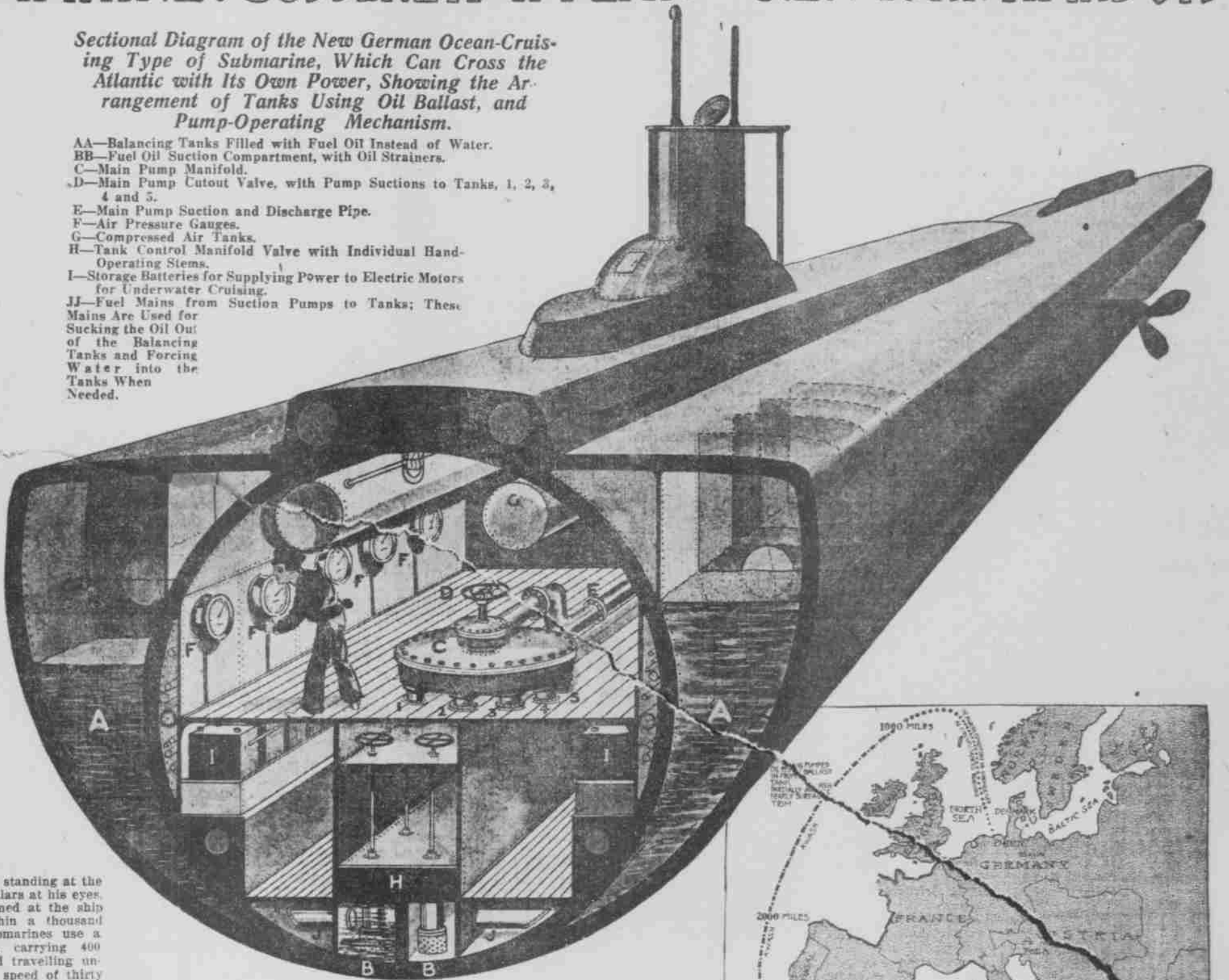
# HOW GERMAN SUBMARINES MIGHT SUDDENLY APPEAR IN NEW YORK HARBOR

"It is a fact that it would be perfectly possible for a flotilla of German submarines to negotiate the trans-Atlantic passage and maintain itself off our coast by means of secret bases in the West Indies, or even on the very coast of the United States itself. By filling its ballast tanks with oil in place of water, at the start of its voyage; by travelling at slow speed on the surface by night, and even by day when no vessels were in sight, it would be possible for one of the largest submarines to reach our coast with a reserve of oil fuel sufficient for several days' cruising. A submarine base for replenishment of oil supplies would be a very small affair, and it could be snugly located on some unfrequented stretch of our coast, especially in the North; and the refilling of oil tanks could be done at night. It is as well to remember that a surprise submarine attack within our harbors and naval bases is to-day physically practicable."

From The Scientific American.

Sectional Diagram of the New German Ocean-Cruising Type of Submarine, Which Can Cross the Atlantic with Its Own Power, Showing the Arrangement of Tanks Using Oil Ballast, and Pump-Operating Mechanism.

- AA—Balancing Tanks Filled with Fuel Oil Instead of Water.
- BB—Fuel Oil Suction Compartment, with Oil Strainers.
- C—Main Pump Manifold.
- D—Main Pump Cutout Valve, with Pump Suctions to Tanks, 1, 2, 3, 4 and 5.
- E—Main Pump Section and Discharge Pipe.
- F—Air Pressure Gauges.
- G—Compressed Air Tanks.
- H—Tank Control Manifold Valve with Individual Hand-Operating Stems.
- I—Storage Batteries for Supplying Power to Electric Motors for Underwater Cruising.
- JJ—Fuel Mains from Suction Pumps to Tanks; These Mains Are Used for Sucking the Oil Out of the Balancing Tanks and Forcing Water into the Tanks When Needed.



THE startling fact has been amply demonstrated that the Germans can send their dreaded submarines across the Atlantic Ocean to the shores of the United States.

We need not pay much attention to the report that the German submarines are already using a base off the Maine coast for the purpose of operating against British shipping. The mere fact that they could do so is of vital importance to the United States and should be fully realized by those who wish to protect our coasts against all possible serious war dangers.

Remember that the appearance of a fleet of enemy submarines off our coast with bases of supply to maintain them in prolonged service would mean the stoppage of all commerce on our coasts and in our harbors and the torpedoing of our passenger boats, unless we had the most up-to-date equipment to deal with them.

To meet them we need not only a fleet as large as any other nation, but a large auxiliary fleet of submarines, aeroplanes and fast patrol vessels.

By sending a submarine through hostile waters all the way from Emden, the naval base on the North Sea, to the Dardanelles, a distance of 4,100 miles, the German navy has proved its ability, beyond question, to send submarines to New York, a distance practically equal to that already covered.

These vast distances are rendered possible by the revolutionary construction of the new petroleum-driven type of German submarine. The water ballast tanks, which are an essential feature of the submarine, enabling her to rise and submerge, are filled with petroleum at the start of the voyage. As the fuel tanks are exhausted the petroleum from the ballast tanks flows in and its place is taken by water.

The petroleum engine drives the submarine while it is on the surface, and at the same time accumulates power in the electric engines, which drive the boat when submerged.

Skilful handling of the submarine increases its cruising radius in various ways. Steamships may be engaged or forced to tow the submarine in midocean when out of reach of hostile cruisers in order to economize fuel.

In making its now famous voyage to the Dardanelles the German undersea boat had to thread her way through the North Sea, almost constantly within sight of British patrol vessels. It would have been impossible for her to go south through the Straits of Dover, because this is so narrow that it is almost completely filled up with mines and other obstructions. The northward course compelled the submarine to go around the far north of Scotland. This added 1,500 miles, almost entirely within sight of the British Isles, to her journey.

When the submarine reached the Straits of Gibraltar there were numerous British cruisers constantly patrolling the narrow waterway to be passed. The submarine had passed several Spanish steamers into her service. The British patrol vessels went to investigate these suspicious looking ships, which then turned back to sea. While they were doing so the submarine submerged and kept on through the straits in an eastward direction toward the Dardanelles. The signs of its presence, which might have been detected by keen observation, were missed while the patrol vessels were chasing the decoy steamers.

The new German submarine is a comfortable sea-going vessel when on the surface, or in "surface trim," as it is called. The decks are well above water, the craft is able to open her hatches, and the ship is navigated from the bridge. She has a long, flat deck carried on a light superstructure, which has nothing to do with the submerging of the vessel, as it is perforated to allow water to run freely in and out.

The deck is surrounded by a rail consisting of stanchions and wire rope. She carries two masts hinged at the deck, which can be raised to a vertical position for carrying the wireless. When the ship is going to submerge the wireless is removed, the two masts are folded on deck and tied down, the hand railing, the bridge and its fittings are taken down and sent below. After the last of the crew has disappeared through the hatchway it is closed and bolted securely from within.

The submarine then is in the awash condition, the main ballast tanks being filled and all hatches and other openings tightly secured. In this condition she has a slight reserve buoyancy of a few hundred pounds. The oil engines are now disconnected and electric motor started. As soon as she has way on the horizontal diving planes are depressed and the ship descends at a moderate angle until the desired

depth is reached. The small reserve buoyancy tends to make the boat rise to the surface, and this is counteracted by maintaining a slight degree of downward helm.

Inside the boat is a pressure dial which shows the man at the wheel the depth at which the boat is travelling.

When an enemy's ship is to be attacked the submarine is sunk until the tops of the periscopes only are above the water. Through these the commander has clear vision of objects on the surface the view being very much the same as he would obtain standing at the surface with good binoculars at his eyes.

The torpedo is then aimed at the ship from any distance within a thousand yards. The German submarines use a twenty-one-inch torpedo, carrying 400 pounds of explosive, and travelling under its own power at a speed of thirty to forty knots.

If the submarine is attacked by a number of torpedo destroyers, which are the most effective surface vessels for this kind of warfare, it can escape altogether by admitting sufficient water to destroy the reserve buoyancy and settle quietly on the bottom.

This is known as "going to sleep." When the commander wishes to rise to the surface he can do so by admitting compressed air to the ballast tank, which blows out a portion of the water, and starting his electric motors. Then by lifting his horizontal planes he can come to the surface where he pleases.

These new German submarines have a surface displacement of a thousand tons and are 300 feet long. The maximum speed at the surface is about twenty knots, and submerged they can make a speed of about eleven knots, with a radius of about a hundred miles, at the end of which the stored electric power is exhausted and it is necessary to come to the surface to generate power. When running at low speed at the surface they can travel about 7,000 miles without replenishing their oil tanks.

A dozen giant torpedoes are carried on this boat. They have four torpedo tubes ahead and two astern, making it possible for them to fire the whole of their torpedoes in quick succession if the exigencies call for it.

The submarine is the gun as well as the ship, and it must be steered to aim at the object which it is desired to hit.

It is an interesting fact that the aeroplane has proved a very effective weapon in guarding against submarines and is likely to be more so as the ability of the planes to keep in the air for a long period is increased. That is why the United States needs a large supply of the type of seagoing aeroplanes known as hydroplanes to defend our harbors against possible submarine attack.

The value of aircraft in detecting submarines lies in the fact that their height eliminates reflection at the surface of the water just as the glass-bottomed boats of Santa Catalina do. In clear water the aviator can see a submarine at a depth of fifty feet or more and can signal to a patrolling torpedo boat or to a following dirigible. The latter approaching the surface closely can drop a heavy bomb on the submarine, which, if it rises to repel the attack by its high-angle guns, can be rammed by nearby destroyers.

The weakness of the submarine has been its inferiority in gun power, as compared to such light vessels as the torpedo destroyer, but this is being corrected, and there is every reason to believe that we shall before long see the submarine battleship whose details have already been thought out by American naval constructors.

The German submarine attack by gunfire on the liner *Armenian*, the sinking of the *Crown of Castle* off Scilly Islands on March 29 in the same manner by the *U-28*, and other recent exploits, show that the latest German submarines are very much more powerful in gunfire than the earlier ones. They are firing a four-inch shell weighing thirty-three pounds. The gun with its recoil cylinder and sheltering hood is

mounted upon a revolving pedestal, with seats for two operators. The revolving pedestal is supported by a plunger elevator worked by a pneumatic cylinder. The gunhead is really the hatch cover of the boat, and when the weapon is lowered this cover sinks into position against a rubber gasket in the recess at the top of the hatch. The gun pointers take their position when the structure is down in the interior of the boat and rise with it when the hatch cover is raised.

We have seen that it is easily possible for the newest submarines to cross the Atlantic from the European continent to our shores. The travelling radius of 7,000 miles mentioned for these vessels would permit them to cross and leave them a margin of about 3,000 miles for manoeuvring up and down our coasts. This, of course, would give them enormous possibilities of doing injury to our shipping, commerce and warships.

Along our vast and thinly populated coast there are thousands of bays, creeks, inlets and islands where a submarine could probably find a secret hiding place or base, secure from observation by our few naval patrol vessels.

The coast of Maine, with its hundreds of deep-water inlets and indentations, appears to offer a particularly great number of such hiding places. From a central point on the Maine coast to New York, allowing for a considerable detour out to sea, is about 350 miles. The new submarine, after her transatlantic voyage, could therefore make about five round trips from her hiding place on the Maine coast to New York before exhausting her original supply of fuel. Boston would be within much easier distance.

The southern part of our Atlantic coast also offers an abundance of hiding places from which the principal ports of the South and the Gulf could be terrorized. The Sea Islands of South Carolina would furnish practically undiscoverable hiding places. Then there are the Bahama Islands, over five hundred in number, and mostly uninhabited, stretching from Florida to the West Indies. Here any number of submarines could hide in safety.

The submarine could not only come here and operate for a considerable time with her original supply of fuel, but there are many methods by which her supplies could be renewed and she could be enabled to keep up her predatory operations indefinitely.

The commonest procedure by the Germans is to engage small steamships, generally travelers, firing neutral flags, to supply the submarines with fuel. The submarine comes to the surface, a pipe line is run from the tender to her tanks and the oil fuel pumped in. To guard against such a procedure by an enemy we should need a much larger navy than we have and constant vigilance among our patrolling vessels.

There are, of course, other ways in which the predatory submarines could be maintained. Spies and agents of the enemy living in our own country could convey oil and provisions to the submarines in their secret lurking places. Our coast is so vast and so poorly watched that it would be much easier to conduct such operations here than in Europe.

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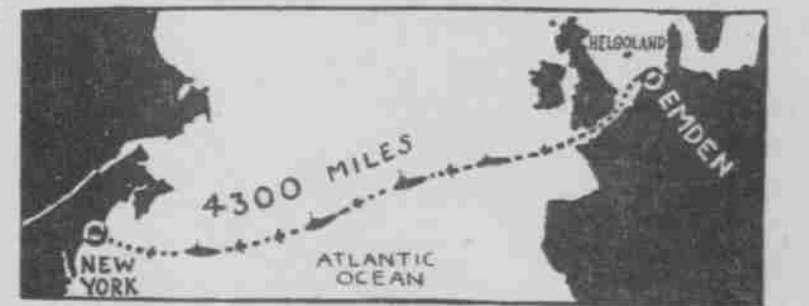
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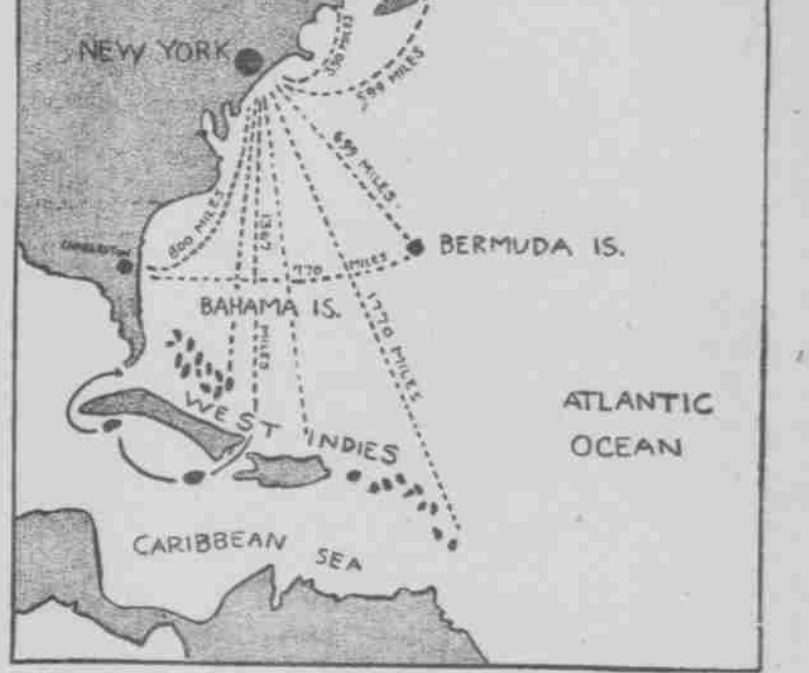
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The Actual Route Followed by the German Submarine Which Went from Emden to the Dardanelles and There Torpedoed Two British Battleships.



Map of the Route and Distance That Would Have to Be Covered by a Submarine Travelling from the German Submarine Base, Emden, to New York.



Map Showing Various Convenient Places That Could Be Used with Ease by an Enemy Submarine as Bases of Operation Against New York After She Had Crossed the Atlantic.

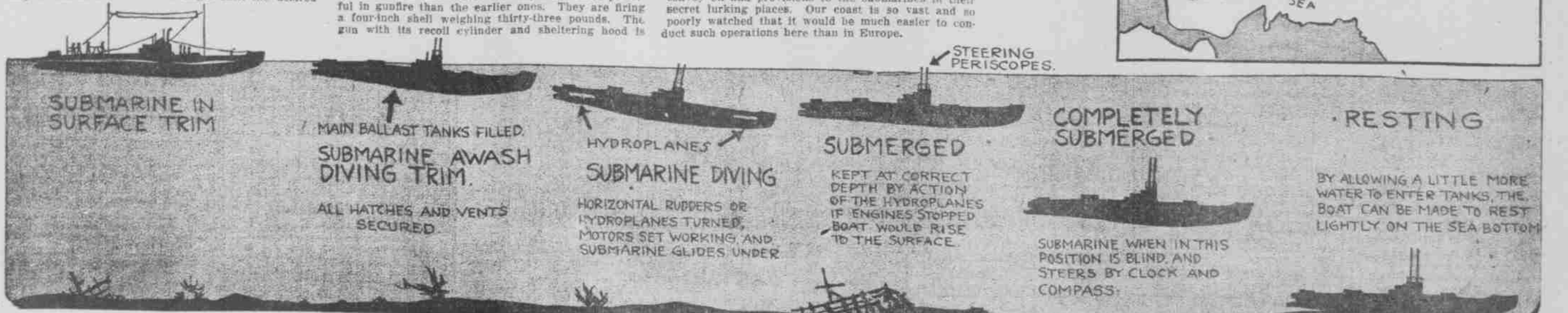


Diagram Showing the Various Stages of a German Submarine in Operation from the Surface to the Bottom.

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